"COMPARATIVE ANALYSIS OF PERFORMANCE EFFICIENCY OF FERTILIZER INDUSTRY IN INDIA"

A THESIS

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SUBMITTED BY
NIRAJ P. RAMANI
ASSISTANT PROFESSOR IN M.B.A
N.R.VEKARIA INSTITUTE OF BUSINESS MANAGEMENT STUDIES
JUNAGADH-362001

UNDER THE GUIDANCE OF
Dr. PRATAPSINH L. CHAUHAN
PROFESSOR, HEAD & DEAN
DEPARTMENT OF BUSINESS MANAGEMENT
(M. B. A. PROGRAMME)
SAURASHTRA UNIVERSITY
RAJKOT – 360 005

JUNE -2007

CERTIFICATE

This is to certify that synopsis titled **"COMPARATIVE ANALYSIS OF PERFORMANCE EFFICIENCY OF FERTILIZER INDUSTRY IN INDIA"** submitted by Mr. Niraj P. Ramani for the award of Degree of doctor of philosophy in the faculty of management is based on research work carried out by him under my guidance and supervision. To the best of my knowledge and belief it has not been submitted for any other degree or diploma.

Date: June, 2007

Dr. PRATAPSINH L. CHAUHAN
PROFESSOR, HEAD & DEAN
Dept. Of Business Management
Saurashtra University,
Rajkot – 360 005.

NIRAJ P. RAMANI (M.B.A.)
ASSISTANT PROFFESSOR IN M.B.A
N.R.VEKARIA INSTITUTE OF BUSINESS MANAGEMENT STUDIES
JUNAGADH – 362 001

DECLARATION

I declare that the thesis entitled "**COMPARATIVE ANALYSIS OF PERFORMANCE EFFICIENCY OF FERTILIZER INDUSTRY IN INDIA**" is a record of independent research work carried out by me under the supervision and guidance of Dr. PRATAPSINH L. CHAUHAN PROFESSOR, HEAD & DEAN, Department of Business Management, (MBA Programme), Saurashtra University, Rajkot. This has not been previously submitted for the award of any diploma, degree, associatesship or other similar title.

Date: June 2007 (NIRAJ P. RAMANI)

Place: Rajkot

This Research Work is Dedicated

To

My Father
Late Shri Pravinbhai Z. Ramani

&

My Mother
Smt. Jyotsanaben P. Ramani

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PREFACE

The present study deals with the comparative analysis of performance efficiency of fertilizer industry which is mainly engaged in production of fertilizer and Agro Products. This study is aimed at exploring the operational efficiency, financial efficiency and partial productivity of fertilizer Group of Companies. The fertilizer industry plays a vital role in the growth and development of a country as it provides required infrastructure for the economic development of the country. As we know that fertilizer industry is based on agriculture. In India agriculture is totally depends on monsoon because we do not have enough facility of irrigation. In India many people are doing farming and there is a huge demand of fertilizer in India. Therefore, it is assumed that in the factor which are obstructions the profitability vis-à-vis liquidity position that leads to operational efficiency and financial efficiency of the industry.

The fertilizers Group of Companies in India which are mainly engaged in the production of fertilizer are taken up for the study. For the purpose of comparative analysis of performance efficiency of fertilizer industry eight (8) leading companies having a large plant have been selected. The period covered under the study extends over seven years from 1999-2000 to 2005-06. Analysis is done by adopting various techniques such as ratio analysis trend analysis etc.

In order to judge the efficiency and performance of the fertilizer Group of Companies with the help of published

accounting annual reports, some publications, and reference books related with performance efficiency was also studied. Most useful information has been gathered from the various journals reports, periodicals and daily newspapers. It is hoped that the thesis will be of immense help and use to practicing financial Managers, Management, Government officials, employees, Shareholders, Academicians and research scholars.

The present study is divided into seven chapters. The first chapter focuses on overview of fertilizer industry. The second chapter describes the Conceptual Framework of concept of performace, concept of appraisal, productivity, financial efficiency and operational efficiency the third chapter is related with the Research Methodology. In the fourth chapter operational efficiency of fertilizer industry has been analyzed. The financial efficiency of fertilizer industry has been critically analyzed in the fifth chapter. The sixth chapter has been devoted for the Analysis of partial productivity. Finally, in the last chapter suitable and significance suggestions have been made and conclusion drawn.

I am thankful to Dr. Pratapsinh L. Chauhan Professor & Head, Department of Business Management, Saurashtra University, Rajkot who has guided me through out my research work.

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Place: Rajkot

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LIST OF ABBREVIATIONS

IFFCO	INDIAN FARMER FERTILIZER CO-OPERATIVE Ltd.
GFCL	GODAVARI ERTILIZER & CHEMICALS LTD.
GNFC	GUJARAT MARMADA VALLEY FERTILIZER COMPANY LTD.
MCFL	MANGLORE CHEMICALS & FERTILIZER LTD.
MFL	MADRAS FERTILIZER LTD.
NFL	NATIONAL FERTILIZER LTD.
CFL	COROMANDEL FERTILIZER LTD.
CFCL	CHAMBAL FERTILIZER & CHEMICALS LTD.
AVR.	AVERAGE
EBT	EARNING BEFORE TAX
EBIT	RARNING BEFORE INTEREST & TAX

CHAPTER-1
Overview of the Fertilizer Industry

Introduction

Fertilizer, Fuel for Growing Plants

Just like humans and animals, plants need adequate water, sufficient food, and protection from diseases and pests to be healthy. Commercially produced fertilizers give growing plants the nutrients they crave in the form they can most readily absorb and use: nitrogen (N), available phosphate (P) and soluble potash (K). Elements needed in smaller amounts, or micronutrients, include iron (Fe), zinc (Zn), copper (Cu) and boron (B).Fertilizer is generally defined as "any material, organic or inorganic, natural or synthetic, which supplies one or more of the chemical elements required for the plant growth". Sixteen elements listed in Table 1.1 are identified as essential elements for plant growth, of which nine are required in macro quantities and seven in micro quantities Of the elements listed in Table No. 1.1, carbon, oxygen and hydrogen are supplies by air and water and are, therefore, not treated as nutrients by the fertilizer industry. The main aim of the industry is to provide the primary and secondary nutrients which are required in macro quantities.

Note: As per the Fertilizer Control Order (FCO) 'fertilizer' means any substance used or intended to be used as fertilizers of the soil and/ or crop and specified in part A of Schedule I and includes a mixture of fertilizers and special mixture of fertilizers. Primary nutrients are normally supplied through chemical fertilizers.

They are chemical compounds containing one or more of the primary nutrients and are generally produced by chemical reactions. Whatever may be the chemical compounds, its most important ingredient for plant growth is the nutrient content. The primary nutrients are nitrogen, phosphorus and

potassium; however, their concentration in a chemical fertilizer is expressed as a percentage of total nitrogen (N), available phosphate (P_2O_5) and soluble (K_2O). Thus, ammonium sulphate contains 20.6 per cent N; single super

Table 1.1
Essential elements for plant growth

No.	Name of element	Nomenclature
1	Carbon	
2	Oxygen	
3	Hydrogen	
4	Nitrogen	
5	Phosphorus	Primary nutrients
6	Potassium	
7	Calcium	
8	Magnesium	Secondary nutrients
9	Sulphur	
10	Boron	
11	Chlorine	
12	Copper	
13	Iron	Micro nutrients
14	Manganese	
15	Molybdenum	
16	Zinc	

Sources: Fertilizer manufacturer's association publication

phosphate 16 per cent P_2O_5 and muriate of potash 60 per cent K_2O.The grade of a fertilizer is expressed as a set of three numbers in the order of per cent N, P_2O_5 and K_2O. If a nutrient is missing in a fertilizer, a zero represents it. Thus ammonium sulphate is represented as 20.6-0-0 (since it does not contain phosphorus and potassium), single super phosphate as 0-16-0 (as it does not contain nitrogen and potash), muriate of potash as 0-0-60 (as it does not contain nitrogen or phosphorus). When a fertilizer contains more than one nutrient, for example diammonium phosphate, it is shown as 18-46-0,

indicating that it contains 18 per cent of nitrogen, 46 per cent of P_2O_5 and no potash. Similarly, "Suphala", a nitro phosphate fertilizer produced by RCF, Trombay, is shown as 15-15-15 indicating that the product contains 15 per cent N, 15 per cent P_2O_5 and 15 per cent K_2O.

Definitions of Fertilizer

Substance that adds inorganic or organic nutrients to soil for the purpose of increasing the growth of crops, trees, or other vegetation.

Any of a large number of natural or synthetic materials, including manure and nitrogen, phosphorus, and potassium compounds, spread on or worked into soil to increase its fertility.

Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth means a substance containing 1 or more recognized plant nutrients, which substance is used for its plant nutrient content and which is designed for use, or claimed to have value, in promoting plant growth. Fertilizer does not include unmanipulated animal and vegetable manures, marl, lime, limestone, wood ashes, and other materials exempted by rules promulgated under this part.

It is defined that Substance which makes the land or soil capable of producing more vegetation or crops.

An artificial chemical is mixture of one or more major plant nutrients such as nitrogen, potassium, phosphorus, and calcium.

Any organic or inorganic material of natural or synthetic origin these are added to a soil to supply elements essential to plant growth.

. A substance that is put on the ground to help crops and other plants grow better. Fertilizers give plants nutrients. Fertilizers can be man-made chemicals or natural materials such as manure. Flock: The name used for some groups of animals of all the same kind. For example, birds, goats, sheep, geese, etc.

Each crop year, certain amounts of these nutrients are depleted and must be returned to the soil to maintain fertility and ensure continued, healthy future crops. Scientists project that the earth's soil contains less than 20 percent of the organic plant nutrients needed to meet our current food production needs. Therefore, through the scientific application of manufactured fertilizers, farmers are meeting the challenge of the future, today.

Improvements in agricultural efficiency through research and technology increase food output while protecting the environment and enriching our world in numerous ways. Fertilizers feed the growing world. As the world's population continues to climb toward an estimated 8.5 billion in 2040, experts estimate that food production must increase more than two percent annually to even maintain current diets. Commercial fertilizers will be key in the fight to feed the growing world. Because fertilizer is the most controllable source of plant nutrients, farmers, through careful selection of nutrient rates, placement, and timing of fertilizer placement, will be able to supply the food plants need at nearly optimum levels to achieve economical and environmental efficiency.

Fertilizers protect the environment. The efficient use of fertilizer also helps to conserve the natural environment. With fertilizers and modern high-yield farming practices, more food is produced per acre each year, so land may be conserved. Fertilizers, used properly, help to prevent the widespread loss of habitat that results from wasteful "slash and burn" low-yield farming, which is a major global environmental threat.

Fertilizers also help to reduce global warming because they improve plant nutrition. Through enhanced photosynthesis, healthy crops give off more oxygen, helping to balance the Earth's atmosphere. It has been estimated that U.S.-grown crops release up to 500 million tons of oxygen into the atmosphere each year.

Fertilizers enhance consumer products. Thanks to fertilizers, fruits and vegetables are available in affordable abundance, as everyone knows. But nitrogen (N), phosphorous (P) and potassium (K), the major ingredients of fertilizers, also forms the basis for many familiar everyday products. For example, nitrogen is used to make nitric acid, a major component in batteries, tires, lacquers and paints. Chances are, the soda you drink contains phosphoric acid, derived from phosphate, and your favorite bath soap contains potash. Fertilizers at work in industry: Aside from their benefits to agriculture, fertilizer components are central to such industrial processes as semiconductor chip making, resin manufacture, cattle feed production, metal finishing, the manufacture of detergents, fiberglass insulation and more, even rocket fuel!
N, P and K: The Building Blocks of Healthy Crops From wheat, corn, rice and beans to apples, pears, squash and zucchini, manufactured fertilizer nourishes plants with the food they need to grow and be healthy. Nitrogen, for example, is part of every plant's proteins and is a component of DNA and RNA, the genetic "blueprints" of life itself. Taken up in larger amounts than other nutrients, nitrogen makes plants green and is usually most responsible for increasing yields.

Another component of plant DNA is phosphate, which helps plants to use water efficiently. It also helps to promote root growth and improves the quality of grain and accelerates its ripening. And potassium, commonly called potash, is important because it is necessary for photosynthesis, which is the production, transportation and accumulation of sugars in the plant. Potash makes plants hardy and helps them to withstand the stress of drought and fight off disease.

Past performance of the fertilizer industry

The global fertilizer industry is relatively small in financial term: an output of approximately $ 30 – 35 billion of final products at ex-factory prices on an “average” year. There are approximately 1000 manufacturing companies

with some 2000 – 3000 production sites for a volume of an estimated 359 million tones in 1998 .The largest companies have less than 5 % market share.

Table 1.2

World Fertilizer Consumption: 1998 (000t product)

Urea	86100
ABC(Ammonium bicarbonate)	45000 est.
NPK's/Blends	42000est
AN/CAN	35400
SSP(Single Super phosphate)	34900
Ammonium Phosphates	30600
MOP(a) (Muriate of Potash)	22400
Nitrogen Solutions	13200
AS(Ammonium Sulphate)	12600
NH3 Direct Application	5500
TSP(Triple Super phosphate)	4700
SOP(Sulphate of potash)	1600
Others(b)	25000
Total	359000

Sources: Fertilizer manufacturer's association publication

(a) excludes k2o in NPK's, blends

(b) Mg nutrients, PK, Nk, KN, micronutrients, etc.

The industry may be conveniently categorized into 4 layers:

- Primary producers or extractors

  Produce basic products or intermediates such as phosphate rocks, potash, ammonia, phosphoric acid, nitric acid, NPK's, etc.

- Formulators, blenders, mixers

  Custom-make products to suit user's needs

- Distributors

  Import and/or supply the products down the distribution chain

- End-users Farmers/agricultural producers

In order to ensure the smooth operation, a number of peripheral parties are involved transporters, bag producers, technology licensors and fabricators,

insurers, financiers, etc. Investment in exploitation or production is generally capital-intensive. The participation of the State had been a common practice. There is a trend towards privatization, principally in the developing and the Former centrally planned countries where they have lagged behind the developed countries in raising private capital.

Currently the world applies the fertilizer products that contain some 140 million tones nutrient to over 80% of the global arable land totaling around 1.4 billion hectares. About 60 % of the fertilizers are used in cereal crops, 10 % in pastures, 8 % in oilseeds while the rest goes to sugar crops, cotton, fruits, vegetables, beverages, horticulture, etc. In turn the lands yield some 2.3 billion tones of cereals, 300 million tones of oilseeds and a wide spectrum of other agricultural commodities. One in four tones of cereals and oilseeds is used to support a farmed animal population of 45 billion. Fertilizers play a key role in sustaining the above by enhancing crop yields. At least 40% of the crop yield is the result of fertilizer input.

Over the last century, the industry has produced, if compounds, blends and micro-nutrients are excluded, less than 20 basic fertilizer products. Among them, calcium cyan amide and basic slag have virtually disappeared. TSP is on the “danger” list while ABC (ammonium bicarbonate) is on the “watch” list. The trend is towards more concentrated fertilizers, with nutrient per unit product increasing from under 30% 25 years ago to nearly 40% currently.

In the absence of new products, the industry, however, has been active in formulating and blending existing materials and as well as improving their quality for both storage and application. Credit should be given for its success in energy efficiency in production. It is worthwhile to mention that there is also limited success in producing controlled-release fertilizers aimed at reducing the impact of nitrogen leach ate to soils. More recently, the improvement in fustigation techniques have successfully extended the scope of cultivation in the arid regions.

Although fertilizer production takes place in nearly 100 countries, there are very few cases of self-sufficiency. Roughly one in four tonnes of fertilizers product or intermediate is sold across the border. An examination by sector the three major nutrients will unveil the complexity of the industry as a whole.

Potash: The primary use of potash in agriculture is to promote plant growth and build resistance to diseases. More than 10% of the output is used as feed supplement for livestock and poultry and in industries for water softening, soaps and TV screen manufacture, and as deicers. The principal ores for potassium chloride are primarily sylvinite (NaCl + KCl) or carnality (KCl + $MgCl_2$). The less abundant ores are hartsalz, kainite and langbeinite. The two latter ores contain potassium sulphate. The mining for ores has reached a very high level of sophistication in Canada in which laser beam, sonar system, auto analyzer and computer direct the entire mining operations.

The ores obtained either from the mines or solar evaporation of brines is then beneficiated using one of the three techniques: thermal dissolution, flotation or electrostatic beneficiation. The choice depends on the composition of the ores, local energy sources and the percentage of insoluble. The thermal dissolution process depends on the differentiation solubility of potassium chloride and sodium chloride with rising temperatures to 100-110°c. The flotation technique relies on the phenomenon of inducing a hydrophobic or hydrophilic bias between Constituent components. Using a frothing agent such as pine oil, the hydrophilic component that appears on the bubble surface when air bubbles are introduced, the product is swiped off by rotating paddles. Electrostatic beneficiation is a dry process in which the dry ore is placed on the vibrating electro statically charged trough at high temperatures (300° - 700°c) whereby the KCl becomes negatively charged while halite positive. The ore that falls through is recycled.

The major environmental concern is the enormous quantity of salts, principally sodium chloride and insoluble that have to be managed to avoid

leaching to the surroundings. To date the potash industry has handled the wastes problem very well.

Potash is a very stable product in the market for its prices and being the least controversial environmentally. There are only 14 producing countries of which the 4 largest producers (Canada, Russia, Germany and Belarus) account for more than three-quarters of the total output. Of the total of about 25 million tonnes of K_2O produced annually, less than 20% are used for home consumption. The most important exporters in 2000 were Canada (41%) followed by Belarus, Russia and Germany, accounting for about 13% each while Israel (7%) and Jordan (6%) have gradually gained market share

Table 1.3

World Potash Production and Exports (000t K2O)

	PRODUCTION		EXPORT	
	1988	2000	1988	2000
Canada	8327	9174	7623	8468
Russia	--	3716	--	2739
Germany	5800	3409	4189	2720
Belarus	--	3372	--	2791
Israel	1244	1748	1035	1513
Jordan	805	1162	802	1129
USSR	11301	--	3491	--
Others	4435	3224	1815	1050
	31192	25815	18955	20410

Sources: Fertilizer manufacturer's association publication

The four regions: Asia, North America, West Europe and Latin America accounted over 90% of the global imports in 2000. Among the individual countries, the largest importers were: USA (4772 Kt K_2O), China (3039 Kt), Brazil (2381 Kt), India (1592 Kt) and France (1274 Kt). Since the beginning of the 1990's, nearly 10 million tonnes of K_2O consumption has been lost in the Former Soviet Union and Central Europe. Although potash production is confined to a limited number of countries, there is a very large excess capacity globally. This has discouraged the exploitation of large

deposits in Brazil, Thailand, Laos and elsewhere, since the start-up of new mines would require heavy financial undertaking in addition to competing with many of the low cost producers.

To roundup, there are two other potassium salts that are selectively used in agriculture: potassium sulphate which is for crops that are less tolerant to chlorides, for example, tobacco and other solanaceous cultivars and certain vegetables, and potassium nitrate, largely used in fertigation. Potassium sulphate can be found in naturally occurring complex ores such as langbeinite, kainite, or it is produced by reacting sulphuric acid and KCl. Similarly, potassium nitrate is obtained from deposits in Chile or by the reaction of nitric acid with KCl.

Phosphates

Phosphate plays a central part in the energy transferring processes of all living organisms. Its role in yield enhancement and rooting are well known. It is added as feed supplements in livestock and poultry and in enriching the food chain in aquaculture. It is widely used in the manufacture of pharmaceuticals, detergents and in water treatment. Fine grade phosphoric acid is used in soft drinks and food products.

About 80% of the phosphate is derived from deposits of sedimentary origin while the igneous deposits make up the remainder. The latter are found in Russia (Kola), South Africa (Phalaborwa), with smaller deposits in Brazil, Finland and Zimbabwe (Figure 2). The phosphate rock mineralogy is extremely complex. For instance, the sedimentary appetites contain besides phosphorus the ions such as Ca^{++}, Na^{+}, Mg^{++}, F^{-}, and CO_3^{--} with varying degrees of substitution among themselves. Iron and aluminum are also present in certain deposits. The complexity of their composition holds the key to beneficiation process and as well as the degree of solubility during acidulation. The contamination with radio nuclides and cadmium bears important consideration with respect to environmental regulations.

A global reserve of the phosphate rock exceeds 60 billion tonnes, an equivalent of nearly 500 years of production at current rates. The continuous mining of the highly concentrated ores (average 31.4% P_2O_5) over the last decade or more will eventually shift the exploitation to lower grade ores and this is bound to drive up cost. Already some researches are being conducted to examine alternate but viable means at extracting the marginal ores.

Table 1.4:

World Phosphate Rock Production (000t)

	1988	2000	% Change
USA	45389	39161	-13.7
Morocco	25015	21568	-13.8
China	16600	19374	+16.7
FSU	34400	11749	-65.8
Tunisia	6103	8304	+36.1
Jordan	6611	5526	-16.4
Brazil	4672	4725	+1.1
Israel	3479	4110	+18.1
South Africa	2850	2778	-2.5
Syria	2342	2166	-7.5
Senegal	2326	1783	-23.3
Togo	3464	1370	-60.5
India	739	1136	+53.7
Egypt	1146	1096	-4.4
Mexico	835	1053	+26.1
Algeria	1332	876	-34.2
Others	5884	4958	-15.7
Total	162041	131733	-18.7

Sources: Fertilizer manufacturer's association publication

The bulk of the phosphate rock is used for phosphoric acid production. The proportion that is used for direct application and mixtures is relatively insignificant. Except for the specialized application of electric furnace to produce elemental phosphorus, the wet process is the main mechanism deployed to obtain merchant grade phosphoric acid. The basic chemical reaction is represented in the below equation:

$Ca_{10}F_2(PO_4)_6 + 10H_2SO_4 + xH_2O \_ 6H_3PO_4 + 10CaSO_4 . yH_2O + 2HF$

In the dehydrate process the gypsum is fully hydrated $CaSO_4.2H_2O$ and in the hemi hydrate process less water of crystallization is retained : $CaSO_4.½H_2O$. Hemihydrate processes have the significant advantage of producing phosphoric acid with a relatively high concentration without resorting to a concentration stage. The complexity of the rock composition has offered opportunity to several companies that specialize in exploiting the differential advantages of both the processes.

Table 1.4 shows the world production of processed phosphates by region. North America and Africa dominate the stage since they account for almost 60% of the phosphoric acid production. USA is currently the global leader in the production of processed phosphates (phosphoric acid, MAP, DAP). In 2000 it is by far the largest exporter of DAP, capturing 55% of the export market in spite suffering a drop of 30% in the preceding year (Table 1.5). Approximately one in two tones of DAP and MAP produced is sold across the national border. Asia is the biggest market for DAP and approximately 60% are sold there. The largest importers are China (2000: 1875 Kt P_2O_5), India (442 Kt), Pakistan (370 Kt), Vietnam (265 Kt) and Japan (208 Kt). The Asian, Oceania and Latin American markets are dominated by USA. On the other hand, the West European market has a strong Moroccan and Tunisian presence although some inroad is now made by the Russian, Lithuanian and Polish exporters.

Table 1.5

World Production of processed Phosphates: 2000 (000t P2O5)

Region	Phos. Acid	MAP	DAP	TSP
North America	10537	2471	5195	519
Africa	5258	268	1122	676
Asia	2016	14	2513	229
E.Europe/C.Asia	2425	1208	895	--
Socialist Asia	1700	780	680	180
Middle East	1923	101	618	358

Latin America	1683	559	178	354
West Europe	1275	144	171	86
Central Europe	544	102	150	137
Oceania	152	--	152	--
World	27513	5648	11673	2540
World Export	4600	2557	5865	1628
% Exported	16.7	45.3	50.2	64.1

Sources: Fertilizer manufacturer's association publication

Table 1.6

2000: Major processed Phosphate Exporters & Importers (000t P2O5)

Exporters	Phos.acid	MAP	DAP	TSP	Total
USA	260	1141	3223	259	4886
Morocco	1548	177	584	283	2592
Russia	--	1018	601	--	1619
Tunisia	581	--	466	388	1435
Israel	393	7	--	211	611
Jordan	314	--	211	--	469
South Africa	420	25	23	--	469
Belgium	266	36	7	21	330
Lithuania	14	--	259	--	273
Senegal	233	--	--	--	233
Importers					
India	2260	62	442	--	2764
China	27	3	1875	--	1905
Brazil	141	630	83	276	1130
Australia	44	315	214	80	653
France	146	31	234	186	597
Canada	--	467	69	3	539
Pakistan	140	--	370	--	510
Belgium,	243	28	173	51	495
Turkey	142	62	192	13	409
UK	186	83	26	95	390

Sources: Fertilizer manufacturer's association publication

USA and the Russian Federation account for about 40% each of the MAP exports. The Russian exports go mainly to the countries on either sides of the

Atlantic and the Black Sea areas. USA presence is much more global except in Europe.Unlike USA where ammonia is readily available, the phosphoric acid exporters are ammonia deficit countries. Morocco accounts for over one-third of the global export followed by Tunisia (13%), South Africa (9%), Israël (9%), Jordan (7%) and Senegal (5%). However, in recent years, Morocco and Tunisia have improved their export performance of DAP as well. The trade in phosphoric acid continues to grow steadily strength despite limitations. Due to the corrosive nature of the acid, specially erected facilities for offloading and storage are necessary at harbor terminals. India is by far the largest importer, and has been regularly buying from abroad between 2.0 to 2.4 million tonnes P2O5 over the last few years. Its largest suppliers are Morocco, South Africa, Tunisia, Jordan in addition to its captive supply from Senegal. West Europe as a whole remains a distant second to India. There is considerable intra West European trade on that product as well.

TSP continues to decline, unable to compete with DAP and MAP in delivering total nutrients on the high end and is disadvantaged against single super phosphate (SSP) with the latter offering the benefit of calcium. The export leaders are Tunisia, Morocco, USA and Israel, while the large importers are France, Brazil, Iran and Bangladesh.

The secret of SSP continuing success appears to be its simplicity in production: acidulation of the rocks with sulphuric acid. More than 60 % of the SSP produced is in China where it is used as a basal dressing for rice and other grains. This is true in India as well. For the other significant markets: Australia, Brazil, New Zealand and the Russian Federation, the primary outlet is pasture.

Nitrogen: Nitrogen is present in DNA and RNA, the building and replicating blocks of life. From the ammonium or nitrate radicals, products such as ammonia, nitric acid, ammonium salts and urea are produced.

The starting chemical block in the nitrogen industry sector is ammonia, of which 90% is channeled towards making fertilizers. Ammonia is also the precursor for many industrial chemicals. Its derivative, urea, forms is the largest component in the fertilizer industry totaling nearly 90 million tonnes. Urea is also used in the production of adhesives, dyes, plastic, resins, pool chemicals and as feed supplements for livestock. Another derivative of ammonia is nitric acid which is used in the production of carpets, lacquers, paints, tyres, explosives, batteries and in photography. Ammonium nitrate, an end-product of nitric acid, is a popular fertilizer, particularly in the temperate zone for short maturity crops. Ammonium nitrate is used as explosive for mining and munitions

Ammonia

The earliest Haber-Bosch ammonia plants were depended on coke-based producer gas as a source of hydrogen. Coal gasification reduced the dependency on its proximity to steel plants. By the 1950's the use of natural gas has allowed the enlargement of the plant capacity, initially 165 tpd in 1953 to 600 tpd in 1965. Nowadays, plants with single-train capacity of 1500 tpd – 1800 tpd are not uncommon. While USA continued to exploit its abundant natural gas in the 1970's the other developed countries turned to naphtha and fuel oil since they were cheaply available. After the oil crisis of 19773/74, natural gas became the feedstock of choice.

Currently, about three-quarters of the world's ammonia production is derived from natural gas. Of the balance, 16% is obtained from coal, mainly among the 800 small ABC plants scattered all over China. Fuel oils and naphtha have a limited share and these plants are mostly confined to India. Ammonium sulphate is the only significant nitrogenous fertilizer that is not directly derived from ammonia. It is a by-product of the caprolactam and acryl nitrite manufacture. Ammonia supply holds the key to the understanding of nitrogenous fertilizers supply. It has grown from strength to strength from 93.3

Mt N in 1994 to an estimated 107.8 Mt N in 2000, despite a slow-down in demand for nitrogenous fertilizers. A summary of ammonia production and export by region for 2000 is shown in Table 1.7

The bulk of the ammonia produced in Asia is for home consumption; while the export oriented countries are Trinidad, Ukraine, Russia, Qatar and several others from the gas-rich regions (Table 1.8). Trade in ammonia is far more restrictive than any other fertilizers since special discharge terminals and storage facilities are necessary.

Although a very large tonnage is produced in USA, it continues to rely on ammonia imports to supplement its production of ammonium phosphate in which it is the leading exporter. Sizable quantities are imported by India and the leading industrialized countries in West Europe and Asia for the manufacture of a range of products mentioned earlier.

Table 1.7:

Ammonia Production and Export by Region: 2000 (000t N)

Region	Total tonnage	% share	Export tonnage	% share
Socialist Asia	27762	25.8	--	--
Rest of Asia	19777	18.3	943	7.4
North America	16125	15.0	1550	12.2
East Europe	14498	13.4	3815	30.0
West Europe	10894	10.1	1528	12.0
Middle east	7340	6.8	1298	10.2
Latin America	4981	4.6	2880	22.7
Central Europe	4664	4.3	387	3.0
Africa	1076	1.0	312	2.5
Oceania	681	0.6	--	--
Total	107797	-	12712	

Sources: Fertilizer manufacturer's association publication

Table 1.8:

Major Ammonia Producers and Exporters: 2000 (000t N)

Country	**Tonnage**	**%Global**	**%Expecte**

			d
China	27650	25.6	0
USA	11995	11.1	5.5
India	10148	9.4	0
Russia	8735	8.1	28.0
Canada	4130	3.8	21.5
Indonesia	4011	3.7	19.6
Ukraine	3577	3.3	33.8
Trinidad	2686	2.5	90.1
Netherlands	2543	2.4	23.1
Germany	2473	2.3	12.7
Pakistan	1884	1.7	10.7
Poland	1862	1.7	10.7
Saudi Arabia	1743	1.6	23.5
Egypt	1511	1.4	4.4
Japan	1405	1.3	0
Bangladesh	1255	1.2	10.2
Qatar	1097	1.0	28.0

Sources: Fertilizer manufacturer's association publication

Table 1.9:

Major Ammonia Importers: 2000 (000t N)

	2000	1990	% Change 2000 v/s 1990
USA	4215	2296	+83.6
India	1105	441	+150.6
Korea	654	495	+32.1
Turkey	600	593	+1.2
France	513	395	+29.9
Spain	495	499	-0.8
Taiwan	411	155	+165.2
Belgium	396	618	-35.9
Morocco	321	371	-13.5
Italy	288	216	+33.3
Finland	266	309	-13.9
Norway	264	106	+149.0
Sweden	246	220	+11.8
UK	236	470	-49.8
Denmark	216	321	-32.7

Sources: Fertilizer manufacturer's association publication

Urea: The popularity of urea goes beyond economics. For urea to be taken up, it must first be hydrolyzed to ammonia, which in turn is oxidized microbiologically to nitrite and then to nitrate. In temperate regions, urea is used for top-dressing cereals and pasture, through at 80-85% the efficacy of AN/CAN. For rice, urea is the preferred nitrogen source, since the rice plant is uniquely predisposed to absorb the ammonium radical. In flooded rice, under anaerobic conditions, the nitrates are rapidly reduced to N2O and gaseous nitrogen and hence lost to the atmosphere. Elsewhere, urea is used in virtually all crops due to its widespread availability and competitive pricing.

In 2000, a total of 55 countries produced 107.4 M.t. of urea (Table 1.10). The 10 biggest producers are located either in the highly populous rice growing areas in Asia or where natural gas is readily available. The global production and consumption pattern since 1973 is shown in Figure 3. From the trend, it is obvious that setbacks in either production or consumption are extremely rare events. The reason for its resilience is that urea trends to cannibalize other straight nitrogenous fertilizers, AN, CAN, AS and even ammonium phosphates under difficult market conditions.

Table 1.10:
Urea Producers: 2000

Production Range	Countries	Total Production (000t urea)	% Share
Upto 0.5 M.T.	27	5415	5.0
0.5 M.T. to 1.0 M.T.	10	6913	6.4
1.0 M.T. to 2.0 M.T.	8	10893	10.1
2.0 M.T.	Bangladesh	2388	2.2
	Saudi Arabia	2638	2.5
	Ukarian	3128	2.9
	Pakistan	3535	3.3
	Russia	4332	4.0
	Canada	4530	4.2
	Indonesia	6319	5.9
	USA	6935	6.5
	India	19697	18.3
	China	30700	28.6

	Total	107423	

Sources: Fertilizer manufacturer's association publication

Table 1.11 provides a summary of the urea capacities by region. During the last decade, the greatest growth took place in China in which nearly 20 M.t. of new capacities were added; the rest of Asia also put up an impressive 11 M.t. The Middle East regions together with Latin America are planning to accelerate the pace of expansion over the next 5 years. West Europe is the only region that is cutting back on capacities.

Capacity utilization follows closely to market demand. The 1995/96 period was particularly buoyant for the agricultural commodities when cereal prices reached an all time record. The global capacity utilization reached almost 85% during that year. Granular urea is gaining in popularity compared with prills. The granulation technology had been around for more than 40 years. It started with drum granulation in the sixties. By the seventies, penetration of this technology was already widespread in North America due to the strong demand for blending and mechanical application. The development of fluidized bed granulation in the 1980's provided another impetus to granular urea production.

Table 1.11:

World Urea Capacities by Region (000t urea)

	1990	1996	2000	2005+planned
Asia excl. China	26556	34169	37504	46787
Asia Socialist	26556	34169	34874	42811
Central/East Europe	18826	17028	17026	19125
Middle East	9411	10335	13467	19308
North America	9641	11520	12935	14211
West Europe	6963	6109	6091	6072
Latin America	4563	5065	5689	11089
Africa	757	789	815	496
Oceania	407	383	472	1209
Total	91831	110061	128873	161097
% Capacity Utilization	82.4	84.7	83.3	

Sources: Fertilizer manufacturer's association publication

Aggressive expansion for granular urea production is planned in the Middle East and Latin America and to a lesser extent in Asia. In the Middle East, the new capacities would be from Saudi Arabia, Oman, Iran and Kuwait. China is likely to add some capacity by 2005. For the rest of Asia, only Indonesia and Bangladesh have plan for additional capacity in the near future. Except for countries with a sizable domestic market, the production from the new capacities would be geared almost entirely for export. No granular plant has been on the drawing board for Central and East Europe despite their large export of prills.

About 25% of urea produced is exported. Although, 42 out of 55 producing countries sell their product abroad, 12 of the largest exporters make up three quarters of the total. The trade is complex since some 120 countries import varying quantities of tonnages

In 1998 there are 14 countries with an off-take of urea exceeding 1 million tones (Table1.13). They account for well over 80% of the total off-take. The largest consumers, China and India, have steadily built new urea capacities to avoid dependency on huge imports. However, China has been absent from the market since 1998 due to import ban instituted a year previously. In 1996, it imported over 6 million tones. India also took a dip in import from around 800 Kt to less than 175 Kt last year. Meanwhile, USA has taken up the slack and increased its import by nearly 1.5 M.t. over the last two years. West Europe also took advantage of the low prices by increasing its import by more than 1.3 M.t. over the previous two years. Latin America, a region with vast potential for growth, had also increased its import lately.

Table 1.12:

Urea Exporters/Importers: 2000 (000t urea)

Exporters	Countries	Total Volume	% Share
Up to 250 Kt	19	1220	4.7
250 Kt to 500 Kt	5	1656	6.3

500 Kt to 750 Kt	7	4037	15.4
750 Kt to 1 M.T.	5	4411	16.8
1 M.T.	Qatar Canada Indonesia Saudi Arabia Ukraine Russia	1639 2033 2085 2180 3107 3824	6.3 7.8 8.0 8.3 11.9 14.6
Importers			
Up to	91	3931	15.0
250 Kt to 500 Kt	11	3815	14.6
500 Kt to 1 MT	6	3835	14.6
1 MT	Mexico Italy Turkey Thailand Australia Brazil Vietnam USA	1220 1237 1263 1293 1361 1822 2252 4163	4.6 4.7 4.8 4.9 5.2 7.0 8.6 15.9
	Total	26192	

Sources: Fertilizer manufacturer's association publication

Ammonium nitrate/CAN: The availability of large-scale production of ammonia greatly boosted ammonium nitrate production. Currently there are many proprietary processes available. The basic pathway involves the conversion of ammonia to nitric oxide, and further oxidation to nitrogen dioxide with appropriate catalysts, and the absorption of the latter in water to nitric acid. Through neutralization with ammonia, AN salt is obtained. The production of nitric acid is an exothermic process and its plant is analogous to a power plant in which heat is recuperated to drive other processes. Modern nitric acid plants are therefore fully integrated.

Table 1.13:

1998 Urea Consumption (000t product)

		1998	1988	% Change 1998 V/S 1988
1	China	26193	17752	+47.5

2	India	20396	12557	+62.4
3	Indonesia	4290	3178	+35.0
4	USA	4012	3061	+31.1
5	Pakistan	3887	2187	+77.7
6	Vietnam	2374	796	+198.2
7	Banglades h	1899	1145	+65.9
8	Brazil	1859	415	+348.0
9	Iran	1546	686	+125.4
10	Canada	1397	467	+199.1
11	FSU	1109	5000	−77.8
12	Australia	1092	161	+578.3
13	Egypt	1091	390	+179.7
14	Thailand	1033	333	+210.2
	World	866133	64261	+34.0

Sources: Fertilizer manufacturer's association publication

Nitric acid is enormously versatile. When oxidized, esterifies, nitrated or neutralized with appropriate chemicals they produce innumerable varieties of products. By far the two largest derivatives are fertilizers and explosives. The production of ammonium nitrate and subsequent granulation has been a subject of intensive research as well. In certain countries where straight ammonium nitrate is prohibited for use as fertilizer, it is mixed with dolomitic limestone to obtain calcium ammonium nitrate (CAN).

Both ammonium nitrate and calcium ammonium nitrate are ideally suited to temperate agriculture and that explains its dominance in those regions. With a combined total exceeding 35 million tonnes (10.6 million tones N), they currently occupied the third position, as a source of nitrogenous fertilizer. They had lost the dominant position to urea in 1978. Ammonium nitrate and CAN are the products of choice for wheat, barley, rye and oat. Median rainfall (600-1000 mm per annum) and well-developed rooting system ensure that the disadvantage of leaching of the nitrate component in the soil is minimized. Ammonium nitrate and CAN consumption reached their highest

levels in 1985/87 and then began to level off. The difficulties in Central Europe and F.S.U had resulted in a consumption loss of nearly 10 million tonnes between 1989 and 1993. Some recovery has taken place since then.

Table 1.14 shows the major AN/CAN users. As expected, European countries feature prominently on the list.

Table 1.14:

1998 AN/CAN Consumption (000t)

	AN (N)	CAN (N)	Product
Germany	993	--	3972
France	1047	--	3125
USA	578	--	1725
Poland	261	234	1715
UK	500	46	1677
Spain	118	279	1468
China	481	--	1436
Egypt	476	--	1421
World Total	6963	3659	35421

Sources: Fertilizer manufacturer's association publication

Ammonium Sulphate

A by-product of industries, principally from steel and fiber (caprolactam) production, ammonium sulphate continues to maintain a market niche. It was a dominant product alongside with ammonium nitrate until the advent of urea. Its usage reached the highest level (15.3 million tonnes) in 1980 but since then, it has oscillated with the fortune of the industries that it is principally dependent upon as the source of the raw materials.

With cleaner industrial production, its other component, 24%S, is becoming more important. Ammonium sulphate is widely used in tropical countries in powdered mixtures. Major consuming countries are Brazil, USA, Thailand, Japan, Malaysia and Italy.

Ammonia

The use of ammonia in direct application is limited by the need for large outlay for storage and application equipment and the requirement for special safety precaution and extensive farm size. Over the last 25 years, this practice has not gained ground world-wide

USA alone accounts for 80% of this practice *(Table 1.15)*. Denmark, which between 1975 and 1983 applied 70 to 80% of its nitrogenous fertilizer by this technique, has virtually ceased to do so today. Canada, Mexico and Australia are the only countries with any significant consumption through this application.

Table 1.15

1998 Ammonia Direct Applications (000t)

1	USA	4375
2	Canada	612
3	Mexico	229
4	Australia	136
5	Denmark	16
	World Total	5487

Sources: Fertilizer manufacturer's association publication

Nitrogen Solutions: Unlike ammonia direct application, the prospect for nitrogen solutions is much better. The need for special safety regulations and pressure tanks is no longer necessary. A wide variety of options is available for application: through irrigation system or water; sprinklers or pressure injection. Nitrogen losses through volatilization are also minimized. The volume applied has almost doubled over the last quarter of a century to nearly 18 million tonnes

Besides aqua ammonia, (20-28%N), urea-ammonium-nitrate (32%N) is gaining in popularity. USA accounts for over two-thirds of the nitrogen solutions market *(Table 1.16)*. European countries, led by France, are adopting

this technique too. The FSU, which accounted for a very substantial usage previously, has virtually ceased to be a factor today.

Table 1.16

1998 Nitrogen Solutions Consumption (000t)

1	USA	8816
2	France	2063
3	Germany	871
4	Canada	318
5	UK	256
6	Spain	156
	World Total	13154

Sources: Fertilizer manufacturer's association publication

Ammonium bicarbonate (ABC)

Outside China, very little is known about the usage of ammonium bicarbonate. Currently an estimated 42 million tonnes of ABC, supplying nearly 8 million tonnes N is used in Chinese agriculture *(Graph 1.7)*. However, official estimates vary greatly. The product is a relic of the "Great Leap Forward" championed by Mao Zedong principally as a defense against the Soviet threat. It is estimated that there are some 800 small factories scattered in over 600 counties producing this product to service local needs. ABC is used as a basal dressing for rice and wheat cultivation. It is highly unstable and difficult to handle. Its main advantages are price, availability and local participation in production. There are changes taking place in China that will eventually replace this product with either urea or ammonium nitrate.

NPK Compounds / Blends

The addition of nitric acid to rock phosphate by Erring Johnson in 1928 produced a new group of fertilizers known as nitro phosphates. The "Odda Process", named after town where it was first discovered was further developed by Norsk Hydro and BASF. Kemira Oy introduced modification to this process with the addition of sulphuric acid to result in the "Mixed Acidulation Nitro phosphate Process". Each of the processes has its inherent

advantages. The resulting compounds are widely used in Europe and in many parts of the world. USA, on the other hand, developed the granular blends using DAP, MOP, urea, as to produce the desired NPK ratios. According to IFA estimates, global NPK consumption reached a peak of 24.4 million tones nutrient in 1978 and then began to drift downward. The decline in usage in FSU and Central Europe was a major contributing factor from 1988 onwards

West Europe and Japan have been reducing compound usage while in the United States the blends have been partially replaced by nitrogen solutions and DAP and ammonia direct applications.

Overall, the use of NPK's in developing countries have more than doubled between 1978 and 1998 to 6.5 Mt from 3.1 Mt nutrient whereas the developed countries have declined from 21.3 Mt to 13.1 Mt nutrient during the same period

Role of Fertilizer Industry in Economic Development

The fertilizer industry has fulfilled a remarkable role in sustaining the nutritional well being of the global population. At the onset of the first millennium there were approximately 200 million people on the planet, and the first billion was reached only in 1850. Thereafter, the pace quickened: doubling in eighty years and again after another 45 years. The sixth billion mark was reached in October 1999. The prognosis by experts varies on the size and timing the global population would peak: from a low of 9 billion by 2070 to a high of 28 billion by 2150.

Agriculture, which accounts for 27% Of GDP, provides sustenance to two-third of our population. Besides, it provides crucial backward and forward linkages to the rest of the economy. Successive five-year plans have stressed on self-sufficiency and self-reliance in food grains production and concerted efforts in this direction have resulted in substantial increase in agriculture production and productivity. This is clear from the fact that from a very modest level of 52 Million MT in 1951-52, food grain production rose to

above 206 million MT in 1999-2000. Behind India's Success Story in agriculture sector for not only meeting total requirement but also having exportable surplus of food grains, the significant role played by chemical fertilizers is well recognized and established beyond any doubt.

Chemical fertilizers have played a vital role in the success of India's Green Revolution and consequent self-reliance in food-grain production. The increase in fertilizer consumption has contributed significantly to sustainable Production of food grains in the country. The Government of India has been consistently pursuing policies conducive to increased availability and consumption of fertilizers in the country. Since there are no viable sources/reserves of potash (K) in the country, its entire requirements are met through imports. The overall consumption of fertilizers in nutrient terms (N, P & K) currently is about 17.5 million MT per annum.

As of now, the country has achieved near self-sufficiency in production capacity of urea and Di Ammonium Phosphate (DAP), with the result, India could manage its requirement of these fertilizers from indigenous industry. That's why imports of all Fertilizers except Muriate of Potash (MOP) have presently been nominal. Whereas not long back, India Imported 3.82 million MT of urea and DAP both in 1999-2000 to meet their indigenous demand.

Over the last five decades, the production of nitrogenous (N) and phosphates (P) fertilizers taken together has increased from a mere .03 million MT in 1950-51 to 14.628 million MT in nutrients terms in 2001-02. Similarly, the overall consumption of fertilizers in nutrients terms (N, P and K) has increased from .07 million MT to about 17.36 million MT during the same period. Accordingly, per hectare consumption of fertilizers which was less than 1 Kg in 1951-52 has gone up to the level of 90.1 Kg in 2001-02.

Brief History of Fertilizer Industry

Since the beginning of agriculture several thousand years ago, soil fertility has been a concern of farmers. At first, farmers sought out areas with fertile soils. They farmed them until the fertility was exhausted, and then moved to another area. In other regions, such as flood plains along the Nile Valley, soil-laden flood waters annually renewed the soil fertility.

The trend in the development of the fertilizer industry is somewhat similar to global population growth since it had also a very long nascent period. For instance, ammonium nitrate and urea were already chemically defined in 1659 and 1773 respectively. The exploitation of their potential as fertilizers came only two to three centuries later. Large-scale commercialization of fertilizers began with the discovery of sodium nitrate in Chile in 1809. For over a century thereafter, the country exported over a million tonnes of the product annually. It was the dominant nitrogenous fertilizers until the discovery of the Haber-Bosch process for synthesizing ammonia and its derivatives. A similar monopoly was enjoyed by the potash sector. Following its discovery in 1839 in Strassfurt, Germany, and subsequent exploitation, it was the world's sole producer of potash until 1918. Its annual output was around 1 million tones K2O. Although other deposits were subsequently discovered in France (1904), Spain (1925), USA (1925) and Russia (1930), Germany continued to be the world's largest supplier until 1944. Today's world largest producer, Canada, discovered its potash deposits only in 1943.

The 1840's represented an early important era for the industry. Justus von Liebig Propounded the "Law of the Minimum" and this has a lasting influence on plant nutrition ever since. Today, this concept is translated into "Balanced Fertilization". Further, in 1842, John Lawes, made an important step into chemical processing of fertilizer by mixing sulphuric acid with rock

phosphate to obtain single superphosphate. He patented the technique and probably became the first in the industry to own an intellectual property.

Rock phosphate exploitation in the early years was slow; the first 10,000 tonnes of production was reached in 1853, and the first million tonnes in 1885. With limited availability of phosphate deposits, the European superphosphate producers had to rely on North America, first from Canada but subsequently from South Carolina in USA. Tunisia was a significant supplier before Morocco started production in 1921. The total production of rock phosphate in 2000, from some 30 countries, amounted to 131.7 million tonnes or 41.3 million tonnes P2O5.

The demand for concentrated fertilizers was evidently non-existent in the early days since phosphoric acid had been commercially available in 1870. Major changes in agriculture in USA had resulted in the large-scale production plants of TSP and ammoniated phosphates in the 1920's and 1930's to meet the demand.

The success in synthesizing ammonia using the Haber-Bosch process in 1913 usher in the modern era of nitrogenous fertilizer production. Previous to that, small quantities of ammonia were derived from coal which was then converted to ammonium sulphate. The first synthesis of a nitrogenous fertilizer was made in Norway in 1903 using an electric arc to produce nitric oxide which was hydrolyzed to nitric acid subsequently reacted with limestone to produce calcium nitrate. About the same time, a process to produce calcium cyanamide using an electric arc over coke and lime was perfected. Both these processes were eventually abandoned in the absence of cheap electricity.

The early ammonia plants were modest by current standards: 25 to 50 tpd. The product was converted to explosives or was used as an intermediate for other synthetic products. It was too expensive to be used as fertilizers. Only after the two world wars did the ammonia nitrate find its way to agriculture, initially, to reduce strategic stockpiles. At the same time, the techniques of

efficient production gained from wartime experiences had spilled over to industrial production. The era of the modern fertilizer industry took off in the early 1960's. The Green Revolution provided the necessary impetus through breeding cereals that respond well to nutrient inputs. The oil crises of 1973/74 transform manufacturing economics, thereby shifting production radically to gas-rich countries.

Development & Progress of Fertilizer Industry in India

At present, there are 57 large sized fertilizer plants in the country manufacturing a wide range of nitrogenous, phosphatic and complex fertilizers. Of these, 29 units produce urea, 20 units are of DAP and complex fertilizers, 7 units produce low analysis straight nitrogenous fertilizers and remaining 9 manufacture ammonium sulphate as by-product.

Besides, there are about 64 small and medium scale plants in operation producing single super phosphate (SSP). The total installed capacity of fertilizer production, which was 120.58 lakh MT of nitrogen and 52.31 lakh MT of phosphate as on 31.03.2003 has marginally reduced to 119.98 lakh MT of nitrogen and 53.60 lakh MT has risen to 54.20 lakh MT of phosphate as on 01.04.2004.

PRODUCTION CAPACITY

The production of fertilizers during 2003-04 was 106.34 lakh MT of nitrogen and that of phosphatic fertilizers was 36.30 lakh MT of phosphate. The production target for 2004-2005 has been fixed at 117.02 lakh MT of nitrogen and 48.78 lakh MT of phosphate, representing a growth rate of 10.04% in nitrogen and 34.4% in phosphate, as compared to the actual production in 2003-2004. Production targets of both nitrogen and phosphate are less than the installed capacity because of low production by Rashtriya Chemicals & Fertilizers (RCF) Trombay and Thal, and Brahmaputra Valley

Fertilizer Corporation Ltd. (BVFCL), Namrup due to gas limitations and equipment problems. This trend is likely to continue as the Government has decided to close all the plants of Fertiliser Corporation of India (FCI) and Durgapur & Baruni plants of Hindustan Fertilizer Corporation of India (HFC), barring Namrup units of erstwhile HFC presently under revamp, which is now under the separate entity of BVFCL. Actual production during 2003-04 was 106.32 lakh MT of nitrogen and 35.68 lakh MT of phosphate. Taking ëNí and ëPí together, almost equal to the production during the corresponding period of last year.

Table 1.17:

Unit-wise installed capacity, production and capacity utilization during 2002-03 and 2003-04 NITROGEN

Name of Company/Plant	Annual Installed (31-3-04)	Production(e000/ MT)		Percentage capacity utilization	
		2002-03	2003-04	2002-03	2003-04
Public Sector NFL:Nagpal-I	80.0	13.5	16.0	16.9	20.0
NFL:Nagpal-II	220.1	220.1	220.1	100.0	100.0
NFL:Bhatinda	235.3	235.5	235.4	100.1	100.0
NFL:Panipat	235.3	225.4	235.3	95.8	100.0
NFL:Vijapur	397.7	397.7	406.4	100.0	102.2
NFL:Vijapur Expn.	397.7	398.8	400.3	100.3	100.7
Total:NFL	1566.1	1491.0	1513.5	95.2	96.6
BVFCL-Namrup-I	0.0	0.0	0.0	0.0	0.0
BVFCL-Namrup-II	144.9	85.7	110.7	59.1	76.4
Total (HCF)	144.9	85.7	110.7	59.1	76.4
FACT:Udhyogamandal	77.0	69.4	68.1	90.1	88.4
FACT:Cochin-I*	-	4.4	0.0	2.9	0.0
FACT:Cochin-II	97.0	103.7	85.3	106.9	87.9
Total(FACT):	174.0	177.5	153.4	54.5	88.2
RCF:Trobay**	45.0	45.6	44.4	101.3	98.7
RCF:Trombay-IV	75.1	51.7	48.8	68.8	65.0
RCF:Trombay-V	151.8	9.6	8.1	6.6	5.3
RCF:Thal	785.1	707.2	796.5	90.1	101.5

Total (RCF)	1067.0	814.1	897.5	77.0	84.9

* Plant closed by Government.

** Production of Urea suspended

Name of Company/Plant	Annual installed capacity (31-03-04)	Production (e000i MT)		Percentage capacity Utilization	
		2002-03	2003-04	2002-03	2003-04
MFL: Chennai	366.7	256.5	253.5	69.9	69.1
SAIL: Roulkela	120.0	0.4	0.0	0.3	0.0
By Product	38.7	28.9	19.9	74.7	51.4
Total (Public):	**3467.4**	**2854.1**	**2948.8**	**78.9**	**85.0**
C o o p e r a t i v e Sector IFFCO: Kandla	318.9	368.0	322.1	131.5	101.0
IFFCO: Kalol	250.5	247.5	220.6	98.8	88.1
IFFCO: Phulpur-I	253.5	253.6	248.7	100.0	98.1
IFFCO: Phulpur-II	397.7	397.8	391.5	100.0	98.4
IFFCO: Aonla-I	397.7	398.4	397.8	100.2	100.0
IFFCO: Aonla-II	397.7	398.0	397.8	100.1	100.0
Total (IFFCO):	2016.0	2063.3	1978.5	104.4	98.1
KRIBHCO: Hazira	795.4	737.6	815.6	92.7	102.5
Total (Co-operative):	**2814.4**	**2800.9**	**2794.1**	**101.0**	**99.4**
Total (Pub.+Coop.)	**6278.8**	**5655.0**	**5742.9**	**88.5**	**91.5**
Private Sector GSFC: Vadodara	248.1	178.5	223.1	71.9	89.9
CFL: Vizag	124.0	111.9	133.8	90.2	107.9
SFC: Kota	174.3	181.1	167.4	103.9	96.0
DIL: Kanpur	332.1	0.0	0.0	0.0	0.0
ZIL: Goa	288.7	264.2	278.1	91.5	96.3
SPIC: Tuticorin	370.7	324.3	344.3	87.5	92.9
MCF: Mangalore	207.2	199.0	170.9	96.0	82.5
EID-Parry: Ennore	41.2	30.8	34.0	74.8	82.5

Name of Company/Plant	Annual Installed Capacity (31-03-04)	Production (e000/ MT)		Percentage capacity utilization	
		2002-03	2003-04	2002-03	2003-04
GNFC:Bharuch	356.7	357.9	336.5	100.3	94.3
TAC:Tuticorin	16.0	19.7	20.5	123.1	128.1
HLL:Haldia	121.5	111.7	91.1	91.9	75.0
PNF:Nagpal	16.0	0.0	0.0	0.0	0.0
GSFC:Sikka-I #	105.8	117.9	81.0	111.4	76.6
GSFC:Sikka-II #	71.3	0.0	9.5	0.0	13.3
Total(GSFC-Sikka):	177.1	117.9	90.5	66.6	51.1
GFCL:Kakinada	120.6	134.7	142.8	111.7	118.4
IGCL:Jagdishpur	397.7	397.7	396.6	100.0	99.7
Hindalco Industries Ltd.:Dahej	72.0	54.2	40.9	75.3	56.8
Total (IGCL):	469.7	451.9	437.5	96.2	93.1
DFPCL: Taloja	52.9	38.7	34.6	73.2	65.4
NFCL: Kakinada-I	274.8	258.4	275.3	94.0	100.2
NFCL: Kakinada-II	274.8	287.7	273.9	104.7	99.7
Total (NFCL):	549.6	546.1	549.2	99.4	99.9
CFCL:Gadepan-I	397.7	397.9	417.6	100.1	105.0
CFCL:Gadepan-II	397.7	397.8	393.1	100.0	98.8
Total(CFCL):	795.4	795.7	810.7	100.0	101.9
TCL:Babrala	397.7	397.8	397.7	100.0	100.0
OCF:Shahjahanpur	397.7	374.7	394.5	94.2	99.2
OCF:Paradeep	325.2	132.2	65.1	40.2	20.0
Total(OCF):	722.9	506.9	459.6	70.1	63.6
PPL:Paradeep	129.6	134.5	164.9	103.8	127.2
By Product	7.1	3.6	3.7	50.7	52.1
Total (Private Sector):	5719.1	4906.9	4890.9	85.8	85.5
Total(Pub+Coop+Pvt):	11997.9	10561.9	10633.8	87.2	88.6

Name of Company/Plant	Annual InstalledCapacity (31-03-04)	Production (e000i MT)		Percentage capacity utilization	
		2002-03	2003-04	2002-03	2003-04
Public Sector:					
FACT:Udyogamandal	29.7	31.1	28.2	104.7	94.9
FACT:Cochin-II	97.0	103.7	85.3	106.9	87.9
Total(FACT):	126.7	134.8	113.5	106.4	89.6
RCF:Trombay	45.0	45.6	44.4	101.3	98.7
RCF:Trombay-IV	75.1	51.7	48.8	68.8	65.0
Total(RCF):	120.1	97.3	93.2	81.0	77.6
MFL:Chennai	142.8	73.4	77.6	51.4	53.4
HCL:Khetri	30.1	0.0	0.0	0.0	0.0
SSP Units	12.8	1.9	0.0	14.8	0.0
Total(Pubic):	**432.5**	**307.4**	**284.3**	**64.0**	**65.7**
Cooperative Sector					
IFFCO:Kandala	825.1	949.5	832.6	131.0	100.0
Total(Pub.+Coop.):	**1257.6**	**1256.9**	**1116.9**	**104.8**	**88.8**
Private Sector					
GSFC:Vadodara	75.9	35.4	65.0	46.6	85.6
CFL:Vizag	166.0	150.2	175.7	90.5	105.8
ZIL:Goa	197.4	141.8	166.1	71.8	84.1
SPIC:Tuticorin	218.5	143.0	146.2	65.4	66.9
MCF:Mangalore	82.8	46.7	40.2	56.4	48.6
EID-Parry:Ennore	48.0	37.7	38.4	78.5	80.0
GNFC:Bharuch	28.5	35.2	24.3	123.5	85.3

Name of Company/Plant	Annual Installed Capacity (31-03-04)	Product (e000i MT)		Percentage capacity utilisation	
		2002-03	2003-04	2002-03	2003-04
HLL:Haldia	310.5	310.0	234.0	99.8	75.4
GSFC:Sikka-I #	270.5	301.2	206.9	111.3	76.5
GSFC:Sikka-II #	182.2	0.0	24.2	0.0	13.3
Total (GSFC-Sikka):	452.7	301.2	231.1	66.5	51.0
GFCL: Kakinada	308.2	285.2	362.2	92.5	117.5
Hindalco: Dahej	184.0	137.2	103.6	74.6	56.3
DFPCL: Taloja	52.9	38.7	35.6	73.2	65.4
OCF: Paradeep	802.8	337.7	151.6	42.1	18.9
PPL: Paradeep	331.2	292.9	344.0	88.4	103.9
SSP Units	901.1	354.4	396.6	39.3	44.0
Total (Private Sector):	4160.5	2647.3	2513.6	63.6	60.4
Total (Pub+Coop+Pvt.):	5418.1	3904.2	3630.5	72.8	67.0

Sources: Fertilizer manufacturer's association publication

The production performance of both nitrogenous and phosphatic fertilizers during 2003-04 was less than the target mainly due to constraints in supply and quality of natural gas, equipment breakdowns, delay in commissioning of Namrup-II and Duncan Industries Limited (DIL) Kanpur remaining under unscheduled shutdown. In case of phosphate, production in DAP plants was low due to shortage of phosphoric acid and imported ammonia. Similarly, production of complexes was also low due to high inventory in silo as well as in field go downs and poor off-take due to dismal sale in many states.

CAPACITY UTILIZATION

The domestic fertilizer industry has attained the level of capacity utilization that compares favourably with others in the world. The capacity utilization during 2002-03 and 2003-04 was 87.2% and 88.6% for nitrogen and 72.8% and 67% for phosphate respectively.

The capacity utilization of the fertilizer industry is expected to improve through revamping, modernization of the existing plants and closure of unviable capacity of sick fertilizer units.

Table 1.18:
urea units set up between: 1951-2001 with reassessed capacity

Year of Comm.	Unit	Feedstock and sector	Installed capacity (lakh/MT)	Project cost Rs./Crore
1967	GSFC-Baroda	Gas-Private	3.706	63.22
1969	SFC-Kota	Naphtha Private	3.790	30.00
1970	DIL-Kanpur	Naphtha Private	7.220	52.12
1971	MFL-Madras	Naphtha Private	4.868@	63.22
1973	ZIL-Goa	Naphtha Private	3.993	48.82
1975	SPIC-Tuticorin	Naphtha Private	6.200	73.56
1976	MCFL-Mangalore	Naphtha Private	3.800	74.90
1978	NFL-Nangal	FO/LSHS-Public	4.785	132.50
1978	IFFCO-Kalol	Gas-Coop.	5.445	71.23
1979	NFL-Bhatinda	FO/LSHS-Public	5.115	239.30
1979	NFL-Panipat	FO/LSHS-Public	5.115	223.50
1981	IFFCO-Phulpur	Naphtha-Coop	5.511	205.18
1982	RCF-Trombay-V	Gas-Public	3.30	174.60
1982	GNFC-Bharuch	FO/LSHS-Public	6.360	445.00
1985	RCF-Thal	Gas-Public	17.068	890.00
1986	KRIBHCO-Hazira	Gas-Coop.	17.292	890.00
1987	HCF-Namrup-III	Gas-Public	3.300	285.55
1988	NFL-Vijapur	Gas-Public	8.646	507.35
1988	IFFCO-Aonla	Gas-Coop.	8.646	647.84
1988	Indogulf-Jagdishpur	Gas-Public	8.646	701.52
1992	NFCL-Kakinada	Gas-Public	5.970	1185.54
1993	CFCL-Kota	Gas-Public	8.646	1153.15
1994	TCL-Babrala	Gas-Public	8.646	1479.74
1995	OCFL-Shahjahanpur	Gas-Public	8.646	960.00
1996	IFFCO-Aonla expansion	Gas-Cooperative	8.646	955.00
1997	NFL-Vijapur expansion	Gas-Public	8.646	1071.00
1997	IFFCO-Phulpur expansion	Naphtha-Cooperative	8.646	1190.00
1997	IFFCO-Kalol expansion	Gas-Cooperative	1.50(additional)	149.71
1998	MFL,Manali(TN) revamp	Naphtha-Public	0.76	601.43**
1998	NFCL-Kakinada expansion	Naphtha-Private	5.970	970.00
1999	CFCL-Gadepan expansion	Naphtha-Private	8.646	1256.00

Sources: Fertilizer manufacturer's association publication

Note: * This does not include subsequent investments.

** Total revamp cost for ammonia-urea and NPK plants.

@ After revamp

STRATEGY FOR GROWTH

The fertilizer industry has adopted the following strategy to increase fertilizer production,

_ Expansion / retrofitting / revamping of existing fertilizer plants.

_ setting up joint venture projects in countries having abundant and cheaper raw material resources.

_ working out the possibility of adopting alternative sources like liquefied natural gas to overcome the constraints in the domestic availability of natural gas.

Table 1.19:

List of public and cooperative sector under the administrative control of department of fertilizers

PUBLIC SECTOR:

S.No.	Name of Company	Headquarters	Incorporation in
1	Fertilizers &Chemicals Travancore Ltd.	Udyogamandal	September, 1943
2.	Fertilizers Corporation of India Ltd. (Re-organised)	New Delhi	January, 1961
3.	National Fertilizers Ltd.	Noida	August, 1974
4.	Rashtriya Chemicals &Fertilizers Ltd.	Mumbai	March, 1978
5.	Pyrites, Phosphates &Chemicals Ltd.	Noida	March, 1960
6.	Madras Fertilizers Ltd.	Chennai	December, 1966
7.	Projects & Development of India Ltd.	Sindri	March, 1978
8.	Hindustan Fertilizers Corporation Ltd.	New Delhi	March, 1978
9.	Brahamaputra Velly Fertilizers Corporation Limited (BVFCL)	Guwahati	April, 2002
10.	FCI Aravali Gypsum And Minerals India Ltd.	Jodhpur	Feb., 2003
11.	Indian Farmers Fertilizer Cooperative Limited	New Delhi	November, 1967
12.	Krishak Bharti Cooperative Limited	Noida	April, 1980

COOPERATIVE SECTOR:

11	Indian farmer Fertiliser cooperative Limited	New delhi	Nov, 1967
12.	Krishak Bharti Cooperative Limited	Noida	April, 1980

JOINT SECTOR:

12	Indian Potash Limited	Chennai	Feb 1971

Sources: Fertilizer manufacturer's association publication

PROJECTS UNDER IMPLEMENTATION

Brahmaputra Valley Fertilizer Corporation Ltd., is implementing a major revamp of its Namrup units at Namrup, Assam in the North Eastern region of the country, at an approved completion cost of Rs. 525 crore to increase urea production to 5.55 lakh tonnes per annum. The project is expected to be commissioned in October 2004.

JOINT VENTURES ABROAD

Due to constraints in the availability of gas, which is the preferred feedstock for production of nitrogenous fertilizers and the near total dependence of the country on imported raw materials for production of phosphatic fertilizers, the Government has been encouraging Indian companies to establish joint venture production facilities, with buy back arrangement, in other countries, which have rich reserves of natural gas and rock phosphate.

The details of the existing joint ventures in the fertilizer sector are given below. The joint ventures already established have given the Indian sponsors an assured source of supply of phosphoric acid, a vital input for manufacture of DAP and other phosphate and complex fertilizers.

The Government of India (GOI), Indian Farmers Fertilizer Cooperative Ltd. (IFFCO) and Southern Petrochemical Industries Corporation Ltd. (SPIC) are equity partners in a joint venture company set up in Senegal. The initial equity contribution of the Indian consortium in the venture in 1980 amounted to Rs. 13.67 crore, i.e. about 18.20% of its total equity. At present the Indian sponsors together hold 25.57% of equity (GOI-9.06%,IFFCO-15.23% and SPIC-1.28%) in the joint venture company in Senegal named Industries Chimiquesdu Senegal (ICS). The company produces phosphoric acid and finished phosphate fertilizers in its plants in Senegal. The phosphoric acid produced in the plant is being utilized for production of phosphate fertilizers in the country through buy back arrangements by the Indian sponsors. ICS implemented a project for doubling the production capacity of its phosphoric acid plants and development of new rock phosphates mines at cost of about

US $ 250 million, which has been commissioned in February 2002. The phosphoric acid production capacity of the plant has thus increased to 6.60 lakh tonnes per annum. A major portion of the phosphoric acid produced by ICS is sold to IFFCO.

SPIC, Jordan Phosphates Mines Company Ltd.(JPMC) and Arab Investment Company (AIC) have set up a joint venture project in Jordan to produce 2.24 lakh tonnes of phosphoric acid per annum. 52.17% of the equity of the joint venture named Indo Jordan Chemicals Company Limited is held by SPIC, 34.86% by JPMC and 12.97% by AIC. The plant had been commissioned in May 1997. The phosphoric acid produced by this venture is imported by SPIC.

A joint venture (Indo Moroc Phosphore SA) between Office Cherifien Des Phosphates (OCP), Morocco and Chambal Fertilizers & Chemicals Ltd. (CFCL) to produce 3.30 lakh tones per annum of phosphoric acid at a total cost of US $ 205 million had been commissioned in Morocco in October 1999. The equity of US $ 65 million in the venture is held by OCP and CFCL equally.

OVERSEAS JOINT VENTURES UNDER IMPLEMENTATION / CONSIDERATION

IFFCO & KRIBHCO along with Oman Oil Company are setting up a joint venture urea project in Oman for production of 16.52 LMT of urea and 2.48 LMT of ammonia per annum. Oman India Fertilizer Company (OMIFCO), the joint venture company, will sell urea produced to Government of India at fixed long term prices (LTPs), for a period of 15 years and ammonia to IFFCO for 10 years at a fixed price. The implementation of this project has commenced on 15.8.2002 and is expected to be completed within 35 months i.e. by 15.7.2005. OMIFCOís equity of US $ 320 million is held by the Oman Oil Company (50%) and Indian Sponsors, IFFCO & KRIBHCO

equally (25% each). 3.8.2. SPIC is setting up a gas-based nitrogenous fertilizer plant at Dubai in United Arab Emirates to produce 4.00 lakh tonnes of urea

Table 1.20:

Year-wise, nutrients-wise consumption, production And imports of fertilizers

Year	CONSUMPTION				PRODUCTION				IMPORTS		
	N	P	K	Total	N	P	K	Total	N	P	K
1981-82	40.69	13.22	6.73	60.64	31.44	9.49	0.00	40.93	10.54	3.43	6.44
1982-83	42.24	14.37	7.27	63.88	34.24	9.80	0.00	44.04	4.25	0.63	6.44
1983-84	52.05	17.30	7.75	77.10	34.85	10.48	0.00	45.33	6.56	1.43	5.56
1984-85	54.87	18.26	8.38	82.11	39.17	12.64	0.00	51.81	20.08	7.45	8.71
1985-86	56.61	20.06	8.08	84.74	43.28	14.28	0.00	57.56	16.80	8.16	9.03
1986-87	57.16	20.79	8.50	86.45	54.10	16.60	0.00	70.70	11.03	2.55	9.52
1987-88	57.17	21.87	8.20	87.84	54.66	16.65	0.00	71.31	1.75	0.00	8.09
1988-89	72.51	27.21	10.68	110.40	67.12	22.52	0.00	89.64	2.19	4.07	9.82
1989-90	73.86	30.14	11.58	115.58	67.47	17.96	0.00	85.43	5.23	13.11	12.80
1990-91	79.97	32.21	13.28	125.46	69.93	20.52	0.00	90.45	4.14	10.16	13.28
1991-92	80.46	33.21	13.61	127.28	73.01	25.62	0.00	98.63	5.66	9.67	12.36
1992-93	84.27	28.44	8.84	121.55	74.30	23.06	0.00	97.36	11.37	6.89	10.82
1993-94	87.89	26.69	9.08	123.66	72.31	18.16	0.00	90.47	15.88	7.22	8.57
1994-95	96.07	29.31	11.25	135.63	79.45	24.93	0.00	104.38	14.76	3.80	11.09
1995-96	96.23	28.96	11.56	138.77	87.77	25.58	0.00	113.35	19.93	6.47	13.15
1996-97	103.01	29.77	10.30	143.08	85.99	25.56	0.00	111.55	11.67	2.46	6.13
1997-98	109.00	39.15	13.73	161.28	100.86	29.75	0.00	130.61	13.62	6.72	11.40
1998-99	113.54	41.12	13.32	167.98	104.80	31.41	0.00	136.21	6.35	9.68	15.42
1999-00	115.92	47.99	16.78	180.69	108.90	33.99	0.00	142.89	8.33	15.03	17.39
2000-01	109.20	42.15	15.67	167.02	109.61	37.43	0.00	147.04	1.54	3.96	15.41
2001-02	114.16	44.16	17.07	175.39	107.68	38.60	0.00	146.28	2.69	4.29	17.01
2002-03	104.74	40.19	16.01	160.94	105.62	39.04	0.00	144.66	0.66	1.70	14.38
2003-04 *	113.24	44.02	17.48	174.74	106.34	35.30	0.00	142.64	1.32	3.38	15.48

Sources: Fertilizer manufacturer's association publication

Table-1.21

Sector-wise capacity utilization of nitrogenous and phosphates fertilizers

Nutrient	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Nitrogen (N) Public Sector:	70.0	78.3	77.6	79.9	85.8	74.1	78.9	85.0
Cooperative Sector	107.0	116.2	112.0	108.8	99.4	101.0	101.0	99.4
Private Sector:	112.7	120.5	116.8	117.6	99.3	95.0	85.8	85.5
Total (Nitrogen):	93.5	101.5	99.6	100.5	94.9	89.6	87.2	88.6
Phosphate (P) Public Sector:	78.3	90.3	93.1	93.9	75.8	58.3	64.8	65.7
Cooperative Sector:	113.2	154.6	161.9	157.8	128.0	141.4	131.0	100.9
Private Sector:	87.9	97.2	92.0	83.1	83.1	69.6	63.6	60.4
Total (Phosphate)	88.0	101.0	99.1	95.0	87.1	75.7	72.8	67.0

Sources: Fertilizer manufacturer's association publication

per annum at an estimated cost of US $ 170 million. The joint venture company by the name SPIC Fertilizers and Chemicals Limited, incorporated in Mauritius, is promoted by SPIC with equity participation of 51%, MCN Investment Corporation of USA with equity participation of 39% and Emirates Trading Agency of UAE with equity participation of 10%. The project is under implementation and is expected to be commissioned during the last quarter of 2005 and urea produced is proposed to be imported by SPIC through a firm buy back arrangement.

A Memorandum of Understanding (MOU) was signed between Government of India/IFFCO & KRIBHCO and Govt. of Iran/Qeshm Free Area Authority (QFAA) on 6.3.1994 for exploring the possibility of setting up a nitrogenous fertilizer plant in QFAA. A supplementary MOU was signed on 26.11.1996, reflecting the agreed position of the joint venture partners on the price of inputs required for the proposed fertilizer project. The feasibility report for the establishment of a 7.26 lakh MTPA urea and 0.74 lakh MTPA of surplus ammonia project at an estimated cost of US $ 470 million was appraised by the joint venture partners and found to be unviable. Fresh studies

are being conducted by QFAA on the proposal for exploring possible alternatives.

Table 1.22
Profitability of public & cooperative sector undertakings

Name of undertaking	Net Profit (+) / Net Less (-)			
	2000-01	2001-02	2002-03	2003-04 (Provision
1. PUBLIC SECTOR UNDERTAKINGS				
1. NFL	27.31	40.61	286.27	59.84
2. FACT	-151.95	0.57	-199.93	-270.91
3. RCF	64.97	24.21	-48.07	167.79
4. MFL	-29.76	-66.10	4.12	-81.02
5. PPCL	-108.30	-114.20	-143.45	-130.00
6. FCI	-948.84	-104.10	-1166.31	-1113.70
7. HFC	-767.72	-572.71	-1059.56	-1098.90
8. PDIL	-32.66	-36.06	-37.59	8.06
9. BVFCL	0	0	-32.06	-2.47
10. FAGML	0	0	2.41	4.12
2. COOPERATIVE SECTOR				
11. IFFCD	231.00	308.37	557.21	329.67
12. KRIBHCO	138.10	187.33	34.01	152.70

Sources: Fertilizer manufacturer's association publication

Table 1.23

Details of non-plan and plan expenditure during 2003-2004 and budget provision for 2004-2005

			BE 2003-04	RE 2003-04	BE 2004-05
1.	NON-PLAN PROVISION				
A.	REVENUE SECTION				
	1.	Secll Proper	5.58	6.12	6.17
	2.	Office of FICC	1.91	1.63	1.48
	3.	Subsidy on Indigenous Fertilizers	7555.00	8139.55	8143.15
	4.	Subsidy on Imported Fertilizers			
		Gross	1410.75	2.00	
		Recovery	-701.60	-1.00	
		Net	709.25	1.00	473.00
	5.	Payment to Manufactures/Agents for concessional sale of decontrolled fertilizers	4456.00	3556.00	4046.00
	6.	Grant to M.I.S. Studies	0.01	0.01	0.01
	7.	Productivity Award in the field of Fertilizer Production	0.03	0.03	0.03
	8.	Write off of plan loans interest and penal interest on GOI loan to FCI, MFL, PDIL, and PPL		520.98	0

		Write of matched with receipt		-520.98	0
		Net		0.0	
	9.	Post closure committed liabilities to PPL	0	0.01	0.01
	TOTAL (REVENUE SECTION)		12727.98	11804.35	12679.85
B.	CAPITAL SECTION				
	Non Plan loans to PSUs				
	HFC		50.00	4.85	0.01
	FCI		60.00	4.49	0.01
	PPCL		54.00	27.07	0.01
	PDIL		17.99	135.51	0
	BVFCL		35.73	35.73	28.12
	FACT		0	60.00	0
	TOTAL (CAPITAL SECTION)		217.72	268.65	28.15
	TOTAL: NON-PLAN		12945.70	12073.00	12698.00
2.	PLAN PROVISIONS				
A.	REVENUE SECTION				
	1.	Grant to KRIBHCO for RFP	18.00	18.00	23.64
	2.	Grant to PDIL for R&D	4.00	4.00	0
	3.	S&T Programme of Department	3.00	3.00	1.50
	4.	Grant in the field of Management Information Technology	1.50	1.50	1.21
	TOTAL (REVENUE SECTION)		26.50	26.50	26.35
B.	CAPITAL SECTION				
	Investments In and loans to PSUs				
	1.	FCI	0	0	0
	2.	FACT	22.00	22.00	10.14
	3.	HFC	134.00	134.00	81.00
	4.	PDIL	0	0	0
	5.	MFL	14.00	14.00	12.68
		Total PSUs:	170.50	170.50	103.82
	TOATL (CAPITAL SECTION)		170.50	170.50	103.82
	TOTAL PLAN		197.00	197.00	130.17
	TOTAL : DEPARTMENT OF FERTILIZERS		13142.70	12270.00	12828.17

Name of PSU	Group	Total No. of Employees	Number of employees belonging to				
			SC	ST	Ex-serviceman	Phy-Handicapped	OBC
1. FACT	A	1252	174	22	9	10	172
	B	1404	173	35	23	17	335
	C	1792	232	68	88	31	647
	D	918	170	22	18	16	339
	Total	5366	749	147	138	74	1493
2. KRIBHCO	A	1288	31	09	09	02	103
	B	344	17	06	07	-	47
	C	590	48	32	13	05	94
	D	64	08	04	06	01	21
	Total	2286	104	51	35	08	265
3. MFL	A	352	27	4	-	1	83
	B	338	54	2	-	2	121
	C	592	151	1	18	3	226
	D	24	17	-	-	-	6
	Total	1306	249	7	18	6	436

4. PDIL	A	380	19	3	0	1	25
	B	79	7	5	0	0	1
	C	49	7	0	0	0	0
	D	6	1	0	0	0	1
	Total	514	34	8	0	1	27
5. NFL	A	1400	264	62	7	6	46
	B	1614	402	115	25	12	78
	C	1710	451	101	84	24	180
	D	263	149	14	6	8	21
	Total	4987	1266	292	122	50	295
6. RCF	A	1368	193	39	4	4	45
	B	1618	157	60	5	3	0
	C	1282	196	160	4	10	45
	D	159	35	6	0	5	12
	Total	4427	581	265	13	22	102

Sources: Fertilizer manufacturer's association publication

PROBLEMS RELATED TO FERTILIZER INDUSTRY

The role played by the fertilizer sector in achieving self-sufficiency in food grain production can hardly be over-emphasized. The increase in fertilizer consumption has contributed significantly to a sustained improvement in the production of food grains in the country. From a modest 52 million tonnes (mt) in 1951-52, the food grain production rose to 202.54 mt in 1998-99. Although some of the per hectare consumption of fertilizer nutrients in India is less than other developed and developing countries, consumption has increased about 100 times since Independence, from less than 1 kg. in 1951-52 to about 90.04 kg. in 1998-99.

Table 1.24
Number of fertilizer sale points-All India
1997-98 to 2003-04

As on	Cooperatives and Other institutional Agencies (number)	Per cent share to total	Private (number)	Per cent share to total	Total number of sale point

31-3-1997	70684	27	191259	73	261907
31-3-1998	70176	26	201738	74	271914
31-3-1999	72579	26	207818	74	280397
31-3-2000	73933	26	205360	74	279293
31-3-2001	73136	26	211828	74	284964
31-3-2002	69511	24	217883	76	287394
31-3-2003	69098	24	214003	76	283101
31-3-2004	63995	23	218473	77	282468

Sources: Fertilizer manufacturer's association publication

Over the years, the Indian industry has become largely self-reliant in design engineering and execution of fertilizer projects. Fertilizer plant operators have fully absorbed and assimilated the latest in fertilizer technology and are in a position to operate and maintain the plants at their optimum levels without any foreign assistance. The average performance of gas-based plants in the country today is amongst the best in the world. The country has also developed expertise in fabrication and supply of major critical equipment like high-pressure vessels, static and rotating equipment, heat exchangers etc. required for fertilizer projects. Indigenous vendors are in a position to compete and secure orders for such critical equipment under international competitive bidding procedure. Over 70 per cent of the equipment required for major fertilizer plants is today manufactured indigenously.

The Indian Fertilizer Industry has had its share of glory. It has, however, flourished in the past two decades under the protective umbrella of the Retention Pricing Scheme, a unit-wise cost-plus scheme that assured a fixed rate of return on the net worth for each unit. Though this scheme has been successful in achieving the objectives of increasing production and consumption of fertilizers in the country, ensuring availability at an affordable price and giving a reasonable rate of return to the producers, several aberrations have crept into it over a period of time. There are allegations that this scheme has been grossly misused. It is a cost-plus scheme and provides no incentive either to buy the cheapest plant or to cut down operating costs and

there is no pressure on producers to be efficient. That the scheme has also resulted in a lack of competitive environment and is somewhat inconsistent with the underlying philosophy of economic liberalization

While the scheme has been discontinued for all fertilizers except urea since 1992, factors discussed above and the increasing burden on subsidy that a developing country like India can ill-afford, have necessitated a re-look at this scheme for urea also. Surviving outside the protected environment of the retention price scheme is one of the biggest challenges awaiting the fertilizer industry.

Another and a more immediate challenge that the industry faces today is that of being exposed to international competition in the more open WTO regime. Because of the WTO commitments, quantitative restrictions have to be removed by the end of March 2001. Cheaper imports could threaten the domestic industry specially the units that do not use gas as feedstock. Due to inherent inefficiencies and cost disadvantage, non-gas-based units producing over 30 per cent of the domestic output would not be able to compete in a globally competitive environment. Even the gas-based units would have to exercise considerable financial discipline to be able to compete. Phosphatic fertilizer producers would also face similar threats as the cost at which the industry purchases raw materials nearly match the cost of imported fertilizers. In the short run domestic companies may enjoy the protection of differential subsidy in some form or the other. But in the long run they will have to compete on a stand-alone basis.

The industry will need to come to terms with problems of feed stock also. While the country has been totally dependent on imports for its potash requirements and largely dependent for phosphate requirements, it is soon going to experience similar situation in urea manufacture as well. Natural gas,

the most efficient feedstock for urea manufacture, is even now not available for new fertilizer capacity. Studies indicate that by 2011 it may be difficult to meet the full requirements of even the existing units. The Government and the industry will need to focus research and development efforts in tapping unconventional sources of energy like coal bed methane, natural gas hydrates and underground coal gasification. To this end, a national policy need be formulated in a time-bound manner. Focused efforts will also be required to find a suitable technology to manufacture urea from the abundant high-ash coal and to establish joint ventures in countries with cheap and abundant raw material.

One of the biggest challenges to chemical fertilizers is likely to come from chemical fertilizers themselves. Repeated use of chemical fertilizers without practicing methods of organic farming can impair fertility of the soil. Some reports indicate the organic content of the soil has been registering a steady decline. Excessive use of chemical fertilizers also reduces the water and nutrient retention capacity of the soil. This could result in an increase in insoluble nutrients in the soil, causing pollution and contamination of ground water. Farmers need to be educated on supplementing the use of chemical fertilizers with traditional manures such as rural or urban compost and green manure. Use of bio- fertilizers has also been encouraged to help make insoluble nutrients available to the plants. Promoting integrated nutrient management systems therefore, should become an integral part of companies' marketing efforts.

(1) The next half a decade or so is, therefore, going to be a testing time for the industry. Its future will depend upon how well it is able to adapt to the changing environment. A vibrant fertilizer industry is central to food security of the country. The entire fertilizer sector, including the Government, industry and the stake holders will have to do their bit to

see that the industry lives up to these challenges. Frequent change in govt policy has affected the growth of industry.

(2) Cooperative sector is found to be performing week in managing the recent trends in industry.

(3) The policy of cost-plus pricing ha s affected the industry in negative manner.

(4) The commitments of WTO are affecting the growth of industry.

(5) Potash requirement should be satisfied from within the country so that factor of dependency on other countries reduced.

(6) Distribution network is weak in comparison to other countries.

Government Policy Vs. Fertilizer Industry

Economic liberalization and reforms are the two key notes of the Government's political philosophy today, which has embraced almost all sectors of the economy. Even in the case of the fertilizer sector, an attempt to introduce liberalization has been made since August 1992. It is obvious that the fertilizer sector has to fall in line with the rest of the economy and a total decontrol would therefore have to be ultimate goal for this sector. In 1992, with a view to reducing the subsidy, all the phosphatic and potassic fertilizers were decontrolled. Consequently the prices of these fertilizers increased sharply leading to fall in their consumption and distorting the ratio of fertilizer consumption. The retention pricing scheme (RPS), which was introduced in 1977, thus got confined to urea only. The nineties remained a decade of uncertain policies. To review the existing system of subsidization of urea and suggest an alternative broad-based scientific and transparent methodology a High Powered Fertilizer Pricing Policy Review Committee (HPC) under the

Chairmanship of Professor C.H. Hanumantha Rao, was set up. The Committee has explored a number of options for determining producer price such as the existing RPS with some modification, group retention price, uniform administered price and market oriented system. Government of India is drawing a long term policy for fertilizer industry, which is to ensure that the transition to total decontrol is achieved in a phased manner. GOI proposes to decontrol fertilizers completely by 2006.

FEEDSTOCK POLICY

At present, natural gas based plants account for more than 60% of urea capacity, naphtha is used for less than 30% of urea production and the balance capacity is based on fuel oil and LSHS as feedstock. The two coal based plants at Ramagundam, Andhra Pradesh and Talcher, Orissa were closed down due to technological obsolescence and non-viability.

Natural gas has been the preferred feedstock for the manufacture of urea over other feedstocks viz. naphtha and FO/LSHS, firstly, because it is clean and efficient source of energy and secondly, it is cost effective and internationally competitive in terms of manufacturing cost of urea. However, pricing of feedstock also becomes a very important factor in the production of urea due to the fact that the cost of feedstock constitutes about 60 to 75% of the total cost of production of urea. In respect of gas-based units, cost of feedstock accounts for 60% of cost of production, whereas for naphtha based and FO/LSHS based units, it accounts for about 75% of the cost of production.

Although natural gas is the preferred feedstock for production of urea, due to the dwindling supplies of natural gas, even the gas based units have been forced to partially use naphtha even for feedstock. The burgeoning demand for natural gas by sectors such as fertilizer, power, transport etc. has resulted in efforts to increase domestic gas supply, mainly from fields being developed by private companies/joint ventures as well as development of new gas reserves recently discovered, through step up in exploration. It has also

given rise to the prospects of early LNG import into the country by 2004-05. It is expected that by the terminal year of the tenth Five Year Plan, 4-5 LNG terminals may be operational at different coastal locations in the country.

The Dahej LNG terminal of Petronet LNG Ltd. (PLL) has already been commissioned. The fertilizer industry is in negotiations with the prospective LNG suppliers on the issues of pricing and availability of LNG. An Inter-Ministerial Group, under the Chairmanship of Deputy Chairman.

Planning Commission has been constituted to deliberate on these issues. The Government has already announced a policy for treatment of conversion of the non-gas based units to NG/ LNG. Under this policy, while the investments made on conversion will not be recognized, the operational efficiency including energy efficiency arising from conversion to NG/LNG will not be mopped up for a maximum period of 5 years in respect of naphtha based plants and for 10 years in respect of FO/LSHS based plants from the date of commissioning of the converted plant. The proposed Long Term Fertilizer Policy has chalked out a three phased programme starting 2000-01 to 2006-07 with definite actions to be performed in each phase as listed below;

Phase 1: 2000-01 and 2001-02

(A) Removal of Aberrations and Deficiencies

i) Reassessment of capacity and modulation of off take depending
On demand

ii) Increase in the price of urea at regular intervals

iii) Improvement in the implementation of the concession scheme

(B) Initiation of New Measures

i) The problem of feedstock

ii) Feasibility of a coal based technology

iii) Joint Ventures

iv) Decision on fertilizer pricing policy

v) Policy towards creation of new capacity

vi) WTO related matters

vii) Removal of distribution controls on urea

viii) Extension of concession scheme to bio fertilizers

Phase II (2002-03 – 2003-04)

i) Final decision on feed back

ii) Creation of new capacities long term perspective

iii) Decision on degree of protection to indigenous industry

iv)New initiatives

a) Role of the regulator

b) Extension of concession scheme to urea

c) Removal of MRP

d) Emphasis on productive investment

e) Change in the relationship between industry and the Farmers

f) Balanced fertilizer use

g) Eco-friendly fertilizer use

h) Creation of Fertilizer Policy Planning Board

Phase III (2004-05 – 2006-07)

i) Withdrawal of MRP and Concession scheme

ii) Role of Government in decontrol scenario

iii) Policy relating to LNG

W.T.O. Implications

Quantitative restrictions on import of fertilizers have been removed since April 1, 2001. The proposal to institute a tariff rate quota (TRQ) for urea imports has been put on hold for the time being, retaining the basic custom duty of five per cent for the year 2001-02. Under the TRQ regime, it is proposed to allow imports of a specific quantity at the existing rate of five per cent custom duty and quantities beyond at higher custom duty.

At present, there is no bond rate of duty on urea and Government can impose a higher tariff say 150-200 per cent in future. But pegging the duty at such levels may not be appropriate because imports of urea thus will become costly to meet the demand-supply gap which is likely to increase in future. The TRQ option will therefore, provide the flexibility in importing a certain critical quantity at a lower duty. Urea imports have been canalized through MMTC, STC and IPL. The exim policy has continued with this arrangement, though it has been mentioned that the designated parastatals would have to function henceforth on 'Commercial Principles' in accordance with Article XVII of GATT. In other words they can import any quantity without any restriction. There will be a bond rate of 5 per cent custom duty on import of DAP and MOP. The W.T.O related issues are under detailed examination by the Government.

Types of Fertilizers & Fertilizer Manufacturing Process

Fertilizer Types

Because every crop is different and the soils and weather conditions crops are grown in vary dramatically around the world, commercial fertilizers, which are manufactured from natural sources, come in many formulations.

Combining air with hydrogen using natural gas as the feedstock makes ammonia, the building block for nitrogen fertilizers. Ammoniated phosphates, which include monoammonium phosphate (MAP) and diammonium phosphate (DAP), are made by reacting ammonia with phosphoric acid. Muriate of potash, also called potassium chloride, is made from mine ores that have been processed to remove naturally occurring salts. Ammonium nitrate is a solid fertilizer containing approximately 34 percent nitrogen that is water soluble and used in various fertilizer solutions. Aqua ammonia is another nitrogen-based fertilizer made by combining ammonia with water. It contains up to 25 percent nitrogen and is either applied directly to the soil or is used to manufacture phosphate fertilizers.

Nitrogen solutions:

They are water solutions of ammonia, ammonium nitrate and, sometimes, urea, a solid fertilizer containing approximately 45 percent nitrogen, and other soluble compounds of nitrogen. Nitrogen solutions are used in ammoniating super phosphate, the manufacture of complete fertilizer and for direct injection into the soil. They vary in composition and nitrogen content and are sometimes applied under pressure.

Nitrogen (N):

Nitrogen is a part of all plant proteins and is a component of DNA and RNA - the "blueprints" for genetic characteristics. It is necessary for plant growth and chlorophyll production. Nitrogen is the building block for many fertilizers. Where does N come from? Nitrogen is present in vast quantities in the air, making up about 78 percent of the atmosphere. Nitrogen from the air is combined with natural gas in a complex chemical process to make ammonia.

Phosphorus/Phosphate (P):

Phosphorus as a nutrient is sometimes most valuable to plants when put near the seed for early plant health and root growth. Plant root uptake is dependent on an adequate supply of soil P. Phosphorus is relatively insoluble in water. The water in most soils contains only a few pounds of P per acre. So for a crop such as corn, soils must replace all of the P in the soil water 2 to3 times each day to meet the crop's demand for P. Phosphorus compounds help in directing where energy will be used. Phosphorus compounds are needed in plant photosynthesis to "repackage" and transfer energy. Phosphate is also a component of DNA, so it is one of the building blocks of genes and chromosomes. Phosphorus is involved in seed germination and helps plants to use water efficiently. Where does P come from? Phosphorus occurs in natural geological deposits. Deposits can be found in the U.S. and other parts of the world. To make the P in phosphate ore soluble and available for plants to use,

the ore is combined with sulfuric acid and further processed to make many different kinds of phosphate fertilizers.

Potassium/Potash (K):

Potassium protects plants against stresses. Potassium protects plants from cold winter temperatures and helps them to resist invasion by pests such as weeds and insects. Potassium stops wilting, helps roots stay in one place and assists in transferring food. Potassium is a regulator. It activates plant enzymes and ensures the plant uses water efficiently. Potassium is also responsible for making sure the food you buy is fresh. Where does K come from? The element potassium is seventh in order of abundance in the Earth's crust. Through long-term natural processes K filters into the oceans and seas. Over time, these bodies of water evaporate, leaving behind mineral deposits. Although some of these deposits are covered with several thousands of feet of earth, it is mined as potash or potassium chloride. Potash ore may be used without complex chemical conversion; just some processing is necessary to remove impurities such as common salt.

Micronutrients:

Besides the three macronutrients, there are also several micronutrients necessary in small quantities for plant growth. Micronutrients are mainly involved in metabolic reactions as a part of enzymes where they are used over and over without being consumed. Nevertheless, their functions are very specific and cannot be substituted for by some other element. These include: calcium, magnesium, sulfur, boron, copper, iron, manganese, molybdenum and zinc. **The Fertilizer Manufacturing Process** the various steps involved in the manufacture of finished fertilizer products, from raw materials through intermediate products, are shown in Figure.

Nitrogen Fertilizers

The intermediate product in the case of nitrogen (N) fertilizers is ammonia (NH_3), which is produced by combining nitrogen extracted from the air with hydrogen from hydrocarbons such as natural gas, naphtha or other (heavier) oil fractions, and hydrogen which is obtained by means of the Steam Reforming Process. Approximately 85% of the anhydrous ammonia plants in the EU use natural gas. Measures to improve production processes have focused on reducing the amount of hydrocarbon feedstock required to produce a tone of ammonia.

The further processing of ammonia produces straight N fertilizers such as urea, ammonium nitrate and calcium ammonium nitrate, as well as solutions of the above fertilizers and ammonium sulphate. Ammonia is also the main component of many multi-nutrient fertilizers.

Phosphate Fertilizers

Rock phosphate (27 - 38% P_2O_5) is the raw material source from which all types of phosphate fertilizers are produced, with the minor exception of basic slag (12 - 18% P_2O_5), which is a by-product of steel production.

In its unprocessed state, rock phosphate is not suitable for direct application, since the phosphorus (P) it contains is insoluble. To transform the phosphorus into a plant-available form and to obtain a more concentrated product, phosphate rock is processed using sulphuric acid, phosphoric acid and/or nitric acid. Acidulation by means of sulphuric acid produces either phosphoric acid, an intermediate product in the production of triple super phosphate (TSP), MAP, DAP and complex fertilizers, or single super phosphate (SSP). Acidulation using phosphoric acid produces TSP, and acidulation using nitric acid produces NP slurries for use in the manufacture of complex fertilizers.

Potash Fertilizers

Most potassium (K) is recovered from underground deposits of soluble minerals, in combination with either the chloride or sulphate ion. Although the low-grade, unrefined material can be applied direct, the minerals are normally purified, to remove sodium chloride, and concentrated before use. The resulting potash fertilizers are applied as straight K fertilizers such as potassium chloride and potassium magnesium sulphate or are used in the manufacture of multi-nutrient fertilizers.

Multi-nutrient Fertilizers

Most multi-nutrient fertilizers produced in the EU are either complex fertilizers, each granule of which contains a uniform ratio of nutrients, or blends. Typically, complex NPK fertilizers are manufactured by producing slurries of ammonium phosphates, to which potassium salts are added prior to granulation or prilling. PK fertilizers, on the other hand, are generally produced as compounds by the steam granulation of super phosphates (SSP or TSP) with potassium salts.

Scope and Implications for the future

India has become third largest country with a total capacity of 11.07 million tons of N and 3.760 million tons of P2O5 in year 2000-2001. Further capacity addition for N has now been stalled for the time being due to very narrow demand supply gap at present and costly feed stock. However, there will be some addition to the phosphates capacity.

Domestic production of nitrogenous fertilizers was 11.004 million tons in 2000-2001, whereas production of phosphates a fertilizer was 4.70 million tons (Table-1), which are marginal higher compared, to last year production. All India capacity utilization has gradually improved over the years and was maintained at almost cent per cent level for N. However, during 2000-01

restrictions were imposed on capacity utilization of Urea at 92% as a consequence the production of urea declined. The increase in production of total N is observed due to increase in production of DAP and other complexes which also have 'N'. Production of DAP during 2000-01 was 10 % higher compared to previous year. The capacity utilization for P2O5 fertilizers was cent per cent (Table 1.25).

New Capacity building for production of urea will now take place where the natural gas is available in abundance and at low price

Table 1.25:

Capacity and production of n and p fertilizers in India (000t)

Year	Capacity		Production	
	N	P	N	P
1995-96	8998	2924	8769	2593
1996-97	9332	2948	8593	2578
1997-98	9987	3165	10083	3058
1998-99	10571	3206	10477	3181
1999-2000	11068	3748	10873	3407
2000-2001	11068	3748	11004	3748

Sources: Fertilizer manufacturer's association publication

Government is keen on implementation of Indo-Oman Fertilizer Project. The financial closure could take effect in October 2001 and the commercial production will begin 36 months after that. The entire production of 1.65 million tons per annum of urea from this project will be purchased by India on long term basis.

Table 1.26

Production of urea and dap in India (000t)

Year	Urea	DAP
1995-96	15805	2645
1996-97	15628	2765
1997-98	18594	3665
1998-99	19292	3864
1999-2000	19807	3861
2000-2001	19734	4888

Sources: Fertilizer manufacturer's association publication

Imports of Fertilizers

Imports of urea have declined substantially during the past five years (Table 1.28). There has been no import of urea during 2000-01. Already there is a huge stock of urea, around 2.5 million tons as on march 31, 2001. Therefore there will be no need for any further stock building during next six months. India is presently self sufficient in respect of urea.

Table 1.27

Imports of Fertilizers 1995-96 – 1999-2000

Year	Urea	DAP	MOP
1995-96	3782	1475	2356
1996-97	2328	475	110
1997-98	2389	1563	2380
1998-99	556	2091	2579
1999-2000	533	3268	2946
2000-2001	68	844	2450

Sources: Fertilizer manufacturer's association publication

Investment in Fertilizer Industry

Fertilizer production is capital intensive and presently the cost of production of indigenous material is high and returns on investment are low. The Indian fertilizer industry which achieved phenomenal growth in eighties, witnessed decline in the growth rate during the nineties. In the recent past, the

fertilizer industry has not attracted any significant investment. No multinational has invested in fertilizer sector in India.

Due to sufficient indigenous capacity and low international prices of urea the Government of India in Feb. 2000 decided that no new grassroots projects will be allowed during the next three years in public, private or cooperative sector. So even if the Government reviews its decision, the earliest a project could start would be by 2004-05.

Government is also considering disinvestments of its equity of public sector fertilizer units up to 51 per cent or even more. Thus, handing over the management control of the company to a strategic buyer. The disinvestment in National Fertilizer Limited (NFL), a major urea producer in the country is underway.Lack of availability of natural gas in the country has prompted investors to collaborate for joint ventures abroad for urea production. Gulf countries, due to abundant availability of gas, nearness to Indian shores and investment friendly environment, are becoming the first choice for joint ventures.Among the Public Sector Units, The Fertilizer Corporation of India Limited (FCI), Hindustan Fertilizer Corporation Limited (HFC), Projects & Development India Limited (PDIL), Pyrites, Phosphates & Chemicals Limited (PPCL) were declared sick. They are under consideration of Bureau of Industrial and Financial Restructure (BIFR).

As India does not have potential rock phosphate reserve, it is completely dependent on import of either rock phosphate or phos acid or DAP. There has been new capacity addition by way of importing rock phosphate and converting it to phos acid and then to DAP/NPK or conversion of phos acid at rock phosphate mines abroad in JV and importing phosphoric acid for further conversion to DAP/NPK. It is heartening to note that apart from the operating joint venture plants for phosphoric acid in Senegal, Jordan and Morocco some more projects and expansions are being contemplated by the Indian companies.

Subsidy on Fertilizers

The union budget for 2000-01 raised urea prices by 15 percent; DAP by 7 percent and that of MOP by 15 percent. This move enabled the Government of India (GOI) to prune the subsidy bill to some extent. However, there was no increase in urea price in the union budget for 2001-02. In the long term policy, the subsidy withdrawal in a phased manner has been proposed. However, modalities to phase out the subsidy have not been clearly mentioned.

With the withdrawal of subsidy and concessions the prices of fertilizers will increase. In the totally decontrolled scenario, the stability and uniformity of fertilizer prices is not likely to be achieved. Indian farmers who were getting fertilizers almost at the uniform price throughout the country may not continue to avail this opportunity. They may also witness fluctuating market price of a fertilizer within a short span of one crop season. Such price variation may affect farmers purchase decision as well.

Research and Development Efforts

Fertilizer use in India is mainly limited to urea, DAP, MOP and SSP. Else where in the world the specialty products such as completely soluble solid fertilizers for drip irrigation and efficient products like USG, Coated urea etc. are used. New research and development activities are required to be encouraged in the areas of new product, energy saving, alternate feedstock etc. Without R & D efforts Indian fertilizer industry will continue to employ stereo type operation and there will be little innovation.

CONCLUSIONS

- Government is contemplating complete decontrol in phased manner by 2006-07.
- Quantitative restrictions on fertilizer imports have been removed since April 1, 2001.

- The implications of present policy environment for fertilizer sector in India are not promising. There are possibilities that domestic production and consumption of fertilizers may decline.
- The policy considerations which are likely to be implemented may result in making the domestic production of fertilizers unviable.
- At present there is no demand-supply gap in urea.
- A switch over in feed stock from naphtha to LNG for urea is envisaged depending on its availability and price.
- High energy cost do not permit further expansion in urea capacity within the country, joint ventures abroad are likely to be developed.
- For phosphate/potash also, joint ventures abroad are likely to be developed as there is no potential reserve within the country.

Recent Development and Brief News of Fertilizer Industry

Phos acid prices spiral out of control

Phos acid suppliers have raised their prices by a whopping $10 per tonne to between $497-$507 per tonne in quotes submitted today. The price paid for supplies last year was $402.75 cfr. The lowest price was quoted by OCP of Morocco, at $497 cfr, for supply of 6.40 lakh tonnes of phos acid. The offer came with a 60day interest free credit valid until April 30, 2005. The other quantity supplier was Foskor, at 4,10,000 tonnes, at a price of $506 cfr per tonne. The quotes were submitted today in New Delhi to the Phos Acid Consumer Group. Suppliers have been called for negotiations on April 11, 2005. The website carries here details of all quotes received today.

MFL wants fair distribution of phos acid

Even as the process leading up to the purchase of phosphoric acid heats up, Madras Fertilizers Ltd. (MFL) has loudly protested the unilateral cutting down of allocated supplies to the company for 2004-05 by the Phos Acid

Consumer Group. Despite the company's willingness to open L/Cs, both Foskor and OCF had apparently failed to meet their commitments. Oswal Chemicals and Fertilizers had also backed out of a deal to supply 80,000 tonnes of phos acid. MFL has now pleaded with the DOF that the PACG should put together a mechanism to ensure fair distribution of available quantities of phos acid. It has also asked the DOF to monitor the fair distribution of committed quantities so that "stronger customers do not snatch away the material". PMT-GAIL agrees to sell 5.5-6 mmscmd of gas at $3.73/mmbtu: Fertilizer companies accept deal under protest but NTPC refuses

GAIL and the Panna Mukta Tapti (PMT) consortium have agreed on a gas price of $3.73/mmbtu (plus transmission charges and marketing costs) for supply of 5.5-6 mmscmd of gas on a priority basis to power and fertilizer companies, power secretary S.C. Tripathi disclosed to this website on Wednesday. Earlier this gas was supplied under the government's subsidized pricing regime. Most fertilizer companies have agreed to the new price -- though there are murmurs of protest -- but power major NTPC has refused to accept the higher price. GAIL has now said that if the power company refuses to fall in line, it will have no option but to re-allocate the gas to other priority consumers. It has been agreed that the PMT consortium will only sell their quota of gas at a price higher than offered to the priority consumers. GAIL, in turn, has agreed not to charge differential tariffs for transportation of gas sold by the PMT consortium.

Details of allocations of PMT gas to power & fertilizer companies

This information carries here a re-allocation of supplies to power and fertilizer companies assuming a supply of only 6 MMSCMD of gas from the Panna-Mukta-Tapti (PMT) consortium. Power secretary S.C. Tripathi told this website that the gas supply to these units will be 6 mms cmd but may come

down to 5.5 mmscmd, in which ase there will be pro rata cuts on allocations. Fertilizer companies seem less reluctant than power companies to accept the deal because feedstock pricing is a 'pass through' under the cost-plus retention pricing system. This is not the case with power companies where tariff increases are difficult to implement and are often bogged down in regulatory red tape. However, there is now a realization that cheap gas will not longer be available in the current deregulated environment.

DOF set to send SSP subsidy issue to CCEA, says fertilizer secretary

Despite the Department of Expenditure's (DOE) non acceptance of the proposal to substantially hike subsidy payments to single super phosphate (SSP) manufacturers, the Department of Fertilizers (DOF) is all set to send the proposal to the Cabinet Committee on Economic Affairs (CCEA). "We will be sending the proposal to CCEA with all comments from concerned departments," Fertilizer Secretary SNPN Sinha told this website. "The CCEA will take a decision on this issue. The Agriculture Ministry is supporting the DOF's proposal to double the current subsidy level from Rs 650 per tonne to Rs 1,300-1,350 per tonne. The DOE has candidly rejected the proposal. The DOE says that it is not in a position to grant any more subsidies to the fertilizer sector," Sinha added.

H S Bawa, Vice Chairman of Chambal Fertilisers and Managing Director of Zuari Industries Ltd, has asked Fertilizer Secretary SNPN Sinha to expedite the process of reassessing the compensation to be paid for sale of Paradeep Phosphates Ltd (PPL) to Zuari Maroc Phosphates Ltd (ZMPL). The global audit firm, KPMG, which has now been assigned the task of re-examining the valuation process of PPL, presented its audit report to the DOF on February 28, 2005. Earlier, Price WaterouseCoopers (PWC) was assigned the valuation job but the DOF rejected its findings. The DOF and ZMPL are now expected to submit their respective comments on the KPMG's

report. "We want this issue to be sorted out soon," Bawa told this website. "KPMG seems to have calculated the compensation amount lower than that of PWC. My request is for an amicable solution because the issue has been lingering for a long time." Meanwhile, Sinha has also directed the DOF officials to prepare their comment on this issue.

NFL in talks with Saudi Aramco for fertilizer plant in Saudi Arabia

National Fertilizer Ltd. (NFL) is in negotiations with Saudi Aramco to set up a fertilizer plant in Saudi Arabia along the lines of the fertilizer plant in Oman, promoted by Iffco and Kribhco. This was disclosed during a a tele-conference with from Riyadh by petroleum minister Mani Shankar Aiyar. He also confirmed an arrangement by which Hindustan Petroleum Corporation Ltd. (HPCL) will participate in a Saudi EOU refinery in the Red Sea while, in return, Saudi Aramco will make an investment in HPCL's Visakhatnam refinery, which will be re-oriented towards exporting petroleum products in the eastern market. Aiyar has completed a series of successful discussions which included issues like commercial storage of Saudi crude in India and cooperation in the fertilizer and mining sectors. The website carries here the excerpts of Aiyar's media briefing after his meeting with his counterpart Ali Al-Naimi. Also carried here is the seven-point agenda included in the Memorandum of Collaboration (MoC) in the R&D sector between IOC with Saudi Aramco.

Details of fertilizers imported during 2004-05

The website caries here the company-wise details of fertilizerd imported during the the period 2004-05. The total import made during the period is 6,41,005 tonne of urea, 5,54,544 tonne of DAP and 30,76,764 tonne of MOP. During the period, IPL imported the maximum quantity of 14,47,208 tonne of MOP while Cargill imported the maximum of 1,98,210 tonne of

DAP. The maximum quantity of urea --2,85,662 tonne -- was imported by GNVFC. Urea and DAP imports during Rabi pegged at 4.7 lakh tonne and 3.7 lakh tonne The Department of Fertilizers (DOF) has estimated the total availability of urea at 117 lakh tonne for Rabi 2004-05 as against an assessed requirement of 108.35 lakh tonne. The opening stock as on October 1, 2004, is estimated at 11 lakh tonne while production for the entire Rabi period (October, 2004-March, 2005) has pegged at 101.7 lakh tonne. Urea import during the season is estimated at 4.7 lakh tonne. Similarly, the total availability of DAP for the season is projected at 43.4 lakh tonne, comprising of 3.7 lakh tonne of imports, an opening stock of 11.9 lakh tonne and a Rabi production of 27.5 lakh tonne. The opening stock for MOP as on October 1, 2004, is estimated at 2.1 lakh tonne. Imports of 15 lakh tonne of MOP upto February 28, 2005, took the total availability to about 17 lakh tonne. The sales reported during the same period have been 9.4 lakh tonne for direct application which left an unsold stock of about 2.75 lakh tonne in various field godowns as on February 28, 2005.

GNFC plans to resume sale of AN melt from September 2005

Gujarat Narmada Valley Fertilizer Company Ltd (GNFC) has sought permission from the Department of Fertilizers (DOF) to resume the sale of Ammonium Nitrate (AN Melt), which was disrupted after a fire in one of the company's nitrophosphate plants in February 2004. After the incident, GNFC had decided to discontinue the production of AN (Melt) keeping in mind the explosive nature of the product. As a precautionary measure, the company has also shifted the entire AN (Melt) filling station outside the plant battery limit to avoid a recurrence of the incident. Now that the detailed engineering and procurement works are over in the plant, GNFC has decided to resume sales of AN (Melt) from September 2005.Tariff Commission study of pipeline tariff: GAIL happy with recommendations Contrary to popular belief, GAIL seems not unhappy with the Tariff Commission's interim recommendation for a

single tariff for consumers of LNG through its trunk pipelines. "GAIL would be happy to accept a uniform methodology based on international practices with clearly spelt-out norms on important parameters like economic life for capital recovery, actual availability and design margins for volume assumptions, number of operation days, and inflationary effect on cost of asset replacement and return on equity. Once this is standardized, companies other than GAIL, which are engaged in the business of natural gas transmission in India or likely to be engaged in the gas transmission business in India, would also have to adhere to the norms recommended by the Tariff Commission, so that consumer interest is protected in all the cases," said a GAIL official in a written reaction to a report on this website. According to GAIL the Tariff Commission has been asked by the petroleum ministry to take into account the impacts of actual volume throughputs and inflationary effect on cost of asset replacement in its final report. "It is pertinent to mention that as per the tariffs mandated by the Ministry of Petroleum and Natural Gas, R-LNG consumers beyond Vijaipur are charged a pittance, viz. Rs. 22/1000 SCM, which is not reflective of the more than 1,000 kms of the HVJ pipeline facilities that they are using to transport R-LNG beyond Vijaipur. As per our estimates, GAIL is suffering an under-recovery to the tune of Rs. 48 crore annually on account of R-LNG consumers who are using the HVJ facilities beyond Vijaipur. We are looking forward to charge the quantum of tariff, as determined by the Tariff Commission, for transmission of R-LNG through the HVJ system downstream of Vijaipur up to New Delhi," GAIL said.

News Brief

Indo Gulf Fertilisers Limited has announced that the Life Insurance Corporation of India Ltd. has acquired 58,179 shares aggregating to 0.12% of the share capital of Indo Gulf Fertilisers Ltd. on March 11, 2005. The mode of acquisition is through Open Market and the shareholding of Life Insurance

Corporation of India Ltd. after the said acquisition is 22,70,356 shares aggregating to 5.03% of the share capital of Indo Gulf Fertilisers Ltd

RCF proposes to manage FACT for a fee

Rashtriya Chemicals and Fertilizers Ltd (RCF) has submitted a proposal to the Department of Fertilizer (DOF) to undertake the management of Fertilisers and Chemicals Travancore Ltd (FACT) for an initial period of three years. RCF has said that it intends to turn around the loss making South-based company in a profit making PSU for a suitable fee. For this, RCF has sought a Fixed Fee (FF) of 1% on the total turnover of FACT and a Management Remuneration (MR) of 10% of the net profit. The Fixed Fee shall be paid to RCF every month on provisional basis at 1/12th of the turnover of the previous year to be adjusted at the end of the year based on the audited accounts, while the MR is to be paid to RCF after the ascertainment of the profit for the financial years as certified by the statutory auditors. However, if FACT does not register profits in a financial year, RCF shall not be entitled to any MR for that year. But RCF has put in a few caveats before it takes over the management control. RCH has argued that since FACT has projected the requirement of Rs 100 crore towards additional working capital, the government should consider giving a guarantee on behalf of FACT to the banks for offering working capital loans to the extent of Rs 100 crore. Thereafter, RCF would negotiate with the banks to obtain a competitive rate of interest. RCF has also asked the government to write-off the outstanding interest of Rs 34.80 crore for 2003-04. Apart from these, RCF also wants the conversion of a part of the GOI loan of Rs 514.46 crore into equity capital of Rs 252.23 crore while the balance is to be written-off. Another caveat is that FACT's non-plan loan of Rs 60 crore will have to be written off. Fertilizer Minister directs DOF to enhance buffer stock of DAP to 5-7 lakh tonne

Fertilizer Minister Ram Vilas Paswan has directed the DOF to enhance the buffer stock of DAP from 2 lakh tonne to 5-7 lakh tonne. The existing

authorised buffer stock for DAP is 2 lakh tonne, which is apparently inadequate to fulfill the requirement in case of shortages. The incremental quantity of DAP will be met either through enhancement of indigenous production or imported DAP. "We will try to get the enhanced quantity through additional indigenous production. If that will not be possible, we are ready to even import DAP to have a better buffer stock," official sources told this website.

Urea News

IPL has finalised 15,000 tonne(+/-10%) bulk prilled urea with Qafco at US$232 per tonne fob with 30 days credit. The material will fulfil the requirement of Zuari. The shipment will be discharged at Mangalore around second-half of April 2005.GAIL threatens to discontinue gas supply to Iffco from April, 2005: DOF pleads on behalf of the cooperative GAIL has threatened not to renew the Gas Sale Purchase agreement with fertilizer giant Iffco after it lapses on March 31, 2005 unless all past dues are paid up. GAIL has demanded a principal amount of Rs 217.85 crore in unpaid dues. GAIL says that it is under obligation to supply gas to Iffco once the contract expires. When compounded, the amount goes up to a staggering Rs 3793 crore. GAIL's claim is being vociferously disputed by Iffco, which claims that there are no past dues to be paid to GAIL. The dispute is now under arbitration of the Gujarat High Court. Meanwhile, the Department of Fertilizers (DOF) has written a letter to the petroleum ministry urging against disconnection of supplies to the cooperative giant. The DOF is of the view that the dispute should be resolved through mutual discussions.

Latest plant-wise data on urea production (till March 15, 2005)

The information carries here production figures of urea for the first fortnight of March 2005. Output was at 8.11 lakh tonne against a targeted production of 6.92 lakh tonne. The upsurge in output is due to increased production by NFL, RCF, GSFC, SFC, Zuari, GNFC, NFCL and TCL against target levels. Production could have been higher but for the fact that IFFCO, Kribhco and CFCL produced less than their targeted levels. The data is also given cumulatively for the period April 1, 2004 to March 15, 2005. Against a target of 186.30 lakh tonne of urea for April-March period, production has been significantly higher at 195.50 lakh tonne. The website carries here unit-wise disaggregated production figures for the first fortnight of March 2005 and cumulatively for April 1, 2004 to March 15, 2005.

Expert Group constituted to review phos acid formula

As per the directive of fertilizer minister Ram Vilas Paswan, the Department of Fertilizers (DOF) has constituted an Expert Group to re-examine the proposed methodology for determining the price of phosphoric acid. The group consists of Chairman Abhijit Sen, Member, Planning Commission and includes Joint Secretary (Fertilizer) B.K. Sinha, GSFC's CMD A K Luke, FAI's DG B K Saha and Director (Cost) Tariff Commission. Although no time frame has been set for the group to give its report, Paswan is hopeful of that the Expert Group very submit the report soon enough, highly placed ministry sources told Kribhco's expansion project-I: Hazira project to be completed in 39 months, to cost Rs 1,750 crore Kribhco's Hazira expansion project will have an annual urea production capacity of 10.56 lakh tonne. The capital cost will be Rs 1,750 crore (including a foreign exchange component of Rs 990 crore). The project will be completed in 39 months from the date of approval by the government. The DOF has stipulated that the long run average cost (LRAC) for the project will be determined under the extant policy based on a capital cost of Rs 1,750 crore. However, the LRAC will be revised

downwards if the actual project cost is lower. No cost escalation will be taken into consideration for re-determination of LRAC. However, any variations in the capital cost on account of foreign exchange rate, changes in rates of duties, levies and taxes shall be considered.

Kribhco's expansion project-II: Debt-equity ratio fixed at 2.5:1

The Long Run Average Cost (LRAC) for Kribhco's Hazira expansion project has been worked out on a debt equity ratio of 2.5:1. Kribhco had earlier proposed to execute the project with a debt equity ratio of 2:1 to provide comfort to the lenders and to have adequate debt service coverage ratio during the initial operating period. However, in accordance with the policy for new and expansion urea units -- which prescribes a debt equity ratio of 2.5:1 (indicative) for determination of LRAC -- the debt equity ratio for the Hazira expansion project has been fixed at the same level. Meanwhile, the equity portion of Rs 583.24 crore will be arranged by Kribhco from its own resources and the debt of Rs 1,166.48 crore from banks and financial institutions. No budgetary support is required from the government for setting up this project. The website carries here the summary of performance indicators in respect of Kribhco's proposal and financial commitments on the project.

Kribhco's expansion project-III: Rs 500 crore savings in capital cost Kribhco's expansion project is expected to bring about significant savings. The project will save around Rs 500 crore in capital cost due to availability of existing infrastructure and offsite facilities. The proposed plant is a high capacity plant and requires movement of "Over Dimensional Consignments" which is feasible at coastal locations like Hazira. Apart from these, Kribhco has its own private railway siding and 300 wagons under its Own Your Wagon Scheme. Therefore, no logistic problems are anticipated for the Indian Railways for transporting the additional production of fertilizer to deficit zones

like the south and east. Moreover, Hazira is likely to be the hub of natural gas/LNG in the country where gas is expected to be available at very competitive prices. The demand in Gujarat and in surrounding states is expected to increase due to the implementation of various irrigation schemes. This will provide Kribhco with a good market to sell its fertilizer produced from the proposed Hazira expansion project. Further, there are other advantages in establishing indigenous urea plants over imports in terms of multiplier benefits to the economy through employment generation, utilization of indigenous engineering capabilities, design capabilities, manufacturing capabilities, infrastructure facilities, self reliance, food security and safeguards against political upheavals abroad.

Kribhco's expansion project-IV: Project viable even at a gas price of $4.5/mmbtu, given urea price of $140 PMT

The fertilizer department has stipulated that any new or expansion project will be given subsidy on the basis of the Long Run Average Cost principle up to a delivered cost of $3/mmbtu for natural gas and $3.50/mmbtu for LNG. However, if this delivered price of NG exceeds US $ 3.0/MMBTU or of LNG exceeds US $ 3.5/MMBTU, the project will get concession based on the escalated LRAC based price or the prevailing import parity price of urea, whichever is lower, with the originally determined LRAC based concession acting as the floor concession rate, for the initial period of 5 years. It is seen from calculations made for the project that at average import price (fob Middle East), there is a saving of Rs. 341/MT even at a gas price of US$ 4.5/MMBTU. At the current level of import price of urea of US$ 250/MT, the saving from this project, at the same gas price, increases substantially to Rs. 5,401 /MT. Only in a situation where import price of urea falls below US$ 115/MT and gas price is more than US$ 3.5/MMBTU, will urea from KRIBHCO's project be costlier than urea procured at international prices. In

any case, as per the policy on new and expansion project of urea, the Government will review the concession to be given to such projects after five years from the date of commercial production to evaluate the option between LRAC based price and the import parity price of urea exclusive of freight and dealer's margin.

Balanced use of fertilizers: Paper works out pricing of nutrients from various sources

The information carries here a strategy paper with workings on nutrient pricing of N&P in different fertilizers. The report was to the Task Force on Balanced Use of Fertilizers. The strategy aims at improving the use of P and K nutrients and reducing the excess use of N. The paper suggests that in order to arrive at the N:P ratio of 4:2, the price of urea needs to be increased from Rs 4,830 per tonne to Rs 6,279 per tonne while keeping the price of the K at the same level. Since such a drastic increase in the price of urea may result in resistance from farmers and a significant reduction in urea off-take, the report recommends that the price hike be phased out over a period of 3-5 years. This measure will result in the reduction in subsidy outgo on urea and part of the savings from urea subsidy can be directed to promote the balanced use of fertilizer. The paper further recommends that there is a scope to promote MAP as a basal dose fertilizer because of its high P content and its agronomical suitability for all crops and soils. This may bring down the consumption of DAP if the subsidy is also extended to MAP. Thus, the overall subsidy burden for phosphatic fertilizers is expected to remain unchanged. Currently, India uses around 2 to 3 million tonne of MAP per annum. The current N:P:K consumption ratio is 6.9:2.6:1 as compared to the generally accepted/desired ratio of 4:2:1. The paper has also suggested that adequate price weightage be given to the "S' component in some fertilizers by linking the price to elemental sulphur, which works out to approximately Rs 6 /kg ,

considering elemental sulphur price at Rs 4900 /MT. The paper says that subsidy support should be given to all micro nutrients for fortification in customized fertilizers that are soil-crop specific as that is considered to be the best route for delivering the micro nutrients. The paper goes to to provide workings on pricing of nutrients coming from different sources.

MFL wants fair distribution of phos acid

Even as the process leading up to the purchase of phosphoric acid heats up, Madras Fertilizers Ltd. (MFL) has loudly protested the unilateral cutting down of allocated supplies to the company for 2004-05 by the Phos Acid Consumer Group. Despite the company's willingness to open L/Cs, both Foskor and OCF had apparently failed to meet their commitments. Oswal Chemicals and Fertilizers had also backed out of a deal to supply 80,000 tonnes of phos acid. MFL has now pleaded with the DOF that the PACG should put together a mechanism to ensure fair distribution of available quantities of phos acid. It has also asked the DOF to monitor the fair distribution of committed quantities so that "stronger customers do not snatch away the material".

Phos acid prices spiral out of control

Phos acid suppliers have raised their prices by a whopping $10 per tonne to between $497-$507 per tonne in quotes submitted today. The price paid for supplies last year was $402.75 cfr. The lowest price was quoted by OCP of Morocco, at $497 cfr, for supply of 6.40 lakh tonnes of phos acid. The offer came with a 60day interest free credit valid until April 30, 2005. The other quantity supplier was Foskor, at 4,10,000 tonnes, at a price of $506 cfr per tonne. The quotes were submitted today in New Delhi to the Phos Acid Consumer Group. Suppliers have been called for negotiations on April 11, 2005. The website carries here details of all quotes received today.

Kribhco's Hazira expansion: North block insists on signing of GSA with Reliance

Kribhco's Hazira expansion project will have to wait for another few months before it can elicit an approval from the Cabinet Committee on Economic Affairs (CCEA). The CCEA has returned the cabinet note on Kribhco's Hazira expansion project to the Department of Fertilizers (DOF). The CCEA has directed the DOF to obtain the views of Ministry of Petroleum and Natural Gas on the issue of gas availability. The note was sent to the CCEA after the project was cleared by Public Investment Board (PIB) on November 17, 2004. The finance ministry has acquiesced to the project albeit with certain conditionality. It has directed that the construction work on the project should commence only after the Gas Supply Agreement (GSA) and Gas Transportation Agreement (GTA) are finalized. The finance ministry has also directed the DOF to include the details on the progress made in the acquisition and reliability of the process technology to be used for this plant. Reliance Industries has entered into an MoU to supply gas to the project and there is some skepticism about whether the gas will arrive on time.

NFL recover meager Rs 1.02 crore from Karsan against total dues of Rs 246.47 crore

NFL has been able to recover a mere Rs 1.02 crore from the scam tainted Krasan Ltd. of Turkey out of Rs 246 crore that the latter had siphoned out on the guide of supplying 200,000 tonnes of urea. NFL has been pursuing recovery proceedings against identified assets of executives and associates of Karsan Ltd in Geneva, Monaco, Turkey, Bahrain, USA, Kazakhstan and Hyderabad but it has not succeeded in recovering much money. The only known assets identified in the name of M/s Karsan is understood to have been transferred to the various accounts of Karsan's executives, their relatives and associates. With the result , the recovery proceedings initiated against these individuals in various countries are still in progress and taking time in finalization. Pursuant to NFL filing a request for arbitration before International Chamber of Commerce (ICC) on

October 7, 1996, against Karsan, the ICC Tribunal rendered their final award on December 3, 1996 in favour of NFL, directing M/s Karsan to pay NFL US$ 40.69 million plus interest @ 5% on US$ 37.62 million w.e.f. November 14, 1995, till the time of recovery. The stated amount in question constitutes the principal amount, damages and interest awarded by the Tribunal as on March 31, 2004.

Current Status of Fertilizer Industry in India

12-Aug-2006 Fertilizers: Strong demand proves to be the saving grace .The production of all types of fertilizers increased in the first three months of 2006-07 and there was adequate availability of fertilizers in all the states. The shortage of natural gas, interruption in steady flow of phosphatic acid, increasing cost of raw materials due to volatility in crude oil prices, issues involved in the subsidy payment posed risks for the current increasing production.

A fertilizer is a material - organic or inorganic, natural or synthetic - which supplies one or more of the elements required for plant growth. Plants need around 16 nutrients for their growth. While some of them can be obtained from the atmosphere, others have to be obtained from the soil. The different types of fertilizers include organic fertilizers, bio-fertilizers and chemical fertilizers.

Aggregate financials of 19 listed fertilizer companies for the quarter ended June 2006 have reported a 35% rise in revenues to Rs 6776 crore. The production of Urea has increased by 1.33% to 48.14 lakh tonne as compared to 47.50 lakh tonne. The DAP production was up by 4.89% for the April-June period to 9.58 lakh tonne from 9.14 lakh tonne. The Single Super Phosphate (SSP) production increased from 5.38 lakh tonne to 6.42 lakh tonne, a rise of 19.29%. Overall the fertilizer production increased by 5.75% to 81.62 lakh tonne from a level of 77.19 lakh tonne. This rise in production propelled the topline growth.

Increase in raw material cost (specially in procuring natural gas and crude oil price increase) and delays in getting subsidy payments from the government increased the operating costs for the companies resulting in operating profit increasing by only 9% to Rs 684 crore. The operating margin was also hit and reduced by 244 basis points to 10.1%. Reduction in interest payment as well as depreciation led to a healthy growth of 40% in PBT levels. Finally, PAT increased by 62% to Rs 164 crore. The profitability has also improved due to chemical business of the companies.

Individual Company Performance

Tata Chemicals has posted a healthy 49% increase in its net sales to Rs 757.46 crore for the quarter ended June 2006. This rise can be attributed to healthy improvement in soda ash and edible salt sales realizations, production and sale of DAP and NPK fertilizer in the corresponding quarter last year was lower owing to inconsistent supply of phosphatic acid. Enhanced fertilizer trading activity in line with Tata Chemicals' endeavour to enhance its association with the farmer and be a complete agri solution provider further improved income from operations. Net profit has increased by 16% to Rs 75.35 crore. The fertilizer segment reported a massive rise of 74% in sales to Rs 381.76 crore in the quarter ended June 2006 PBIT rose by 95% to Rs 51.57 crore. This was possible as the company got assured supply of phosphatic acid which enabled significantly higher DAP and NPK fertilizer sales. Capital employed rose by 2% to Rs 1346.06 crore. This segment contributed 50% of the sales, 36% of the PBIT in the quarter ended June 2006.

Gujarat Narmada Valley Fertilizers Company (GNFC) has reported an increase in sales of 37% to Rs 431.20 crore and PAT for the quarter stood at Rs 47.05 crore as compared to Rs 61.39 crore in corresponding quarter in previous year a fall of 23%. The fertilizer business has increased by 67% to Rs 255.59 crore. PBIT has increased by 106% to Rs 0.61 crore on account of improvement in

PBIT margin by 686 basis points to 0.24%. This segment contributes 55% of the total sales revenue for the company and 1% of the total PBIT.

Gujarat State Fertilizer & Chemicals (GSFC) has reported a 6% growth in net sales to Rs 449.17 crore and PAT of the company after prior period adjustment stood at Rs 50.06 crore, a decline of 29%. The fertilizers segment sales has reported a growth of 14% to Rs 197.56 crore. The fertilizers segment has contributed 44% of the total revenue. PBIT margins for the segment turned negative to –7.10% from 4.34%. Thus PBIT of the segment showed a loss of Rs 14.02 crore. 75% of the total capital is employed in the fertilizers business. The capital employed under this segment was higher by 20% to Rs 1580.35 crore.

Deepak Fertilizers and Petrochemicals Corporation (DFPCL) sales have increased by 21% to Rs 166.67 crore. One of the reason for revenue growth in the company is increase in sales of fertilizers. PAT for the quarter stood at Rs 24.79 crore as compared to Rs 22.62 crore in corresponding quarter in previous year an increase of 10%. The fertilizers segment sales of manufacturing fertilizers reported a massive growth of 84% to Rs 17.68 crore while revenue from traded fertilizers has increased by 57% to Rs 43.45 crore. Over all, this segment recorded 64% growth in revenue to Rs 61.13 crore. The fertilizers segment as whole contributed 36% of total in sales of which manufactured fertilizers contributed 11% while traded fertilizers contributed 25%. PBIT margins for the segment has improved from –15.39% to –9.13%. Segment posted a loss of Rs 5.58 crore, a reduction in loss by 3%.

Rashtriya Chemicals and Fertilizers (RCF) posted a net sales growth of 67% to Rs 658.26 crore. PAT stood at Rs 7.46 crore compared to a net loss of Rs 0.61 crore in corresponding quarter of previous year. The Thal division reported a massive 138% increase in net sales to Rs 452 crore in the quarter ended June 2006. PBIT increased by 148% to Rs 26.96 crore. Capital employed in this division has been increased by 51% to Rs 1387.06 crore. This division

contributed 69% of the sales and cornered around 63% of capital employed as of June 2006.Trombay division reported a 8% increase in net sales to Rs 193.60 crore in the quarter ended June 2006. PBIT posted a loss of 6.22 crore a reduction of 46%. Capital employed in this division has been scaled up by 11% to Rs 862.48 crore. This division contributed 29% of the sales and cornered around 39% of capital employed as of June 2006.

Chambal Fertilizers showed a topline growth of 12.7% to Rs 532.70 crore. PAT fell by 27.7% to Rs 37.2 crore. The company has two segment in the fertilizer division, one is own manufactured and the other being traded segment. Own manufactured fertilizer segment reported a 26% increase in net sales to Rs 408.41 crore in the quarter ended June 2006. PBIT posted a profit of 68.76 crore an increase of 24%. Capital employed in this division has been scaled up by 7% to Rs 1799.61 crore. This segment contributed 77% of the sales and 90% of PBIT. This segment cornered around 63% of capital employed as of June 2006. Traded goods segment reported a 14% fall in net sales to Rs 54.54 crore in the quarter ended June 2006. PBIT increased by 20% to Rs 2.64 crore. Capital employed in this division has been increased by 1892% to Rs 62.16 crore from 3.12 crore. This segment contributed 10% of the sales, 3% of PBIT and cornered around 2% of capital employed as of June 2006.

New Urea Policy

The fertilizer department has sought the cabinet's nod for the new urea policy. The department has proposed to decimalizes urea imports. It has also proposed free urea imports for sale at MRP or below. Prior approval of the fertilizer department was needed for the sale of imported urea.

Now units can sell urea not needed by the government directly to farmers. The government will also consider long-term buyback from urea JVs abroad. Also, urea JVs abroad will be allowed to sell directly to farmers at MRP. The entire urea output has been proposed be brought under the Essential Commodities

Act. Naphtha units along Hazira- Bijapur- Jagdishpur (HBJ) pipe have been offered two years to convert to gas. Other naphtha-based urea units will get three years to convert to gas. While furnace oil-based urea units will convert to gas in four years. GNFC and RCF are expected to benefit from the shift from naphtha to gas-alert. However, conversion investment will not be considered for urea pricing/subsidy.

Outlook

The fertilizer industry, despite witnessing strong demand growth, has not able to capitalize on the same, due to rising input costs, suppressed selling price of Urea and DAP and disproportionately lower subsidy. However, players that have ventured into chemicals are better placed in the current uncertain times than the pure fertilizer companies. In a recent development, the fertilizer ministry has sought the cabinet's nod for the new urea policy. If approved by the cabinet, it is expected to provide respite to the industry.

Table No.1.28

Fertilizer Sector aggregates: Margins shrink, bottom-line skyrockets due to strong topline growth

Particulars	0606(3)	0506(3)	Var (%)
Sales	6776	5011	35
OPM (%)	10.1	12.5	
Operating Profit	684	628	9
Other Income	90	147	-39
PBIDT	773	776	0
Interest	210	261	-20
PBDT	563	515	9
Depreciation	279	312	-11
PBT	284	203	40
Tax	120	102	18
Cash Profit	443	413	7
Net Profit	164	101	62
Figures in Rs croreSource: Capitaline Corporate Database			

Table No.1.29
Aggregate balance sheet of fertilizer industry from 2003-2006

Industry - Fertilizers - Nitrogenous / Phosphatic			[Rs. in Crs.]		
Year	**Latest**	**2006**	**2005**	**2004**	**2003**
No. of Companies	25	18	23	23	23
INCOME :					
Sales Turnover	31,010.06	28,042.20	27,971.46	23,479.91	21,911.06
Excise Duty	598.83	574.91	516.42	427.35	371.9
Net Sales	30,411.23	27,467.29	27,455.04	23,052.56	21,539.16
Other Income	3,222.75	2,609.27	1,143.05	929.81	691.06
Stock Adjustments	-50	-97.66	37.04	-445.75	-343.6
Total Income	33,583.98	29,978.90	28,635.13	23,536.62	21,886.62
EXPENDITURE :					
Raw Materials	17,906.28	16,286.26	14,743.11	11,127.76	9,934.85
Power & Fuel Cost	4,834.44	4,220.03	5,002.36	4,210.54	4,045.12
Employee Cost	1,464.84	1,245.00	1,284.74	1,273.02	1,449.71
Other Manufacturing Expenses	2,229.91	2,013.76	2,271.59	1,949.38	2,377.76

Selling and Administration Expenses	2,140.62	1,772.31	2,005.02	2,076.33	2,001.61
Miscellaneous Expenses	745.75	631.31	564.14	674.02	1,262.11
Less: Pre-operative Expenses Capitalised	673.6	670.4	831.09	779.31	925.96
Total Expenditure	28,648.24	25,498.27	25,042.85	20,531.74	20,145.20
Operating Profit	4,935.74	4,480.63	3,592.28	3,004.88	1,741.42
Interest	1,845.97	755.93	3,223.48	3,249.13	3,481.36
Gross Profit	3,089.77	3,724.70	368.8	-244.25	-1,739.94
Depreciation	1,335.26	1,264.03	1,137.59	1,131.33	1,188.87
Profit Before Tax	1,754.51	2,460.67	-768.79	-1,375.58	-2,928.81
Tax	683.8	623.15	548.06	371.95	252.86
Deferred Tax	-28.11	-28.08	24.08	-157.36	-165
Reported Net Profit	1,098.82	1,865.60	-1,340.93	-1,590.17	-3,016.67
Extraordinary Items	1,235.27	1,021.37	264.72	41.33	-327.35
Adjusted Net Profit	-136.45	844.23	-1,605.65	-1,631.50	-2,689.32
Adjst. below Net Profit	386.89	72.13	-39.43	-0.12	309.69
P & L Balance brought forward	-721.23	38.57	-272.82	-146.1	-7,461.61
Statutory Appropriations	0	0	0	0	0
Appropriations	606.61	1,343.08	-1,248.46	-1,463.35	-984.04
P & L Balance carried down	157.87	633.22	-404.72	-273.04	-9,184.55
Dividend	411.59	337.04	412.95	354.86	464.68
Preference Dividend	0.01	0.01	0.3	0	0.4

Source: Fertilizer manufacturer's association publication

Table No.1.30

Aggregate profit and loss of fertilizer industry from 2003-2006

Industry - Fertilizers - Nitrogenous / Phosphatic			[Rs. in Crs.]		
Year	**Latest**	**2006**	**2005**	**2004**	**2003**
No. of Companies	25	18	23	23	23
INCOME :					
Sales Turnover	31,010.06	28,042.20	27,971.46	23,479.91	21,911.06
Excise Duty	598.83	574.91	516.42	427.35	371.9
Net Sales	30,411.23	27,467.29	27,455.04	23,052.56	21,539.16
Other Income	3,222.75	2,609.27	1,143.05	929.81	691.06
Stock Adjustments	-50	-97.66	37.04	-445.75	-343.6
Total Income	33,583.98	29,978.90	28,635.13	23,536.62	21,886.62
EXPENDITURE :					
Raw Materials	17,906.28	16,286.26	14,743.11	11,127.76	9,934.85
Power & Fuel Cost	4,834.44	4,220.03	5,002.36	4,210.54	4,045.12
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Preference Dividend	0.01	0.01	0.3	0	0.4

Source: Fertilizer manufacturer's association publication

Conclusion:

On the basis of above information researcher has concluded that Profile of the fertilizer Industries, the brief history of selected units of fertilizer industries as well as various collected quantitative and qualitative data are useful to nation and society for the further research.

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Chapter 2

Conceptual framework of Performance Efficiency

Concept of Performance:

According to Erich L. Kohlar "It is a general term applied to a part or to all of the conduct of activities of an organization over a period of time, often with reference to Past or Projected costs efficiency management responsibility or accountability or the like" [1]Robert Albanese "Performance is used to mean the efforts extended to achieve the targets efficiently and effectively the achievement of targets involves the integrated use of human, financial and natural resources." [2] Both the above definitions describe that the word 'performance' refers to presentation with quality and result achieved by the management of company. It carries into account the accomplishment of objectives as well as goals setting for the Company comparing the present Progress to the past. Although, in the context of the Present. Study covers financial cost and social aspects. Overall conclusion of the activities of the Companies is mentioned by one word i.e. 'Performance'.

Concept of Efficiency:

'Efficiency' is closely related to security of the working system of a company as whole according to Sudha Nigam" Appraisal is a technique to evaluate past, current and Projected Performance of a Concern."[3]It is a powerful applied tool to examine, to measure, to interpret to weigh critically and draw outputs. Different specialist who examines the specific problem with their company does appraisal. Appraisal can be divided into two Parts (I) internal (ii) external. According to Pitt Francis "Internal efficiency of the company not only means making some of having adequate human, Physical and Financial resources but seeing that they are optimally employed." [4] Thus,

the concept of efficiency means the evaluation and performance of a concern included in the appraisal.

Measurement of Performance:

"Measurement is a process of mapping aspects of a domain into other aspects of a range according to some rule of correspondence" While according to Tripathi "Measurement is the assignment of numerals to characteristics of objects, persons, states or events, accounting to rules. What is measured is not the object, person, state or event itself but some characteristics of it. When objects are counted for example we do not measure the object itself but also its characteristics of being present. We never measure people only by their age, height, weight or some other characteristics." **5** But we measure through their overall performance.

While measuring the performance of the company the first requirement is the thoughts and goals of human beings are mostly realized through the establishment of diverse kinds of relevant associations. The functions of all associations were established for fulfillment of some goals and objectives. As an output point of view Association needs measurement of performance to find out as to how much the organization has achieved by its course of action towards its goals or targets.

Financial Appraisal:

"Financial Appraisal is a scientific evaluation of profitability and Financial Strength of any Business Concern". According to Kennedy and Macmillan financial statement analysis attempt to unveil the meaning and significance of the items composed in Profit and Loss account and balance sheet So as to assist the Management in the formation of sound operating Financial Policies".**6**

According to Accounting Point of view financial statements are prepared by a business enterprise at the end of every financial year "Financial Statements are end products of financial accounting". They are capsulated periodical reports of financial and operating data accumulated by a firm in its books of accounts - the General Ledger.

For proper interpretation of financial statement, users must have a basic understanding of the conceptual framework and principles underlying their preparation. Otherwise users will not recognize the limits of financial statements. The financial statement analysis facilitates a sufficient guideline about the behaviour of financial variables of measuring the performance of different units in the Industry it also facilitates to indicate the current scenario of improvement in the organization.

Concept of Performance Appraisal:

"Performance Appraisal as a concept is purely a developmental tool for a company. As a developmental tool, it is not merely the end product or the final assessment. It is important as the whole process of appraisal. The learning opportunity for the appraiser and the apprise starts with setting of the tasks and targets. It manifests in the whole gamut of appraisal procedure such as self appraisal, appraisal interviews final appraisal, grading and developmental planning etc." [7]

Performance appraisal is composed of two words “performance and appraisal. Performance indicates how the management of an enterprise has been accomplishing the goals, which they had set for the enterprise. Performance is a measure of the degree to which an organization fulfills its purpose. And the purpose is to achieve its objectives. To quote E.A. Helfert, “The measurement of business performance is more complex and difficult, since it must deal with the effectiveness with which capital is employed, the

efficiency and profitability of operations, and the value and safety of the various claims against the business." Appraisal refers to critical review with a view to improving performance. It includes the act to examine, to measure, to interpret and to draw conclusions. Achievement involves an integrated use of human, financial and natural resources. Erich L. Kohler refers to performance as "a general term applied to a part or all of the conduct or activities of an organization over a period of time- often with reference to past or projected costs, efficiency, management responsibility, or the like." However, appraisal can be defined as a systemic procedure of drawing conclusions. Every enterprise is assessed on the basis of its activities in the various areas.

Meaning of performance appraisal

Performance appraisal may be defined as a critical assessment of the various activities, in the different areas of operations, of an enterprise. A periodical appraisal of the operations of an organization is essential for financial strength and good profitability just like a regular checkup for physical fitness. In the case of bad or deteriorating situation it indicates the areas of improvements whereas in a good situation the way to improvement in the performance of an organization to the maximum extent. Thus performance appraisal is a process of evaluating the efficiency and effectiveness of an organization.

Basis of performance appraisal

Performance appraisal involves a broad area of coverage. The perspective throughout is on the effective management of company resources. Performance appraisal can be done through a careful and critical analysis of the financial statement of an enterprise. Usually the financial statement of a business concern comprises two statements: balance sheet or position statement and profit and loss account or income statement. However, in big concerns two more statements are prepared. They are profit and loss appropriation account and fund flow statement. The overall performance of a

business cannot be judge without a systemic analysis and interpretation of its financial statements. The advantages of such an analysis are as follows.

(i) The results based on a proper financial analysis are more scientific and logical; hence there is less possibility of their being wrong.

(ii) Such decisions are not subjective. The complexities, depth, interdependence and multi decision attitude of various modern business activities are not easy to understand without a rational approach or criticism.

(iii) No doubt, experience is a good teacher, but the facts and decisions taken on the basis of observation and experience can be rectified only if they are supported with a proper financial analysis.

(iv) Such an analysis makes the information more understandable even to a layman. Decisions based on it are more practical.

The following parties are deeply interested in a systemic and sound financial analysis and interpretation:

1. Debenture holders in the company
2. Creditors, suppliers of raw materials and other parties who deal with the company
3. Employee and trade unions
4. Economist and investment analysts
5. Existing and prospective investors
6. Customers who wish to enter into a long term agreement with the company
7. Taxation authorities
8. Member of parliament, legislatures, the Public Accounts Committee and various governmental committees and commissions
9. Company Law Boards etc.

Objectives of the performance appraisal

(i) To find out the financial stability of a business concern

(ii) To assess its earning capacity

(iii) To estimate and evaluate its stock and fixed assets

(iv) To assess its capacity and ability to repay short and long term loans

(v) To estimate and examine the possibilities of its future growth

(vi) To estimate the administrative efficiency of its management

Performance appraisal is a close and a critical study of various measures observed in the operation of Business Organization. The concept of human body is similar to the concept and case of business organization.

Human body requires medical check up and examination for maintaining fitness of bodies, similarly the performance of a business organization has got to be assessed periodically. Erich A. Helfert organization has got to be assessed periodically. Erich A. Helfert started "The person analyzing business performance has clearly in mind which tests should be applied and for what specific reasons. One must define the view points to be taken, the objectives of the analysis and possible Standard Comparison". Business Organization have the "Balance Sheet" and the "Profit and Loss Account" by the statements of change in financial position value added statements are also prepared for annual reports. They may be considered as additional financial statements. The data embodied in financial statements are rearranged in order to facilitate the appraisal of performance. The financial figures are approximated to the nearest rupee to simplify the process of appraisal.

However no single attempt can give firm results of appraising the performance of business organization. Business conditions differ according to location, type of facilities, products and services, plant capacity, capital structure, accounting policies, caliber of management and levels of efficiency. Such conditions of business organizations have become more complicated in the event of multi-product and multi business organizations. All these

differences are part and parcel at the time of appraising the performance of a business organization.

Types of Performance

There are such areas where the performance should be modified of improved by effective assessment of various types of activities performed by the business organization in different areas of operations. Those areas of operations may be termed as the areas of performance. The important areas described under the following heads:

(I) Productivity

Productivity is usually defined as a ratio of output produced per unit of resource consumed by the process. "Productivity is a measure of performance in producing and distributing goods and services, value added or sales minus purchases divided by workers employed".[8]

(ii) Profitability

The word "Profitability" is modulation of two words "Profit" and "Ability". In another words it referees to "Earning Power" or "Operating Performance" of the concerned Investment. The concept of profitability may be defined as "The ability of a given Investment to earn a return from its use"[9]

Measurement of profitability is the overall measure of performance. Profits known as bottom lines are also important for financial institutions. Analyzing and interpreting various types of profitability ratios can obtain creditor's performance of profitability.

(iii) Fixed assets

"Generally fixed assets known as non liquid and long term property element" The fixed assets concern with that part of capital include al the tangible as well as intangible property. The tangible assets refer to productive

assets like plant, machinery, tools and other facilities. "Which are used in carrying on productive activities of a business enterprise".

The amount invested in fixed assets is realized gradually from each unit of sales made during the life span of the assets. The performance of fixed assets is shown through interpretation of fixed assets structure, impact of gross block on sales and operating profit margin, average annual growth and efficiency in the use of fixed assets.

Fixed assets by the nature, are long term tangible assets, therefore they should be financed through the long term sources of funds in the case of ratio of fixed assets to net worth it can be analyzed to study financing of fixed assets and this ratio is very important as it shows that owners have granted enough funds to finance fixed assets.

(iv) Working capital:

The term working capital refers to the firm's current or circulating asset. In another words it means the excess of current assets over current liabilities.

Concept of Productivity:

"Productivity means different things to different things to different people. To workers, productivity means a speed up in their work pattern. To union leaders it means the productivity for opportunity to negotiate for higher wages. To management it means increased profitability to consumers and it means better goods at lower costs. To marketing directors productivity improvement increased the firm’s competitiveness abroad by reducing the cost of good sold in foreign market and to economists; it means an increase in country's standard of living field to gain in output per man hour". According to Dr. Chauhan P. L. "Productivity is at the heart of economic growth and development. It is focal point in business and economic matters all over the world. All working people,

farmer, a carpenter, a black smith, a technician, businessmen, an engineer, a nurse or doctor, any one is interested in productivity. When any person strives to make a better living for himself and his family, he realizes more on productivity than on hard work". Productivity is the ratio of output to input. Productivity denotes the efficiency with which the various inputs are transformed into the goods and services. Productivity is said to be high when more output is derived from the same input. “Productivity denotes and trend of productiveness of the factors of production, labor, materials, and capital. It is usual today identify this trend as a measure, a ratio or a rate of return, a relationship between output and input over a period of time". According to Maital and Meltz "Productivity has been termed as myster" because the studies on productivity growth hide more than they reveal" Productivity is measured as the ratio between the output of a given commodity or service and the inputs used for that product, which are in the process. And therefore the concept of productivity term that" It should classify and bring order to an intricate array of variable relating to inputs and outputs. But to think of Productivity today is too often unproductive because the term lacks specific definition and general acceptance" Commonly, Productivity, as a source or cause of comparatively high levels of output and improvements in productivity as the major contributors to growth of particular business unit. Thus "Productivity is a rough measure of the effectiveness with which we use the most important productive resources". Productivity therefore, refers to the measurable relationship between well defined outputs and inputs.

Production and Productivity:

“Production and productivity are often not distinguished at all. Just as the Army is not the Navy and the Navy is not the Army. Production and productivity is not the same thing. Production is the amount of the absolute flow of product during a given period. Productivity is the measure of the efficiency in production of factors inputs and / or factor / input services" the

term 'productivity is used with reference to "The relationship between actual inputs and actual outputs. It is primarily measure overtime, comparing the performance this year with previous years and shows the improvements achieved by the organization. Productivity may also be used to compared production faculties or against bench marks". According to international labor organization (ILO) productivity refers to "the effective and efficient utilization of all resources, capital, land, materials, energy, information, and time in addition to labor" There are few confusions about productivity.

Firstly productivity is not only labor efficiency or labor productivity. Secondly misconception is that it is possible to judge performance simply by input. Third with efficiency means producing high quality goods in the shortest possible time but there are requirement of consideration is those goods are needed. Fourthly cost cutting does not always improvement productivity. "It is the Pivot of all the productive economic activities affecting the cost of production and determining all the variables like the prices, wages, salaries and cost of capital and services" thus, increasing productivity means the increasing efficiency of different resources of production with shortest efforts. In other wards, along with increase in quantities of factors and inputs, productivity improvements will also be contributing is additional source of output increase. For any given increase in output, improvement of a higher rate of productivity applied for connotes a saving or economy in the requirements of additional supplies of inputs and factors. Generally it can be said that production is an absolute term and refers to the total value of manufactured goods and provision of services produced during a period. Which aim is to satisfy people's wants where as productivity on other hand denotes as relative terms in relation to the input or resources used in turning out a given amount of output. As well as productivity does not depend upon the increase in production.

Importance of productivity

Importance of productivity in contest of the present day competitive world economic environment is the adoption and use of the latest technology and therefore "Productivity is the change in results obtained for the resources expended or productivity change is any alteration in output - input relationships including those resulting from changes in the production process, changes in the methods of using existing processes, changes in the input proportions or input mix and changes in the rate or scale at which existing processes are utilized" It may be true that " in every country developed or developing with a market economy or a centrally planned economy, the main source of economic grow this an increase in productivity. Inversely slackening of growth stagnation and decline entail or are accompanied by a slow down productivity improvement". (12) Suppose industry is to be the engine of economic growth and modernization as well as competition the chosen paths for improving industrial efficiency, productivity improvements will be the indicators of success. "The National importance of extending economic incentives from standard factory production to services and less standard productive operations is, in the main three fold, there is first the fact that services and underside processes have advanced less in productivity.

Secondly if some operations are paid by piece, others by time, the piece workers are likely to take home much higher earnings than the time workers. Thirdly extending incentive schemes beyond standard factory production lies in the saving of man power". While at the micro level "Productivity finds a prominent place in the business mission of the organization. Discussions revealed that the top Management considers improvements in productivity as vital to the process of developing a competitive edge and generation of adequate internal resources to finance the company's growth"

According to Raman M.V.V. "The importance of Productivity lies into understanding effectiveness and efficiency by providing a basis for doing right

things, setting objectives, measurement and control, the significance of technology and management in productivity improvements and role of individual managers, get clarified, leading to managerial effectiveness. In this sense management gets a dimension encompassing activities in the total economic system & managerial effectiveness its content" Thus, the significance of productivity is increasing each unit to national welfare is now universally recognized fact.

Relationships of Productivity with Efficiency:

Productivity itself is a sign of efficiency in production. It may be improved when production is carried out with a view to economical manner. Lower productivity shows the waste and inefficiency in the use of resources. High-level productivity results in high level of profits. The sharing level of productivity looks to it that maximum output should take place from whatever minimum input one is engages in the best of a concern depends upon the maximum profit it can draws. According to Gordon K.C. et al., "with due allowances for temporary current value in fluctuations or changes in commodity of product prices there is strong positive correlation among time series data measuring productivity, profitability or efficiency".

It means that all these measures indicates a rate of growth in capabilities of organization to fulfill their missions namely to produce and distribute more and better products or services by managing the development and application of technology as well as human resources. According to Alan Lawler "efficiency is comprehensive measure of how organization satisfy the effectively resources are used to generate useful output". Generally efficiency can be measured by taking into account the inputs and outputs and therefore productivity is the efficiency and capacity of producing different articles by the raising the rate of productivity or efficiency of the company one can from an

idea about its production performance. To sum up production performance measures the level of efficiency.

Concept of profitability performance

Concept of Profitability:

Simply, profitability is Profit making ability of a business organization, According to Gibson and Boyer "Profitability is the ability of the firm to generate earnings" the word Profitability is modulation of two words 'Profit' and 'ability' Profit is the bottom line of the financial statement of meaning of Profit derives according to the purposes and usages of figures, While term 'ability' indicates the power of the business organization to generate Profits. "Ability" is also referred to as" Earning power or "Operating performance of the concerned investment" (2).

According to Franks and Broyles "The expected return from the Capital Markets represents an opportunity cost. Since incrementally, companies can employ their funds in the capital market that market provides the appropriate reference point against which to measure profitability. Put another way a profitable investment project is one which provides a return sufficient to attract capital from the Capital Market" while how and up to believes that "The ability of a given investment to earn a return from its use" It may remarked that the ability of Profit making could denote a improved or constant during a specific period In accountancy Profitability may be described as a yard stick of firm performance. It is a relative concept, which regulates and controls over management policy and decisions.

Profit and Profitability

Profits and then cream of the business without it may not serve the purpose its true the "Profits are useful intermediate become towards which a firms Capital should be directed" west on and Brigham mentioned that "To the financial management Profit is the test of efficiency and a measure of control, to the owners a measure of the worth of their investment, to the creditors the

margin of safety, to the government a measure of taxable capacity and a basis of legislative action and the country profit is an index of economic progress, national income generated and the rise in the standard of living". While profitability is an out come of Profit. In the other words No Profit Derived towards no Profitability. "It may be remarked that the Profit making ability might denote a constant or improved or deteriorated state of affairs during a given period, thus, profit is an absolute connotation where as profitability is a relative concepts" Profit and profitability are two different concepts, although they are closely related and mutually interdependent, playing distinct role in Business. R. S. Kulshrestha mentioned that "Profits in two separate business concerns might be the same and yet more often than note their profitability could differ when measured in terms of the size of investment." As outcome of above statements it can be said that Profitability is broader concept comparing to the concept of Profit. The levels of Profitability help in establishing quantitative relationship between Profit and level of investment or sales.

Measurement Tools of Profitability:

For taking policy decision under different situations, measurement of Profitability is essential. According to Murthy V. S. "The most important measurement of Profitability of a company is ratio i.e. profitability of assets, variously referred to as earning power of the company, return on total investment or total resources committed to operations". Profitability ratios are calculated to measure the operating efficiency of the firm. According to Block and Hirt "The income statement is the major device for measuring the Profitability of a firm over a period of time." Measurement of profitability is as essential as the earning of profit itself for the business concern. Some managerial decisions like rising of additional finance, further expansion, and problems of bonus and dividend payments rest upon this measurement. It can be measured for a short term and as well as for a long term. The relation to sales is the good short-term indication of successful growth while profitability

in relation to investment is the successful growth while profitability in relation to investment is the healthier for long turn growth of the business. Profitability provides overall performance of a company and useful tool for forecast measurement of a company's performance. "The overall objective of a business is to earn a satisfactory return / Profit on the funds invested in it, while maintaining a sound financial position. Profitability measures financial success and efficiency of Management" The importance of analysis of profitability performance can see from the reality that besides the management and owners of the company, financial institutions, creditors, bankers also look at its Profitability. Appraisal of performance as regards to profitability can be drawn from interpreting various ratios.

However there are few factors affecting to the firm's Profitability. Each factor in turn will affect the Profitability ratios. In present study profitability ratios can be measured through two groups' i.e. Profitability ratios in relation to capital employed. The examples of sales based profitability ratio are Net Profit ratio, operation ratio and gross profit ratio and in relation to Capital employed profitability ratio are Earning per share, Return on Capital employed and Return on owners equity of the company will be discussed below:

Profitability Ratios in relation to Sales:

(I) Gross Profit Ratio:

"The excess of the net revenue from sales over the cost of merchandise sold is called gross profit, gross profit on sales or gross margin"

This ratio is calculated by dividing the gross profit by net sales and is usually expressed as a percentage. The formula of gross profit ratio is given below:

Gross Profit Ratio **= Sales - Cost of Goods Sold** x 100

$$= \frac{\text{Gross Profit}}{\text{Sales}} \times 100$$

The gross profit ratio highlights the efficiency with which management produces each unit of product as well as it indicates the average spread between the cost of goods sold and the sales revenue. Any fluctuation in the gross ratio is the result of a change in cost of goods sold or sales or both. A high gross profit ratio is a mark of effectiveness of management. The gross profit ratio may increase due to any of the below factors:

(1) Lower cost of goods sold where sales prices remaining constant
(2) Higher sales prices where cost of goods sold remaining constant
(3) An increase in the proportionate volume of higher margin items.
(4) A combination of variations in sales prices and costs. While in the case of low gross profit ratio it may reflect higher cost of goods sold due to firm's inability to purchase at favorable terms, over investment in plant and machinery etc. secondly this ratio will also be low due to a decrease in prices in the market.

(ii) Net Profit Ratio:

Net Profit is obtained when operating expenses; interest and taxes are subtracted from the gross profit. It indicates that the portion of sales is left to the proprietors after all costs; charges and expenses have been deducted.

Net Profit ratio is differ from the operating Profit to Sales Ratio in as much as it is computed after adding non-operating surplus / deficit. (Difference of non-operating incomes and non-operating expenses). The net profit ratio is measured by dividing profit after tax by Net Sales:

$$\text{Net Profit Ratio} = \frac{\text{Profit after tax x 100}}{\text{Net Sales}}$$

Net profit margin ratio establishes a relationship between net profit and sales and it indicates management efficiency in Administering, manufacturing and selling the products. This ratio is the overall measure of the firm's ability to turn each rupee sales into net profit. While the net profit is inadequate, the Firm will fail to achieve satisfactory return on owner's equity due to various reasons. Such as (I) Falling price (ii) rising costs and declining sales Thus, this ratio is very useful to the proprietors and widely used as a measure of overall profitability.

Profitability in relation to Capital Employed:

Earning Per Share (EPS)

Earning per share is widely method of measuring profitability of the common shareholders investment it measures the profit available to the equity shareholders on per share basis. The earning per share is calculated by dividing the profit after taxes by the total number of common shares outstanding.

$$\text{Earning Per Share} = \frac{\text{Profit after Tax}}{\text{Number of Equity share outstanding}} \times 100$$

The earnings per share calculations made over years shows whether or not the firms earning power on per share basis has changed over that period. "The earnings per share simply show the profitability of the firm on a per share basis. It does not reflect how much is paid as dividend and how much is retained in business but as a profitability index. It is a valuable and widely used ratio" Thus, the profitability of common shareholder's investment can be measured easily by earning per share.

Return on Capital Employed:

Return on capital employed often called as 'Return on investment' "Return on capital employed may be approximated by a fraction. The bottom-line should represent the average amount of capital employed and the top line would represent an average of accounting earnings from the projects." Generally, it is known about the rate of return on investment (ROI) or equivalently rate of return on assets. This ratio is computed by dividing net earnings net earnings by total assets." This ratio is computed by dividing net earnings by total assets." This ratio is calculated as follows:

$$\text{Return Capital Employed} = \frac{\text{Profit after tax}}{\text{Capital Employed}} \times 100$$

Above formula gives the conventional approach of calculating. Return on investments where investment represents pool of funds supplied by the shareholders and lenders. While profit after tax represents residue income of shareholders, therefore it is conceptually unsound to use profit after tax in the calculation of return on investments (ROI)

Return on Owners Equity:

Return on owner's equity is also known as return on shareholder's equity. This ratio shows how the firm will have used the resources of owners. It may true that this ratio is one of the most relationships in financial analysis. The return on owner's equity is calculated by following formula.

$$\text{Return on Owners Equity} = \frac{\text{Profit after Tax}}{\text{Owner's equity}} \times 100$$

Where, owners equity = share capital + reserve & surplus.

This ratio indicated the extent to which this objective has been fulfilled. This, ratio reflects great interest to present as well as prospective shareholders and also important for management, because management has responsibility of

maximizing the owners wealth in the market place. This ratio would be compared with the ratios for other similar companies as well as the industry average. Thus, it shows the relative performance and strength of the company.

Fixed assets performance

Concept and Nature of Fixed Assets:

"Fixed assets are tangible assets of relatively permanent nature that are used in business activities. Land is permanent and does not loss its value over time. Buildings, equipments and other fixed assets, however decrease in value over their useful life." In other words "Fixed Assets are the Assets of a relatively permanent nature used in operation of a business and which are not intended for sale." He term fixed assets is used to describe the permanent investment in tangible assets of a business, whereas sometimes used to include all the assets, which are not current.

Therefore, it is advisable to formulate "The term non current assets in the ratio analysis, under consideration in order to indicate that all non current items are included in the comparison with capital." For the further explained the term 'Fixed Assets' defined as "These assets are acquired in order to use them in the production of other goods and services, not for the purpose of resale. If the assets are held for resale they are classified as inventory, even though they are long lived assets." Generally fixed assets not concern with trading assets, they are not acquired for sale as well as they cannot be included in inventories.

Structure Fixed Assets:

Fixed Assets highlighted non-liquid and long-term property elements. They include all tangible and intangible assets. The term 'tangible means having bodily substance. While "intangible" assets has no bodily value resides only in the right which its possession confers upon its owner." The usual

examples of intangible assets are good will; patents copy rights and also franchise right. Intangible assets may be valuable.

These assets are neither physical goods nor evidence of property such as bonds or notes, but the value to be depend upon the frequently elimination from conservative businessman. Tangible assets include land and building tools and facilities plants and fixture, vehicles and delivery equipments and similar other properties those having physical substance. The amount invested in fixed assets is less or more permanently blocked or sunki in them. Some times fixed assets symbolize as slow moving investments. According to Patan and Littleton "These assets are infect, revenue charges in suspense, awaiting some future matching with the revenues as costs or expenses." Fixed assets are service assets held in the business for aiding production and are available for use during their estimated life. They produce income indirectly through their use in operation.

In the structure of fixed assets of selected public limited electronics companies the magnitude and trend in the proportion of gross block and net block to the total assets have been studied.

Efficiency in the utilization of Fixed Assets:

The efficiency in the use of fixed assets is measured by the turnover of fixed assets dividing the amount of sales by the amount of fixed assets. Which can be read as the number of rupees of sales for each rupee invested in fixed assets? The ratio also indicates the adequacy of sales in relation to the investment in fixed assets. High turnover of fixed assets would indicate that the fixed assets are being utilized effectively. As well as it is indicated, whether fixed assets are contributing more and more to sales. While low turnover of fixed assets indicates inefficient utilization of fixed assets. The formula for calculation of fixed assets turnover may be described as:-

$$\text{Fixed Assets Turnover} = \frac{\text{Net Sales}}{\text{----------}}$$

Fixed Assets

Here fixed assets represent the depreciated value of fixed asset, i.e. net fixed assets or net block. A firm collects fixed assets for the purpose of generating sales therefore the efficiency of fixed assets should be judged in relation to sales.

Financing of Fixed Assets

Fixed assets mainly financed by the owners of business organization. It represents more or less permanent investment of funds. The funds provided by the owners should be normally sufficient not only to finance the entire fixed assets requirements but also a part of the working capital. Long-term borrowings are also of almost permanent source of funds and in such a situation it would not be sufficient to relate the fixed assets with only the shareholders fund. Therefore the analysis of the financing of fixed assets has been done with the help of fixed assets to long-term funds ratio.

Fixed Assets to Long Term Funds:

In the light of last discussion they may also provide that shareholders and a part of working capital should finance fixed assets. It means that management should try to avoid the use of borrowed capital for financing the fixed assets. If it is not possible for management to generate enough shareholders' funds and ultimately it has to rely on the long term borrowed funds. Fixed assets to long term funds ratio should not be more than a hundred in fact it should be substantially less than a hundred. Suppose the ratio is less than a hundred it will indicate that the long-term funds are being used for purpose other than fixed assets also. This position is desirable one since net working capital requirement is also a permanent requirement.

The long-term funds are includes share capital, reserve and surplus, secured loans and unsecured loans according to Harvey D. A. "Secured loans becomes larger or are taken up for longer periods some sort of security frequently needs to be provided by the borrower." While "unsecured loans has

an advantage of specified amount is made to an individual or organization in return for an appropriate amount of interest and agreement of reply the sum due at some future date." Above both of definition gave the clear idea on the concerned.

In fact the proper ratio should be 67 percent or they're about since that will show the long-term funds are being mainly used for long-term purpose and that a part is being used to finance net working capital. The formula of the ratio is given below:

$$\text{Fixed assets to long term} = \frac{\text{Fixed Assets}}{\text{Long-term funds}} \times 100$$

Where, fixed assets = net fixed assets (Net block) (After depreciation)

Long term funds = share capital + reserve & surplus + secured loans + unsecured loans - less deferred expenditure

Net Capital Employed Turnover:

Net Capital employed or assets are used to generate sales. Therefore a firm should manage its employed net capital efficiently to maximize sales. Generally the relationship between sales and assets is called Net Capital employed Turnover. The business organization can calculate net capital employed turnover simply by dividing net sales by net assets.

$$\text{Net Capital Employed Turnover Ratio} = \frac{\text{Net Sales}}{\text{Net Capital Employed}}$$

Business organizations ability to produce a large volume of sales for a given amount of net capital employed is the most important aspect of its

operating performance. Some analysts exclude intangible assets such as good will, patents etc. while computing the net capital employed turnover. As well as fictitious assets accumulated losses or deferred expenditures may also be excluded for calculating the net capital employed turnover.

Working capital performance

Concept of Working Capital:

"The working capital of a business enterprise can be said to be that portion of its total financial resources which is put to a variable operative purpose." (1) There are two concepts or classification Viz. "Gross" and "Net" where "The gross working capital is the total of all the current assets or that amount of funds invested in current assets that are employed in the business process "(2)" It is also known as quantitative view. While "Net Working capital is the difference between current assets and current liabilities." (4) "It is also known as qualitative concepts." (5) Net working capital refers to accounting point of view.

Both of concepts of working capital have their own importance. The gross working capital is the sum of all such assets as are required to be converted into cash during a short operating cycle of one year. While net working capital is the excess of current assets over current liabilities. (6)

Professor Husband and Dockeray explained the usefulness of quantitative concepts of working capital as "Despite the uncertainty of quantitative concepts of working capital it provides a more objective basis of determining the type and amount of financing." (7) "The 'gross' working capital concept emphasizes the use and the 'net' concept the source "(8)" The integration of both these concepts is necessary in order to understand working capital management from the point of view of risk, return and uncertainty." (9) Thus above both of concepts of working capital have their own uses and merits. The choice of the particular concept will depend upon the purpose in

view of the two concepts the net is more useful, if the purpose is to find out the financial position of an enterprise". (10)

The gross concept is sometimes preferred to the concept because of the following reasons:

1. It emphasis the importance of managing every current asset individually in the day to day operations of a business and thus helps to identify the different areas of financial responsibility in relation to working capital.
2. It provides adequate working capital. This is one of the primary considerations in the management of working capital. Knowledge of gross working capital is more relevant than the sources from which it is finished.
3. For the purpose of calculating the rate of return on investment in working capital, the gross concept is more useful.

However, the net working capital concept does not defy the computation of total current assets. Moreover, by emphasizing the fact that working capital does not increase by short-term borrowing, it reminds the management to look for permanent sources for financing such requirements. Lastly, the net concept highlights the need for having some excess of current assets over current liabilities. The net concept is important for the following reasons.

1. It indicates the margin of safety for short-term creditors. Excess of current assets over current liabilities is the margin to which a firm's current assets can decline without adversely affecting short-term creditor's liquidity.
2. Excess of current assets over current liabilities allows a firm to sell goods on credit for a longer term and purchase non current assets.
3. Any excess within limits is taken as an index of the solvency of a firm.

4. When current assets show a tendency to exceed current liabilities over a period of years, the excess should be taken as more or less permanent in nature and should thus be met out of permanent sources.

Both the net and gross concepts of working capital have their own uses and the choice of a particular concept will depend upon the purpose in view. If the short-term financial strength of a business is to be found out, the net concept is more useful. On the other hand, if the aim is to find out whether the total current assets of the concern are being put to maximum use, the gross concept is preferable.

EVALUATION METHODS:

A study of Performance efficiency through productivity, financial efficiency and operational efficiency is made by using the followings tools and techniques.

1. Ratio analysis

Ratios analysis is the process of determining and presenting in arithmetical terms the relationships figures and groups of figures drawn from these statements. A ratio expresses the results on the basis of comparison of two figures in numerical terms.

A ratio is a statistical yardstick that provides a measure of relationship between two accounting figures. According to batty " Accounting ratios describe the significant relationship which exists between figures shows on a balance sheet in a profit and loss account in a budgetary control system or in any of the part of accounting organization." [12]. The ratio is customarily expressed in following ways:

1. It may be obtained by dividing one value by other. This expression is known as "Times".
2. If hundred then the unit of multiply the above expression becomes percentage.

3. It may be expressed in the form of "proportion" between the two figures or known as pure ratio.
4. It may also be depicted in the form of graphs like ratio graph.

Importance:

A ratio is known as symptom like blood pressure. The pulse rate of the temperature of an individual often ratio analysis is used as a devices to diagnose the financial position of an enterprise. It shall point out if the financial condition is very strong, good, partly good, poor. As such the ratio analysis is a powerful tool of financial analysis through it economic and financial position of a business unit can be fully x-rayed.

Ratio analysis becomes meaningful to judge the financial condition and profitability. Performance of a firm only when there is comparison of present in fact analysis involves two types of comparison. First a comparison of present ratio with past and expected future ratios for the same firm, the second method of comparison involves comparing the ratio of the firm with those of similar firms of with industry average at the same point of time.

Further "Ratio analysis" presents the figures in which the net result of the financial position and problems is concentrated. They provide a co-ordinate frame of reference for the financial manage. They tell the entire story of the 'Financial adventures of the enterprise as heap of financial date are buried them. They simplify the comprehensive of financial statistics.

On the basis of above it may be concluded that ratios are very important for interpretation as they give valuable and very useful information about business.

Limitations:

Every flower of rose has its own beauty in spite of numberless thorns in the same way ratio analysis has a variety of advantages, though it is not free from limitations, some of which are as below:

1. The formula for calculating each ratio is not well standardized.

2. No standard ratios are available for evaluating the significance of each ratio.
3. Ratio ignores non-monetary factors like general economic climate, government and management policies, which vitally affect the financial health of the enterprises.
4. If too many ratios are calculated, they are likely to confuse, Instead of revealing meaningful conclusions.
5. The ratios are generally calculated from the past financial statement and thus, are no indicators of future.
6. Ratios are not exact measure of financial situation as the balance sheet and profit and loss account are based on accounting conventions, personal judgments and recorded facts.

As Ratios are simple to calculate, there is a tendency to over employ them, which lead to accumulation of mass data. However significant the ratio may they cannot replace business efficiency and decision - marking. They do not provide mechanical solution to business problems.

Classification of Ratio:

Some writers have described that there are as many 42- business ratios. First of all it is necessary to ascertain the ratios for a particular study. The financial ratios may be classified in the various ways. If the nature and objective of calculating each ratio is given then the customary and convenient classification from the point of view of management and investors will be:

(A) Liquidity Ratio

These ratios throw the light upon the liquidity position of a concern the main ratios are:

1. Current ratio
2. Liquid ratio or quick ratio or acid ratio
3. inventory to working capital ratio

4. Working capital turnover ratio
5. Debtor turnover ratio
6. Average debt collection period

(B) Productivity Ratio

1. Output to input ratio
2. Input to output ratio

(C) Profitability ratio

These ratios X ray the profit making ability of the enterprise. They may calculate either on the basis of operating profit or net profit. These ratios are of two types first related to sales and second profitability. The main efficiency ratios are

1. Gross profit ratio
2. Operating ratio
3. Net profit ratio
4. Return on gross capital employed
5. Return on net capital employed
6. Return on net worth

(D) Activity Ratio

Activity ratio expressed how efficient the firm is managing its resources. These ratios express relationship between the level of sales and the investment in various assets. The import and commonly used activity ratios are as under:

1. Total assets turnover ratio
2. Fixed assets turnover ratio
3. Current assets turnover ratio
4. Capital turnover ratio

(E) Financial Structure Ratio

These ratio highlight the management policies regarding trading on equity. These more important ratios concerning capital structure is given below.

1. Long term debt equity ratio
2. Total debt equity ratio
3. Interest coverage ratio
4. Fixed assets to capital employed
5. Capital gearing ratio
6. Proprietary ratio
7. Net fixed assets to net worth ratio

[2] TREND ANALYSIS

Trend analysis technique is useful to analyze the firm financial position and to put the absolute figures of financial statement in more understandable form over a period of years. This indicates the trend of such variable as sales cost of production, profit assets and liabilities.

The different approaches of trend analysis are as follows.

1. Common size vertical analysis
2. Common size horizontal analysis
3. Trend analysis helps the analyst and management to evaluate the performance, efficiency and financial condition of an enterprise.

(i) Common size vertical analysis

All the statement may be subject to common size vertical analysis a figure from the same year's statement is compared with the basic figure selected from the statement should be converted into percentage to some common base. The common size vertical income statement and balance sheets of selected companies of fertilizer industry covered by this study are given in the study.

(ii) Common size horizontal analysis

When asking horizontal analysis, a figure from the account is expressed in terms of same account figures from selected base years. It is calculation of percentage relation that each statement then bears to the same item in the bas4e year. Horizontal analysis can help the analysis to determine how an enterprise has arrived at its current position.

The technique of common size statement is very useful when we wish to compare the performance of the industry for presentation of the data in percentage from since it eliminates problems relating to differences in organization size.

[3] Comparative statement analysis:

Statement prepared in a form reflecting financial data for two or more periods are known as comparative statement. The data must first be properly set before comparison in the preparation of comparative financial statement uniformity is essential otherwise comparison will be vitiated. Comparative financial statement is very useful to the analyst because they contain not only the data appearing in a single statement but also information necessary for the study of financial and operating trends over a period of a year. They indicate the direction of the movement in respect of financial position and operating results. Comparison of absolute figure has no significance if the scale of operation of one company is much different from that of others.

(i) Comparative balance sheet

Increase and decrease in various assets and liabilities as well as in proprietor's equity or capital brought about by the conduct of a business can be observed by a comparison of balance sheets at the beginning and end of the period. Such observation often yield considerable information, which is of value informing an opinion regarding the progress of the enterprise and in order to facilitate comparison a simple device known as the "comparative balance sheet" may be used.

(ii) Comparative income statement

As income statement shows the net profit or net loss resulting from the operations of a business for designated period of time. A comparative income statement shows the operating result for a number of accounting periods so that changes in absolute data from one period to another may be started in terms of money and percentage. The comparative income statement contains the same columns as the comparative balance sheet and provides the same type of information.

As the income statement presents the review of the operating activities of the business and the comparative balance sheet shows the effect of operation of its assets and liabilities. The latter contains a connecting link between the balance sheet and income statement. Income statement and balance sheet are contemporary documents and they highlight certain important facts.

[4] Fund flow analysis

The balance sheet is in the nature of a showing the position of a firm at a particular moment of time. The business process is very dynamic with transactions occurring regularly, each of which affects in some way, the immediately preceding financial position. A balance sheet therefore, merely provides the picture of a fleeting condition at a point of time and if balance sheets drawn at different time are compared any different pound between the closing and beginning figures would be the result of various transaction taking place during the interim period. The business process involves a continuous inflow and outflow of funds. This funds flow analysis helps the analysis to appraise the impact of the management's decision on the business during a given period of time.

[5] Other techniques of analysis

Several other techniques like cash flow analysis and break even analysis are also some time useful for analysis. The use of various statistical techniques is also used frequently for financial analysis, providing a more

scientific analysis. The tools generally applied are moving average, index number, range, standard deviation, correlations, regression and analysis of time series.

Diagrammatic and graph orientations are often used in financial analysis. Graphs provides a simplified way of presenting the data and often give much more vivid understandable of trends and relationships. Pie graphs bar diagrams and other simple graphs are often used for financial analysis.

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CHAPTER – 3
RESEARCH METHODOLOGY

Introduction

The fertilizer industry has fulfilled a remarkable role in sustaining the nutritional well being of the global population. At the onset of the first millennium there were approximately 200 million people on the planet, and the first billion was reached only in 1850. Thereafter, the pace quickened: doubling in eighty years and again after another 45 years. The sixth billion mark was reached in October 1999. The prognosis by experts varies on the size and timing the global population would peak: from a low of 9 billion by 2070 to a high of 28 billion by 2150. The global fertilizer industry is relatively small in financial term: an output of approximately $ 30 – 35 billion of final products at ex-factory prices on an "average" year. There are approximately 1000 manufacturing companies with some 2000 – 3000 production sites for a volume of an estimated 359 million tones in 1998. The largest companies have less than 5 % market share. The industry may be conveniently categorized into 4 layers although fertilizer production takes place in nearly 100 countries, there are very few cases of self-sufficiency. Roughly one in four tones of fertilizers product or intermediate is sold across the border. An examination by sector the three major nutrients will unveil the complexity of the industry as a whole.

Financial soundness of a business enterprise largely depends upon the operational efficiency, financial efficiency and productivity of the business enterprise. The operational efficiency can be achieved by managing the different total assets, fixed assets, capital employed and working capital such as receivable management, cash mgt.and proper debt collection policy. An output is obtained by the combined input of a number of factors like labour,

material, capital, land and organization. The ratio between output and one of these factors of input is generally known as the productivity of the factors considered, the ratio between output and all these factors is known as total productivity. It is considered as a measure performance of the economy as a whole. In the broadest concept, productivity may be taken to constitute the ratio of all available goods and services to the potential resources of the group of the country. The financial efficiency can be achieved after control over the cost of production. In recent years, cost of almost all elements of production like cost of raw material consumed, wages cost, excise duty, power and fuel cost, interest burden, administrative expenses, selling and distribution expenses etc. have been increased heavily. On the other hand, selling price of cement, textiles, automobiles, woolen, engineering, tea, paper, and chemical products is decreased. The problem of increasing productivity implies the full proper and efficient utilization of the available resources of men – machines-money – power – land- capital etc. productivity cannot have a mask attack on wastage of every type and in every sphere. It constantly urges to find better, cheaper, quicker, easier and safer ways of doing job, manufacturing a product and providing a service. It aims at the maximum utilization of resources for yielding as many goods and services as possible, of the kinds most wanted by consumers, at the lowest possible cost. In these circumstances, to keep the progress of business enterprise is very essential for management in present environment, to achieve the profit it tends to introduce various control techniques over expenditure and get maximum output.

A study of Comparative Analysis of performance Efficiency can be classified on the basis of persons interested in the analysis. Generally external and internal parties are interested in such analysis of study. Objectives of both these analysis are different. An external analyst has to depend upon the published information of financial statement, which is not enlightening them.

While internal analysis knows every thing regarding the information provided in the financial statements.

Different analysts always make analysis or study of financial performance knowingly, generally, external analyst's analysis the information as per their requirements. Financier is interested in the financial and liquidity position. A shareholder is interested in the profitability. Management is interested in the productivity and operational efficiency. Thus various stakeholder of business enterprise like management, investors, bankers, financial institutions, creditors, employees, government, economist, prospective investor's etc., look at operational efficiency, financial efficiency and productivity of the business concern.

Relevance of the Study

In previous portion we have seen overview of fertilizer as well need relevance and some of the issue of fertilizer industry i.e. this industry in not commercially profitable, etc. The study on comparative analysis of performance efficiency of fertilizer industry in India is important because of the following things.

India is an agricultural country and a lot of things depend on agriculture, the farmers are producing different crops by utilizing different fertilizer but at the same time they do not know about the fertilizer as well as soil of the land, blindly following others.

From conducting the study we will know about the things as shown below:

a) Financial performance of industry with the highlights of all major fertilizer companies. If final out put of this study that is financial stability of the industry is good than we can conclude that they have good market and good sales too. They are earning good profit by providing quality fertilizer to all farmers.

b) The farmers have many options to purchase fertilizer because in India we have 15 good companies who are busy with fertilizer. By doing

comparative analysis of all companies through fertilizer industry we can produce good information for the society that is quality of the fertilizer.

c) Performance efficiency is also a parameter of market manpower and many more things to find and check this study is vital.

Review of Literature:

Very much literature on Fertilizer Industry in relevance to its long history and economic importance is available. Plenty of analytical literature is before us on problems associated with Performance efficiency, productivity, operational efficiency, financial efficiency, size and technology, capacity utilization, financial performance and plant location. Relevant material and literature have been disclosed below:

Poddar write two most important books in 1962 and 1966 in which he elaborated all the facts regarding various aspect of the industry. Institutions such as C.M.A., Association of Trade and industry, Commerce research Bureau, Economic Times, Tariff Commission, National productivity Council etc. have made efforts to study the general problems in historical perspective.

Indian Association of trade and industry having made a study on the basis of annual reports of the leading 19 companies which accounts for 90% of the total production in India and published. It covered analysis of the financial trend and productivity on the basis of the study of the financial trend and productivity on the basis of the study of the consolidate balance sheet and profit and loss account of these companies. It also compared various features of productivity and profitability with other important cement producing countries like U.K, u.S.A., Belgium and Japan.

In 1989 Howard Dresner, a research analyst at Gartner (until 2005, now Chief Strategy Officer at Hyperion Solutions Corporation), popularized "Business Intelligence" as an umbrella term to describe a set of concepts and methods to improve business decision-making by using fact-based support

systems. BPM is built on a foundation of BI, but marries it to the planning and control cycle of the enterprise - with enterprise planning, consolidation and modeling capabilities. As CSO at Hyperion, Dresner has become a champion for BPM and has suggested that it is subsuming BI.

The term "BPM" is now becoming confused with "Business Process Management", and many are converting to the term "Corporate Performance Management" or "Enterprise Performance Management" means performance efficiency of fertilizer industry.

In the book Corporate performance assessment published by the Tokyo: Asian Productivity Organization, 2001 discussed that the performance of the organization is depend on the various factors and that should be consider first. This research purely related with the performance of the enterprise.Infosys believes that Corporate Performance Management (CPM) is an approach to bring in systematic and integrated improvements in the management processes to ensure efficiency and effectiveness in strategy execution. At the core of CPM is A metrics-based strategic planning and execution framework that helps align strategic plans with resource allocation and strategic initiatives Strategic goal alignment through enhanced communication and focusing processes / resources towards organization objectives A structured information based review mechanism that provides the feedback loop and connects strategic planning to operational performance measures

Approach of the Infosys

Most enterprises have deeply entrenched strategic planning processes; but strategy fails during execution. Executives spend ample time in making incremental improvements in processes viz. planning, budgeting and forecasting, but isolated and siloed implementations fail to create organization wide alignment and deliver required results.

Infosys' CPM approach focuses on incorporating best principles of corporate performance management than a mere implementation of popular frameworks, and is based on our proprietary Performance Management cycle that helps an organization to execute upon its strategies effectively and efficiently. This concept focuses on the efficiency of the company.

Infosys has used this concept very effectively within the company to achieve significant results. The company has streamlined bottom-up information flow to senior management (moved from 400 metrics to 30 metrics directly linked to strategic objectives). It has achieved over 65% reduction in cycle time for budgeting, thus allowing for frequent reviews. This has meant that budgets remain relevant throughout the year. Further, there has been a 40% reduction in

Planning cycle time. Re-engineering of the review processes has freed up 20% of senior management time which was spent on review meetings. In addition, this has improved the effectiveness of these reviews. Most importantly, Infosys achieved a dramatic 30% improvement in forecast efficiency. The company has met financial forecasts for the last 48 quarters in a row, since it went public in India. Perhaps, this bears testimony to the effectiveness of the multigenerational Improvement program that it embarked upon through the CPM approach.

Chakravarty and Reddy make study on ratio analysis as major tool for financial performance by studying 22 ratio of productivity, profitability, liquidity and turn over groups of the industries for the period from 1961 to 1971.

In 1979 Kaura and Subramaniam used conventional ratio analysis and merit rating approach for the study of financial performance of 10 units for the period from 1972 to 1979. He observed liquidity, profitability, financial structure and over all performance which reveled that the financial strength of the units had declined over the years.

Zigon Performance Group is based in suburban Philadelphia and was founded in 1986 with the sole purpose of helping clients improve employee performance through better performance measurement. ZPG shares its unique and proprietary measurement processes and idea database with a broad range of Fortune 1000 clients nationwide by providing training, assessment services and publishing. This study helps the company to improve his productivity, operational efficiency as well as financial efficiency in many ways.

Performance management is more than a buzzword. This book attempts to dispel the clouds of confusion surrounding this concept. Mark A Stiffler in his book Performance: Creating the Performance-Driven Organization attempts to clear out any misunderstanding or plain lack of understanding about performance management.

In the introduction, Stiffer states that it is not just another book on performance management but the first one. Stiffer personalizes both, the subject and the book, by way of issuing something of a caution early on when he makes clear to the reader that he has his opinion on the 'sorry' state of performance management. Disputes and arguments may be possible about the 'first book' claim. However, it may be hard to overlook the fact that in later parts, the author lays importance on the individual rather than the organization.

Dr. Kumar Bar Das published a comprehensive book in 1987, which covered period from 1970 to 1980. He included various aspect like factor productivity, location degree of competition, capacity utilization, size efficiency, financial efficiency, distribution pattern and government policies with respect to pricing and distribution. He indicated that all profitability ratios decreased gradually and became negative for 1973-74 and 1974-75 but improved gradually thereafter.

Dr. Promod Kumar published a book in 1991 "Analysis of financial statement of Indian Industries" The study covered the 17 private sector, 5 state owned public sector and 1 central public sector companies. He studied analysis

of activities, assessment of profitability, return on capital investment, analysis of financial structure, analysis of fixed assets and working capital. In his research he revealed various problems of industries and suggested remedies for the problems. He also suggested for the improvement of profitability and techniques of cost control.

Statement of problem:

"**Comparative Analysis of performance Efficiency of Fertilizer Industry in India**." The basic purpose of the study is to understand the performance trend in fertilizer sector of India. This will require the study of operational efficiency of fertilizer industry, the financial efficiency of fertilizer industry as well as performance efficiency of fertilizer industry in India.

The performance analysis of a business organization largely depends upon the relationship between five major parts of performance analysis, those are given as below.

a) Relationship between cost of production and the selling price affect them. In the age of globalization this is a very vital question to any industry.
b) Productivity and efficiency played key role in Birla group of Industry. The study of selected companies shows comparatively lower standards of productivity.
c) Profit and profitability are also other considerable things. Due to high degree of competition the profit margin is decrease.
d) There are certain uncontrollable and controllable factors affecting profits of the companies. It is hypothesized and by controlling the controllable factors, the companies can improve their profit and profitability.
e) There are rapid changes in Liquidity position determining factors i.e. manufacturing process and business fluctuation.

f) The companies faced multifarious problems during the study period and still it is facing many problems are tackled properly: the performance of the company will improve.

This study is based on the secondary data drawn from published annual reports of fertilizer companies under study. Various studies have been conducted under the university faculty but no significant research work seems to have been under taken on the interpretation and analysis of performance of industry. Present attempts will be an original contribution in this field as the problems of the study is unique in every aspect.

Objectives of the Study

The objective of the study is to analysis and interprets Operational Efficiency, financial efficiency and Productivity selected fertilizer group of companies. The objectives are as under

1. To analysis the operational efficiency
2. To measure the financial efficiency
3. To assess and comment on determinants of the production, and productivity.
4. To suggest ways and means to improve performance

Hypothesis of the Study

"A Hypothesis is a special proposition, formulated to be tasted in a certain given situation as a part of research which states what the researcher is looking for." **1** In the research study, two hypotheses has been tested, these are as under:

Hypothesis based on chi-square Test:

Chi square test is useful for inter comparison. For establishing casual relationship regression line of variable "Y" on variable "X" has been calculated and within the help of regression equation of "Y" on "X" calculated value of "YC" has been computed for appropriate variables as per the

statement of Null Hypothesis (Ho) "There is no significant difference between actual and computed variables on the regression line in selected companies of fertilizer industry." If the calculated value of Chi-square(X^2) is higher than the table of chi-square, the arising difference are significant and hence Null Hypothesis is rejected otherwise accepted.

Alternative hypothesis (Ha): The statement of alternative hypothesis describe, as 'there is significant difference in actual and computed variables if the Null hypothesis is accepted, the alternative Hypothesis will be rejected or vice-versa.

Hypothesis based on Kruskal Wallis:

"This tests the rank randomization analogue of the observation randomization." **2**

One way Analysis of Variance Test:

It is useful for inter-unit comparisons. The following null and alternative hypothesis has been tested on the basis of Kruskal Wallis one way analysis of variance test.

- The Productivity of the Selected Units of the Fertilizer Industry under the period of study is good.
- The Financial Efficiency of the Selected Units of the Fertilizer Industry within the period of study is good.
- The Operational Efficiency of the selected units of the Fertilizer Industry within the period of study is good.

The acceptance of the null hypothesis would suggest that there is no significant difference between the productivity, operational efficiency and financial efficiency of the selected units, which means that the ratios of the units came from identical populations, in such selected units as the comparison of the ratios will have little significance. In contrast, the rejection of the null hypothesis will revel that there is significance difference between the ratios of

the units, suggesting the usefulness of comparison the level of significance used in this case will also be at 5 percent, while the degree of freedom will (total no. of units-1) or (8-1=7) in the present study.

As per this study the self existent assumptions are as under:

1. The data of industry by the postulate. However it is possible to sketch conclusions of the individual company.
2. There are such areas where the performance can be improved by the effective management of recourses. These areas include production, productivity, financial efficiency and operational efficiency.
3. There are certain controllable and uncontrollable factors which by the effective to the profit of the companies. It is hypothesized and by controlling factors, the company can justify their profit performance.
4. The selected units faced problems during the study period and presently also. If the problems are tackled properly the performance of Operational, Productivity and financial efficiency stand and will be improved as per determined

Universe of the study:

The universe of the study consists of the units of the fertilizer industry operating in India.

Period of the study

The period of study is seven year starting from 1999-20002000 to 2005-06. As started earlier, Indian economy switched over to open economy from closed economy since July 1991. The study relates past perform process. The industrial growth rate during the period was on the normal peak. Hence it would be proper to study when the growth rate was stable in comparison to past years.

The study is based on secondary data taken from published annual reports of the companies. In addition to that financial literature, government

and non government documents, published articles, books on the related aspect where also included.

The data are also collected from PROWESS database, which is the corporate database from centre for monitoring Indian economy Mumbai. The researcher has taken some data and information from database manages by Capital line 2000. In additional to this, the researcher has also organized personal unstructured interviews and meeting of the key personality of the fertilizer industry for the reliability of the data.

Sampling design:

There are several public as well as private sector units of fertilizer industry operating in the country. The researcher has selected some units belonging to public sector and some units belonging to private sector as a random sample representing whole universe of the this study.

Data collection method

This study is based mainly on secondary data, which are published in the annual reports of the selected industry units. The annual reports are collected from the head office of the respective units. The other data source is Prowess database & capital line software from CMIE, Mumbai. Various publications of fertilizer industry and related journals, progress report, articles and other publication have also been used for this study.

The data collected were duly classified and analyzed by using relevant statistical techniques and applying appropriate parametric and nonparametric test for testing of hypothesis. The data collected were duly classified and analyzed by using related statistical techniques and applying appropriate parametric and nonparametric test.

"Research is a process of systematic and in depth study or search of any particular topic, subject or area of investigation, backed by the collection, compilation, presentation and interpretation of relevant details or data. It is a

careful search or inquiry into any subject matter, which is an endeavor to discover or find out valuable facts, which would be useful for further application or utilization" [3] research and analysis of management problems would result in certain conclusions by means of logical analysis.

For the purpose of performance efficiency of selected companies of fertilizer industry, the secondary data are used. As definition point of view." The term secondary data refers to the statistical material which is not originated by investigator him self but which he obtains from some one's record. [4] Secondary data were not gathered specially to meet the needs of the problem at hand. For the study data have been collected for the period of seven years from the published annual reports of their registered offices or stock exchanges by visiting personally or by post. Various publication have been of selected units of fertilizer industry collected from their corporate offices of respective companies and other publications have also been used as stock exchange official directory, Economics times, Financial express, R.B.I. bulletin, other periodicals. Journals and kothari's industrial directory of India.

Personal interviewing of the additional director, chairman, directors, joint president, company secretary, chief accountant, general manager finance, executives joint technical advisory and assistant director have conducted to collect some keynote information of the companies and industry.

The figure contained in the annual reports and accounts have been rounded off to crores up to two decimal places. All the collected data have been presented and formulated in the form of condensed balance sheet and income statement. All the ratios and mentioned statement have been analyzed and interpreted.

As conclusion point of view inter firm comparison has been made for analysis of performance of selected companies. Various techniques of analysis i.e. ratio analysis, trend analysis, regression graphs, means, diagrams, have

used for the presentation and interpretation of the data and at the end on the basis of the conclusion, some suggestion have made for development of performance.

Tools and techniques

During the process of research, the researcher has used various tools for the measurement of performance like ratio analysis, trend analysis, variance analysis etc. The collected data were duly edited, classified and analyzed using all types of relevant statistical techniques and employing the most appropriate parametric and non parametric test. Some of the statistical techniques used for this study are given below.

(I) Tools for analysis

For the present study following tools have been used for analysis of performance of fertilizer group of Companies.

(1) Concept of Variable: The variable used in the present study is (i) out put (ii) input both are as under**:**

(i) OUTPUT:

It is an important variable. It may be presented in physical units or in monetary values. Generally output is measured with the help of an index of physical production. Under certain circumstances, the use of sales in property weighted physical units in lieu of production is also found. In addition, sometimes. Physical capacity is taken to measure output. According to prasad N.K. "the output consists, it may be measured in term of sales values of quantity or both. Monetory sales value is however, not true measure of output because due to the varying profit margins and marketing costs, it fluctuates from period to period and hence is not comparable. Quantitative data volume or number of units are better measures of output but where varieties of products are manufactured and the product mix and types, specifications and qualities of the products are liable to change from time, data are rendered un

comparable. The commonly adopted method is to take both sales values and quantity adopted method is to take both sales values and quantity into account for measuring output"[5] in the present study both sales revenue and quantity have been taken in to account for measuring the output and units of outputs.

(ii) Input:

Input comprises of a number of diverse factors, it is not possible to have a common physical unit for measurement of all these factors labour, material, overheads, fuel, and power. These factors constitute the main inputs of an industry.

(2) Ratio Analysis:

Ratio is well known and most widely tool of financial analysis can be defined as "the indicated quotient of two mathematical expression." as operation definition or ratio is the relationship between one item to another in a simple mathematical form." a ratio is simply one number expressed interims of anther. It is found by dividing one number the base into the other"[6]

"Generally there are two methods of expressing relationship in ratios"[7] (i) The percentage method like 100 percent etc. "Analysis use ratio to connecting different parts of the financial statements in a to find clues about the status of particular aspects of the business"[8] (ii) The Phrase method such as one and half to one and two for one. Ratio is useful analysis for financial statement. It is conveniently and clearly capsulate the data in a form that is easily understood interpreted as "ratio are simply a means of highlighting in arithmetical terms, the relationship between figures drawn from financial statements"[9] The technique of ratio analysis is the process of determining and interpreting numerical relationship based on the financial statements

According to Batty "accounting ratio describe the significant relationship which exist between figures shown in a Balance sheet, in a profit

and loss account, in a budgetary control system or another part of accounting organization"[10]

It concludes whether the financial condition of a business enterprise is good or bad it is universally used for appraising the performance of a business firm.

(3) TREND ANALYSIS:

The ratio analysis gives a reasonable good picture but it is incomplete in on important respect-It ignores the time dimension. The radios are snapshots of the picture at one point in time but there may be trends in motion that are in the process of rapidly eroding a relatively good present position"[11]Trend analysis is tool of analysis the financial statement in more simplified form over a period of years, "Trend analysis is horizontal analysis of financial statements often called as 'pyramid method' of ratio analysis-a guide to yearly changes."[12]

In the wards "one of the most useful forms of horizontal analysis is trend analysis. It is especially helpful in revealing proportionate change over time in selected financial data" [13] Trend analyses make it easy to understand the changes in an item over a period of time and to draw conclusions regarding the changes in data. For analyzing the trend of data depicts in the financial statements it is necessary to have statements for a number of years. This method involves the interpretation of the percentage relationship that each statement item, bears to the same item in the 'base year.'

(II) Stastistical Tools

Statisitcal tools are utilized for data analysis and interpretation of the firm. A brief outline of the various statistical techniques being used for present study those are:

(1) CHI-SQUARE TEST:

The Chi-square test (x^2) is one of the widely used non-parametric tests among the several tests of significant developed by statisticians. Chi-square pronounced as Ki-Square.According to Ullman Neil R"Chi-square as a non parametric test it can be used to determine if categorical data shows dependency or the two classifications are independent. It can be also be used to make comparisons between theoretical populations and actual data when categories are used"[14] the formula used for calculation of chi-square is as following [15]

$$\text{CHI-SQUARE } (X^2) = \frac{(O-E)^2}{E}$$

Where 'O' denotes the observed values and 'E' refers to the expected values. The expected value will be calculated with the help of Regression analysis and time series analysis. Chi-square distribution and critical values of Chi-square are obtained from the tables of Chi-Square distribution. The expected values will be determined with the help of assumption where the data come from the hypothesized distribution. The Chi-Square distribution is a continuous probably distribution which has the value zero at its lower limit and extraction.

(2) KRUSHAL WALLIS ONE-WAY ANALYSIS OF VARIANCE TEST:

Stevenson W.J.States, "It is a one way analysis of variance test that employs ranks rather than actual measurement, and its assumptions concerning the data are relative weak[16] the calculations are accomplished by converting each observation to rank. While ranking the observations, all the values are treated as if they belong to one sample the ranks are given from the lowest number to the highest number. As such the lowest number is ranked as 1, The next lowest as 2 and so on until all observations have been ranked if

there happens to be case of tie, that is resolved by giving them the average values of ranks"[17] The sum of rank in each sample size, and the total number of observations are used to compute the statistic (H) [18]

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{(Rj)^2}{Ni} - 3(N+1)$$

Where
N = TOTAL NUMBER OF OBSERVATIONS
K = TOTAL NUMBER OF SAMPLES.
Hj = THE NUMBER OF OBSERVATION IN THE Jth SAMPLE

Rj = THE SUN OF RANKS IN JTH SAMPLE

(3) INDEX NUMBERS

"Index number as a number which is used to measure the level of a given phenomenon as compared to the level of the same phenomenon at same standard date"[19] Index numbers nothing more than a relative number, or a relative which expresses the relationship between two figures, where one of the figures is used as a base present study indices of sales, production and capacity utilization of selected Birla group of companies have been found out by taking 1997-98 as the base year and indices of the rest years have been calculated.

(4) ARITHMETIC MEAN

It is called as the average of difference of the values of items from some average of the series. According to Gulerian "the most commonly used average is the arithmetic mean, briefly referred to as the mean"[20] the mean has been found by adding all the variables and dividing it by the total number of years taken.

(5) STANDARD DEVIATION

Standard deviation may be defined as positive square root of the variance. While the variance of a sample is the average square deviation of values from the mean [21]

(6) CO-EFFICIENT OF VARIATION:

Co-efficient of variation has been defined as the percentage of the standard deviation to the mean. It should be noted that higher the variability the greater would be the co-efficient of variation. Therefore, it may be pointed out that for the stability of results, Co-efficient of variation must be low. Co-efficient of variation (C.V.) may be calculated with the help of standard deviation and mean [22]

$$\text{CO-EFFICIENT OF VARIATION} = \frac{\text{STANDARD DEVIATION}}{\text{ARITHMETIC MEAN}} \times 100$$

(7) Variance Analysis/F-Test in One Way Classification:

Analysis of variance was developed by R. A. Fisher and a test so developed by him is known as Fisher's test or more commonly F- test. Now days, F- test is widely used in the analysis of variance. It is mainly used to test hypothesis of equality between two variances. This test is also used to test the hypothesis of equality among several means. This test is particularly suitable for experimental work as no assumption of equality is required. The analysis of variance is mainly carried on under: (1) one-way classification and (2) Two way classification. For this study one-way classification variance analysis is used.

The actual analysis is carried on the basis of a ratio between the variances rather than between the variances. The variance ratio is obtained by dividing the variance between samples by the variance within samples. This ratio forms the F- statistics. F ratio is:

$$F = \frac{\text{Variance between samples}}{\text{Variance within samples}}$$

Generally the variance between sampled is greater than variance within samples. Sometime, though in rare cases, the variance within samples may be greater than the variance between samples. In such a case the two variances should be interchanged so that the value of F is always greater than one. This can be achieved by taking the value of the numerator always greater than that of the denominator.

The calculated F-ratio should be compared with the critical value of F to draw inference. One should be very careful in consulting the table containing the critical value of F. These values are given for various levels of significance on the basis of degrees of freedom for greater and smaller variance.

(iii) Kendall's Co-efficient Of Concordance:

Kendall's Co-efficient, presented by the symbol W, is an important nonparametric measure of relationship. It is used for determining the degree of association among several (k) sets of ranking of N objects or individuals. When there are only two sets of ranking of N objects, we generally work out Spearman's Co-efficient of correlation, but Kendall's Co-efficient of concordance (W) is considered an appropriate measure of studying the degree of association among three or more sets of ranking. This descriptive measure of agreement has applications in providing a standard method of ordering objects according to consensus when we have an objective order of the objects.

The degree of agreement between the judge data reflects in the variation in the rank sums. When all the judges agree, this sum is a maximum. Disagreement between judges reflects itself in a reduction in the variation of rank sums. For maximum disagreement the rank sums will tend to be more or less equal. This provides the basis for defining of a Co-efficient of

concordance. When perfect agreement between judges, W equals to 1. When maximum disagreement exists, W equals to 0.

The procedure for computing and interpreting Kendall's Co-efficient of concordance (W) is as follows.

(a) All K judges in the usual fashion should rank all the objects N.

(b) For each object determine the sum of ranks

(Rj) assigned by k judges

(c) Determine Rj and then obtain the value of S as under

$$S = S (Rj - Rj)^2$$

(d)Work out value of W using the following formula

$$W = \frac{S}{1/12\ K^2 (N^3 - N)}$$

Where tied ranks occur, the average method of ranks is adopted. If the ties are not numerous, we may compute W as stated above without making any adjustment in the formula, but they are numerous, a correction factor is calculated for each sets of ranks.

A correction factor T is calculated for each of the k sets of rank and these are added together over the k sets to obtain ET. We than use formula for finding value of W as under:

e) If the observed value of S is equal or greater than that shown in table at 5% level of significance, then null hypothesis is rejected.

f) Significant value of W may be interpreted and understood as if the judges are applying essentially the same standard in the N objectives under consideration.

Outline of the chapter plan

CHAPTER–1

Profile of the fertilizer industry in India

This chapter, which includes the Introduction: Fertilizer, Fuel for Growing Plants, Past performance of the fertilizer industry , Role of fertilizer industry in economic development, Brief history of fertilizer industry, Development & progress of fertilizer industry in India, Problems related to fertilizer Industry, Government policy v/s fertilizer industry, Types of fertilizer & fertilizer manufacturing process, Scope and implications for the future, Conclusions, Recent development and brief news of fertilizer industry, Current status of the fertilizer industry in India. In the last the brief introduction of selected units has been given, which included the ownership of the industry, main product, and incorporation of years.

CHAPTER–2

Conceptual framework of performance efficiency

The chapter includes introduction and concept of Conceptual framework of Performance – Efficiency – Performance Appraisal, and productivity - Significance – different techniques of analysis –

(1) Ratio analysis -classification of ratio–operational efficiency ratio- financial efficiency ratio- productivity ratio.

(2) Trend analysis

(3) Comparative analysis

(4) Fund flow analysis and

(5) Other techniques.

CHAPTER – 3

RESEARCH METHODOLOGY

The chapter covers the Problems related to public sector enterprise, Relevance of the study, Review of the literature, Statement of problem, Objectives of study, Hypothesis of the study, Universe of the study, Period of the study, Sampling design, Data collection method, Tools and Techniques which included Various statistical measures like mean, standard deviation, regression, index number, have been used and least-square trend, qui-square of productivity have been fitted, Kruskal Wallis one way-analysis of variance test and 'X' test have been applied to test the validity of two hypotheses namely (1) Null hypothesis (2) Alternative hypothesis., Outline of Study, Finally the limitations of present study have been shown.

CHAPTER- 4

ANALYSIS OF OPERATIONAL EFFICIENCY

This chapter deals with concept of operational efficiency, Activity in relation to total resources- calculation of operational efficiency ratio – total assets turnover ratio – Fixed assets turnover ratio-capital turnover ratio – current assets turnover –Raw material to net sales ratio- wage & salary to net sales ratio-power (fuel) to net sales ratio-financial charges to net sales ratio-debtor turnover ratio-inventory turnover ratio-one way ANOVA test and KRUSKAL Wallis test-conclusion

CHAPTER – 5

ANALYSIS OF FINANCIAL EFFICIENCY

This chapter describe the concept of financial efficiency, profitability, difference between profit and profitability, measurement tools such as gross profit ratio, operating profit ratio, net profit ratio, return on gross capital employed, Return on net capital employed, Return on net worth and earning per share. One way ANOVA test and Kruskal Wallis one-way analysis of variance test used with conclusion of the chapter

CHAPTER – 6

PRODUCTIVITY ANALYSIS

The chapter shows the conceptual framework of productivity, relationship of production and productivity, Relationship with efficiency, partial productivity and overall productivity. While productivity accounting contained material, labour, overheads as well as overall productivity and Conclusion.

CHAPTER – 7

Chapter wise general criteria, summery, finding and suggestions of the study have been presented for improvement and future development plans of Birla group of companies. It is the last chapter of given research work and conclusion led towards the end of the chapter.

Limitations of the Study

- This study is based on secondary data.
- This study is limited to the selected inputs of fertilizer industry and the findings are not applicable to the whole industry.

- There are many approaches to the measurement of performance efficiency. There is no unity among the experts. So the researcher has taken the approaches which he felt appropriate.
- The calculation of partial productivity is only for academic interest.
- This research based on fertilizer related commercial activity. The researcher for this study has not covered other aspects of fertilizer industry.

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Chapter-4
Operational efficiency analysis

Concept Operational Efficiency

Sales are the major factor of judging the activity of an enterprise and the total resources available in the business affect it. The term sales indicates the efficiency with which investment in the assets is rotted in the process of doing business.Effcieincy rotation of capital or total resources would lead to higher profitability depends up the sales or turnover ratio, sales ratio is calculated usually by comparing the net sales with the total investment.

As the management of the concern is responsible for making proper use of resource, it is necessary available to clarify the word "Total resource" The total resources available in the enterprises are characterized by total assets which are made up of fixed assets and current assets. Since the assets of a business used for producing revenue, hence efficient utilization of the assets is necessary for business activity. Activity is judged in relation to total investment as represented by total assets, this is ascertained by sales to total assets ratio or an activity index. Some of the principle ratios have been used in the study as under.

Analysis of operational efficiency through ratio

Total Assets Turnover Ratio:-

The Total Assets Turnover Ratio is an indication of financial soundness of the business in terms of the sales revenue generated against total funds employed in the business. This ratio also indicates the efficiency with which the assets of the company here been utilized. A high ratio suggests better utilization of the total assets of vice-versa. However, care should be taken in drawing conclusions. Some times the purchase of assets may not result in higher the sales but may, however, cause reduction in cost and thereby result in an increasing the profit. In such cases even if the ratio declines, the situation is considered favorable. Thus, this ratio is a measure of performance of the business. This is also termed as capital turnover ratio and this ratio can be calculated as:

$$\textbf{Total Assets Turnover} = \frac{\textbf{Net Sales}}{\textbf{Total Assets}}$$

A high ratio depicts that total assets were utilized efficiently, but a low ratio may be caused due to large outlays on fixed assets. A company must manage its total assets efficiently and generates maximum sales through proper utilization of assets. Table no.1

represents the total turn over ratio in fertilizer companies under study during the years 1999-2000 to 2005-06.

Table No.4.1

Total assets turnover ratio in fertilizer companies under study during the years 1999-2000 to 2005-06.

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	1.13	1.3	1.28	1.4	1.44	1.83	0.63	1.29	0.36	28.15	1.83	0.63
GFCL	4.88	4.35	4.57	3.13	2.56	3.68	2.76	3.70	0.92	24.84	4.88	2.56
GNFC	0.7	0.79	0.98	0.95	1.06	1.26	1.48	1.03	0.27	26.01	1.48	0.7
MCFL	2.82	2.94	2.58	1.59	1.47	2.1	1.99	2.21	0.58	26.31	2.94	1.47
MFL	0.69	1.51	1.46	1.54	1.69	1.95	2.13	1.57	0.46	29.28	2.13	0.69
NFL	1.11	1.24	1.57	2.05	1.99	2.79	2.42	1.88	0.61	32.62	2.79	1.11
CFL	1.65	1.41	2.03	1.45	1.96	2.38	2.17	1.86	0.37	19.83	2.38	1.41
CFCL	0.51	0.67	0.91	0.86	1.07	1.32	1.41	0.96	0.33	33.95	1.41	0.51
Group	1.686	1.7763	1.9225	1.6213	1.655	2.16375	1.874	1.81	0.488	27.62	2.48	1.135

Sources: computed from the annual reports & accounts of the perspective companies.

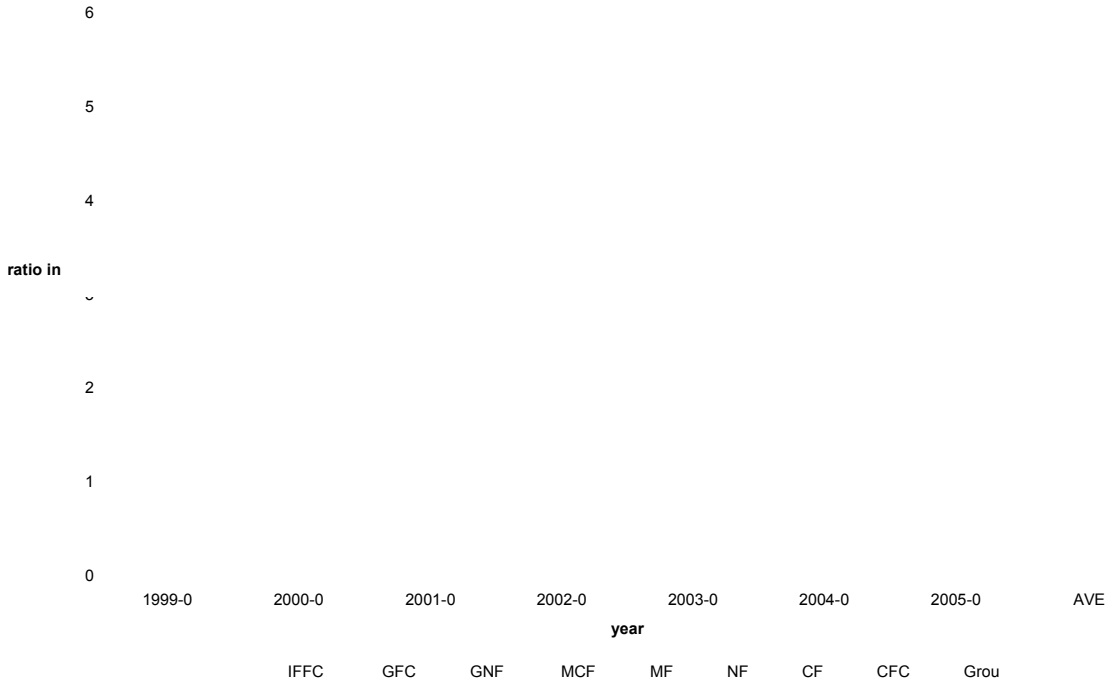
Table no.4.1 makes it evident that the total assets turnover ratio in IFFCO increasing continuously from 2001-02 to 2005-06. It was 1.13 times in 1999-2000 and it was 1.30 times in 2000-01. The ratio then after slightly declined to 1.28 times in 2000-01 and then it rose to 1.4 times in 2002-03 and 1.44 timesi n 2003-04. The ratio was 1.83 times in 2004-05 which was very good but it was below one in 2005-06.The average ratio was 1.29 times which the standard deviation of 0.36 percent and co-efficient of variation of 28.15 percent. The ration ranged between 0.63 times in 2005-06 and 1.83 times in 2004-05. The total assets turn over ratio indicates good operational efficiency use of the total assets.

In Table, no.4.1GFCL witnessed a fluctuating trend in total assets turnover ratio. It was 4.88 times in 1999-2000 which stepped down to 4.35 times in 2000-01 but thereafter it continuously stepped down. IT slightly went down to 3.13 times in 2002-03 and further to 2.56 times in 2003-04. The ratio went up to 3.68 times in 2004-05 and thereafter it declined to 2.76 in 2005-06. The average ratio was 3.70 times with standard deviation of 0.92 percent

and co-efficient of variation of 24.84 percent.The operation efficiency was the best of this company.

The above Table no.4.1showed total assets turn over ratio of the GNFC. The average ratio has been 1.03 with the increasing trend during the study period. The ratio was

Graph No. 4.1



0.70 times in 1999-2000, which increased to 0.79 times in 2000-01? The further stepped up to 0.98 times in 2001-02 and then it slightly went down to 0.95 times. The turnover ratio from 19999-2000 to 2002-03 was below one, which does not show good operation efficiency of the company. But the turnover ratio was increased to 1.06 times in 2003-04 and 1.26 times in 2004-05. The ratio was 1.48 times 2005-06, which was the highest ratio during the study period. The operational efficiency of the total assets in the last three years was very good. The standard deviation was 0.27 times and co efficient of variation was 26.01 percent.

The above Table no.4.1 witnessed total assets turnover of the MCFL. The total assets turnover ratio showed very fluctuating trend during the study period. The ratio was 2.82 times in 1999-2000 and it was 2.94 times in 2000-01. The ratio was very good in these years. But it was slightly gone down to 1.59 times 2002-03 and 1.47 times in 2003-04. The ratio was more than two (2.1) times in 205-06. The standard deviation was 0.58 times and co-efficient of variation was 26.31 percent. The ratio has been the highest of 2.94 times in the years of 2000-01 and the lowest of 1.47 percent in 2003-04. The ratio was very good showing good operational efficiency.

The above Table no.4.1 showed total assets turnover ratio of MFL.The ratio indicated the fluctuated trend during the study period. The ratio was 0.69 times in 19999-2000, which was less than the one. The ratio was highly increased to 1.51 time's n 2000-01 and after this year, the ratio declined to 1.46 times in 2001-02. The ratio was 1.69 times in 2003-04 and 1.95 times in 2004-05 indicating higher efficiency use of assets. The ratio was the highest in the last year of the study period. The average ratio was 1.57 times with a standard deviation of 0.46 times and co-efficient variation of 29.28 percent. The over all operational efficiency has been very good.

The total assets turnover ratio of NFL was seen in the above Table no.4.1. The ratio on average has been 1.88 times with a standard deviation of 0.61 times. The ratio was found highest of 2.79 times in 2004-05 and very lowest of 1.11 times in 1999-2000. The ratio in most of the years has been found quite satisfactory.

CFL showed it total assets turnover ratio in the above Table no.4.1. The total assets turnover ratio indicated highly fluctuated trend during the study period. The average ratio was 1.86 times which more than one indicating good assets utilization efficiency was. The ratio was 1.65 times in 1999-2000 then after it was 1.41 times in 2000-01. The ratio was more than two 2.03 times in 2001-02. The total assets turnover ratio declined to 1.45 times in 002-03 and the reached to 1.96 timesi n 2003-04 and 2.38 times in 2004-05. The ratio in the last years of the study period has been found very more than two. The standard deviation was 0.37 ties and co-efficiency of variation was 19.83 percent.

The total assets turnover ratio of CFCL was found in the above Table no.4.1. The ratio indicated increasing trend during the study period. The average ratio was found 0.96 times which was very less than the one times. The total assets turnover ratio was 0.51 times in 1999-2000 and 0.67 times in 2000-01. The ratio was 0.91 times in 2002-03 but the ratio stepped up to 1.07 times in 2003-04 and 1.32 times in 2004-05. The ratio was 1.41 times in 2005-06.the ratio was showed increasing trend from 2003-04 to 2005-06. The maximum ratio was 1.41 times in 2005-06 and minimum ratio was 0.51 times in 1999-2000.

On the basis of above analysis, it can be said that the total assets turnover ratio of GFCL was found very highest of 2.76 times followed by IFFCO, MFL, CFL, MCFL and GNFC. The average ratio of CFCL was below the total average of industry. So this company is advised to utilize the assets efficiently.

Total Assets Turnover Ratio (ANOVA Test)

Null Hypothesis: There is no any significant difference in Total Assets Turnover Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Total Assets Turnover Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.4.2
Total Assets Turnover Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	37.886	7.000	5.412	19.504	0.000	2.207
Within Groups	13.320	48.000	0.277			
Total	51.206	55.000				

Since F cal > F critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that Total Assets Turnover Ratio does differ significantly.

Fixed Assets Turnover Ratio:-

The fixed assets turnover ratio means the efficiency with which the firm is utilizing in fixed assets. It also indicates the adequacy of sales in relation to the investment in fixed assets turnover ratio is sales divided by fixed assets less depreciation and can be expressed as:

$$\text{Fixed Assets Turnover Ratio} = \frac{\text{Net Sales}}{\text{Net Fixed Assets less Depreciation}}$$

Generally, a high fixed assets turnover indicates efficient utilization of fixed assets in generating sales while a low ratio indicates inefficient management and utilization of fixed assets. It also indicates that the company has an excessive investment in fixed assets in comparison of the volume sales. To obtain fixed turnover ratio sales are divided by the depreciated value of fixed assets, not the market value. Thus, a firm whose plant and machinery has considerably depreciated may show a higher fixed assets turnover ratio than firm which has purchased plant and machinery recently. The fixed assets turnover ratio of the selected fertilizer companies in India has been cataloged in table

Table no.4.3

Fixed Assets turnover ratio in fertilizer companies under study during the years 1999-2000 to 2005-06.

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	1.87	2.21	2.18	2.74	2.78	3.57	1.12	2.35	0.78	33	3.57	1
GFCL	17.7	20.03	13.74	7.91	9.91	14.21	18.47	14.57	4.50	30.92	20.03	7
GNFC	1.42	1.65	1.69	1.37	1.56	2.1	2.53	1.76	0.41	23.58	2.53	1
MCFL	6.14	6.51	4.1	2.21	2.45	3.59	3.68	4.10	1.67	40.72	6.51	2
MFL	0.99	2.29	1.85	2.04	2.3	2.6	2.39	2.07	0.53	25.77	2.6	0
NFL	1.78	1.98	2.24	2.76	2.94	3.31	3.73	2.68	0.71	26.71	3.73	1
CFL	3	2.52	2.98	2.74	3.24	4.25	5.24	3.42	0.97	28.4	5.24	2
CFCL	0.65	0.88	0.99	1.04	1.3	1.59	1.78	1.18	0.40	34.18	1.78	0
Group	4.194	4.7588	3.7213	2.8513	3.31	4.4025	4.868	4.02	1.248	30.41	5.7488	2.31

Sources: computed from the annual reports & accounts of the perspective companies.

GraphNo.4.2
Fixed assets turnover

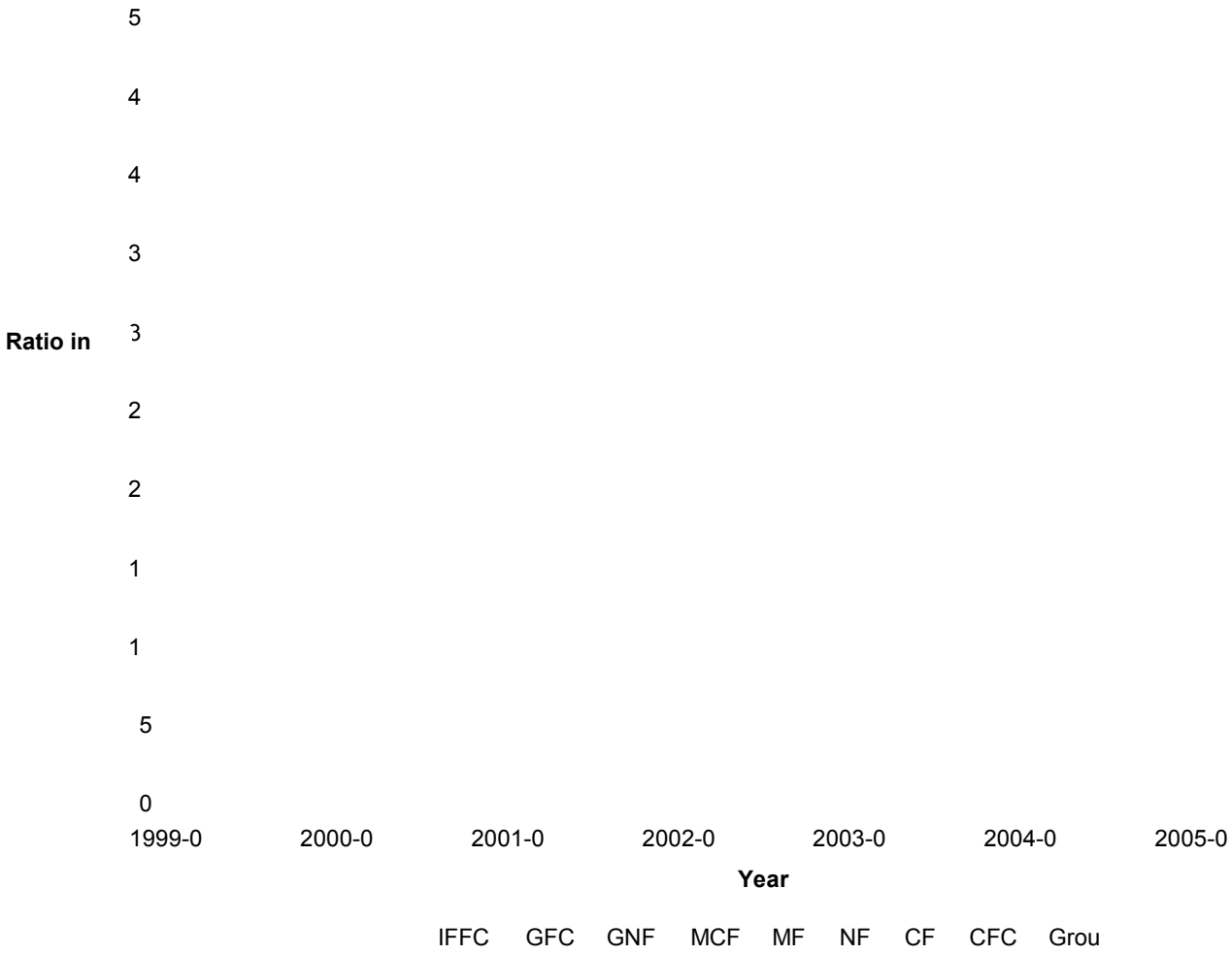


Table No.4.3 indicates hat fixed assets turnover ratio in IFFCO witnessed continuously an increasing trend during the study period except for the year 2005-0. It was 1.87 times in 1999-2000, which increased to 2.21 times in 2000-01. The ratio was 2.18 times in 2001-02 and 2.74 times in 2002-03. The ratio was again increased to 2.78 times in 203-04 and 3.57 times in 2004-05. The ratio increased due to continuously increasing in sales during the study period. The average ratio was 2.35 times. The ratio declined due to new addition of fixed assets in 2005-06.

Fixed assets turnover ratio of GFCL was manifested in the Table No.4.3. The fixed assets turnover ratio was showing highly fluctuating trend during the study period. The fixed assets ratio ranged between 7.91 times in 2002-03 and 20.03 times in 2000-01 with an average ratio 14.57 times. The ratio was very high in all years of the study period. The ratio was increased due to increased in sales in all years. The standard deviation was 4.50 tomes

and co-efficient of variation was 30.92 percent which showed high fluctuation in fixed assets turnover ratio.

The above Table No.4.3 showed fixed assets turnover ratio of GNFC which showed fluctuating trend during the study period. The ratio was 1.42 times in 1999-2000 and rose to 1.65 times in 2000-01. The ratio was again gone up to 1.69 times in 2001-02. The fixed assets turnover ratio after this year stepped down to 1.37 times in 2002-03 and then it rose 1.56 times in 2003-04. The fixed assets turnover ratio was 2.10 times in 2004-05 which was more than two times. The average ratio was 1.76 times, which was more than two times indicating good operational efficiency of fixed assets. The company could generate good volume of sales by utilizing fixed assets efficiently.

The above Table No.4.3 showed fixed assets turnover ratio of MCFL with an average of 4.10 times. The ratio ranged between minimum of 2.21 times in 2002-03 and maximum 6.51 times in 2000-01. The ratio was very good in the all the years. The fixed assets turnover ratio of MCFL showed a declining trend during the study period. The company has purchased new fixed assets in the years of 203-04 and 2004-05 that is why the ratio was slightly gone down.

Fixed assets turnover ratio of MFL was depicted in above Table No.4.3. The ratio showed increased trend during the study period. The average ratio was 2.07 times with standard deviation of 0.53 times and co-efficient of variation of 25.77 percent.The fixed assets turnover ratio was 0.99 times in 1999-2000 which was found increased to 2.29 times in 2000-01. The fixed assets turnover ratio was 1.85 times in 2001-02 and rose to 2.04 times in 2002-03. The ratio was then after slightly gone up to 2.30 times. The ratio was 2.60 times in 2004-05 and 2.39 times in 2005-06. In most of the years the ratio has been more than two which indicating efficiently utilization of the fixed assets.

Table No.4.3 indicates the fixed assets turnover ratio of NFL showed increasing trend during the study period. The average ratio has been 2.68 times with the standard deviation of 0.71 times and co-efficient of variation was 26.71 percent. The ratio was 1.78 times in 1999-2000 and then it rose to 1.98 times in 2000-01. The ratio was 2.24 times in 201-02 and 2.76 times in 2002-03. The fixed assets turnover ratio was 2.94 times in 2003-04 and then it increased to 3.31 times in 2004-05 and 3.73 times in 2005-06. The ratio was very good in the last two years of the study period. The ratio was more than three times which indicates good efficiency and effective utilization of the fixed assets.

The fixed assets turnover ratio of CFL was seen in the above Table No.4.3. The ratio was 3.00 times in 1999-2000 and the after it decreased to 2.52 times in 2000-01. The ratio rose to 2.98 times in 2001-02 and then it went down to 2.74 times in 2002-03. The ratio was 3.24 times in 203-04 and 4.25 times in 2003-04. The ratio found the highest of 5.24 times in 2005-06. The average ratio was 3.42 times with standard deviation of 0.97 times and co-efficient of variation of 28.40 percent. The minimum fixed assets turnover was 2.52 times in 2000-01 and 5.24 times in 2005-06. The operation efficiency of fixed assets and capacity to generate the sales was very good.

The Table No.4.3 indicates that the average fixed assets turnover ratio of CFCL was 1.18 times, which was lower than the industry average of 4.02times. The ratio was fluctuated during the study period between 0.65 to 1.78 times from 1999-2000 to 2005-06.The fixed assets turnover ratio in most of year has been more than one time except in 1999-2000.

The above analysis showed that the operational efficiency of fixed assets was the best of GFCL followed by MCFL, CFCL and CFL. Other selected companies need to utilize the fixed assets effectively and efficiency, so that the company could generate enough sales

Fixed Assets Turnover Ratio (ANOVA Test)
Null Hypothesis: There is no any significant difference in Fixed Assets Turnover Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Fixed Assets Turnover Ratio of Fertilizer units under study.

Level of Significance: 5 percent
Critical value: 2.207
Degree of freedom: 55

Table no.4.4
Fixed Assets Turnover Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	932.416	7.000	133.202	41.391	0.000	2.207
Within Groups	154.471	48.000	3.218			
Total	1086.887	55.000				

It is evident from Table no.4.4 that the difference between Fixed Assets Turnover Ratio in between groups and within groups was significant because the calculated value of 'F'

(41.39) was higher than the critical value of 'F' (2.20) so, null hypothesis is rejected and alternative hypothesis is accepted. Therefore, it indicates a high deviation in Fixed Assets Turnover Ratio of Fertilizer units under study.

Current Assets Turnover Ratio:

The ratio is indicative of the over-all marking efficiency of the organization. The ratio also shows the unnecessary locking up of capital in inventories and funds tied up in unrealized sundry debts. Further, this ratio also suggests whether the sales are adequate in comparison to current assets or whether the current assets are too high in comparison to the sales. Thus, the ratio is an index of 'efficiency' or 'profitability' of a business firm. The current asset of a business firm includes inventories, sundry debtors, bills receivable, cash and bank lance, short-term loans and advances and other current asset.

$$\text{Current assets turnover ratio} = \frac{\text{Sales}}{\text{Current assets}}$$

The higher ratio of current assets reveals the better and efficiency management and utilization of current assets and vice-versa.

Table No.4.5

Current assets turnover ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In times)

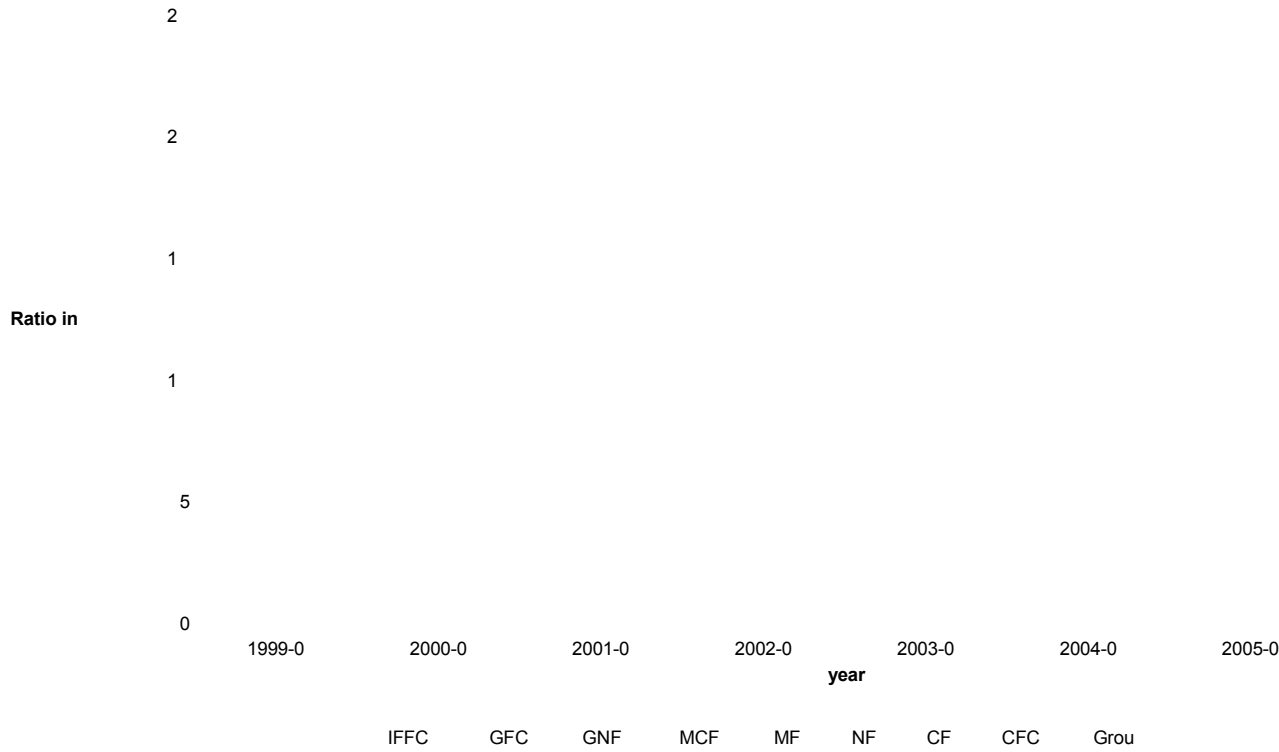
Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	1.87	2.21	2.18	2.74	2.78	3.57	1.12	2.35	0.78	33	3.57	1.12
GFCL	17.7	20.03	13.74	7.91	9.91	14.21	18.47	14.57	4.50	30.92	20.03	7.91
GNFC	1.42	1.65	1.69	1.37	1.56	2.1	2.53	1.76	0.41	23.58	2.53	1.37
MCFL	6.14	6.51	4.1	2.21	2.45	3.59	3.68	4.10	1.67	40.72	6.51	2.21

MFL	0.99	2.29	1.85	2.04	2.3	2.6	2.39	2.07	0.53	25.77	2.6	0.99
NFL	1.78	1.98	2.24	2.76	2.94	3.31	3.73	2.68	0.71	26.71	3.73	1.78
CFL	3	2.52	2.98	2.74	3.24	4.25	5.24	3.42	0.97	28.4	5.24	2.52
CFCL	0.65	0.88	0.99	1.04	1.3	1.59	1.78	1.18	0.40	34.18	1.78	0.65
Group	4.194	4.7588	3.7213	2.8513	3.31	4.4025	4.868	4.02	1.248	30.41	5.7488	2.3188

Sources: computed from the annual reports & accounts of the perspective companies.

Above Table No.4.5 showed current assets turnover ratio of IFFCO under study. The ratio of this company showed slightly fluctuating trend during the study period. The ratio was 1.87 times in 1999-2000, which was then increased and reached at 2.21 times in 2000-01. The ratio was slightly gone down to 2.18 times in 2001-02 but it again rose to 2.74 times in 2002-03. The ratio was also showed increased 2.78 times in 2003-04. The ratio was gone up to 3.57 times in 2004-05 and then it went down to 1.12, which was the lowest during the study period. The average ratio was 2.35 times with standard deviation of 0.78 times and co-efficient of 33 percent. The ratio was more than one all years of study period showing good and efficiency utilization of current assets.

Graph No.4.3



The above Table No.4.5 showed current assets turnover ratio of GFCL. The ratio registered progressive trend during the study period. THE average ratio was 14.57 times with standard deviation of 4.50 tines which was below the average ratio the company. The ratio ranged between maximum of 20.03 times in 2000-01 and minimum of 7.91 times in 2003-04. The ratio was very good and showed efficiency utilization of the current assets.

The current assets turnover ratio of GNFC was manifested in the above Table No.4.5. The ratio was showing the mix and the fluctuating trend during the research period. The ratio was 1.42 times in 1999-2000 which then rose to 1.65 times in 2000-01. The ratio was 1.69 times in 2001-02 and then after it declined to 1.37 times in 2002-03. The ratio was again raise to 1.56 timesi n 2003-0 and reached at more than 2.10 times in 2004-05. The ratio was gain stepped up to 2.53 times in 2005-06. The average ratio was 1.76 times which was more than one, indicated good utilization of current assets to generate sales.

The current assets turnover ratio of MCFL was seen in the above Table No.4.5 . The ratio was the fount the highest of 6.1 timesi n 1999-2000 and found the lowest 2.21 times in 2002-03. The ratio has been on an average of 4.10 which was more than the industry average showing good position of the company. The standard deviation was 1.67 times and co-efficient of variation was 40.72 percent that showed fluctuation in the ratio the company.

The MFL Company showed it current assets turnover ratio in the above Table No.4.5, which indicated progressive trend during the study period. The ratio has been ranged between 0.99 times in 1999-2000 and 2.60 times in 2004-05 with average of 2.07 times. The standard deviation was 0.53 times with co-efficient of variation was 25.77 percent. The current assets turnover ratio was good except on 1999-2000 during the study period.

The Table No.4.5 showed current assets turnover ratio of NFL. The ratio registered increasing trend during the research period. The ratio was the highest of 3.783 times in 2005-06 and the lowest 1.78 times in 1999-2000. The ratio was more than three times 3.31 times in 204-05 and 3.73 times in 2005-06 with an average of 2.68 times. The company has efficiently utilized the current assets.

The above Table No.4.5 showed current assets turnover ratio of CFL.The current assets turnover ratio registered fluctuating trend during the study period. The ratio was 3.00 times in 1999-2000, which declined to 2.52 times in 2001-02. The ratio was 2.98 times in 2001-02 and than again, it went down 2.74 times 2002-03. The ratio was 3.24 times in 2003-04 and it was the 4.25 times in 2004-05 and 5.24 times in 2005-06. The average ratio was 3.42 times with standard 0.97 times and co-efficient of variation 28.40 percent. The ratio in most of the years was during the study period. Current ratio of CFCL was seen in the Table No.4.5. The ratio showed increasing trend during the study period. The ratio had been on average was 1.18 times which was less than the industry average. The ratio ranged between 0.65 times in 1999-2000 and 1.78 times in 2005-06. The ratio was not good from 1999-2000 to 2001-02. The ratio showed increased trend from 2002-03 to 2005-06. The company was not that much efficient to utilize the current assets during the study period.

On the basis of above analysis, it can be said that the utilization of current assets Based on average ratio was better in GFCL followed by MCFL, and CFL. While other companies had the on average ratio was below the combined Group average i.e. GNFCL, NFL, CFCL and IFFCO.

Current Assets Turnover Ratio (ANOVA Test)

Null Hypothesis: There is no any significant difference in Current Assets Turnover Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Current Assets Turnover Ratio of Fertilizer units under study.

Level of Significance: 5 percent
Critical value: 2.207

Degree of freedom: 55

Table No.4.6
Current Assets Turnover Ratio (ANOVA Test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	222.5418	7	31.79169	4.427428	0.000733	2.207436
Within Groups	344.6699	48	7.180622			
Total	567.2117	55				

It is evident from Table No.4.6 that the difference between Current Assets Turnover Ratio in between groups and within groups was significant because the calculated value of 'F' (4.42) was higher than the critical value of 'F' (2.20) so, null hypothesis is rejected and alternative hypothesis is accepted. Therefore, it indicates a high deviation in Current Assets Turnover Ratio of Fertilizer units under study.

Capital Turnover Ratio:

This ratio explains the relationship between net sales to capital employed. This ratio refers over all profitability of a firm and refers efficiency of management. This ratio can be worked out as below:

$$\text{CAPITAL TURNOVER RATIO} = \frac{\text{NET SALES}}{\text{CAPITAL EMPLOYED}}$$

Thus capital turnover ratio, however defined, measures the efficiency of a firm in managing and utilizing its capital, the higher turnover ratio. The more efficient the management and utilization of available capital while low turnover ratios indicative of under utilization of available capital. The capital turnover ratio of Birla Group of company is given below.

Table No.4.7

Capital turnover ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In times)

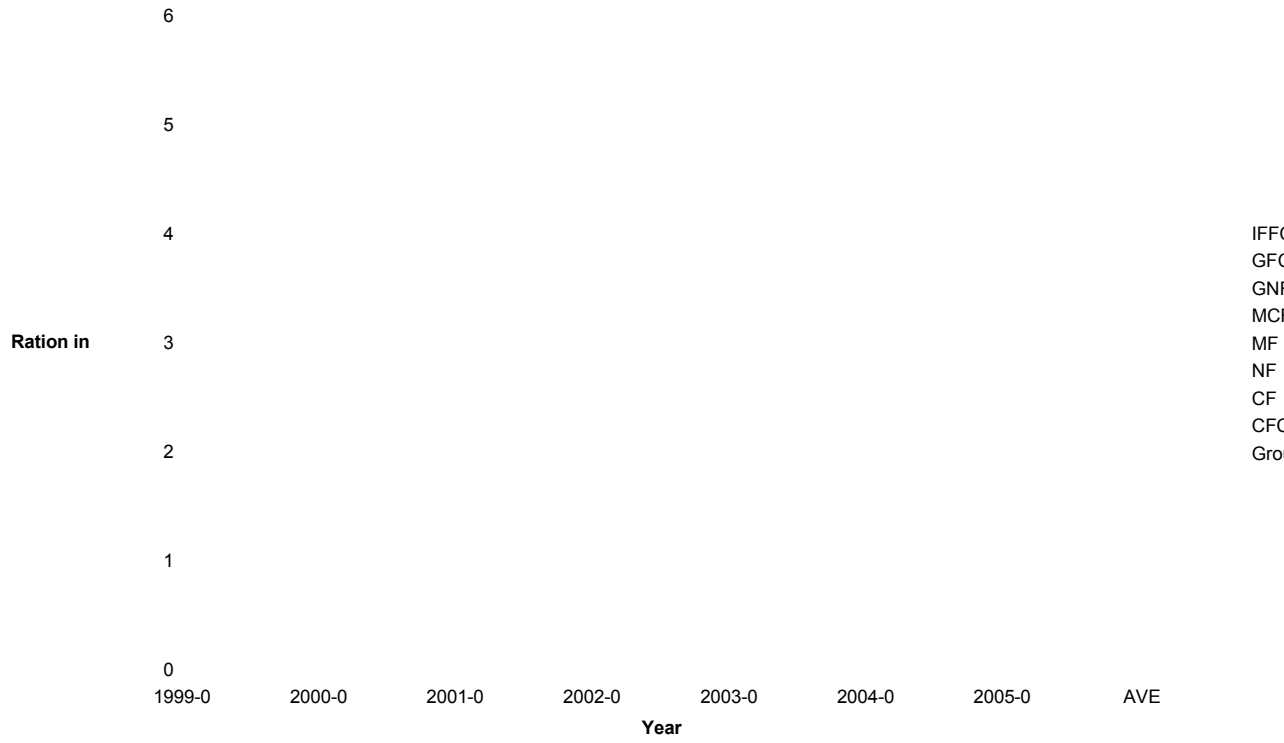
Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	1.13	1.3	1.28	1.4	1.44	1.83	0.63	1.29	0.36	28.15	1.83	0.63
GFCL	4.88	4.35	4.57	3.13	2.56	3.68	2.76	3.70	0.92	24.84	4.88	2.56
GNFC	0.7	0.79	0.98	0.95	1.06	1.26	1.48	1.03	0.27	26.01	1.48	0.7
MCFL	2.82	2.94	2.58	2.27	2.54	2.76	2.42	2.62	0.24	8.99	2.94	2.27

MFL	0.69	1.51	1.46	1.53	1.69	1.95	2.13	1.57	0.46	29.31	2.13	0.69
NFL	1.11	1.24	1.57	2.05	1.99	1.99	2.42	1.77	0.48	26.88	2.42	1.11
CFL	1.76	1.41	2.03	1.45	1.98	2.4	2.17	1.89	0.37	19.45	2.4	1.41
CFCL	0.51	0.67	0.91	0.86	1.07	1.32	1.41	0.96	0.33	33.95	1.41	0.51
Group	**1.7**	**1.7763**	**1.9225**	**1.705**	**1.7913**	**2.14875**	**1.928**	**1.85**	**0.427**	**24.7**	**2.4363**	**1.235**

Sources: computed from the annual reports & accounts of the perspective companies.

The above Table No.4.7 showed capital turnover ratio of IFFCO, which was indicating increasing trend during the study period. The average ratio had been 1.29 times during the study period. The ratio was 1.13 times in 1999-2000 and it went up to 1.30 times in 2000-01. The ratio was slightly declined to 1.28 times in 2001-02 and then after ti went up to 1.40 times in 2002-03. The ratio was 1.44 times in 2003-04 and 1.83 times in 2004-05. The ratio was sharply gone down to 0.63 times in 2005-06. The ratio was showing efficiency utilization of capital employed during the study period.

Graph No.4.4



The capital turnover ratio of GFCL was seen in the Table No.4.7. The ratio was indicating declining trend during the study period. The ratio was 4.88 times in 1999-2000 and 4.35 times in 2000-01.The ratio again increased and went up to 4.57 times but it was 3.13 times 2002-03 and 2.56 times in 2003-04. The ratio was 3.68 times in 2004-05 and then it stepped down to 2.76 times in 2005-06. The capital turnover ratio was has been on average 3.70 times with standard deviation of 0.92 times and co-efficient of variation of 24.84 times.

The capital turnover ratio of GNFC has been depicted in the above Table No.4.7. The capital turnover ratio was 0.70 times in 1999-2000, which fluctuated and went up to 0.79 times in 2000-01. The ratio was 0.98 times in 2001-02 and then after it went down to 0.95 times in 2002-03. The ratio ranged between 0.71 times in 1999-2000 and 1.48 times in 205-06 with an average of 1.03 times. The ratio has been less than one from 1999-2000 to 2002-03, Then after the ratio has been increased from 2003-04 to 2005-06. The ratio was showing the good efficiency of the capital employed.

The capital turnover ratio of MCFL was seen in the above Table No.4.7. The ratio ranged between 2.27 times in 2002-03 and 2.94 times in 2000-01 with an average of 2.62 times. The average ratio was more then industry average. The standard deviation was 0.24 times and co-efficient of variation was 8.99 percent.

The NFL Company showed it capital turnover ratio in the above Table No.4.7. The ratio was found the highest of 2.13 times in 205-06 and the lowest of 0.69 times in 1999-2000. The average ratio has been 1.57 times with standard deviation of 0.46 times and co-efficient of variation of 29.31 percent.

The capital turnover ratio of CFL was manifested in the above Table No.4.7. The ratio was 1.76 times in 1999-2000, which decreased to 1.41 times in 2000-01. The ratio again went up to 2.03 times in 2001-02. The ratio was 1.45 times in 2002-03 and 1.98 times in 2003-04. The ratio again stepped up to 2.40 times and 2.17 times in 2005-06. The average ratio has been 1.89, which was more than industry average.

The capital turnover ratio of CFCL was found in the above Table No.4.7. The ratio was 0.51 times in 1999-2000 and 0.67 times in 2000-01. The ratio then after went up to 0.91 times in 2001-02 and 0.86 times in 2002-03. The ratio has been more than one (1.07) times in 2003-04 and 1.32 times in 2004-05 and 1.41 times in 2005-06. The ratio on an average has been 0.96 times, which was less than the one time that did not show efficiency in utilization in capital employed.

On the basis of above analysis it can be said that the GFCL showed the highest turnover ratio followed MCFL,MFL,NFL,CFL and GNFC. Other companies like IFFCO, and CFCL showed ratio below one, which was not showing efficiency in the utilization of the capital employed.

Capital Turnover Ratio (ANOVA Test)

Null Hypothesis: There is no any significant difference in Capital Turnover Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Capital Turnover Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.4.8
Capital Turnover Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*

Between Groups	41.22524	7	5.889	26.419	0.000	2.207
Within Groups	10.70014	48	0.223			
Total	51.92538	55				

Table 4.8 indicates there is significant difference in capital turnover ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the capital turnover ratio of fertilizers units under study.

Raw Materials to net Sales Ratio:-

"The modifier 'raw' is used in broader sense, as this category includes all the materials used in broader sense, i.e. all the materials used in production, whether in a natural state or changed by previous processing." In the present study raw materials means the material used in the manufacturing process. The figure of raw materials consumed has been arrived by adding the purchases of raw material and the totals reduced by the closing stock of raw material given at the end of the financial year.

Raw material consumed to net sales ratio indicates the relationship between the raw materials consumed and the net sales in the fertilizer processing units in India. It can be calculated based on the following formula:

$$\textbf{Raw materials Consumed to Net Sales} = \frac{\textbf{Raw materials Consumed}}{\textbf{Net sales}} \times 100$$

TABLE NO. – 4.9

Raw materials Consumed to Net Sales ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In percent.)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	65.97	61.72	66.74	64.839	67.11	71.05	139.3	76.67	27.74	36.2	139.3	61.7
GFCL	89.39	79.77	80.26	78.769	86.72	80.05	85.14	82.87	4.16	5.02	89.39	78.8
GNFC	43.02	45.93	43.31	40.036	40.08	44.58	47.48	43.49	2.79	6.43	47.48	40
MCFL	61.23	66.22	61.78	66.071	59.91	67.78	72.71	65.10	4.48	6.88	72.71	59.9
MFL	68.17	59.88	62.77	47.234	55.99	61.62	59.84	59.36	6.50	10.9	68.17	47.2
NFL	45.49	40.28	40.97	39.968	44.28	47.11	52.03	44.30	4.38	9.89	52.03	40

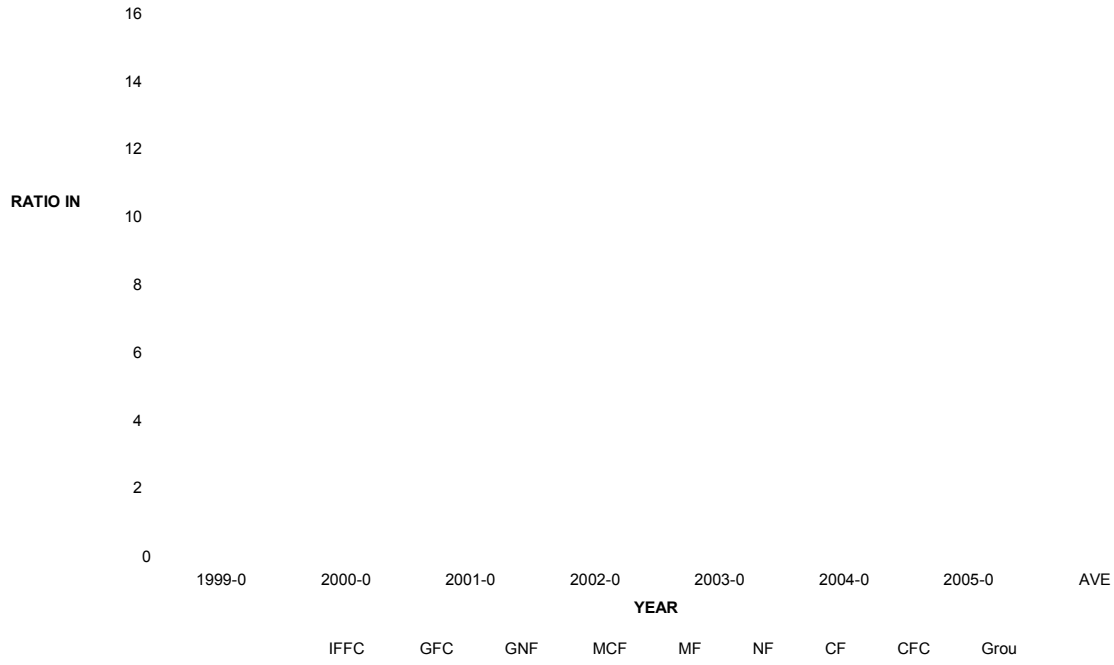
CFL	65.4	60.71	57.51	64.333	62.84	70.09	79.29	65.74	7.14	10.9	79.29	57.5
CFCL	31.89	34.69	35.98	40.292	42.05	43.18	50.04	39.73	6.12	15.4	50.04	31.9
Group	**58.82**	**56.15**	**56.17**	**55.193**	**57.37**	**60.68**	**73.22**	**59.7**	**7.913**	**12.7**	**74.8**	**52.1**

Sources: computed from the annual reports & accounts of the perspective companies.

Table No.4.9 indicated the raw material to net sales ratio of IFFCO ltd. The ratio showed increasing trend during the study period. The ratio was 65.97 percent in 1999-2000 and 61.72 percent in 2000-01. The ratio has increased and reached to 66.74 percent in 2001-02 and then went down to 64.839 percent in 2002-03. The ratio was 67.11 percent in 2003-04 and 71.05 percent in 2004-05. The ratio was highly increased to 139.30 percent in 2005-06. The ratio ranged between 61.70 percent in 2000-01 and 139.30 percent in 2005-06. The ratio was found good in the year of 2000-01.

The raw material to net sales ratio of GFCL was seen in the above Table No.4.9 .The ratio was showing increasing trend with an average of 82.87 percent. The ratio was found the highest of 89.39 percent in 1999-2000 and found the lowest of 78.80 percent in 2002-03. The standard deviation was of 4.16 percent and co0effeicnt of variation was 5.02 percent.

Graph No.4.5
RAW MATERIAL TO NET



The Table No.4.9 showed raw material to net sales ratio f GNFC. The ratio was 43.02 percent in 1999-2000 and then it rose to 45.93 percent in 2000-01. The ratio was again stepped down to 43.31 percent in 2001-02 and 40.08 percent in 2003-04. The ratio as then after increased and reached to 44.58 percent in 2004-05 and 47.48 percent in 2005-06. The ratio on an average has been of 43.49 percent with standard deviation of 2.79 percent. The ratio showed increasing trend of consumed raw material.

The raw material to net sales ratio of MCFL was manifested in the Table No.4.9. The ratio was 61.23 percent in 1999-2000 and 66.22 percent in 2000-01. The ratio after this year declined to 61.78 percent in 2001-02 and than it rose to 66.071 percent in 2002-03. The ratio declined to 59.91 percent in 2003-040. The ratio was again rose to 67.78 percent in 2004-05. The ratio was found the highest in the last years if the study period. The average ratio was 65.10 percent with standard deviation of 4.48 percent. The ratio showed fluctuating trend during the research period.

The raw material to net sales of MFL was seen in the above Table No.4.9. The ratio showed declining trend with an average of 59.6 percent. The ratio ranged between 47.20 percent in 2002-03 and 68.17 percent 1999-2000. The ratio showed standard deviation of 6.50 percent and co- efficient of variation of 10.90 percent during the study period.

The above Table No.4.9 showed ratio raw material to net sales of NFL with increasing trend during the study period. The ratio 45.49 percent in 1999-2000 and then it went down to

40.28 percent in 2000-01 and 39.968 percent in 2002-03. The ratio was 44.28 percent in 2003-04 and 47.11 percent in 2004-05. The ratio was the highest of 52.03 percent in 2005-06. The ratio on an average has been 44.30 percent.

The ratio of CFL was seen in the above Table No.4.9.The ratio was explaining the increasing trend during the study period. The ratio ranged 57.50 percent in 2001-02 and 79.29 percent in 2005-06 with an average of 65.74 percent. The ratio was indicating the standard deviation of 7.14 percent and co-efficient of variation of 10.90 percent

The raw material to net sales ratio of CFCL was seen in the above Table No.4.9. The ratio was 31.89 percent in 1999-2000 and 34.69 percent in 2000-0. The ratio increased to 35.98 percent in 2001-02 and 40.29 percent in 2002-03 and 42.05 percent in 203-04. The ratio was the increased in the last two years of the study period.

On the basis of above analysis, it may be concluded that the ratio of raw material to net sales was the highest in GFCL followed by IFFCO, MCFL, and CFL. Other companies' ratios were below the industry average.

Raw material to net sales ratio (ANOVA test)

Null Hypothesis: There is no any significant difference in Raw material to net sales ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Raw material to net sales ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table 4.10
Raw material to net sales ratio (ANOVA test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	12523.9	7	1789.129	14.84041	4.04E-10	2.207436
Within Groups	5786.779	48	120.5579			
Total	18310.68	55				

Table 4.10 indicates there is significant difference Raw material to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the Raw material to net sales ratio fertilizers units under study.

Wages and Salaries to Net Sales Ratio:

In the present study analysis, wages and salaries comprise of included bonus, gratuity, provident fund, and other allowance and welfare expenses etc. In the Tea companies, a large number of labour force are required, as manufacture of tea is an extremely complex industry undertaking, in the Tea industry labor cost have been examined by the ratio of wages and salaries to net sales ratio is calculated on the basis of the following formula :

$$\text{Wages and Salaries to Net Sales Ratio} = \frac{\text{Wages and Salaries}}{\text{Net Sales}} \times 100$$

Table No.4.11

Wages & Salaries to Net Sales Ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In percent.)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	5.019	4.113	4.604	4.4745	4.332	3.706	5.093	4.48	0.49	10.9	5.093	3.71
GFCL	1.108	1.545	1.333	2.4612	2.144	1.897	1.263	1.68	0.50	29.9	2.461	1.11
GNFC	7.136	6.949	6.634	7.609	8.766	6.687	6.23	7.14	0.84	11.7	8.766	6.23
MCFL	3.851	3.661	3.838	4.5363	3.916	2.891	2.687	3.63	0.64	17.6	4.536	2.69
MFL	3.448	3.656	5.706	4.1894	4.108	3.537	3.925	4.08	0.77	18.9	5.706	3.45
NFL	6.717	7.217	6.649	5.1047	4.883	5.037	4.746	5.76	1.05	18.2	7.217	4.75
CFL	4.11	3.868	3.74	4.8271	3.564	3.006	2.655	3.68	0.71	19.4	4.827	2.66
CFCL	1.776	1.822	1.994	2.2594	2.059	2.07	2.339	2.05	0.21	10.1	2.339	1.78
Group	4.146	4.104	4.312	4.4327	4.221	3.604	3.617	4.06	0.65	17.1	5.118	3.29

Sources: computed from the annual reports & accounts of the perspective companies.

The Table No.4.11 shows the ratio of wages & salaries to net sales of IFFCO witnessing the fluctuating trend as it ranged between 3.71 percent in 2004-05 and 5.09 percent in

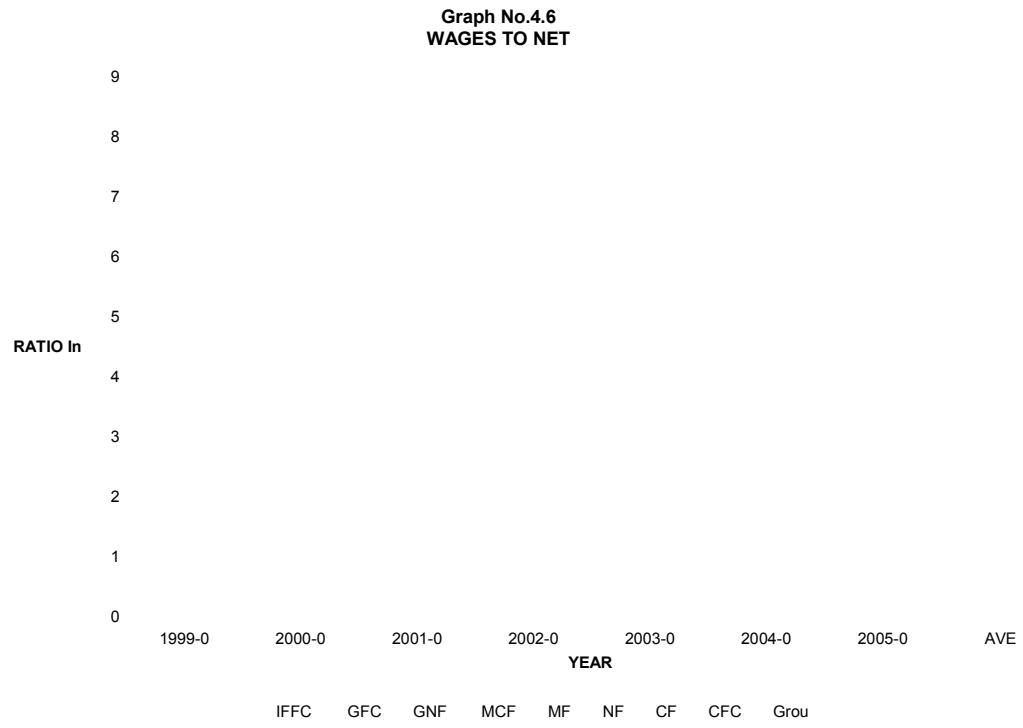
2005-06. It was the highest in the year of 2005-06 because of increase in the rate of wages in IFFCO. The average ratio of this company was also higher than the industry average.

The ratio of salaries and wages to net ales in GFCL indicated a fluctuating trend. Average ratio was 1.68 percent was lower than the industry average. The ratio ranged between 1.11 percent in 1999-2000 and 2.46 percent in 2002-03.

The wages & salaries to net sales ratio of the MCFL was seen in the above Table No.4.11. The ratio was 3.85 percent in 1999-2000 and 3.66 percent in 2000-01. The ratio increased to 4.53 percent in 2002-03 and than after it went down to 3.91 percent. The ratio again went down to 2.89 percent in 2004-05 and 2.68 percent in 2005-06. The standard deviation was 0.64 percent and co-efficiency of variation was of 17.60 percent.

Wages & salaries to net sales ratio of MFL was seen in the above Table No.4.11. The ratio was 3.44 percent in 1999-2000 and 3.56 percent in 2000-01. The ratio was again increased to 5.71 percent in 2001-02 and 4.189 percent in 2002-03. The ratio was 4.108 percent in 2003-04 and then declined to 3.537 percent in 2004-05 and 3.925 percent in 2005-06. The ratio on an average has been 4.08 percent.

Table No.4.11 showed the ratio of wages & salaries to net sales of NFL. The ratio of this company ranged 4.75 percent in 2005-06 and 7.217 percent in 2000-01. The average ratio has been 5.76 percent with standard deviation of 1.05percent.



The CFL shows its Wages & salaries to net sales ratio in Table No.4.11 from 1999-2000 to 2005-06. The ratio was 4.11 percent in 1999-2000 and 3.868 percent in 2000-01. The ratio rose to 3.74 percent in 2001-02 and 4.827 percent in 2002-03. The ratio was declining to 3.56 percent in 2003-04 and 3.006 percent in 2004-05. The again went down to 2.65 percent in 2005-06. The ratio on an average has been 3.68 percent.

The above Table No.4.11 showed Wages & salaries to net sales ratio of CFCL. The ratio of this company ranged between 1.78 percent in 1999-2000 and 2.339 percent in 2005-06.the average ratio has been 2.05 percent with standard deviation of 0.21 percent and co-efficient of 10.10 percent.

Wages to net sales ratio (ANOVA test)

Null Hypothesis: There is no any significant difference in Wages to net sales ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Wages to net sales ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.4.12
Wages to net sales ratio (ANOVA test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	158.5758	7	22.65369	47.23724	2.17E-19	2.207436

Within Groups	23.01949	48	0.479573			
Total	181.5953	55				

TableNo.4.12 indicates there is significant difference in Wages to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the Wages to net sales ratio of fertilizers units under study.

Power and Fuel (Energy) to net Sales Ratio:

In fertilizer Industry Power and fuel is an essential requirement, not only in its continuous availability but also in adequate supply. It is calculated based on the following formula

$$\text{Power and Fuel to Net Sales Ratio} = \frac{\text{Power and Fuel}}{\text{Net Sales}} \times 100$$

Table No.4.13

Power and Fuel (Energy) to net Sales Ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In percent)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	7.609	7.61	7.358	6.739	7.154	6.44	11.42	7.76	1.67	21.6	11.42	6.44
GFCL	1.469	1.71	1.038	1.221	1.045	0.85	0.862	1.17	0.32	27.2	1.707	0.85
GNFC	17.44	17	17.36	16.34	16.06	14.2	12.25	15.81	1.91	12.1	17.44	12.2
MCFL	11.48	14.1	16.44	17.23	16.99	14.5	15.67	15.20	2.02	13.3	17.23	11.5
MFL	18.13	16.2	17.5	19.19	19.77	20.5	26.71	19.71	3.41	17.3	26.71	16.2
NFL	23.69	24.2	24.32	21.82	24.23	24.8	21.26	23.48	1.37	5.85	24.8	21.3
CFL	4.244	5.67	5.106	6.352	4.005	3.48	2.979	4.55	1.21	26.7	6.352	2.98
CFCL	20.07	26.8	21.18	25.46	24.98	28.9	14.49	23.13	4.89	21.1	28.86	14.5
Group	13.02	14.2	13.79	14.29	14.28	14.2	13.21	13.9	2.101	18.1	16.82	10.7

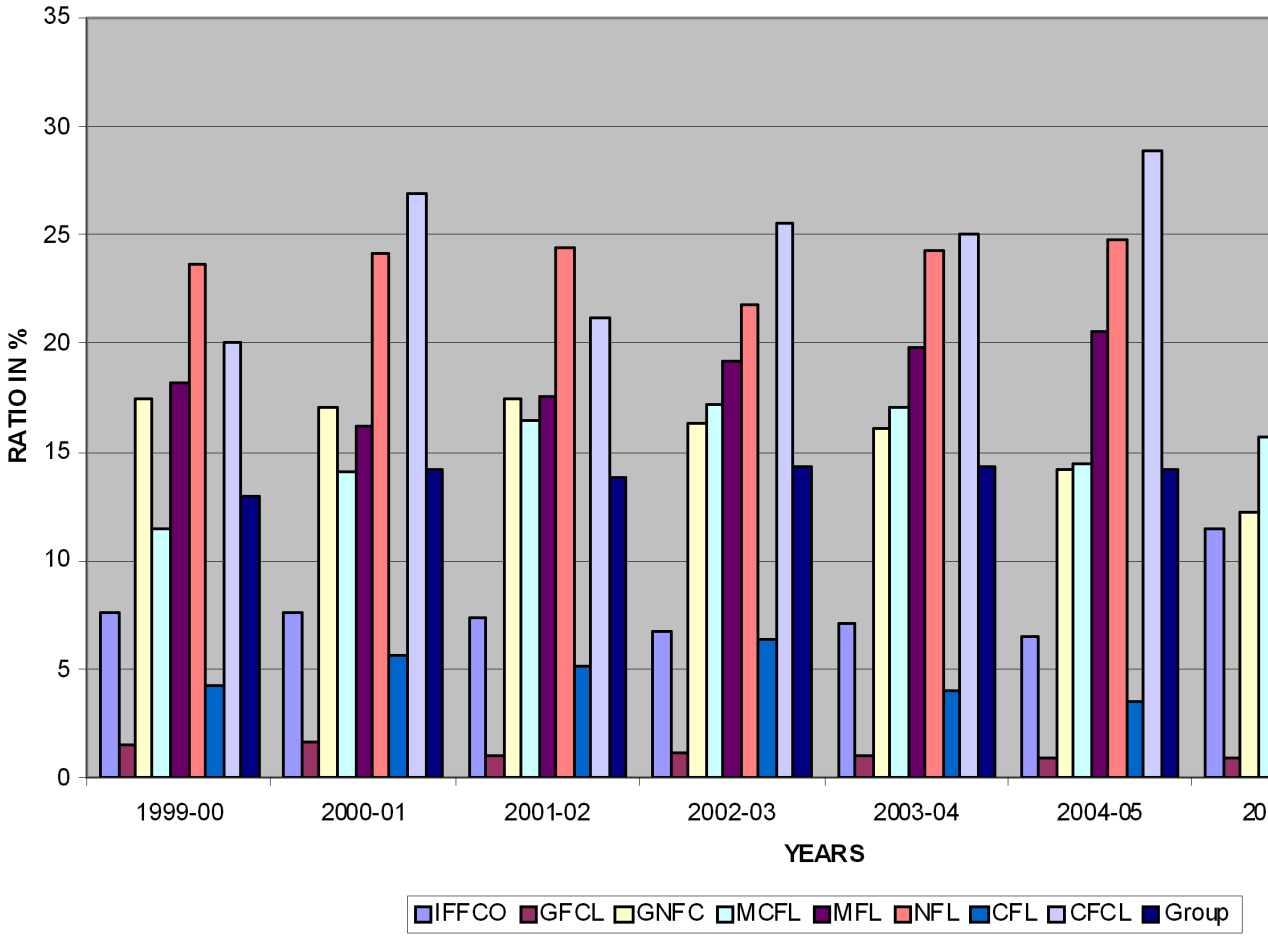
Sources: computed from the annual reports & accounts of the perspective companies.

The above Table No.4.13 registered Power and Fuel (Energy) to net Sales Ratio of IFFCO by showing fluctuating trend during the research period. The ratio was 7.609 percent in 1999-2000 and 7.61 percent in 2000-01. The ratio was slightly declined to 7.358 percent and 7.15 percent. The ratio was sharply declined to 6.44 percent in 2004-05 and then it stepped up to 11.42 percent in the last year of the study period.

The Table No.4.13 indicated the Power and Fuel (Energy) to net Sales Ratio of GFCL. The ratio registered decreasing trend during the research period. The average ratio was 1.17 percent, which was very lower than industry average. The ratio ranged 1.707 percent in 2000-01 and 0.85 percent in 2004-05. The ratio showed standard deviation of 0.32 percent and co-efficient of variation of 27.20 percent.

The Power and Fuel (Energy) to net Sales Ratio of GNFC was seen in the above Table No.4.13 the ratio was 17.44 percent in 1999-2000, which was only 17 percent in 2000-01. The ratio slightly rose to 17.36 percent in 2001-02 and then after it declined to 16.34 percent in 2002-03 and 16.06 percent in 2003-04. The ratio showed declined of 14.20 percent in 2004-05 and 12.25 percent in last year of the study period. The average ratio was 15.81 percent, which was higher than the industry average.

GraphNo.4.7
ENERGY (POWER-FUEL) NET SALES



The MCFL showed it Power and Fuel (Energy) to net Sales Ratio from 1999-2000 to 2005-06 with fluctuating trend. The average ratio was 15.20 percent with Standard deviation of 2.02 percent. The ratio was 11.48 percent in 1999-2000 and 14.10 percent in 2000-01. The ratio was 16.44 percent in 2001-02 after this year the

Ratio increased to 17.23 percent in 2002-03. The ratio again declined to 16.99 percent in 2003-04 and 14.50 percent in 2004-05. The ratio was 15.67 percent in 2005-06.

The Table No.4.13 showed Power and Fuel (Energy) to net Sales Ratio of MFL. The ratio was 18.13 percent in the beginning of the study period after this year this year the ratio declined to 16.20 percent. The ratio was 17.50 percent in 2001-02 and rose to 19.19 percent in 2002-03. The ratio again rose to 19.77 percent in 2003-04. The ratio was 20.50 percent in 2004-05. The average ratio was 19.71 percent with standard deviation of 3.41 percent and co-efficient of variation of 17.30 percent.

Power and Fuel (Energy) to net Sales Ratio of NFL was seen in the above Table No.4.13. The ratio was 23.69 percent in 1999-2000 and then it went up to 24.20 percent in 2000-01. The ratio was 24.32 percent in 2001-02 and then after it declined to 21.82 percent in 2002-03.The ratio was 24.23 percent in 2003-04 and 24.80 percent in 2004-05. In the last year of the study period the ratio was 21.26 percent with an average of 23.48 percent .The standard deviation was of 1.37 percent and co-efficient of variation was of 5.85 percent.

The Power and Fuel (Energy) to net Sales Ratio of CFL was depicted in the above Table No.4.13. The ratio was showing highly fluctuating trend during the study period. The ratio ranged between 2.98 percent in 2005-06 and 6.35 percent in 2002-03. The average ratio has been 4.55 percent. The consumption of Power and Fuel (Energy) was comparatively very less which showed good control over expenses.

The above Table No.4.13 indicated The Power and Fuel (Energy) to net Sales Ratio of CFCL. The ratio was 20.07 percent in 1999-2000 and 26.80 percent in 2000-01. The ratio was 21.18 percent in 2001-02, which increased to 25.46 percent in 2002-03. The ratio was 24.98 percent in 2003-04 and 28.90 percent in 2004-05. The ratio sharply declined to 14.49 percent in the last year of the study period.

Based on the above analysis it may inferred that the Power and Fuel (Energy) consumption was found the highest in NFL and MFL followed by other selected units.

ENERGY (POWER-FUEL)/GROSS SALES RATIO (ANOVA test)

Null Hypothesis: There is no any significant difference in energy (power-fuel)/net sales ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in energy (power-fuel)/net sales ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207
Degree of freedom: 55

Table No.4.14

ENERGY (POWER-FUEL)/GROSS SALES RATIO (ANOVA test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3521.873	7	503.1247	81.28065	2.02E-24	2.207436
Within Groups	297.1185	48	6.189969			
Total	3818.992	55				

Table No.4.14 indicates there is significant difference in energy (power-fuel)/net sales of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis rejected and alternative hypothesis accepted. It may be concluded that there is a high deviation in the energy (power-fuel)/net sales ratio of fertilizers units under study.

Selling & Distribution (Marketing) to Net Sales Ratio:-

Commission and discount on sale, traveling expenses, expenses on advertisement, transportation and forwarding expenses, freight outward commission to sole selling agent, salaries of sales & publicity staff, expenses of branches and agencies, cost of preparing tenders and estimates, stock shortage etc., are included in selling and distribution expenses. These expenses are essential for creating new customers and for selling goods in the market. For new enterprise, these expenses increase considerably because they have to establish themselves in the market

Selling & Distribution

$$\text{Expenses to Net Sales Ratio} = \frac{\text{Selling \& Distribution Expenses}}{\text{Net Sales}} \times 100$$

Table No.4.15

Selling & Distribution (Marketing) to Net Sales Ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In percent)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	7.655	8.02	9.462	9.323	9.252	8.2	11.08	9.00	1.16	12.9	11.08	7.66
GFCL	10.32	9.74	12.88	12.06	8.732	6.02	5.207	9.28	2.87	31	12.88	5.21
GNFC	8.441	7.93	8.766	8.011	6.556	6.94	5.241	7.41	1.24	16.7	8.766	5.24
MCFL	6.202	6.15	6.238	6.91	6.747	5.25	5.17	6.09	0.67	11	6.91	5.17
MFL	5.476	5.94	6.782	7.393	6.803	4.87	3.736	5.86	1.27	21.8	7.393	3.74
NFL	10.83	3.96	5.472	7.62	8.04	7.42	7.03	7.20	2.15	29.8	10.83	3.96
CFL	7.417	9.02	9.932	4.398	11.23	8.1	7.753	8.27	2.16	26.2	11.23	4.4
CFCL	7.707	7.64	7.464	7.795	6.493	5.56	6.025	6.96	0.92	13.2	7.795	5.56
Group	8.006	7.3	8.375	7.939	7.982	6.54	6.406	7.51	1.556	20.3	9.611	5.12

Sources: computed from the annual reports & accounts of the perspective companies.

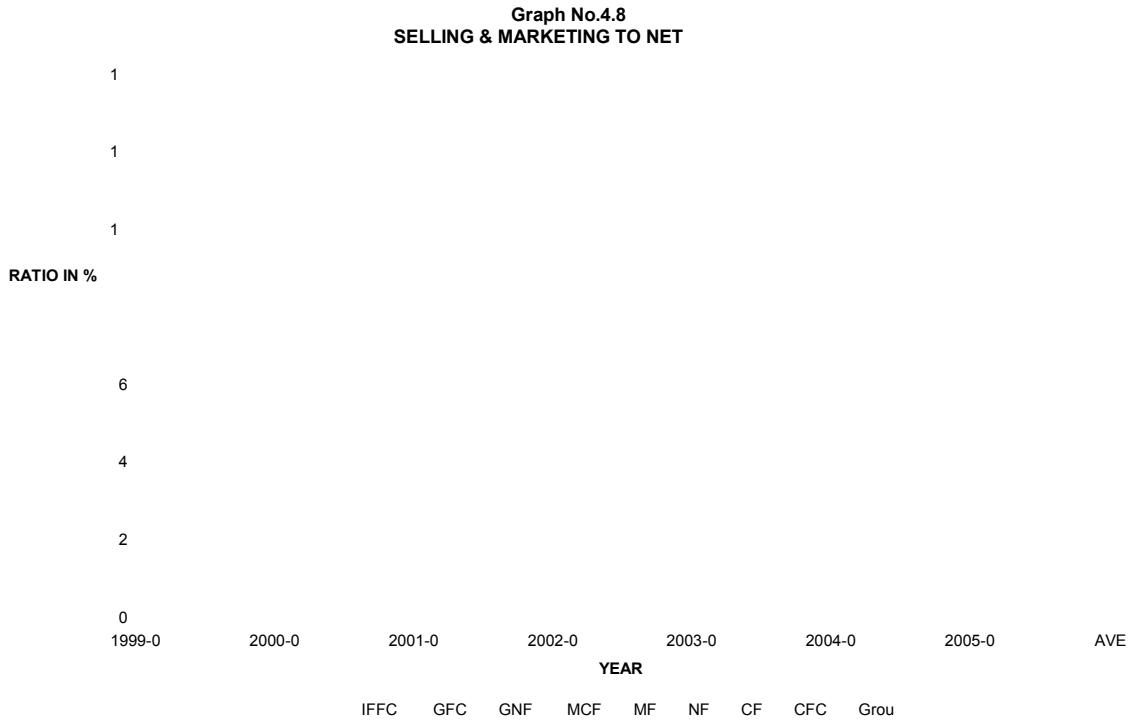
The above Table No.4.15 showed Selling & Distribution (Marketing) to Net Sales Ratio of IFFCO. The ratio showed fluctuating trend during the study period. The ratio was on an average of 9.00 percent with standard deviation of 1.16 percent.The ratio of this company ranged between 7.66 percent in 1999-2000 to 11.08 percent 205-06.

The Table No.4.15 explained the Selling & Distribution (Marketing) to Net Sales ratio of GFCL. The ratio was 10.32 percent in 1999-2000 and then declined to 9.74 percent in 2000-01. The ratio rose to 12.88 percent in 2001-02 and 12.06 percent in 2002-03. The ratio of this company sharply declined to 8.73 percent in 2003-04 and 6.02 percent in 2004-05. It was also found very low in the last years of the study period.

The above Table No.4.15 indicated the Selling & Distribution (Marketing) to Net Sales ratio of GNFL. The ratio was 8.44 percent in 1999-2000 and 7.93 percent in 2000-0. The ratio increased to 8.76 percent in 2001-03 and 8.011 percent in 2002-03. The ratio was 6.55 percent in 2003-04 and stabilized at 6.94 percent in 2004-05. The ratio was 5.24 percent

in 2005-06. The ratio on an average has been of 7.41 percent with standard deviation of 1.24 percent and co-efficiency of variation of 16.70 percent.

The MCFL Company showed the Selling & Distribution (Marketing) to Net Sales. The ratio ranged between 5.17 percent in 2005-06 and 6.91 percent in 2002-03 with an average of 6.09 percent.



The above Table No.4.15 showed Selling & Distribution (Marketing) to Net Sales ratio of MFL. The ratio was 5.47 percent in 1999-2000 and 5.94 percent in 2000-01. The ratio was 6.78 percent in 2001-02 but it declined to 6.80 percent in 2003-04. It was 4.87 percent in 2004-05 and 3.736 percent in 2005-06. The average ratio was 5.86 percent with standard deviation of 1.27 percent.

The Selling & Distribution (Marketing) to Net Sales ratio of NFL was seen in the above Table No.4.15. The ratio was 10.83 percent in 1999-2000 and 3.96 percent in 2000-01. The ratio increased to 5.47 percent in 2001-02 and 7.62 percent in 2002-03. The ratio was 8.04 percent in 2003-04 and declined to 7.42 percent in 2004-05. The ratio was 7.03 percent in 2005-06.the average ratio was 7.20 percent with o-efficiency of variation of 2.15 percent.

The CFL Company's The Selling & Distribution (Marketing) to Net Sales ratio was manifested in the above Table No.4.15.The ratio 7.415 percent in 1999-2000 and it rose to 9.02 percent in 2000-01. The ratio was 9.93 percent in 2001-02 but the ratio was sharply declining to 4.398 percent in 2002-03 and then after it again rose to 11.23 percent in 2003-04. The ratio was 8.10 percent in 2004-05 and declined to 7.75 percent in 2005-06. The average ratio was 8.27 percent with co-efficiency of variation of 26.20 percent.

Table No.4.15 showed Selling & Distribution (Marketing) to Net Sales ratio of CFCL. The ratio of this company showed decline trend during the study period. The ratio ranged between 5.56 percent in 2004-05 and 7.79 percent in 2002-03. The average ratio was 6.96 percent with co-efficiency of variation of 13.20 percent.

on the basis of above analysis, it can be conclude that the percentage of selling and distribution and other expenses to net sales in 2003-04 was highest in (11.23) percent of CF. The percentage of selling and distribution expenses to net sales in 2005-06 was highest in IFFCO.

SELLING & MARKETING TO NET SALES RATIO (ANOVA test)

- **Null Hypothesis:** There is no any significant difference in selling & marketing to net sales ratio of Fertilizer units under study.
- **Alternative hypothesis:** There is significant difference in selling & marketing to net sales ratio of Fertilizer units under study.
- Level of Significance: 5 percent
- Critical value: 2.207
- Degree of freedom: 55

Table No.4.16
SELLING & MARKETING TO NET SALES RATIO (ANOVA test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	77.5113	7	11.07304	3.794765	0.002359	2.207436
Within Groups	140.063	48	2.917979			
Total	217.5743	55				

Table No.4.16 indicates there is significant difference in selling & marketing to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the selling & marketing to net sales ratio

Financial Charges to net Sales Ratio:-

In the present study analysis, financial charges comprise of included interest, lease rent and other financial charges. Financial charges to net sales Ratio calculated based on the following formula:

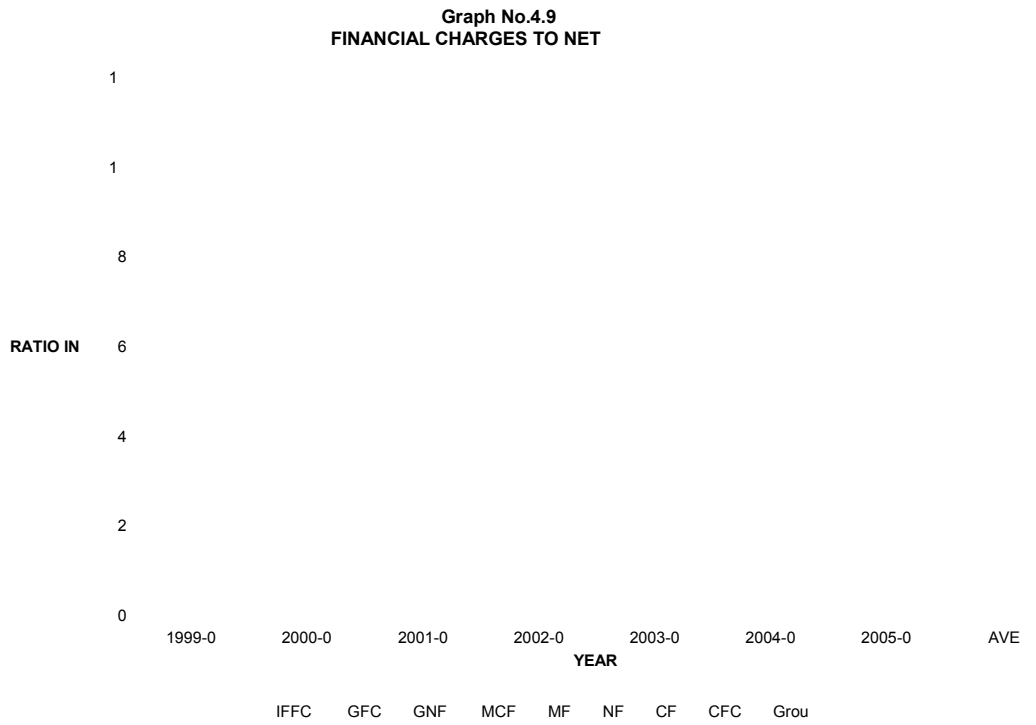
Financial Charges To Net Sales Ratio = **Interest + Lease Rent + Other Financial Charges** / **Net Sales** x 100

Table No.4.17
Financial Charges to net Sales Ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (In percent)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	4.984	4.59	3.38	1.906	0.751	0.52	2.325	2.64	1.76	66.7	4.984	0.52
GFCL	2.041	2.2	2.379	2.499	2.078	1.4	1.205	1.97	0.49	24.7	2.499	1.2
GNFC	8.451	7.55	5.941	4.825	3.277	1.62	1.727	4.77	2.71	56.8	8.451	1.62
MCFL	0.132	0.68	1.255	0.675	0.492	0.49	0.621	0.62	0.34	54.3	1.255	0.13
MFL	8.837	9.28	10.2	9.906	5.835	5.33	6.251	7.95	2.07	26	10.2	5.33
NFL	5.188	4.32	3.706	2.007	1.062	0.7	0.315	2.47	1.93	78.1	5.188	0.32
CFL	3.31	3.52	2.666	2.182	2.315	1.2	1.279	2.35	0.90	38.3	3.523	1.2
CFCL	3.31	11.8	9.98	8.077	5.597	3.61	2.766	6.45	3.56	55.2	11.8	2.77
Group	4.532	5.49	4.939	4.01	2.676	1.86	2.061	3.65	1.719	50	5.988	1.64

Sources: computed from the annual reports & accounts of the perspective companies.

The Table No.4.17 indicated the ratio of Financial Charges to net Sales of IFFCO. The ratio ranged between 0.52 percent in 2004-05 and 4.98 percent in 1999-2000 with an average of 2.64 percent. Ratio showed declining trend during the study period. The ratio showed company was not more depending on interest liabilities.



The ratio Financial Charges to net Sales of GFCL seen in the above Table No.4.17.The ratio was 2.041 percent in 1999-2000 and 2.20 percent in 2000-01, which declined to previous year. The ratio was 2.379 percent in 2001-02 and 2.499 percent in 2002-03. The average ratio was 1.97 percent with declining trend in the last three years of the study period. In the last year of the study period company has reduced the interest burden.

The above Table No.4.17 showed Financial Charges to net Sales ratio of GNFC. The ratio of this company showed decline trend during the study period. The ratio was 8.45 percent in 1999-2000, which increased to 7.55 percent in 2000-01. The ratio was 5.94 percent in 2001-02 and then after it declined to 4.825 percent in 2002-03. The ratio was 3.277 percent in 2003-04 and it was 1.62 percent in 2004-05 and 1.727 percent in 2005-06. The average ratio was 4.77 percent with standard deviation of 2.71 percent.

Financial Charges to net Sales ratio of MCFL seen in the above Table No.4.17. The ratio was 0.132 percent in 1999-2000 and 0.68 percent in 2000-01. The ratio was more than one percent in 2001-02 and then it went down to 0.675 percent in 2002-03. The ratio was .492 percent in 2003-04 and it rose to 0.621 percent in the last years of the study period. The average ratio has been 0.62 percent with co-efficient of variation of 54.30 percent.The company has not reliance on the interest liabilities.

The MFL Company showed Financial Charges to net Sales ratio 1999-2000 to 2005-06. The ratio ranged between 5.33 percent in 2004-05 and 10.20 percent in 2001-02 with an average of 7.95 percent. Interest burden was found high in this company.

The Table No.4.17 indicated Financial Charges to net Sales ratio of NFL. The ratio showed down ward trend during the study period. The ratio was the highest of 5.188 percent in 1999-2000 and the lowest of 0.32 percent in 2005-06.

The Financial Charges to net Sales ratio of CFL was depicted in the Table No.4.17. The ratio was 3.31 percent in 1999-2000 and 3.52 percent in 2000-01 that again decreased to 2.66 percent in 2001-02 and 2.182 percent in 2002-03. The ratio was 2.315 percent in 2003-04 and 1.20 percent in 2004-05. The ratio was again declining to 1.279 percent in 2005-06. The average ratio was 2.35 percent with co-efficiency of variation of 38.30 percent.

The Table No.4.17 indicated the Financial Charges to net Sales ratio of CFCL. The ratio was 3.31 percent in 1999-2000 and it went up very high to 11.810 percent in 2000-01. The ratio again slightly went down to 9.98 percent in 2001-02 and 8.077 percent in 2002-03. The ratio was again gone down to 5.597 percent in 2003-04 and 3.61 percent in 2004-05. The ratio was 2.766 percent which the lowest ratio during the study period. The average ratio was 6.45 percent with co-efficient of variation of 55.20 percent.

Based on above analysis it may be conclude that the interest burden found the highest of 7.95 percent in MFL and 6.45 percent in CFCL followed by other selected unites.

FINANCIAL CHARGES TO NET SALES RATIO (ANOVA test)

- **Null Hypothesis**: There is no any significant difference in financial charges to net sales ratio of Fertilizer units under study.
- **Alternative hypothesis**: There is significant difference in financial charges to net sales ratio of Fertilizer units under study.
- Level of Significance: 5 percent
- Critical value: 2.207
- Degree of freedom: 55

Table No.4.18

FINANCIAL CHARGES TO NET SALES RATIO (ANOVA test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	305.6397	7	43.66282	10.82564	4.23E-08	2.207436
Within Groups	193.5973	48	4.033277			
Total	499.237	55				

Table 4.18 indicates there is significant difference in financial charges to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the financial charges to net sales ratio of fertilizers units under study.

Debtors Turnover: -

The amount of trade debtors depends upon the sales volume, credit expansion practice and the effectiveness of the collection policy. Since debtors constitute a major element of current assets, the credit and collection policies of the business must be under continuous watch. The amount of trade debtors at the end of the accounting period should not exceed reasonable devices to find out as to how many owed days average sales are tied up in the value of amount owed by debtors accounting to the balance sheet.

The debtors turnover or receivables turnover ratio measure how rapidly debtors are collected. However, it is not immediately apparent from the debtors' turnover ratio and therefore, it has to be supplemented by the average collection period, which will be discussed later.

The debtor turnover ratio has been calculated by dividing the amount of sales by the amount of debtors including acceptances. Here the sales figure has been assumed to be of credit sales.

$$\text{Debtors turn over} = \frac{\text{Credit Sales}}{\text{Debtors + Bill receivable}}$$

A high ratio is indicative of shorter timing between sales and cash collection, a low ratio shows that debts are not collected rapidly.

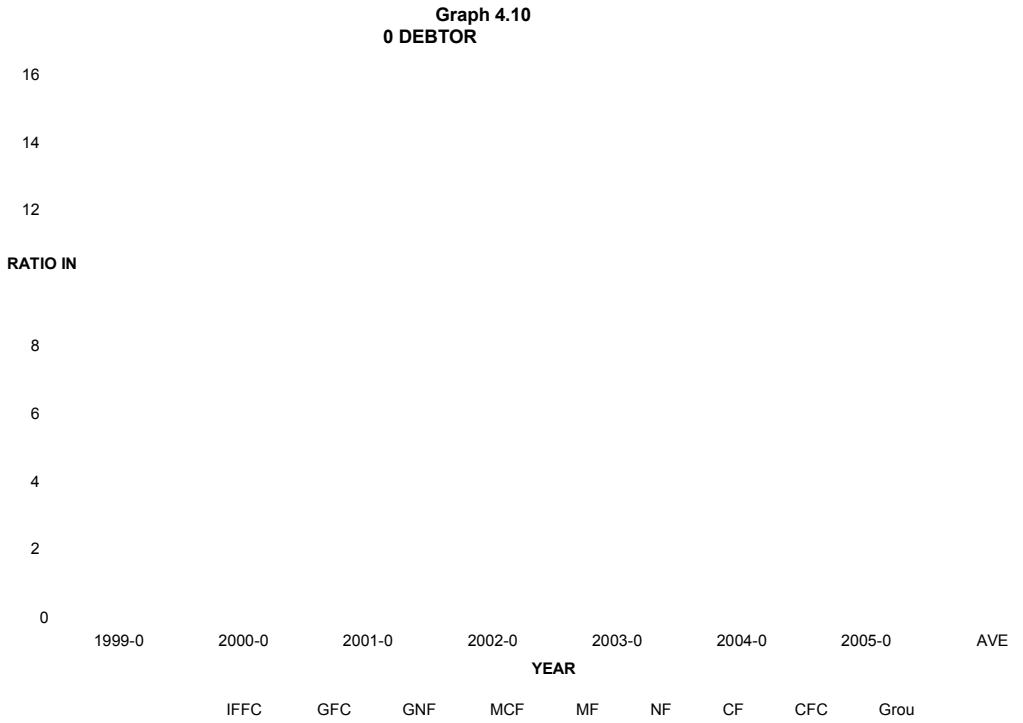
Table No.4.19
Debtor turnover ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (Times)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	21.12	19.1	15.86	15.23	12.72	18.2	13.66	16.56	3.04	18.4	21.12	12.7
GFCL	11.92	8.96	7.84	5.05	5.22	8.21	12.27	8.50	2.87	33.7	12.27	5.05
GNFC	5.1	5.88	5.97	5.9	7.39	8.19	6.34	6.40	1.05	16.4	8.19	5.1
MCFL	16.68	13.5	10.55	11.31	13.69	27.5	61.29	22.06	18.21	82.5	61.29	10.6
MFL	18.77	15.2	8.6	12.83	13.91	27.9	145.7	34.70	49.33	142	145.7	8.6

NFL	5.97	6.14	6.08	5.76	5.3	7.77	5.72	6.11	0.79	12.9	7.77	5.3
CFL	29.57	13.3	9.04	5.82	8.82	12.1	18.46	13.88	8.01	57.7	29.57	5.82
CFCL	5.2	5.57	6.22	5.88	5.78	5.95	6.71	5.90	0.48	8.11	6.71	5.2
Group	14.29	11	8.77	8.473	9.104	14.5	33.77	14.3	10.47	46.5	36.58	7.29

Sources: computed from the annual reports & accounts of the perspective companies.

The IFFCO registered a declining trend during the first five years of the study period. The ratio was 21.12 times in 1999-2000, which declined to 19.10 times in 2000-01. The ratio again declined to 15.86 times in 2001-02 and 15.23 times in 2002-03. The ratio was 12.72 percent in 2003-04 and then it rose to 18.20 times in 2004-05 but it declined to 13.66 times in the last years of the study period. The average ratio was 16.56 times.



The Debtor turnover ratio of GFCL was seen in the above Table No.4.18. The debtor turnover ratio ranged between 5.05 times in 2002-03 and 12.27 times in 2005-06 with an average of 8.50 times. The ratio was very good the year of 2002-03.

The Table No.4.19 showed Debtor turnover ratio of GNFC with an increasing trend during the study period. The ratio was maximum of 8.19 times in 2004-05 and minimum of 5.10 times in 1999-2000. The average ratio was 6.40 times with standard deviation of 1.05 percent.

The above Table No.4.19 showed Debtor turnover ratio of MCFL with an average of 22.06 times, which was very higher than the industry average. The ratio was 16.68 times in 1999-2000 and 13.50 times in 2000-01. The ratio was 10.55 times in 2001-02 and 11.31 times in 2002-03. The ratio increased to 13.69 times in 2003-04 and again rose to 27.50 times in 2004-05 and 61.29 times in 2005-06. The standard was deviation of 18.21 percent co-efficient of variation of 82.50, which showed high fluctuations.

The Debtor turnover ratio of MFL was found in the above Table No.4.19. The ratio was 18.77 times in 1999-2000 and declined to 15.20 times in 2000-01 and 8.60 times in 2001-02. The ratio increased to 12.83 times in 2002-03 and 13.91 times in 2003-04. The ratio was again gone up to 27.90 times in 2004-05 and 145.70 times in the last year of the study period.

The debtor turnover ratio of NFL was seen in the above Table No.4.19. The ratio ranged between 5.30 times in 2003-04 and 7.77 times in 2004-05. The debtor turnover ratio indicated highly fluctuated trend during the study period with an average of 6.11 times.

The CFL Company showed it debtor turnover ratio in the above Table No.4.19. The ratio 29.57 times in 1999-2000 and then after it went down to 13.30 times in 2000-0. The ratio was again gone down to 9.04 times in 2001-02 and 5.82 times in 2002-03. The ratio rose to 8.82 times in 2003-04 and 12.10 times in 2004-05. it was very high of 18.46 times in 2005-06.the ratio was on an average of 13.88 times with standard deviation of 8.01 times.

The above Table No.4.19 showed debtor turnover ratio of CFCL with a fluctuating trend during the research period. The ratio was 5.20 times in 1999-2000, which then after increased to 6.22 times in 2001-02 and declined to 5.88 times in 2002-03 but it rose to 5.78 times in 2003-04. The average ratio has been 5.90 times with standard deviation of 0.48 times and co-efficient of variation of 8.11 percent.

On the basis of above analysis, it can be said that the MFL Company has the highest debtor turnover ratio of 37.40 times followed by MFL, IFFCO, MCFL, and CFL. Other selected units have below industry average debtor turnover ratio.

DEBTORS TURN OVER RATIO (ANOVA test)

Null Hypothesis:

There is no any significant difference in debtor turn over ratio of Fertilizer units under study.

Alternative hypothesis:

There is significant difference in debtor turn over ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.4.20

DEBTORS TURN OVER RATIO (ANOVA test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5008.449	7	715.4928	2.009451	0.073208	2.207436
Within Groups	17091.06	48	356.0637			
Total	22099.51	55				

From the above Table No.4.20, it is clear that difference in between groups and within groups was not significant because the calculated value of 'F' (2.009451) was lower than the

table value of 'F' (2.20). Analysis indicates that there were similarities in debtor turn over ratio of Fertilizer units under study

Kruskal Wallis Analysis

- **Null Hypothesis:** There is no any significant difference in debtor turn over ratio of Fertilizer units under study.
- **Alternative hypothesis:** There is significant difference in debtor turn over ratio of Fertilizer units under study.
- Level of Significance: 5 percent
- Critical value: 14.067
- Degree of freedom: 7 (seven)
- Calculated Value of H = 37.97

On the basis of calculated value of H works out at 37.97, being more than the critical value of 14.067. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the debtor turn over ratio of the fertilizers units under study. It may also lead to the conclusion that the debtor turn over ratio of fertilizers units is differ for units to units.

Inventory Turnover Ratio

Inventory turnover Ratio Indicates the Efficiency of firm's Inventory management. It shows rapidity of turning inventories into sales. Generally, a high turnover is indicative of good inventory management. Simultaneously, a low inventory turnover implies excessive inventory level that warranted by production and sales activities, or a slow moving or obsolete inventory. A high level of sluggish inventory amounts to unnecessary tie-up of funds, impairment of profit and increased cost. On the other hand, a very high inventory turnover may be the result of a very low level of inventory turnover may be the result of a very low level of inventory which results in frequent stockiest. The inventory will also be high if the firm replenishes its inventory in too many small lot sizes. The situation of frequent stick outs and too many small inventory replacements are costly for the firm. Thus, too high and too low inventory turnover rates are not preferred.

The inventory turnover ratio has been calculated by dividing the figure of sales by the figure of the inventory. The ratio (which is shown in days) is to be worked out by dividing the inventory and receivables with the Net Sales. A low ratio indicates that the inventory/receivables are being turned over a large number of times during the year or in other words, goods are being sold promptly and sales proceeds realized quickly, that inventory management and control is good. This also indicates lesser accumulation of stocks and therefore lesser change of the stocks containing obsolete or unsaleable items. A high ratio on the other hand indicates lock up of larger sums in inventory and or slow moving stocks. If the ratio shows an increasing trend, this would indicate that sales are falling or that there are inventory hold-ups.

Table No.4.21

Inventory Turnover Ratio of fertilizer companies under study during the years 1999-2000 to 2005-06. (Times)

Company	1999-000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	max	min
IFFCO	4.73	5.23	5.07	5.58	5.49	7.4	4.45	5.42	0.96	17.7	7.4	4.45
GFCL	5.87	5.43	5.99	4.34	4.94	7.49	9.78	6.26	1.84	29.3	9.78	4.34
GNFC	5.7	6.06	6.3	6.55	7.84	8.88	8.6	7.13	1.29	18	8.88	5.7
MCFL	8.2	10.1	8.37	6.94	6.91	9.99	9.17	8.53	1.31	15.4	10.11	6.91
MFL	5	4.26	2.99	3.76	4.2	5.86	5.26	4.48	0.97	21.7	5.86	2.99
NFL	2.97	3.33	3.88	5.65	7.32	9.4	10.67	6.17	3.05	49.4	10.67	2.97
CFL	5.89	5.61	6.25	5.23	7.86	8.15	6.51	6.50	1.11	17.1	8.15	5.23
CFCL	7.84	8.84	10.03	10.18	10.41	10.3	10	9.66	0.96	9.91	10.41	7.84
Group	5.775	6.11	6.11	6.029	6.871	8.44	8.055	6.77	1.436	22.3	8.908	5.05

Sources: computed from the annual reports & accounts of the perspective companies.

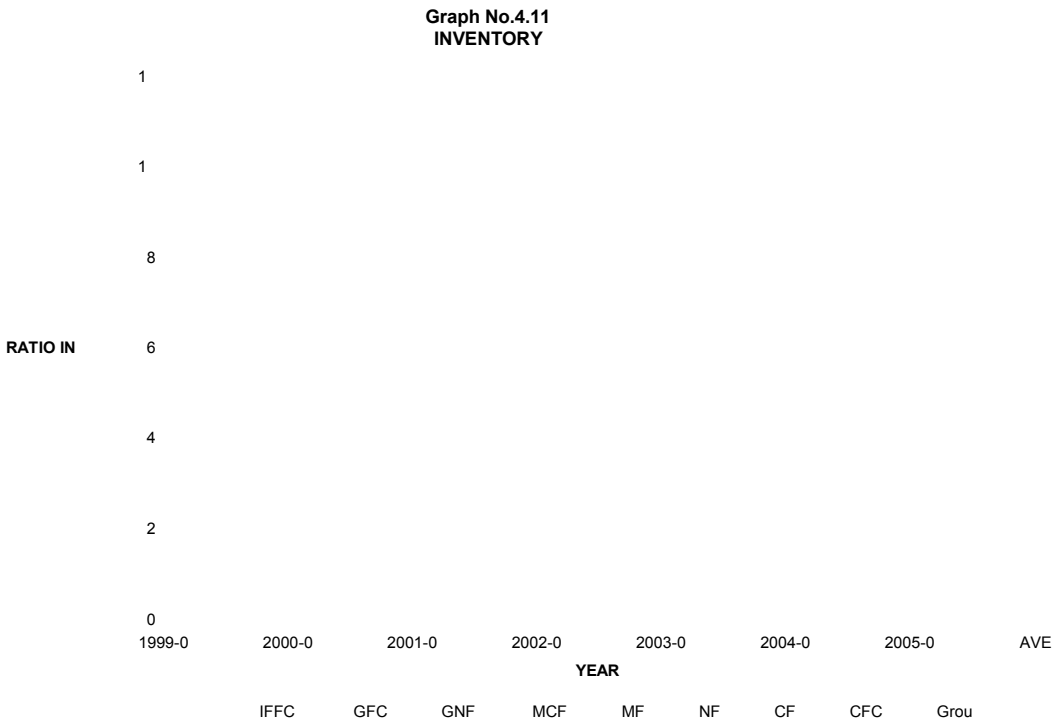
The above Table No.4.21 showed inventory turnover ratio of IFFCO. The ratio of this company was showing fluctuating trend during the study period. The ratio was 4.73 times in 1999-2000 and 5.23 times in 2000-01. The ratio was 5.07 times in 2001-02 and again it rose to 5.58 times in 2002-03. The ratio was 5.49 times in 2003-04 and 7.40 times in 2004-05. The average ratio has been 5.42 times with standard deviation of 0.96 times.

The inventory turnover ratio of GFCL was seen in the above Table No.4.21. The ratio was 5.87 times which was then after declined to 5.43 times. The ratio was 5.99 times in 2001-02 and 4.34 times in 2002-03. The ratio was 4.94 times in 2003-04 and 7.49 times in 2004-05 and 9.78 times in 2005-06.the average ratio was 6.26 times with standard deviation of 1.84 percent.

The inventory turnover ratio of GNFC was depicted in the above Table No.4.21. The ratio was 5.70 times in 1999-2000 and 6.06 times in 2000-01. The ratio again increased to 6.55 times in 2002-03 and 7.84 times in 2003-04 and 8.88 times in 2004-05. The ratio was slightly changed and remained to 8.60 times. Thus, it can be said that the ratio ranged between 5.70 times to 8.88 times during the research period.

The inventory turnover ratio of MCFL was manifested in the above Table No.4.21. The ratio was showing highly fluctuated trend during the study period. The average ratio was 8.53 times with standard deviation of 1.31. The ratio ranged between 10.11 times in 2000-01 and 6.91 times in 2003-04.

The MFL Company was showing the inventory turnover ratio in the above table.21. The ratio was 5 times in 1999-2000 and 4.26 times in 2000-01. The ratio then sharply declined to 2.99 times in 2001-02. The ratio was 3.76 times in 2002-03



and 4.20 times in 2003-04. The ratio was more than five times in 2004-05 and 2005-06. The average ratio was 4.8 times with co-efficient of variation of 21.70 percent.

The above Table No.4.21 indicated the inventory turnover ratio of NFL. The ratio was 2.97 times in 1999-2000 and increased to 3.33 times in 2000-01. The ratio again rose to 5.65 times in 2002-03 and 7.32 times in 2003-04. The ratio was 9.40 times in 2004-05 and 10.67 times in 2005-06. The average ratio has been 6.17 times. The ratio ranged between 2.97 times in 1999-2000 and 10.67 times in 2005-06.

The inventory turnover ratio of CFL was seen in the Table No.4.21. The ratio was 5.89 times in 1999-2000 and 5.61 times in 2000-01. The ratio rose to 6.25 times in 2001-02 but it stepped down to 5.23 times in 2002-03. The ratio rose to 7.86 times in 2003-04 and 8.15 times in 2004-05. The ratio went down to 6.51 times in 2005-06. The average ratio was 6.50 times with standard deviation of 1.11 times.

Inventory turnover ratio of CFCL was manifested in the above Table No.4.21.the ratio was indicating increasing trend during the study period. The ratio ranged between 7.84 times in 1999-2000 and 10.41 times in 2003-04.Inventory turnover ratio found good in this company.

The above analysis showed the CFCL ahs the highest inventory turnover ratio followed by MCFL, GNFC, CFL, NFL and GFCL.

INVENTORY TURNOVER RATIO (ANOVA test)

Null Hypothesis:

There is no any significant difference in inventory turnover ratio of Fertilizer units under study.

Alternative hypothesis:

There is significant difference in inventory turnover ratio of Fertilizer units under study.

Level of Significance: 5 percent
Critical value: 2.207
Degree of freedom: 55

Table No.4.22
INVENTORY TURNOVER RATIO (ANOVA test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	135.3129	7	19.33042	7.705343	3.18E-06	2.207436
Within Groups	120.4177	48	2.508703			
Total	255.7307	55				

Table No.4.22 indicates there is significant difference in inventory turnover ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the in inventory turnover ratio of fertilizers units under study.

Kruskal Wallis Analysis

- **Null Hypothesis:** There is no any significant difference in inventory turnover ratio of Fertilizer units under study.
- **Alternative hypothesis**: There is significant difference in inventory turnover ratio of Fertilizer units under study.
- Level of Significance: 5 percent
- Critical value: 14.067
- Degree of freedom: 7
- Calculated Value of H = 30.42

On the basis of the calculated value of H works out at 30.42, being more than the critical value of 9.488. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the inventory turnover

ratios of the fertilizers units under study. It may also lead to the conclusion that the profitability of fertilizers units is differ for units to units.

CONCLUSION:

Activity and operational efficiency analysis is concerned with measuring the efficiency in assets management. Some times, these analyses are also called analysis of assets utilization. The efficiency with which the assets are used would be reflected in the speed and rapidity with which assets are converted in to sales. The greater rate of turnover, the more efficient the utilization, other things being equal. For this reason, such ratios are called turnover ratio. Turnover is the primary mode for measuring the extent of efficient employment of assets by relating the assets to sales. Depending upon the various types of assets, there are various types of activity ratios, which are total assets turnover ratio, net fixed assets turnover ratio, current assets turnover ratio and capital turnover ratio. All these ratios are used for measuring the performance of activity and operational efficiency of fertilizer companies under study during the years 1999-2000 to 2005-06.

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Chapter-5
ANALYSIS OF FINANCIAL EFFICIENCY

CONCEPT OF FINANCIAL EFFICIENCY.

Financial efficiency is a measure of the organizations ability to translate to its financial resources into mission related activities. Financial efficacy is desirable in all organization of individual mission. It measures the intensity with which a business uses it assets to generate gross revenue and the effectiveness of producing, purchasing, pricing, financing, and marketing decisions. At the micro level financial efficiency refers to the efficiency with which resources are correctly allocated among competing uses at a point of time. Financial efficiency is a measure of how well an organization has managed certain trade of (risk and return, liquidity and profitability) in the use of its financial efficiency. Financial efficiency is regarded as a measure of total efficiency and a management guide to greater efficiency and the extent of the profitability, liquidity, productivity and capital strength can be taken as a final proof of a financial efficiency. Financial efficiency directed towards evaluating the liquidity, stability, and profitability of a concern which put together of a concern. The word efficiency as defined by the oxford dictionary states that; efficiency is the accomplishment of or the ability to accomplish a job with minimum expenditure of time and effort. As expressed by peter ducker “doing the things the right way is efficiency”. This denotes the fulfillment of the objective with minimum sacrifice of the available scarce resource. Fatless and speedy compliance of the process or system procedure is a measure of efficiency providing a specified volume and quality of services with the lowest level of resources capable meeting that specification, performance measures and or indicators are required. These are including measures, productivity, unit of volume of service etc.

CONCEPT OF PROFITABILITY.

Profitability is the ability to earn profit from all the activities of an enterprise. It indicates how well management of an enterprise generates earnings by using the resources at its disposal. In the other words the ability to earn profit e.g. profitability, it is composed of two words profit and ability. The word profit represents the absolute figure of profit but an absolute figure alone does not give an exact ideas of the

adequacy or otherwise of increase or change in performance as shown in the financial statement of the enterprise. The word 'ability' reflects the power of an enterprise to earn profits, it is called earning performance. Earnings are an essential requirement to continue the business. So we can say that a healthy enterprise is that which has good profitability. According to hermenson Edward and salmonson 'profitability is the relationship of income to some balance sheet measure which indicates the relative ability to earn income on assets employed. **1**

PROFIT AND PROFITABILITY

Profits are the cream of the business without it may not serve the purpose .it is true that "profits are the useful intermediate beam towards which capital should be directed" **2** Weston and Brigham mentioned that " to the financial management profit is the test of efficiency and a measure of control to the owners a measure of the worth of their investment, to the creditors the margin of safety, to the government a measure of taxable capacity and a basis of legislative action and the country profit is an index of economic progress national income generated and the rise in the standard of living." **3** While profitability is an outcome of profit. In the other words no profit derived towards profitability. "It may be remarked that the profit making ability might denote a constant or improved or deteriorated stare of affairs during a given period, thus, profit is an absolute connotation were as profitability is a relative concepts." **4** Profit and profitability are two different concepts, although they are closely related and mutually independent, playing distinct role in business. R.S.Kulshrestha mentioned that "profit in two separate business concerns might be the same and yet more often they note their profitability could differ when measured in terms of the size of investment" **5** as outcome of above statement it can be said that profitability is broader concept comparing to the concept of profit levels of profitability helps in establishing quantitative relationship between profit and level of investment or sales.

MEASUREMENT TOOL OF PROFITABILITY:

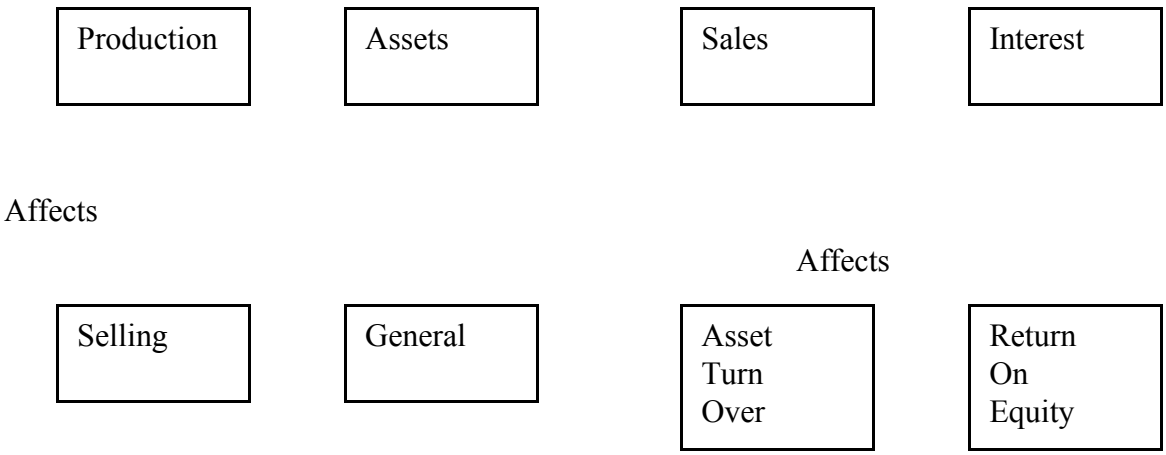
For making policy decision under different situations, measurement of profitability is essential. According to Murthy V.S. "The most important measurement of profitability of a company is ratio. E.g. profitability of assets, variously referred to as earning power of the company, return on total investment or total resources

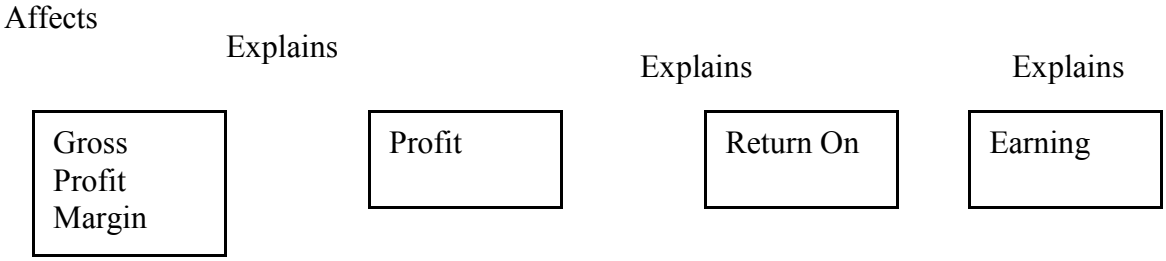
committed to operations. [6] Profitability ratios are calculated to measure the operating efficiency of the firm. According to Block and Hirt "The income statement is the major device for measuring the profitability of a firm over a period of time." [7] Measurement of profitability is as essential as the earning of itself for the business concern. Some managerial decision like rising of additional finance, further expansion, problems of bonus and dividend payments rest upon this measurement. It can be measured for a short term and as well as for a ling term. The relation to sales is the good short-term indication of successful growth while profitability in relation to investment is the healthier for long growth of the business. Profitability provides overall performance of a company and useful tool for forecast measurement of a company's performance. "The overall objective of a business is to earn a satisfactory return/profit on the funds invested in it, while maintaining a sound financial position profitability measures financial success and efficiency of management. [8]

The importance of profitability performance can be seen from the reality that besides the management and owners of the company, financial institutions, creditors, bankers also look at its profitability. Appraisal of performance as regards to profitability can be drawn from interpreting various ratios. However there are few factors affected to the firm's profitability. Each factor in turn will affect the profitability ratio. Diagram No.-6.1, describes factors that affect of different profit ratio and shows which ratio relates to explain other rations.

Diagram No.-5.1

Factors Affecting to Profitability Ratio





Above figure stated that every factor affected earning power, directly or indirectly. The reason is one ratio explains to another. In present study profitability ratios can be measured through two group i.e. (1) profitability ratios in relation to capital employed, the examples of sales based profitability ratio are net profit ratio, operation ratio and gross profit ratio and in relation to capital employed and return on owners equity of the company will be discussed below:

(I) Profitability ratios in relation to sales

(1) Gross Profit Ratio:

"The excess of the net revenue from sales over the cost of Merchandise sold is called gross profit, gross profit on sales or gross margin" **9** this ratio calculated by dividing gross profit by net sales and is usually expressed as a percentage. The formula of gross profit ratio is given below:

$$\textbf{GROSS PROFIT RATIO} = \frac{\textbf{SALES} - \textbf{COST OF GOODS SOLD}}{\textbf{SALES}} \times 100$$

The gross profit ratio highlights the efficiency with which management produces each unit of products as well as it indicates the average spread between the cost of goods sold and the sales revenue. Any fluctuation in the gross profit ratio is the result of a change in cost of goods sold or sales or both. A high gross profit ratio is a mark of effectiveness of management. The gross profit ratio may increase due to any of the below factors.

1. Lower cost of goods sold where sales prices remaining constant.
2. Higher sales prices where cost of goods sold remaining constant.
3. An increase in the proportionate volume of higher margin items

4. A combination of variations in sales prices and costs. While in the case of low profit ratio it may be reflected higher cost of goods sold due to firm's inability to purchase at favorable terms, over investment in plant and machinery etc. secondly this ratio will also be low due to a decrease in price in the market. Table No.5.1 Shows the gross profit ratio of some selected companies of fertilizer industry in India with the average value.

The gross profit ratio of selected companies of fertilizer industry in India is given in the Table No.5.1. The table shows the gross profit ratio of the selected companies of fertilizer industry.

Table No.:- 5.1

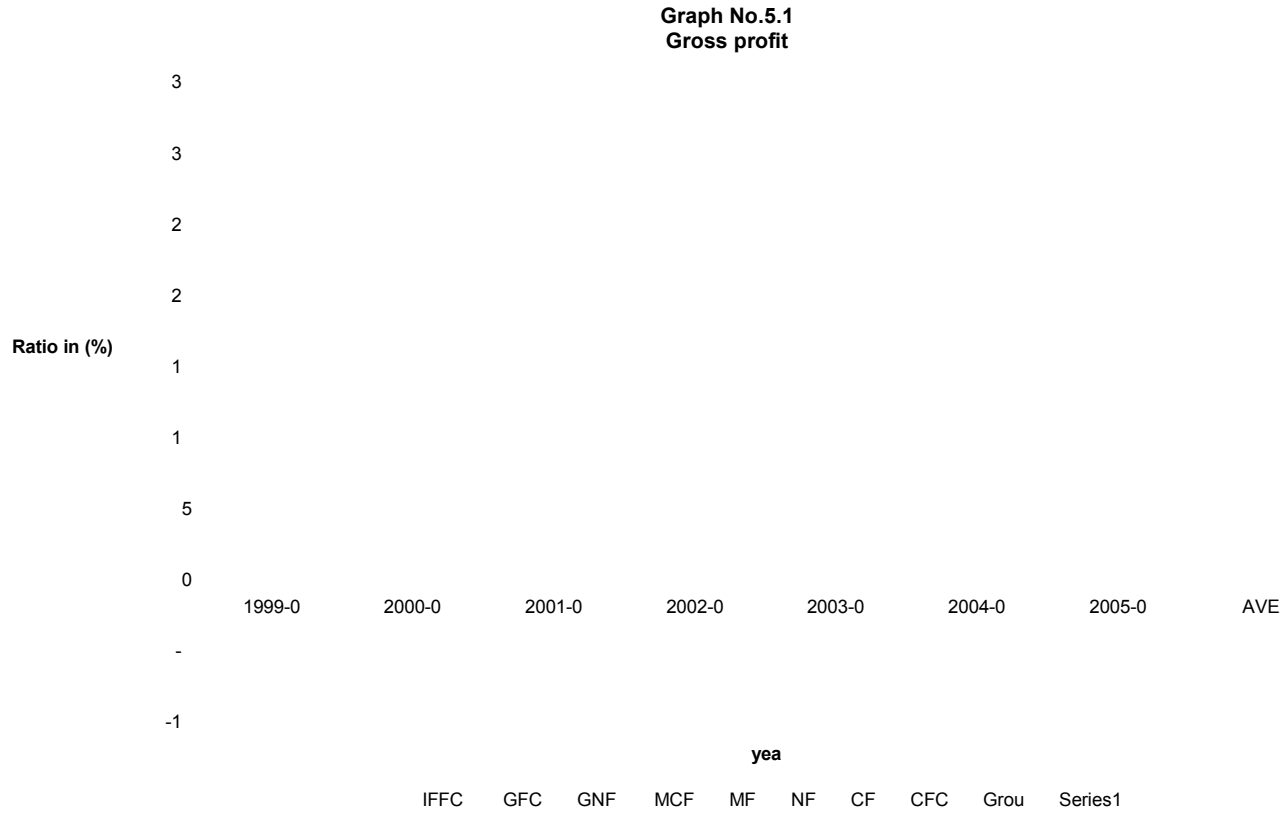
Gross Profit Ratio of selected companies of fertilizer industry in India from 1999-00 to 2005-06. (in percent0

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	9.6	7.4	10.4	15.9	11.8	8.84	13.2	11.02	2.86	25.94	7.43	15.9
GFCL	1.1	-0	1.06	-1.6	1.95	2.78	3.29	1.16	1.74	150.13	-1.64	3.29
GNFC	12	14	13.8	16	18.8	23	25	17.46	4.99	28.58	12.06	25
MCFL	31	7	5.17	5.51	5.39	5.44	4.62	9.20	9.76	106.08	4.62	31.3
MFL	4.2	0.8	-1.9	3.8	-1.8	-1.2	-7.98	-0.57	4.13	-725.74	-7.98	4.19
NFL	5.6	4.3	5.32	16.9	6.99	9.65	8.46	8.18	4.25	51.99	4.34	16.9
CFL	14	14	13.6	10.5	8.37	8.23	8.12	10.94	2.77	25.37	8.12	13.9
CFCL	17	15	15.4	13.6	14.6	16.1	16.1	15.41	1.25	8.12	13.56	17.4
Group	12	7.7	7.86	10.1	8.27	9.12	8.85	9.10	3.97	43.62	7.665	11.9

Table No.5.1 shows the gross profit ratio in relative terms as percent of net sales. As regards the IFFCO, the gross profit ratio varies from 15.89 percent to 7.43 percent. It shows the overall fluctuation in the ratio within the study period. The gross profit ratio of IFFCO was highest in the year 2002-03 the value of the ratio in this year was 15.89. The lowest value of the ratio was in the year 2000-01. From the year 2002-03 the trend of the ratio is declining. In the year 2005-06 the value of the above

said ratio was 13.2. The average value of the gross profit ratio of IFFCO is 11.02. The standard deviation is 2.86 percent and co-efficient of variation 25.94 percent which showed high fluctuation in gross profit ratio during the study period. If so the ratio of the company is fluctuating during the research study.

The above Table No.5.1shows the gross profit ratio or the Godavari Fertilizer & Chemicals Ltd. from 1999-00 to 2005-06. The gross profit ratio of the above said company is very poor and sometimes it shows the negative value which is the sign of poor management of the company. The highest ratio of the company was in the year 2005-06 and the value was 3.29. The lowest value of the ratio is -1.64 in the year 2002-03. so this year shows the very critical for the company. The trend of the ratio is upward from the year 2002-03 but not satisfactory. The average value of gross profit ratio of above said company during the study period is 1.16 which is once again poor. The standard deviation has been 1.74 percent and co-efficient of variation has been 150.13 percent which has shown high fluctuation in gross profit ratio the GFCL.



The given Table No.5.1 shows the gross profit ratio of the GNFC from 1999-00 to 2005-06. The trend of the ratio is upward during the study period. The gross profit ratio of the GNFC was 12.06 in the year 2005-06 which is lowest and in the year 2005-06 the value of the said ratio was 25 which is highest. The average value of the ratio is 17.46 with standard deviation of 4.99 and co-efficient of variation of 28.58 percent. In the year 2005-06 the value of the ratio was more than the average value of the ratio which is good indication for the better development of the company. The company has maintained good gross profit ratio during the study period.

The above Table No.5.1shows the gross profit ratio of Mangalore Chemical & Fertilizer Ltd from the year 1999-00 to 2005-06. The trend of the above ratio is downward. The gross profit ratio of the company is ranged between 4.62 percent in 2005-06 and 31.30 percent in 1999-2000 with an average of 9.20. The standard deviation is 9.76 and co-efficient of variation is 106.08 which shows high fluctuation in gross profit ratio of MCFL. The gross profit ratio of the company is not up to the mark. The company could not generate sufficient sales to earn gross profit and cost of goods sold is also very high.

The Table No.5.1indicates that gross profit ratio of MFL. The trend of the gross profit ratio is fluctuating with an average of (-0.57).The gross is 4.20 percent in 1999-2000 which then declined to 0.80 and -1.90 percent. The ratio is 3.80 percent in 2002-03 and again it went down to minus 1.80 percent and minus 1.20 percent in 2003-04 and 2004-05. In the last to years of the study period the ratio has very bad due to negative ratio. The standard deviation is 4.13 percent and co-efficient of variation is minus 725.74.The performance of the company is very poor because company could not minimize the cost of goods sales.

Above Table No.5.1 showed the gross profit ratio of NFL. The trend of this company is increasing but the average ratio is 8.18 percent. The minimum ratio of the company has been 4.34 percent in 2000-01 and the maximum ratio has been 16.90 percent in the years of 2002-03. The standard deviation is 4.25 and co-efficient of variation is 51.99 percent. The gross profit ratio has been very low in the beginning years of the study period. But the company could be successful to curb the cost of goods and other production expenses.

The above Table No.5.1 shows the gross profit ratio of the Coromandel Fertilizers Ltd. from the year 1999-00 to 2005-06. By considering the data of the table one can say that the value of the ratio is in decreasing trend. The highest value of the ratio was 13.90 in the year 2000-01 and the lowest value of the ratio was 8.12 in the year 2005-06. The average value of the ratio is 10.94 during the study period. The gross profit ratio was 14 percent in 1999-2000 and again it was 14 percent in 2000-01. The gross profit ratio slightly declined to 13.60 percent in 2001-02 and 10.50 percent in 2002-03. The gross profit ratio in 2003-04 and 204-05 has been below the industry average, however overall gross profit ratio was not up to the mark.

The above Table No.5.1 manifested the gross profit ratio of CFCl. The gross profit ratio has been ranged between 13.6 percent in 2002-03 and 17.40 percent in 1999-2000.The average gross profit ratio was 15.41 percent showing progressive trend during the study period. The standard deviation was 1.25 percent which was very low but co-efficient of variation was 8.12 percent which showed slightly fluctuations.

On the basis of above analysis it can be said that the gross profit ratio of GNFC was the highest followed by CFCL, IFFCO, CFL, MCFL and others. The MFL

Company needs to increase sales turnover and try to control cost of goods sold. The gross profit ratio of GFCL was not up to the mark.

Gross Profit Ratio (ANOVA Test)

- **Null Hypothesis:** There is no any significant difference in Gross Profit Ratio of Fertilizer units under study.
- **Alternative hypothesis**: There is significant difference in Gross Profit Ratio of Fertilizer units under study.
- **Level of Significance**: 5 percent
- **Critical value: 2.207**
- **Degree of freedom: 55**

Table No.5.2
Gross Profit Ratio one way ANOVA test

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1918.961	7.00	274.14	12.48	0.00	2.21
Within Groups	1054.619	48.00	21.97			
Total	2973.58	55.00				

Since F cal > F critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that the Gross Profit ratio does differ significantly.

Kruskal Wallis Analysis
Null Hypothesis:
There is no any significant difference in Gross Profit Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Gross Profit Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 14.067

Degree of freedom: 7

Calculated Value of H = 42.29

Kruskal Wallis Analysis indicated that the calculated value of H works out 42.29, being more than the critical value of 14.067. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. It is concluded that there has been

significant difference between gross profit ratios of the fertilizers units under study. The fertilizers units should try to improve the gross profit condition.

(2) Operating Ratio:

Operating Ratio matches the cost of goods sold plus other operating expenses on the one hand, with net sales; on the other hand the operating expenses consist of the following.

1. Selling and distribution expenses, like salaries of salesmen, advertising and traveling expenses.
2. Administration expenses like rent, insurance salaries of office clerks, directors' fees, legal expenses etc. in the form of formula it can be expressed as follows.

$$\textbf{Operating Ratio} = \frac{\textbf{Cost of Goods Sold} + \textbf{Operating Expenses}}{\textbf{Net Sales}} * 100$$

A higher operating ratio is unfavorable. To get the comprehensive idea of the behavior of operating expenses variations in the ratios over a number of years should be studied. The variations in the ratio temporary or long lived can occur due to several factors such as changes in the sales prices.

Table No.:5.3

Operating Ratio of Selected Companies of the Fertilizer Industry in India from 1999-00 to 2005-06. (In Percent)

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	86.76	80	86.4	82.7	85.8	87.9	166	96.6	30.92	32.00	80	166
GFCL	95.26	86	85.6	86.1	93	85.5	89.7	88.7	4.014	4.53	85	95.3
GNFC	81.29	82	77.7	76.4	77.8	77.1	75.4	78.2	2.372	3.03	75	81.6
MCFL	84.53	90	88	94	86	89.2	94.5	89.4	3.774	4.22	85	94.5
MFL	98.08	87	92.5	75.8	86.6	93	101	90.6	8.393	9.27	76	101
NFL	107	110	109	101	103	108	105	106	3.05	2.87	101	110
CFL	81.04	78	74.3	90.6	78.4	83.2	91	82.4	6.367	7.73	74	91
CFCL	65.97	76	70.8	79.9	79.6	85.3	78.5	76.6	6.399	8.35	66	85.3
Group	87.49	86	85.5	85.9	86.3	88.7	100	88.6	5.227	5.90	85	100

Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.

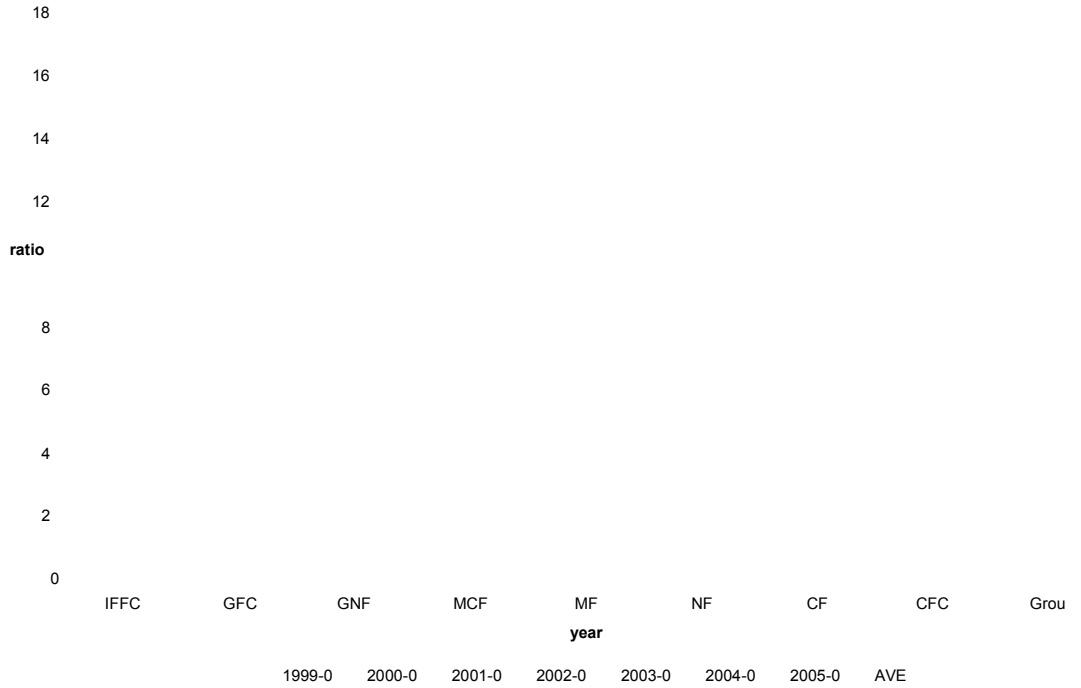
The above Table No.5.3 shows the operation ratio of selected companies of fertilizer industry in India The above table shows the operating ratio of IFFCO from

the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is fluctuating during the study. The highest value of the operating ratio of above company was 166.49 in the year 2005-06 and the lowest value of the ratio was 80.33 in the year 2000-01. The average value of the ratio is 96.63 with an increasing trend. The standard deviation was 30.92 and co-efficient of variation was 32.00 percent which showed slightly fluctuation in the gross profit ratio. The ratio of the company is satisfactory except in the year 2005-06

The above Table No.5.3 shows the operating ratio of Godavari Fertilizers and Chemicals Ltd from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is slow fluctuating during the study. The highest value of the operating ratio of above company was 95.26 in the year 1999-00 and the lowest value of the ratio was 85.48 in the year 2004-05. The standard deviation was 4.014 percent and 4.53 percent with the average value of the ratio is 88.71. The ratio of the company is satisfactory.

The above Table No.5.3 shows the operating ratio of GNFC from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is decreasing with has been average of 78.20 percent during the study. Operating ratio of GNFC has been ranged between 75 percent in 2005-06 and 81.60 percent in 1999-2000.The standard deviation of the ratio was 2.372 percent and Co-efficient of variation was 3.03 percent.

Graph No.5.2



The operating was manifested in Table No.5.3 of MCFL. The operating ratio was 84.53 percent which the increased to 90 percent in 2000-01 and than it declined to 88 percentage in 2001-02. The operating ratio was 94 percent in 2002-03 and 86 percent in 2004-05. The operating ratio in the last three years has been 89.20 percent and 94.50 percent. The operating ratio showed fluctuating trend with an average of 89.40 percent. The standard deviation was 3.774 percent and Co-efficient of variation was 4.22 percent.The operating ratio in all years were very high**.**

The above Table No.5.3 showed the operating ratio of MFL with fluctuating trend. The ratio ranged between 78 percent in 2002-2003 and 101 percent in 2005-06 with an average of 90.60 percent. The operating ratio in the 2005-06 and 1999-2000 was very bad. However overall operating ratio was not satisfactory due to high cost of goods sold. The standard deviation was 8.393 percent and co-efficient of variation was 9.27 percent.The company should try to control production expenses.

The above Table No.5.3 shows the operating ratio of Madras Fertilizers Ltd. from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is fluctuating during the study. The highest value of the operating ratio of above company was 100.99 in the year 2005-06 and the lowest value of the ratio was 75.77 in the year 2002-03. The average value of the ratio is 90.56. The standard

deviation was 3.05 percent and 2.87 percent.The ratio of the company is not satisfactory.

The above Table No.5.3 shows the operating ratio of National Fertilizers Ltd. from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is fluctuating during the study. The highest value of the operating ratio of above company was 108.56 in the year 2001-02 and the lowest value of the ratio was 101.47 in the year 2002-03. The average value of the ratio is 106.12. The ratio of the company is not satisfactory.

The above Table No.5.3 shows the operating ratio of Coromandel Fertilizers Ltd. from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is fluctuated during the study. The highest value of the operating ratio of above company was 90.99 in the year 2005-06 and the lowest value of the ratio was 74.27 in the year 2001-02. The average value of the ratio is 82.39. The ratio of the company is satisfactory.

The above Table No.5.3 shows the operating ratio of Chambal Fertilizers and Chemicals Ltd from the year 1999-00 to 2005-06. The trend of the operating ratio of the above said company is increasing in order with the standard deviation of 3.399 percent and co-efficient of variation was 5.90 percent. The highest value of the operating ratio of above company was 85.31 in the year 2004-05 and the lowest value of the ratio was 65.97 in the year 1999-00. The average value of the ratio is 76.59.

On the basis of above analysis a researcher can conclude that the operating was very good in CFCL followed by GNFC, GFCL and CFL. The other companies operating ratios have been above the group average. These companies need to curb the operating cost.

Operating Profit Ratio (ANOVA Test)

Null Hypothesis:
There is no any significant difference in Operating Profit Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Operating Profit Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table no. 5.4
Operating Profit Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4673.839	7	667.6913	4.632441	0.000506	2.207436
Within Groups	6918.423	48	144.1338			
Total	11592.26	55				

From the above Table no. 5.4, it is clear that difference in between groups and within groups was significant because the calculated value of 'F' (4.63) was higher than the table value of 'F' (2.20). Analysis indicates that there were no similarities in operating profit ratio of Fertilizer units under study.

Kruskal Wallis Analysis
Null Hypothesis:
There is no any significant difference in Operating Profit Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Operating Profit Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 14.067

Degree of freedom: 7

Calculated Value of H = 36.16

Since H cal > H critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that the Operating Profit ratio of fertilizers units does differ significantly.

(3)Net Profit Ratio:-

Net Profit Ratio is obtained when operating expenses, interest and taxes are deducted from the gross profit. It indicates that the proportions of sales are left to the proprietors after all costs; charges and expenses have been deducted.

Net profit Ratio is differing from the operating ratio to sales ratio in as much as it computed after adding non operating surplus/deficit. (Difference of non operating

income and none operating expenses) The net profit ratio is measured by dividing profit after tax by net sales.

$$\text{Net Profit Ratio} = \frac{\text{Profit after tax}}{\text{Net Sales}} * 100$$

Net Profit Margin Ratio establishing relationship between net profit and sales and it indicates management efficiency in administrating, manufacturing and selling the products. This ratio is the overall measure of the firm's ability to turn each rupees sale into net profit. While the net profit is inadequate, the firm will fail to achieve satisfactory return on owner's equity, due to various reasons. Such as (a) falling price (b) Rising costs and declining sales. **10** Thus, this ratio is very useful to the proprietors and widely used as a measure of overall profitability.

A high net profit ratio would ensure adequate return to the owners as well as enable a firm to withstand adverse economic conditions when the selling price declining, the cost of production is rising and demand for the products is falling. **11**

Table No:-5.5
Net Profit Ratio of selected companies of fertilizer industry in India from 1999-000 to 2005-06 (In Percent)

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	6.45	4.2	6.05	9.15	5.57	4.42	6.26	6.02	1.635	27.16	4.2	9.15
GFCL	0.17	-1	0	-1.8	0.79	1.42	1.72	0.17	1.278	752.0	-1.8	1.72
GNFC	5.73	7.9	5.1	6.15	8.08	12.3	13..72	7.54	2.613	34.65	5.1	12.3
MCFL	27.75	5.4	1.85	2.37	2.33	1.42	1.72	6.12	9.631	157.37	1.4	27.8
MFL	0.99	-2	-6	0.36	-5.59	-4.5	-12.15	-4.15	4.483	-108.03	-12	0.99
NFL	1.4	1	1.35	7.84	2.51	4.63	3.24	3.13	2.441	77.98	1	7.84
CFL	7.93	8.6	6.86	4.58	3.48	4.45	4.45	5.77	2.01	34.83	3.5	8.64
CFCL	9.09	6.5	4.04	4.73	5.64	8.23	7.41	6.52	1.846	28.32	4	9.09
Group	7.439	3.8	2.4	4.18	2.85	4.04	1.8071	3.89	3.242	83.35	0.7	9.68

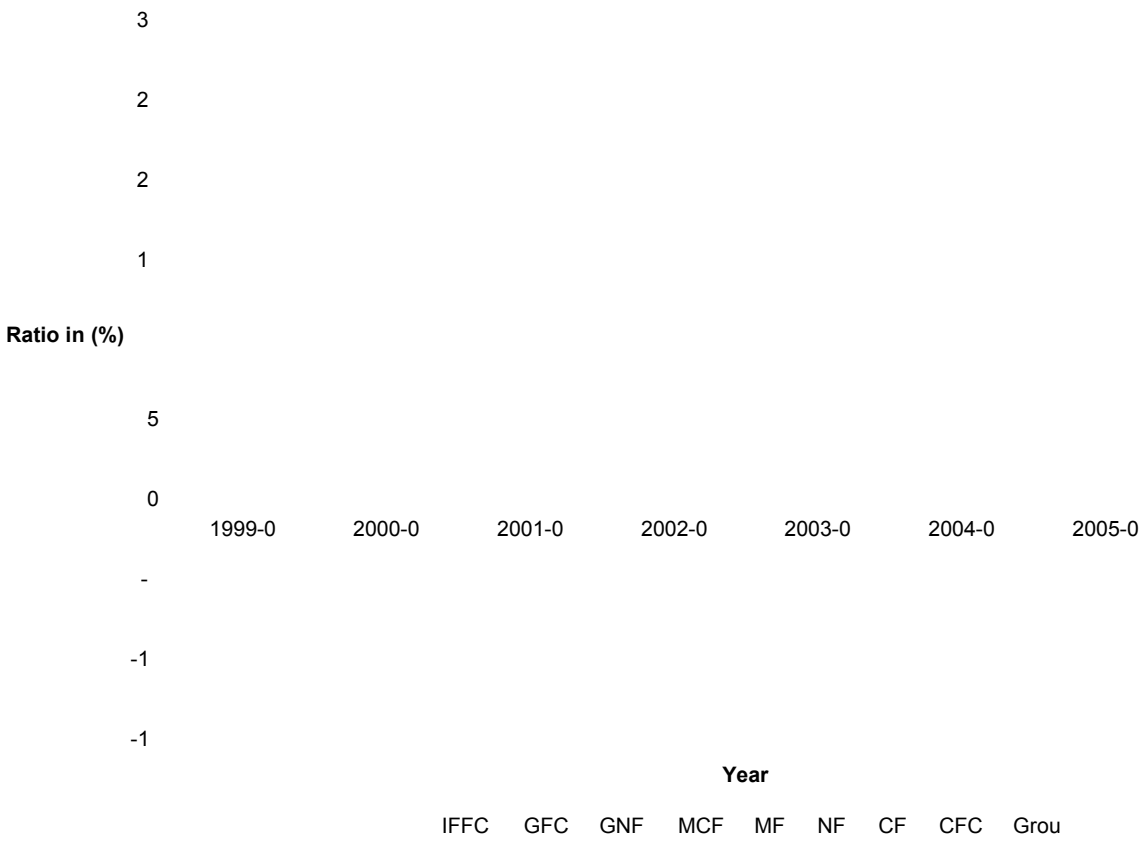
Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.

The above Table No.5.5 shows the Net Profit Ratio of the IFFCO from the year 1999-00 to 2005-06. During the 7 years study period researcher founds many things. The trend of the ratio of above said company was fluctuating during the study period. Up to the year 2002-03 the trend was upward and from this year the trend was down ward. The highest value of the ratio was 9.15 in the year 2002-03 and the lowest value of the ratio was 4.22 in the year 2000-01. The average value of the Net Profit Ratio of above said company was 6.02 during the study period.

The net profit ratio of GCFL was depicted in the Table No.5.5. The net profit ratio was showing negative trend with an average of 0.71 percent. The net profit ratio was 0.17 percent which was the minus -1 percent in 2000-01. The ratio was zero in 2001-02 and it was again minus -1.80 percent 2002-03.The ratio was increased to 0.79 percent in 2003-04.The ratio again rose to 1.42 percent in 2004-05 and 1.72 percent in 2005-06. The average ratio was below the industry average which was not considered to be good ratio. Company should try to minimize production cost. The standard deviation and coefficient was 1.278 percent and 752 Percent which has shown high changes in net profit ratio.

The above Table No.5.5 shows the Net Profit Ratio of the GNFC from the year 1999-00 to 2005-06. During the 7 years study period researcher founds many things. The trend of the ratio of above said company was fluctuating during the study period. Up to the year 2002-03 the trend was fluctuating and from this year the trend was up ward. The highest value of the ratio was 13.72 in the year 2005-06 and the lowest value of the ratio was 5.1 in the year 2001-02. The standard deviation and co-efficient were 2.61 percent and 34.65 percent which showed slightly changes.

Graph No.5.3



The average value of the Net Profit Ratio of above said company was 7.54 during the study period. The company shows the good performance during the study period.

The above Table No.5.5 shows the Net Profit Ratio of the Mangalore Chemicals & Fertilizers Ltd. from the year 1999-00 to 2005-06. During the 7 years study period researcher founds many things. The trend of the ratio of above said company was fluctuating during the study period. Up to the year 2002-03 the trend was decreasing and from this year the trend was mixed. The net profit ratio ranged between 1.40 percent in 2004-05 and 27.80 percent in 1999-2000 with standard deviation of 9.63 percent. The co-efficient of variation was 157.37 which shower highly fluctuations in net profit ratio during the study period. The average ratio was 6.12, which was very higher than the industry average. The net profit ratio was satisfactory in the company due to minimum administrative expenses.

The above Table No.5.5 shows the Net Profit Ratio of the Madras Fertilizer Ltd. from the year 1999-00 to 2005-06. During the 7 years study period researcher

founds many things. The trend of the ratio of above said company was fluctuating during the study period with the standard deviation of 4.83 percent. In the year 2005-06 the trend was decreasing. The highest value of the ratio was 0.99 in the year 1999-00 and the lowest value of the ratio was -12.15 in the year 2005-06. The average value of the Net Profit Ratio of above said company was -4.15 during the study period. The company shows the poor performance during the study period.

The Table No.5.5 showed the net profit ratio of NFL with the fluctuated trend during the research period. The highest net profit ratio found 7.84 percent in 2002-03.and the lowest net profit ratio found of 1.00 percent with average of 3.24 percent. The standard deviation and co-efficient were 3.13 percent and 2.44 percent. The company shows the average performance during the study period.

The above Table No.5.5 shows the Net Profit Ratio of the Coromandel Fertilizers Ltd. from the year 1999-00 to 2005-06. During the 7 years study period researcher founds many things. The trend of the ratio of above said company was fluctuating during the study period. Up to the year 2002-03 the trend was decreasing and from this year the trend was mixed. The highest value of the ratio was 7.93 in the year 1999-00 and the lowest value of the ratio was 3.48 in the year 2003-04. The average value of the Net Profit Ratio of above said company was 5.77 during the study period. The company shows the average performance during the study period.

The above Table No.5.5 shows the Net Profit Ratio of the Chambel Fertilizers & Chemicals Ltd., From the year 1999-000 to 2005-06. During the 7 years study period researcher founds many things. The trend of the ratio of above said company was fluctuating during the study period. Up to the year 2002-03 the trend was decreasing and from this year the trend was mixed. The highest value of the ratio was 9.09 in the year 1999-00 and the lowest value of the ratio was 4.04 in the year 2003-04. The average value of the Net Profit Ratio of above said company was 6.52 during the study period. The company shows the competitive performance during the study period.

Above analysis explains that the GNFC has the highest net profit ratio followed by MCFL, IFFCO, CFCL and other selected. The MFL showed minus net profit ratio which was not good for the company so that company should try to control

administrative expenses. GFCL has also showed very low net profit ratio so this company also needs to minimize the expenses.

Net Profit Ratio (ANOVA Test)

Null Hypothesis: There is no any significant difference in Net Profit Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Net Profit Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.5.6
Net Profit Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	835.982	7.000	119.426	6.742	0.000	2.207
Within Groups	850.298	48.000	17.715			
Total	1686.280	55.000				

Table No.5.6Indicates there is significant difference in Net Profit ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the Net Profit ratio of fertilizers units under study.

Kruskal Wallis Analysis

Null Hypothesis:
There is no any significant difference in Net Profit Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Net Profit Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 14.067

Degree of freedom: 7

Calculated Value of H = 38.51

On the basis Kruskal Wallis Analysis the calculated value of H works out at 38.51, being more than the critical value of 9.488. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the net profit ratios of the fertilizers units under study. It may also lead to the conclusion that the profitability of fertilizers units is differ for units to units.

(II) Profitability in relation to Capital Employed:

(1) Earning Per Share (EPS) :-

Earning per share is widely used method of measuring profitability of the common shareholders investment it measures the profit available to the equity shareholders on per share basis. The earning per share is calculated by dividing the profit after taxes by total numbers of common shares outstanding.

$$\textbf{Earning Per Share} = \frac{\textbf{Profit after Tax}}{\textbf{Number of Equity Share}} * 100$$

The earning per share calculations made over years shows whether or not the firms earning power on per share basis have changed over that period. "The earning per share simply shows the profitability of the firm on a per share basis. It does not reflect how much is paid as dividend and how much is retained in business but as a profitability index. It is a valuable and widely used ratio. Thus, the profitability of common shareholders investment can be measured easily by per share. The given table shows the Earning per share of selected companies of the fertilizer industry.

An investor can take a decision on the basis of the trend of Earning per share for number years. Earning per share has been calculated here in Rs. Per share basis as the denomination of the face value of shares varies in different companies. Following table shows the analysis of the Earning per Share. **12**

Table No.:5.7

Earning Per Share of selected companies of the fertilizer industry in India from 1999-00 to 2005-06. (In rupees)

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max

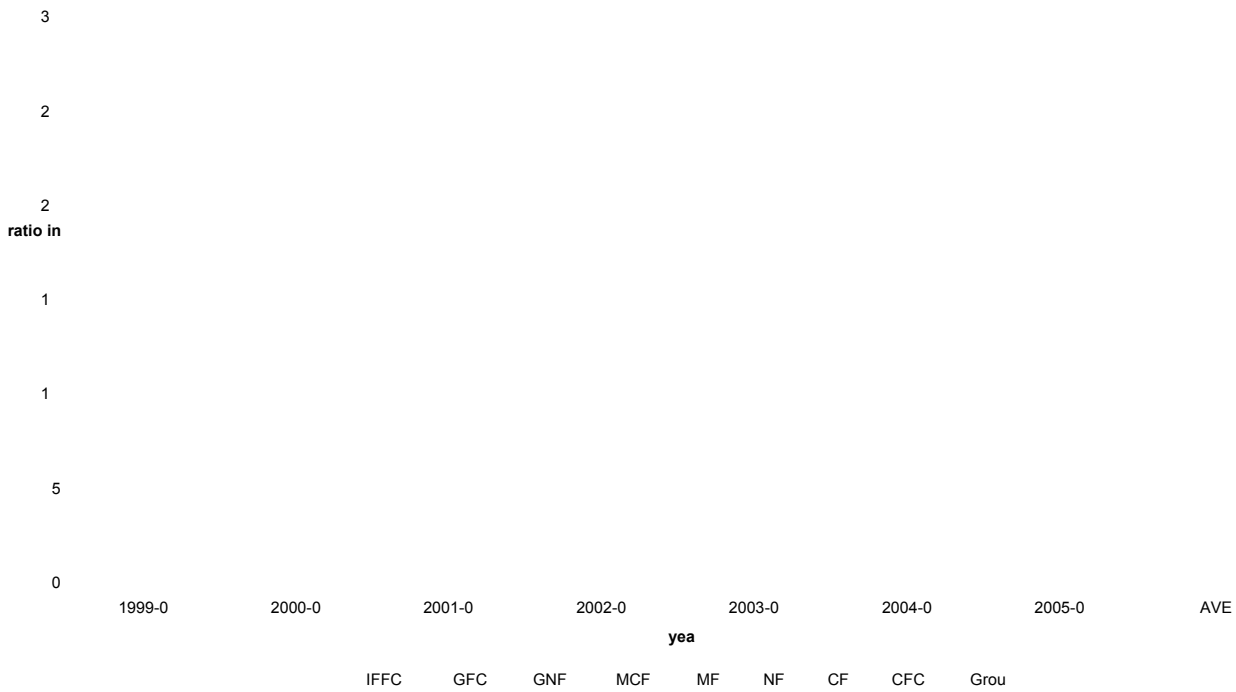
IFFCO	14.59	12	13.8	17.8	12.5	9.36	15.5	13.7	2.703	19.80	9.4	17.8
GFCL	0.31	0	0.61	0	2.23	5.2	7.88	2.32	3.081	132.87	0	7.88
GNFC	4.18	6.9	4.89	5.46	7.6	14.8	19.52	9.05	5.813	64.24	4.2	19.5
MCFL	17.33	2.6	0.84	1.09	1.21	1.88	2.04	3.86	5.972	154.65	0.8	17.3
MFL	0.78	0	0	0.28	0	0	0	0.15	0.296	195.58	0	0.78
NFL	0.66	0.5	0.83	5.05	1.67	3.15	2.26	2.02	1.638	80.96	0.5	5.05
CFL	24.09	27	23.2	13.5	16.1	26.2	6.34	19.4	7.622	39.25	6.3	26.5
CFCL	2.89	2.7	1.85	2.01	2.87	5.16	4.63	3.15	1.265	40.13	1.9	5.16
Group	8.104	6.4	5.75	5.65	5.53	8.21	7.2713	6.7	3.549	52.94	2.9	12.5

Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.

The above Table No.:5.7 showed the Earning per Share of the selected companies of the fertilizer industry in India from the year 1999-000 to 2005-06 tables No.:5.7 showed EPS of IFFCO. The Earning per share of the IFFCO showed highly fluctuated trend during the study period. The EPS was 14.59 Rs. in 1999-2000 which then declined to 12 Rs. in 2000-01.The EPS then rose to 13.80 due to increase in net profit. The EPS was 17.80 Rs. in 2002-03 and 12.50 Rs. in 2003-04. The EPS has gone down to 9.36 Rs. due to decrease in net profit. The EPS was increased and reached at the level of 15.50 Rs.in 205-06. The average EPS was 13.70 Rs. which was good enough compare to industry average of 6.70 Rs. The standard deviation was 2.70 percent and Co-efficient was 19.80 percent.

The above Table No.:5.7 showed indicated EPS of GFCL from 1999-2000 to 2005-06 with an average of 2.32 Rs. The EPS Of this company ranged between zero Rs. in 2002-03 and 7.88 Rs. in 2005-06. The standard deviation was 3.081 percent. The EPS was not in 200-01 and 2002-03 because in these years the EPS was zero. So company is advised to increase net profit by controlling the expenses.

Graph No.5.4



The above Table No.5.7 showed the Earning per share of the GNFC from the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period. From the year 2001-02 the trend of the EPS is upward. The highest value of EPS was 19.52 in the year 2005-06 and the lowest value of the EPS was 4.18 in the year 1999-00. The average value of the EPS was 9.05. The overall trend was considered satisfactory.

The above Table No.:5.7 showed the Earning per share of the Mangalore Chemicals and Fertilizers Ltd. from the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period. From the year 2001-02 the trend of the EPS is upward. The highest value of EPS was 17.33 in the year 1999-00 and the lowest value of the EPS was 0.84 in the year 2001-02. The average value of the EPS was 3.86. The overall trend was considered not satisfactory.

The above Table No.:5.7 showed the Earning per share of the Madras Fertilizer Ltd. from the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period with an average of 0.15 Rs.The highest value of EPS was 0.78 in the year 1999-00 and the lowest value of the EPS was 0 in many year. The average value of the EPS was 0.15. The overall trend was considered not satisfactory.

The above Table No.5.7 showed the Earning per share of the National Fertilizer Ltd from the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period. From the year 2001-02 the trend of the EPS is upward. The highest value of EPS was 5.05 in the year 2002-03 and the lowest value of the EPS was 0.54 in the year 2000-01. The average value of the EPS was 2.02. The overall trend was considered not satisfactory.

The above Table No.:5.7 showed the Earning per share of the Coromandel Fertilizer Ltd. from the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period. From the year 2001-02 the trend of the EPS is upward. The highest value of EPS was 26.51in the year 2000-01 and the lowest value of the EPS was 6.34 in the year 2005-06. The average value of the EPS was 19.42. The overall trend was considered satisfactory.

The above Table No.:5.7 showed the Earning per share of the Chambel Fertilizer & Chemicals Ltd.From the year 1999-00 to 2005-06. The EPS trend of the above said company was fluctuating during the study period. From the year 2001-02 the trend of the EPS is upward. The highest value of EPS was 5.16in the year 2004-05 and the lowest value of the EPS was 1.85 in the year 2001-02. The average value of the EPS was 3.15. The overall trend was considered not satisfactory.

On the basis of EPS analysis of industry, a researcher has concluded that the performance of EPS was the best of IFFCO (13.70) followed by GNFC and CFL. But companies like MFL, NFL, CFCL and GFCL need to increase ESP. These companies could not have better control over administrative expenses.

Earning per share (ANOVA Test)

Null Hypothesis:
There is no any significant difference in **Earning per share** of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in **Earning per share** of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table No.5.8
Earning per share (ANOVA Test)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2240.865	7	320.1236	17.22167	3.69E-11	2.207436
Within Groups	892.2437	48	18.58841			
Total	3133.109	55				

Table No.5.8 Indicates there is significant difference in earning per share of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the Earning per share of fertilizers units under study.

Kruskal Wallis Analysis

EPS of selected companies of fertilizer industry in India and Kruskal Wallis One Way analysis of variance test:

Null Hypothesis: There is no significance difference between EPS of selected companies of Fertilizer Industry.

Alternative Hypothesis: There is significance difference between EPS of selected companies of Fertilizer Industry.
Critical value: 14.067
Level of Significance: 5 percent

Degree of freedom: 7

The calculated value of H works out at H = 41.22, which is higher than the critical value of 14.067. Hence, the rejection of null hypothesis and acceptance of the alternative hypothesis based on Kruskal Wallis's analysis of variance test. The acceptance of alternative hypothesis would indicate that Earning per share of fertilizers units differ from unit to unit.

2. Return on Capital Employed.

In day to day use the term "capital employed' is used to indicate the total investment in the firm whether owners or borrowed. **13** But the capital employed in a firm may be defined in a number of ways and the two most widely accepted definitions are Gross Capital Employed and Net Capital Employed. Gross Capital

Employed usually comprises the total assets used in the business while net capital employed consists of the total assets of the business less its current liabilities.

(I)Return on Gross Capital Employed:-

On the ground that the current liabilities are also a form of capital and all funds must be effectively employed. The Gross Capital Employed concept may be favoured by the analyses. Thus;

Gross Capital Employed = Fixed Assets+ Current Assets

It may be noted that the total of fixed assets and current assets does not necessarily represents total assets or total liabilities of a company.

(II)Net Capital Employed:-

On the ground that further either only short term creditors or only short term debtors should be included in the capital employed. The net capital employed concept may be favored.

Net Capital Employed= Gross capital employed-Current liabilities
OR
Net Capital Employed= Fixed assets- Net working capital

(i) Return on gross capital employed:-

As defined earlier gross capital employed is that total of fixed assets and current assets. Alternatively, it is the quantum of liabilities plus shareholders equity. The numerator, i.e. net profit before interest and taxes has been taken for computing this ratio.

Table No:-5.9

Return on gross capital employed ratio of selected companies of the fertilizer industry in India from 1999-00 to 2005-06.

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	12.95	11.85	13.6	21.2	13.6	12.9	7.02	13.31	4.19	31.45	7	21.2
GFCL	11.82	5.33	12.4	-0.4	8.21	13.1	10.95	8.77	4.88	55.65	-0.4	13.1
GNFC	10.49	12.67	14	14.1	17	24.8	33.36	18.06	8.16	45.21	10	33.4
MCFL	78.6	19.32	12.6	6.95	7.38	9.82	8.34	20.42	26.01	127.34	7	78.6
MFL	6.75	10.82	6.11	15.8	0.37	1.55	-12.34	4.15	8.98	216.34	-12	15.8
NFL	7.46	6.2	8.36	19.3	9.13	19.2	12.85	11.78	5.49	46.60	6.2	19.3
CFL	25.01	21.13	27.8	14.6	15.7	17.1	16.13	19.63	5.11	26.06	15	27.8
CFCL	11.37	12.65	16.4	12.1	14.7	18.7	18.4	14.90	3.00	20.11	11	18.7
Group	20.5563	12.5	13.9	12.9	10.8	14.6	11.839	13.9	8.227	71.093	5.5	28.5

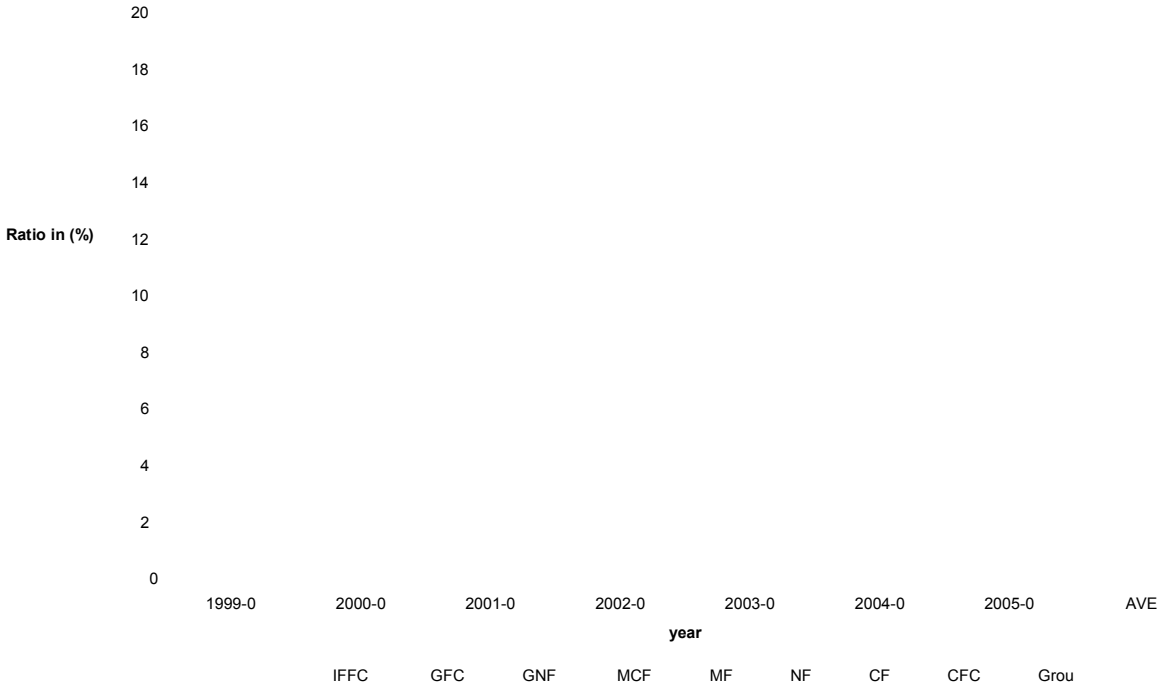
Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.

The Above Table No.5.9 showed Return on gross capital employed of IFFCO. The trend of this ratio was increasing up to 2002-03 and then the trend was declining to 2005-06. The standard deviation was 4.19 percent with an average of 13.31 percent. The return on gross capital employed was 12.95 percent in 1999-2000 and 11.85 percent in 2000-01. The ratio rose to 13.60 percent in 2001-02 and reached at the highest level of 21.20 percent in 2002-03. The ratio then after declined to 13.60 percent in 2003-04 and 12.90 percent in 2004-05. In the last year the ratio was very low. Thus the ratio ranged between 7 percent in 2005-05 and 21.20 percent 2002-03.

The return on gross capital employed of GFCL was shown in the above Table No.5.9.The ratio ranged between minus 0.4 percent in 2002-03 and 13.10 percent in 2004-05 percent in 2004-05.The average ratio was 8.77 percent with a standard deviation of 4.88 percent. The ratio was 11.82 percent in 1999-2000 and 5.33 percent in 2000-01. The ratio was 12.40 percent in 2001-02 and minus 0.40 percent in 202-03. The ratio has been 8.21 percent in 2003-04 which was then after increased to 13.10 percent in 2004-05.

The above Table No.5.9 showed return on gross capital employed of GNFC.The ratio showed very fluctuating trend with an average of 18.06 percent during the study period. The ratio was 10.49 percent in 1999-2000 and rose to 12.67 percent in 2000-01. The ratio was 14 percent in 2001-02 and 14.10 percent in 2002-03.The after it rose and reached to the highest level of 17 percent in 2003-04 and 24.80 percent 2004-05 and 33.36 percent in 2005-06. The ratio was very good in the last three years of study period. The standard deviation was 8.16 percent and co-efficient of variation was 45.21 percent.

Graph No.5.5
Return on gross capital



The above Table No.5.9 has shown return on gross capital employed of MCFL. The ratio was 78.60 percent in 1999-000 which was sharply declined to 19.32 percent in 2000-01. The ratio was 12.60 percent in 2001-02 and 6.95 percent in 2002-03. The ratio rose to 7.38 percent in 2003-04 and 9.82 percent in 2004-05. The average ratio was 20.42 percent with co-efficient of variation of 127.34 percent which shows highly fluctuations in among the ratio.

The return on gross capital employed of MFL was shown in the above Table No.5.9 the ratio was 6.75 percent in 1999-2000 and it went up to 10.82 percent in 2000-01. The ratio was 6.11 percent in 2001-02 and 15.80 percent in 2002-03. The ratio sharply declined to 0.37 percent in 2003-04 and 1.55 percent in 2004-05.the average ratio was 4.15 percent with the standard deviation of 8.98 percent.

The above Table No.5.9 shows the gross capital employed ratio of National Fertilizer Ltd from 1999-00 to 2005-06. The trend of the above said ratio was mixed during the study period. The trend was downward in the beginning of the study and in the year 2003-04 it was upward further it increases in the year 2004-05. The highest value of the ratio was 19.17in the year 2004-05 and the lowest value of the ratio was 6.2in the year 2000-01. The average value of the ratio was 11.78 with a standard deviation of 5.49 percent co-efficient of variation of 46.60. The overall position was good.

The above Table No.5.9 shows the gross capital employed ratio of Coromandel fertilizers Ltd from 1999-00 to 2005-06. The trend of the above said ratio was mixed during the study period. The trend was upward up to the year 2001-02 than it declines up to the year 2003-04 further it increases till the end of study period. The highest value of the ratio was 27.76 in the year 2001-02 and the lowest value of the ratio was 14.57 in the year 2002-03. The average value of the ratio was 19.63 which were higher than the industry average. The standard deviation was 5.11 percent and co-efficient of variation of 26.06 percent.

Chambal Fertilizers & Chemical Ltd.

The above Table No.5.9 shows the gross capital employed ratio of Chambal fertilizers & chemical Ltd. from 1999-00 to 2005-06. The trend of the above said ratio was mixed during the study period. The trend was upward up to the year 2001-02 than it declines up to the year 2003-04 further it increases till the end of study period. The highest value of the ratio was 18.65 in the year 2004-05 and the lowest value of the ratio was 11.37 in the year 1999-00. The average value of the ratio was 14.90 with the standard deviation of 3.00 percent

On the basis of above analysis it van be said that the MCFL could earn highest return on gross capital employed followed by CFL, GNFC, CFCL and IFFCO.The performance of GFCL and MFL was below average than industry average.

Return on Gross Capital Employed Ratio (ANOVA Test)

Null Hypothesis:
There is no any significant difference in Return on Gross Capital Employed Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Return on Gross Capital Employed Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table no.5.10
Return on Gross Capital Employed Ratio (ANOVA Test

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1539.008	7	219.8584	1.89098	0.091786	2.207436
Within Groups	5580.81	48	116.2669			

Total	7119.818	55				

From the above Table no.5.10, it is clear that difference in between groups and within groups was not significant because the calculated value of 'F' (1.89) was lower than the table value of 'F' (2.20). Analysis indicates that there were similarities in Return on Gross Capital Employed Ratio of Fertilizer units under study.

Kruskal Wallis Analysis

Null Hypothesis: There is no any significant difference in Return on Gross Capital Employed Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Return on Gross Capital Employed Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 14.067

Degree of freedom: 7

Calculated Value of H = 22.62

Kruskal Wallis Analysis showed the calculated value of H works out at 22.62, which is higher than the critical value of 14.067. Hence, the rejection of null hypothesis and acceptance of the alternative hypothesis based on Kruskal Wallis analysis of variance test. The acceptance of alternative hypothesis would indicate that in fertilizers units gross capital employed ratio differ from unit to unit.

(II) Return on Net Capital Employed:-

Net Capital Employed is the total of fixed assets plus current assets minus current liabilities. Alternatively, it is the quantum of permanent capital e.g. Non current liabilities plus shareholder's equity. The numerator, e.g. Net profit before interest and taxes but after depreciation has been taken for computing this ratio.

$$\text{Return on Net Capital Employed} = \frac{\text{Net Profit before interest and taxes}}{\text{Net Capital Employed}} * 100$$

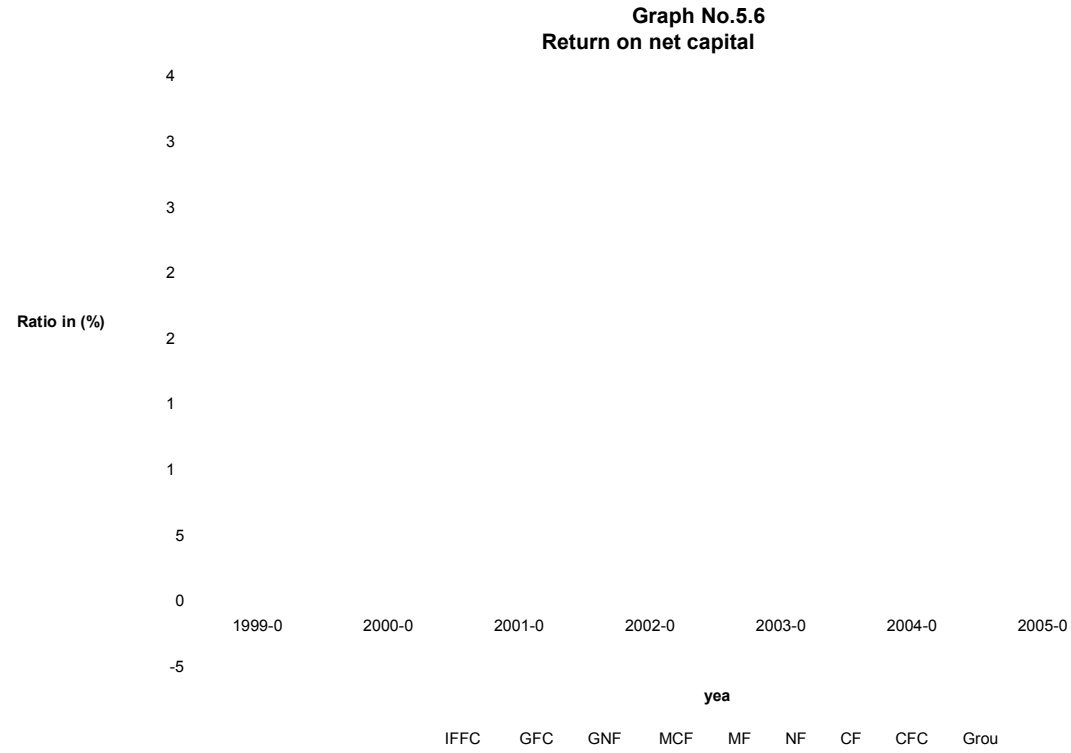
This ratio is the best of overall profitability and efficiency of the business firm. A company with high rate of return on capital employed will be in a position to capitalise; e.g. it can take advantage of all favourable market opportunities.

. **Table no.5.11**

Return on net capital employed ratio of selected companies of the fertilizer industry in India from 1999-00 to 2005-06.

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	13.37	11.76	13.3	22.17	13.19	12.7	9.64	13.73	3.95	28.77	9.64	22.17
GFCL	16.31	4.98	12	-0.45	9.21	10.5	13.76	9.47	5.64	59.61	-0.5	16.31
GNFC	11.26	12.85	12.9	14.12	16.61	25.7	33.4	18.12	8.27	45.65	11.3	33.4
MCFL	11.92	19.89	12.3	10.49	10.4	14.6	11.87	13.07	3.32	25.42	10.4	19.89
MFL	14.38	0	0	13.37	0	0	0	3.96	6.78	170.94	0	14.38
NFL	7.51	6.3	7.59	28.65	9.08	16.5	14.09	12.81	7.93	61.91	6.3	28.65
CFL	27.51	23.6	30.8	16.17	19.25	17.5	18.44	21.90	5.56	25.37	16.2	30.84
CFCL	12.13	12.73	14.5	15.22	14.29	15.3	16.1	14.33	1.4334	10.00	12.1	16.1
Group	14.2988	11.51	12.9	14.97	11.5	14.1	14.6625	13.42	5.3606	53.46	8.18	22.72

Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.



The above table showed return on net capital employed of IFFCO. The ratio showed fluctuating trend during the study period. The ratio was 13.37 percent in 1999-2000 and 11.76 percent in 2000-01. The ratio gain rose to 13.30 percent in 2001-02 and it was reached at the highest level of 22.17 percent in 2002-03. The ratio then after declined to 13.19 percent in 2003-04 and 12.70 percent in 2004-05. The ratio was then slightly declined to 9.64 percent with an average of 13.73 percent. The standard deviation was 3.95 percent and co-efficient of variation was 28.77 percent.

The above table depicted the return on net capital employed of GFCL. The ratio showed decreasing trend from 1999-2000 to 2002-03 then after it was increasing from 2003-04 to 2005-06. The ratio was 16.31 percent in 1999-2000 and then it went down to 4.98 percent in 2000-01. The ratio again was raised to 12 percent in 2001-05 which very low and minus 0.45 percent in 2002-03. The ratio then after increased and reached to 9.21 percent and 10.50 percent in 2004-05. The ratio was very good in 2005-06 of 13.76 percent. The ratio ranged between minus 0.45 percent in 2002-03 and 16.31 percent in 1999-2000 with an average of 9.47 percent.

The above table showed return on net capital employed of GNFC with an average of 18.12 percent. The ratio was 11.26 percent in 1999-2000 and then it rose to 12.85 percent in 2000-01. The ratio was 12.90 percent in 2001-02 and it went up to

14.12 percent in 2002-03. The ratio was showing increasing trend from 2003-04 to 2005-06.The ratio was showing progressive trend during the study period. The ratio was very good and company's earning capacity was good.

Return on net capital employed of MCFL was manifested in above table. The average ratio was 13.07 percent with fluctuating trend during the study period. The ratio was 11.92 percent which rose to 19.89 percent in 2000-01 and then it declined to 12.30 percent in 2001-02. The ratio has been slightly fluctuated and went down to 10.49 percent and 10.40 percent in 2003-04. The ratio was 14.60 percent in 2004-05 and then after it declined to 11.87 percent. The standard deviation was 3.32 percent and co-efficient of variation was 25.42 percent. The ratio ranged between 10.40 percent in 2003-04 and 19.89 percent in 2000-01.

The return on net capital employed of MFL was 14.38 percent in 1999-2000 which were zero in 2000-01 and 2001-02. The ratio rose to 13.37 percent in 2002-03.Once again the ratio were zero in 2003-04, 2004-05 and 2005-06. The return on net capital employed was very bad in this company. The standard deviation was 3.96 percent and co-efficient of variation was 6.78 percent.

The return on net capital employed of NFL was depicted in the above table. The return on net capital employed was 7.51 percent in 1999-2000 and 6.30 percent in 2000-01. The ratio was 7.59 percent in 2001-02 and rose to 28.65 percent in 2002-03. The ratio then after declined to 9.08 percent and again rose to 16.50 percent. But it was slightly gone down to 14.09 percent in 2005-06. The average ratio was 12.81 percent with a standard deviation of 7.93 percent and co-efficient of 61.91 percent.

The above table showed return on net capital employed of CFL. The ratio was 27.51 percent in 1999-2000 and then rose to 23.60 percent in 2000-01. The ratio was the highest of 30.84 percent in 2001-02 after this year the ratio declined to 16.17 percent in 2002-03 but again it went up to 16.17 percent in 2002-03. The ratio was 19.25 percent in 2003-04 and has gone down to 17.50 percent in 2004-05 but again it rose to 18.44 percent in 2005-06. The ratio ranged between 16.20 percent in 2002-03 and 30.84 percent in 201-02 with an average of 21.90 percent. The standard deviation of was 5.56 percent and co-efficient of variation was 25.37 percent.

The return on net capital employed of CFCL was seen in the above table. The average ratio has been of 14.33 percent with standard deviation of 1.433 percent. The

ratio showed progressive trend during the study period. The ratio was 12.13 percent in 1999-2000. The ratio then after increased to 12.73 percent in 2000-01 and 14.50 percent in 2001-02 and 15.22 percent in 2002-03. The ratio was gone down to 14.29 percent in 2003-047 and again it went up to 15.30 percent in 2004-05 and 16.10 percent in 2005-06 with average of 14.33 percent.

On the basis of analysis the return on net capital was found highest of 21.90 percent in CFL and the lowest return on net capital employed was found of 3.96 percent in MFL. The Return on net capital employed was below industry average of GFCL, NFL and MCFL.

Return on Net Capital Employed Ratio (ANOVA Test)

Null Hypothesis:
There is no any significant difference in Return on Net Capital Employed Ratio of Fertilizer units under study.

Alternative hypothesis:
There is significant difference in Return on Net Capital Employed Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207
Degree of freedom: 55

Table no.5.12
Return on Net Capital Employed Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1403.24	7.00	200.46	5.97	0.00	2.21
Within Groups	1612.01	48.00	33.58			
Total	3015.25	55.00				

Table No.5.12 showed the F calculated value > F critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that the Return on Net Capital Employed ratio does differ significantly.

Kruskal Wallis Analysis
Null Hypothesis: There is no any significant difference in Return on Net Capital Employed Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Return on Net Capital Employed Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 14.067

Degree of freedom: 7

Calculated Value of H = 23.61

Kruskal Wallis Analysis reveals that the calculated value of H equal to 23.61 is more than the critical value 14.067. Therefore, the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 per cent level of significance is rejected. The rejection of the null hypothesis and acceptance of its alternative hypothesis would mean that there is significant difference between the net capital employed ratio of fertilizers units under study.

(3) Return on Net Worth:-

Return on net worth is also known as return on shareholders equity. This ratio shows how the firm will have used the resources of owners. It may true that this ratio is one of the most relationship in financial analysis. This return on net worth is calculated by following formula:

$$\text{Return on Net Worth} = \frac{\text{Net Profit after Taxes and Interest}}{\text{Net Worth}} \times 100$$

Where, owner's equity = share capital + reserve & surplus.

This ratio indicated the extent to which this objective has been fulfilled. This, ratio reflects great interest to present as well as prospective shareholders and also important for management, because management has responsibility of maximizing the owners wealth the market place.

This ratio would be compared with the ratios for other similar companies as well as the industry average. Thus, it shows the relative performance and strength of the company.

According to Weston and Brigham "The usual standard of the return on owners fund is 10-15 percent."[14]

. **Table no.5.13**

Return on net worth ratio of selected companies of the fertilizer industry in India from 1999-00 to 2005-06.

Company	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	AVE.	S.D.	co-eff	min	max
IFFCO	13.82	9.25	11.5	18.39	10.34	9.98	9.96	11.90	3.24	27.21	9.98	18.39
GFCL	7.93	-13.9	2.52	-20.02	9.4	16.6	28.61	4.46	16.86	378.18	-20	28.61

GNFC	8.58	12.97	9.36	11.96	15.3	25.6	27.66	15.92	7.67	48.19	9	27.66
MCFL	35.09	22.13	5.96	7.47	7.65	10.9	11.19	14.34	10.61	74.00	6	35.09
MFL	8.73	0	0	-20.03	0	0	0	-1.61	8.75	-541.92	-20	8.73
NFL	2.53	1.95	3.25	27	8.07	14.2	9.53	9.50	8.90	93.62	2	27
CFL	24.6	24.36	26.7	12.16	15.38	19.5	20.45	20.44	5.27	25.77	12	26.67
CFCL	14.39	12.16	9.2	19.95	17.41	22.3	19.99	16.48	4.74	28.76	9	22.27
Group	14.4588	8.621	8.56	7.11	10.44	14.9	15.9238	11.43	8.25	16.726	1	24.3

Sources: Annual Reports and Accounts from 1999-2000 to 2005-06.

The above Table No. 5.13 showed the ratio of rerun on net worth of IFFCO which also indicated fluctuated trend with an average of 11.90 percent. The highest ratio had been found of 18.39 percent and the lowest ratio had also been found of 9.98 percent in 204-05. The standard deviation was 3.24 percent with co-efficient of 27.21 percent. The ratio was quite satisfactory.

The ratio of return on net worth of GFCL was seen in above Table No. 5.13. The ratio explained the progressive trend with an average of minus 20.02 percent in 2002-03 and 28.61 percent in 2005-06.The ratio showed standard deviation of 16.86 percent and co-efficient of variation of 378.18. The co-efficient of variation showed very highly fluctuated during the study period. The average ratio was not satisfactory by ratio in the years of 2005-06, 2004-05 and 2003-04 were very good. The company had shown good performance in the last three years.

The above Table No. 5.13 showed Return on net worth of GNFC. The ratio showed increasing trend with an average of 15.92 percent. The return on net worth ratio ranged between 9.36 percent in 2001-02 and 27.66 percent in 2005-06. The standard deviation was 7.67 percent and co-efficient of variation was 7.67 percent.The average ratio was above average of industry.

Graph No.5.7
Return on net

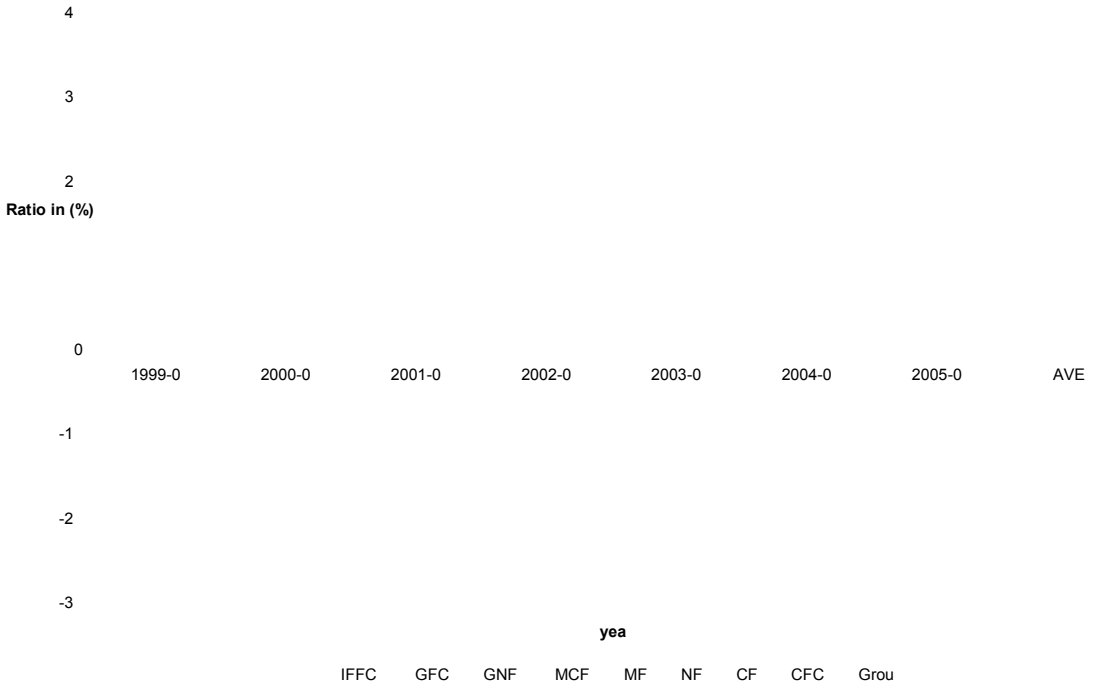


Table No. 5.13. manifested the return on net worth of MCFL. The ratio has been on an average of 14.34 which was very higher than the industry's average. The standard deviation was 10.61 which was near to return on net worth. The return on net worth ratio was found the highest of 35.09 percent in 1999-2000 and the same ratio was found the lowest in 5.86 percent in 2001-02. The ratio was very good in most of the years except in the years of 2001-02 and 2002-03.

The above Table No. 5.13 indicated the return on net worth of MFL with an average of minus 1.61 percent.The ratio showed negative trend during the study period. The ratio was 8.73 percent in 1999-2000 and the after it showed zero in the years of 2000-01, 2001-02. The ratio was minus of 20.03 percent in 2002-03. The ratio again found zero in the last three years of study period. The ratio was negative due to negative net profit during the study period.

The return on net worth was depicted in the above Table No. 5.13 of NFL. The ratio was ranged between 2.53 percent in 1999-2000 and 27 percent in 202-03 with n average of 9.50 percent. The average was ratio below the average of industry which was not indicating good market position of this company. The standard deviation was 8.90 percent which was near the average ratio.

The above Table No. 5.13 showed return on net worth of CFL with decline trend. The average ratio was 20.44 percent which was the best. The ratio was 24.60 percent in 1999-2000 but it was lightly declined to 24.36 percent in 2000-01. The ratio again indicated growth and reached to 26.70 percent which was the highest. The ratio was 12.16 percent in 2002-03 and 15.38 percent in 2003-04. The ratio again increased to previous year to 19.50 percent and 20.45 percent in 2005-06.

The return on net worth of CFCL was seen in the above Table No. 5.13. The ratio ranged between 9.20 percent in 2001-02 and 22.27 percent in 2004-05 with an average of 16.48 percent. The standard deviation was 4.74 percent and co-efficient of variation was 28.76 percent. The average ratio was 16.48 percent which was above the average ratio of industry.

The analysis indicates that the highest ratio of return on net worth was found in CFL followed by CFCL, MCFL, GNFC and IFFCO. The companies like GFCL, MFL, and NFL need to increase net profit in order to increase return on net worth.

Return on Net worth Ratio (ANOVA Test)

Null Hypothesis: There is no any significant difference in Return on Net worth Ratio of Fertilizer units under study.

Alternative hypothesis: There is significant difference in Return on Net worth Ratio of Fertilizer units under study.

Level of Significance: 5 percent

Critical value: 2.207

Degree of freedom: 55

Table no.5.14
Return on Net worth Ratio (ANOVA Test)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2506.28	7.00	358.04	4.26	0.00	2.21
Within Groups	4032.61	48.00	84.01			
Total	6538.88	55.00				

Table no.5.14 indicates there was significant difference in Return on Net worth Ratio of Fertilizers units under study because the calculated value of 'F' was higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that in Return on Net worth Ratio of fertilizers units under study are highly deviated.

Kruskal Wallis Analysis

- **Null Hypothesis**: There is no any significant difference in Return on Net worth Ratio of Fertilizer units under study.
- **Alternative hypothesis:** There is significant difference in Return on Net worth Ratio of Fertilizer units under study.
- **Level of Significance: 5 percent**
- **Critical value: 14.067**
- **Degree of freedom: 7**
- **Calculated Value of H = 23.65**

Kruskal Wallis Analysis (H) cal > H critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that the Return on Net worth ratio of fertilizers units does differ significantly.

Conclusion:

Chapter titled "analysis of financial efficiency" describes the conceptual framework of financial efficiency and profitability. Financial efficiency is the ability of a given investment to earn a return from its use. It's vital instrument to measure not only the business performance but also overall efficiency in its concerned.

In present study seven types of measurement tools of financial efficiency were discussed I.e. Gross profit ratio, operating ratio, net profit ratio, earning per share, return on gross capital employed, return on net capital employed, return and return on net worth. Generally, Earning per share ratio uses widely and famous. The present study showed concept, importance and measurement tools for profitability performance for measure the efficiency of business organization.

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CHAPTER –6
PRODUCTIVITY ANALYSIS

Concept of Productivity

"Productivity is the basic mission of any organization to provide the maximum welfare for the maximum number. Productivity as a measure of efficiency and effectiveness and as a means of improving the quality of life is generic from achieving the highest output from the limited resources. Productivity implies the certainty of being able to do better than yesterday and keeping the tempo continuously to improve upon. Such continuous improvements are to be generated through the research for new technique, methods, process, materials, software, and expertise coupled with vision and dedicated leader - ship having the ultimate faith in the welfare in the welfare of human system. "**1**

"Productivity means different things to different people. To workers productivity means a speed up in their work pattern. To union leaders it means the opportunities to negotiate for higher wages. To management, it means increased profitability. To customer, it betters goods after costs. To marketing directors productivity improvement increases the firm's competitiveness abroad by reducing the coat of good sold in foreign market and to economists; it means an increase in country's standard of living field to gain in output per man-hour. "**2**

Productivity is simply the ratio of output to input. When this ratio is calculated in based price it indicates the change in productivity efficiency over the base year. As the input consist of a number of production factors and elements. Productivity can also be determined separately for each of these factors. Both the output and the input may be expressed in terms of physical units or interims of money.

Productivity is measured as the ratio between the output of a given commodity or service and the inputs used for that product. Productivity ratio is the ratio of output of wealthy produced to the input of resources used in the process.

Productivity and Production:

Productivity and production are often not distinguished at all. Productivity is" The measure of the efficiency in production factors, inputs, and / or factor / input Services.[3] But production is the amount of absolute flow of product during given period without talking the input factors into consideration.

The term "Productivity" is used with reference to performance in production and measuring efficiency of organization, which refers, of improvements in productivity.

"A rise in productivity may con note an increase in output with same resources or the same output by utilizing a smaller quantum of resources. If productivity increases in an economy it means that its factors of production and commodity inputs are manifesting increase in their output efficiency" [4] Thus increasing productivity means the increasing efficiency of various resources of production or better results with lesser efforts. Therefore, measurement of productivity indicates results of performance and efficiency of any enterprise or organization. "It is the pivot of all the productive economic activities affecting the cost of production and determining all the variables like the prices, wages, salaries and cost of capital and services."[5] The key to efficiency and higher productivity lies in working better, ensuring quality rather than faster, ensuring only quantity. "One of the best proper uses of team work and competition is to increase productivity."[6]

On the whole it can be said that production is an absolute term and refers to the total value or quality of goods or services produced during a

period. Productivity, on the other hand, is such a relative terms as shows not only the value or quantity of output or production but also its relation to the input or resources used in turning out a given amount of output. Increase in production does not necessarily result in increase in productivity.

Productivity and Profitability:

Productivity is a sigh of efficiency in production. It can be raised only when production is carried out in a more economical manner. Lower productivity is of Wastage and inefficiency in the use of resources. Higher productivity results in higher Profits. The level of productivity sees to it that maximum outcome should take place from whatever minimum input one engages in the best of a concern depends upon profits. The level of productivity sees to it that maximum outcome should take place from whatever minimum input one engages in the best of a concern depends upon the maximum profit it draws. The profit earned thus brings in the term 'profitability'. If selling prices are increased. The profitability of an enterprise will also increase but it will have a zero effect on the productivity level. In this c**ontex J. P. Srivastava remarks,** "In between cost and profitability there are actually so many other factors besides productivity. For example, Profitability may have its origin in current scarcity."**7**

Thus profitability does not necessarily increase the real wealth of an enterprise as it may increase whenever either the selling prices are increased or by overlooking the effect of inflation etc. He further points out that "the stresses of development and the market mechanism may be playing their due role in inflating the profitability of a product unit. While rationalization of effort in every direction is the true basis of productivity"**8**

However, Chen and Garrah observe: "with due allowances for temporary current value fluctuations or changes in commodity of product prices there is a strong positive correlation among time series data measuring productivity, profitability, or efficiency. They are of the view; " All these

measures indicate a rate of growth in capabilities of organization to fulfill their mission, mainly, to produce and distribute more and better products or services by managing the development and application of technology and human resources." [9] Higher productivity results in higher profit and brings prosperity not only for the concern but also for the workers, the consumers and the nation as a whole lower cost and higher profit, greater stability and incentive for expansion, widespread market, overall prosperity and growth of industry.

Partial Productivity and Overall Productivity:

Partial of factorial is the productivity of individual factors, which contributes to the overall productivity. In order to obviate the difficulty to the overall arising out of diversity of methods of measurement of units of input of different factors (Material, Labour, Overheads) it is convenient to adopt cost as a convenient measure of productivity. In other words, various input and output factors are measured in terms of money and overall productivity, which measured as follows.

$$\text{Overall productivity} = \frac{\text{Cost of output}}{\text{Cost of input}}$$

Overall productivity e.g. the productivity of the business as a whole at king all input factors together may be determined provided the different inputs are expressed in the same quantitative units.[10] so it is necessary to measure the output and input as a whole and every input separately to determine the productivity ratios.

Measurement of Output

Output is sometimes difficult to measure because it consists of a products or a group of products. It may be measured in terms of sales value or quantity. "Accounting always measures revenues for those goods and services of the responsibility center that are sold to outside customers."[11]

In the present study both sales value and quantity have been taken into account for measuring the output and the units of output which are weighed by a standard selling price selected for the base period.

Measurement of Input

In the accounting measurement inputs called as interims of cost. Although resources which are physical things e.g. a pound of material and an hour of lobour. It is compulsory to measure these physical constraints with sources common denominator e.g. money for the purpose of management control system."

We need to be extremely cautious of interpreting any productivity gains in any one of the inputs as a gain in labour productivity may reflect. Change in the technological composition of the product.

The interrelationship between the production inputs it is the relative productivity of all the firms inputs that is the dominant sources of its competitive position"**12**

The quantity output of each year has been calculated for each product with adjustment of closing and opening quantity stock. The prices of the year 1997-98 have been taken as the base year prices.

Productivity Accounting:

Production of goods involves three types of cost material, Labour and other costs, Present study of productivity accounting divided in to four types of productivity i.e. .Materials, Labour, overhead and overall.

Materials Productivity:

The cost of materials used in production of ten surpasses, in this view materials are treated as the first factor in production or manufacturing. "Raw materials are the major inputs in an organization and form the bulk which gets converted in to output"**13** Materials is one of the basic inputs which constitute 50 to 70 percent of the total value of the output of selected companies.

Therefore to improve the performance selected companies, material productivity will have to be improved. Computation of material productivity ratios involves the following steps.

Computation of Material Productivity:

For calculating the material productivity ratio, material output (net sales) is divided by the material input the ratio reveals the output received in constant prices per rupees of material input. Suppose the base year material productivity ratio as 100, Material productivity indices have also been calculated. Material index below 100 will mean low productivity and above 100 will mean improvement in productivity in comparison with the productivity of the base year.

Steps for Computation of Material Productivity:

Hypothesis:

For the analysis purpose of material productivity there are two hypothesis based on statistical methods are tested. The first hypothesis is based on Chi-square test while second hypothesis is based on Kruskal Wallis one-way analysis of variance test.

The hypothesis has been tested to overcome the difficulty of understanding and analysis the results. Infect productivity ratios and indices are based on material inputs and total output, which shows to vary over a period of time, the resulting picture of productivity ratios and indices, also describes fluctuations. Acceptance of the following Null hypothesis will resolve both these difficulties.

[1] Hypothesis Based On Chi-Square:

Null Hypothesis: - Indices of material productivity can be represented by the straight-line trend based on the least square method.

Alternative hypothesis: - Material productivity indices can't be described by the line of the best fit.

Level of significance: - 5 percent

Statistical test used: - chi-square

Critical value: - 12.592

Acceptance of null hypothesis would reveal that the calculated value of Chi-square is less then table Value; it means that the null hypothesis is expected and alternative hypothesis if rejected and assumption of researcher is true.

[2] Hypothesis based on Kruskal Wallis one-way analysis of variance Test:

Null hypothesis:-There is no significant different between the material productivity Ratio of the selected fertilizer group of companies.

Level of significance: - 5 percent

Statistical test used: -Kruskal Wallis one-way analysis variance test.

Critical value: - 24.996

Acceptance of null hypothesis describe that there is no significance Describe that there is no significance difference between material productivity of selected fertilizer group of companies while rejection of null hypothesis shows that there is significant difference between the material productivity ratio of the selected fertilizer group of companies

MATERIAL PRODUCTIVITY OF SELECTED COMPANIES OF FERTILIZER INDUSTRY:

(1) Godavari Fertilizer & Chemical Ltd.

Table No:-6.1

Analysis of Material Productivity Ratio in Godavari Fertilizer & Chemical Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O

				FACTOR	INDEX	VALUE	
1999-00	1041.25	930.8	1.119	0.01005	100	107.46	0.894
2000-01	1056.24	842.5	1.254	0.01855	112.06	107.67	0.798
2001-02	1033.64	829.6	1.246	0.01533	111.37	107.88	0.803
2002-03	767.52	604.6	1.27	0.02763	113.48	108.09	0.788
2003-04	909.91	789.1	1.153	0.01963	103.07	108.3	0.867
2004-05	1200.05	960.6	1.249	0.02209	111.67	108.51	0.8
2005-06	1519.99	1294	1.175	0.01355	104.99	108.72	0.851
Total	7528.6	6251	8.465	0.12684	756.64	756.63	5.801
AVG.	1075.514	893.1	1.209	0.01812	108.09	108.09	0.829
STANDARD DEVIATION =5.30				A=108.0907	Chi Square=1.5509		
Co.-Efficient of Variance=4.90				B=0.20957			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

Table No.6.1 describes the material productivity ratio and index of material productivity, average of material indices, co-efficient of variance and value of chi-square for selected fertilizer companies under study.

Table No.6.1 showed the ratio of material productivity of GFCL fertilizer was quite increasing i.e. in 1999-2000 it showed 1.119 while in 2005-06 it highlights 1.175 with an average of 1.209. The trend was increasing from 199-2000 to 2002-03 and the trend was decline in 2003-04, but again it increases to 111.67 in 2004-05. In the last the trend was declined.

Above Table No.6.1 reveals that material productivity of GFCL fertilizer was slightly fluctuating during the period of study as shown by value of co-efficient of variance 4.90.Further in order to test the null hypotheses whether the distribution of material productivity indices of GFCL confirms to the straight line based on least square method. It was found that the calculated value of chi-square figured at 1.55 which is less than the table value of 12.592, Hence null hypotheses is accepted. The computed value of productivity index showed a positive growth.

(2) Gujarat Narmada Vally Fertilizers Company Ltd.

Table No:-6.2
Analysis of Material Productivity Ratio in Gujarat Narmada Vally Fertilizers Company Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1153.06	496.04	2.3245	0.14005	100.000	100.8178	0.430
2000-01	1339.39	615.24	2.1770	0.12993	93.654	100.3001	0.459
2001-02	1404.79	608.46	2.3088	0.138589	99.322	99.78249	0.433
2002-03	1377.32	551.43	2.4977	0.165888	107.451	99.26485	0.400
2003-04	1446.84	579.94	2.4948	0.180972	107.325	98.74721	0.401
2004-05	1822.62	812.56	2.2431	0.134929	96.495	98.22957	0.446
2005-06	2147.57	1019.65	2.1062	0.12142	90.607	97.71193	0.475
Total	10691.59	4683.32	16.1521	1.011778	694.854	694.854	3.044
AVG.	1527.37	669.0457	2.307441	0.14454	99.265	99.26485	0.435
STANDARD DEVIATION =6.411				A=99.264	Chi Square=2.42		
Co.-Efficient of Variance=6.46				B=-0.5176			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

Table No. 6.2 is the data related to the analysis of material productivity ratio of Godavari fertilizer & Chemical Ltd. At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

Table No. 6.2 showed that the ratio of material productivity of Gujarat Narmada Vally Fertilizers Company Ltd. Was slightly fluctuated. In the year 1999-00 the ratio was 2.3245which increases up to 2.4977in the year 2002-03. If we considered the average of the said ratio than it is 2.307441. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation. During the period of study shown by value of co-efficient of variance 6.46.This is further confirmed by chi-square test. The computed value of chi-square 2.42 has been very less than the critical value 12.592.Hence the null hypotheses is accepted and alternative hypotheses is rejected. It showed that the material productivity index follows the trend values. The computed value of productivity index was a 0.51 growth rate per year. It had also been showed that average material requirement per rupees of output for Gujarat Narmada Vally amounted 0.435.

(3) Mangalore Chemicals & Fertilizers Ltd.

Table No:-6.3

Analysis of Material Productivity Ratio in Mangalore Chemicals & Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPU	INPUT	O/I	COEF.	PROD.	TREND	I/O

	T						
				FACTOR	INDEX	VALUE	
1999-00	615.65	376.98	1.6331	0.058927	100.000	99.62857	0.612
2000-01	680.63	450.73	1.5101	0.0471	92.465	97.89611	0.662
2001-02	571.18	352.89	1.6186	0.056173	99.110	96.16365	0.618
2002-03	562.79	371.84	1.5135	0.054215	92.678	94.43119	0.661
2003-04	614.21	367.95	1.6693	0.0607	102.214	92.69873	0.599
2004-05	878.02	595.16	1.4753	0.039079	90.335	90.96627	0.678
2005-06	1082.31	786.94	1.3753	0.031165	84.216	89.23381	0.727
Total	5004.79	3302.49	10.7952	0.34736	661.018	661.0183	4.557
AVG.	714.97	471.7843	1.542166	0.049623	94.431	94.43119	0.651
STANDARD DEVIATION =6.34				A=94.43	Chi Square=1.69		
Co.-Efficient of Variance=6.72				B=-1.173			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

Table No. - 6.3 is the data related to the analysis of material productivity ratio of Mangalore Chemicals & Fertilizers Ltd**.**At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

Table No. - 6.3 showed that the ratio of material productivity of Mangalore Chemicals & Fertilizers Ltd**.** was slightly in the decreasing trend. In the year 1999-00 the ratio was 1.6331which decreases up to 1.3753in the year 2005-06. If we considered the average of the said ratio than it is 1.542166. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation.

Above Table No. 6.3 reveals that material productivity of MCFL was slightly fluctuating during the period of study as shown by value of co-efficient of variation 6.72.Further in order to test the null hypotheses whether the distribution of material productivity indices of MCFL confirms to the straight line based on least square method. It was found that the calculate value of CH-square figured at 1.69 is less than the table value 12.592.Hence null hypothesis is accepted. The computed value of productivity index showed a very high positive growth of 1.173.

(4) IFFCO Ltd.

Table No. 6.4 is the data related to the analysis of material productivity ratio of IFFCo Ltd. At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

Table No. 6.4 showed that the ratio of material productivity of IFFCo Ltd**.** is mix and fluctuating. In the year 1999-00 the ratio was 1.5159which decreases up to 0.7181in the year 2005-06. If we considered the average of the said ratio than it is 1.400423. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation.

Table No: 6.4
Analysis of Material Productivity Ratio in IFFCo Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	4804.96	3169.75	1.5159	0.06066	100.000	112.299	0.660
2000-01	5424.05	3347.58	1.6203	0.06235	106.888	105.6625	0.617
2001-02	5093.37	3399.3	1.4984	0.05737	98.844	99.02601	0.667
2002-03	6090.99	3949.33	1.5423	0.05941	101.742	92.38951	0.648
2003-04	5918.9	3944.2	1.5007	0.05706	98.996	85.75301	0.666
2004-05	7223.92	5132.85	1.4074	0.04539	92.843	79.11651	0.711
2005-06	5452.71	7593.25	0.7181	0.0168	47.372	72.48001	1.393
Total	40008.9	30536.26	9.8030	0.35903	646.685	646.7266	5.362
AVG.	5715.557	4362.323	1.400423	0.05129	92.384	92.38951	0.766
STANDARD DEVIATION =20.28				A=92.3835	Chi Square=15.43		
Co.-Efficient of Variance=21.95				B=-6.6365			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

The chi-square test rejected the null hypothesis and accepted the alternative hypothesis. This confirms the assumption of straight line based on least square method. The growth rate was 6.63 percent which was the best among all selected units. The lowest input output ratio was found in the year of 2000-01 where the company could save the material. The co-efficient of variation was 21.95 which showed fluctuation in out to input ratio.

(5) Madras Fertilizers Ltd.

Table No.6.5 is the data related to the analysis of material productivity ratio of **Madras Fertilizers Ltd.** At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

It is apparent from the Table No.6.5 that the material productivity ratio of Madras Fertilizers Ltd. The trend of the ratio is mix and fluctuating. In the year 1999-00 the ratio was 1.4670 which increases up to 2.1171in the year 2002-03and once again it goes down up to 1.6712 in the year 2005-06. If we considered the average of the said ratio than it is 1.703886. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation.

Table No: 6.5

Analysis of Material Productivity Ratio in Madras Fertilizers Ltd.

(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	636.95	434.2	1.4670	0.03718	100.000	110.955	0.682
2000-01	1404.43	840.98	1.6700	0.054661	113.841	112.6872	0.599
2001-02	1097.63	689.01	1.5931	0.069902	108.596	114.4194	0.628
2002-03	1139.06	538.02	2.1171	0.088136	144.322	116.1516	0.472
2003-04	1139.75	638.18	1.7859	0.068595	121.745	117.8838	0.560
2004-05	1286.22	792.51	1.6230	0.051559	110.636	119.616	0.616
2005-06	1084.22	648.78	1.6712	0.055891	113.921	121.3482	0.598
Total	7788.26	4581.68	11.9272	0.425925	813.061	813.0612	4.155
AVG.	1112.609	654.5257	1.703886	0.060846	116.152	116.1516	0.594
STANDARD DEVIATION =14.04				A=116.15	Chi Square=9.48		
Co.-Efficient of Variance=12.09				B=1.732			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

In MFL the computed value of chi-square showed by 9.48 has been less than the critical value of 12.92. Hence null hypothesis is accepted and Alternative hypothesis is rejected. It showed that the material productivity index follows trend value which was hypotheses. The growth rate was positive of 1.732 percent and the input out ratio was observed very lowest of 0.472 material requirements per rupees of output average for the unit.

(6) National Fertilizer Ltd.

Table No. 6.6 is the data related to the analysis of material productivity ratio of **National Fertilizer Ltd.** At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

It is apparent from the Table No. 6.6 that the material productivity ratio of **National Fertilizer Ltd.** The trend of the ratio is decreasing. In the year 1999-00 the ratio was 2.1981which increases up to 2.1228in the year 2004-05and once again it goes down up to 1.9220in the year 2005-06. If we considered the average of the said ratio than it is 2.275294. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation and rate of decreasing.

Table No: 6.6
Analysis of Material Productivity Ratio in National Fertilizer Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	2483.4	1129.8	2.1981	0.261283	100.000	111.9471	0.455
2000-01	2861.14	1152.49	2.4826	0.316383	112.942	109.1356	0.403
2001-02	3007.05	1231.84	2.4411	0.290718	111.056	106.324	0.410
2002-03	3653.71	1460.31	2.5020	0.270774	113.827	103.5124	0.400
2003-04	3387.62	1499.95	2.2585	0.226337	102.748	100.7008	0.443
2004-05	3474.06	1636.56	2.1228	0.229476	96.574	97.88924	0.471
2005-06	3590.53	1868.11	1.9220	0.212001	87.440	95.07766	0.520
Total	22457.51	9979.06	15.9271	1.806971	724.587	724.5868	3.101
AVG.	3208.216	1425.58	2.275294	0.258139	103.512	103.5124	0.443
STANDARD DEVIATION =9.76				A=103.5124	Chi Square=3.32		
Co.-Efficient of Variance=9.43				B=-2.81			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

In this unit the calculated value of chi-square is 3.32, which is less than the critical value of 12.592. Hence the null hypothesis is rejected and alternative hypothesis is accepted. It indicates that the material productivity indices followed trend value. The computed values of productivity index showed growth of 2.81 per annum resulting with dawn ward trend. Thus, Material productivity of the unit under was found to be gradually down ward

trend during the period of the study with an overall decreasing trend during the period of study.

(7)Coromandel Fertilizers Ltd.

Table No: 6.7 is the data related to the analysis of material productivity ratio of Coromandel Fertilizers Ltd**.** At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

Table No: 6.7 showed that the ratio of material productivity of Coromandel Fertilizers Ltd**.**Was slightly in the decreasing trend. In the year 1999-00 the ratio was 1.5289 which decreases up to 1.2611in the year 2005-06. If we considered the average of the said ratio than it is 1.535511. The constant fluctuation in this ratio shows the mixed trend of the company. It is fact that the overall trend of material productivity shows the fluctuation. Above Table No: 6.7 reveal that the material productivity of IFFCO was marginal fluctuating during the period of study as shown by value of co-efficient of variance 10.11. This is further confirmed by chi-square 3.17 have been very less than critical value 12.59, hence the null hypothesis is accepted and alternative hypotheses is rejected. It showed that the material productivity indices followed the trend values. The computed value of productivity index showed 3.52 growth rates per year. It has also been showed that the average material requirement per rupee of out-put for IFFCO amounted to Rs. 0.657.

Table No: 6.7
Analysis of Material Productivity Ratio in Coromandel Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	606.27	396.53	1.5289	0.05485	100.000	110.19	0.654
2000-01	611.69	371.34	1.6473	0.059905	107.738	106.93	0.607
2001-02	663.58	381.61	1.7389	0.059575	113.732	103.68	0.575
2002-03	590.21	379.7	1.5544	0.061634	101.666	100.43	0.643
2003-04	1240.4	779.48	1.5913	0.05368	104.080	97.178	0.628
2004-05	1554.39	1089.54	1.4266	0.039287	93.310	93.926	0.701
2005-06	1877.27	1488.58	1.2611	0.00637	82.483	90.673	0.793

Total	7143.81	4886.78	10.7486	0.3353	703.009	703.01	4.602
AVG.	1020.544	698.1114	1.535511	0.047900	100.430	100.43	0.657
STANDARD DEVIATION =10.15				A=100.4299	Chi Square=3.17		
Co.-Efficient of Variance=10.11				B=-3.252			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS.

(8) Chambal Fertilizers & Chemicals Ltd

Table No.-6.8 is the data related to the analysis of material productivity ratio of Chambal Fertilizers & Chemicals Ltd. At the time of calculation of ratio mainly two things is considered i.e. output and input of the selected companies.

The above Table No.-6.8 reveals that material productivity of Chambal Fertilizers Ltd. Decline trend from 199-00 to 2005-06. In the year 1999-00 the value was the ratio was 3.1353 and it decline up to 1.9985 in the year 2005-06. The average value of the ratio is 2.567420 and if you consider the ratio of the all the year it is fluctuating from 3.1353 to 1.9985. The conclusion of the said ratio means material productivity ratio trend is mix and fluctuating during the given period. In CFL the computed value of chi-square showed by 0.311 has been less than the critical value 12.592.Hence null hypotheses is accepted and alternative hypotheses is rejected. It shows that the material productivity index follows trend value. The calculated value of productivity index was showing negative growth -5.63 per year. It is observed from the table that material requirement per rupees of output average by Rs. 0.397 for this unit

Table No.-6.8

Analysis of Material Productivity Ratio in Chambal Fertilizers & Chemicals Ltd.

(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	1361.58	434.27	3.1353	0.076139	100.000	98.783	0.319
2000-01	1794.59	622.61	2.8824	0.060317	91.932	93.1509	0.347
2001-02	1909.45	686.98	2.7795	0.058073	88.650	87.5188	0.360
2002-03	1888.56	760.94	2.4819	0.060919	79.158	81.8867	0.403
2003-04	2217.26	932.25	2.3784	0.054874	75.858	76.2547	0.420
2004-05	2679.31	1156.87	2.3160	0.049326	73.868	70.6226	0.432

2005-06	2741.62	1371.85	1.9985	0.05094	63.741	64.9905	0.500
Total	14592.37	5965.77	17.9719	0.4106	573.207	573.207	2.781
AVG.	2084.624	852.2529	2.567420	0.058655	81.887	81.8867	0.397
STANDARD DEVIATION =12.33			A=81.8867		Chi Square=0.311		
Co.-Efficient of Variance=15.056			B= -5.63				

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Material productivity ratios of selected companies from Fertilizer Industry of India and Kruskal Wallis one way analysis of variance test.

Kruskal Wallis test is useful measurement tool to test the null hypothesis that 'K' independent random samples come from identical universes against the alternative hypothesis. It indicates that the universe is not equal.

The comparative position of material productivity ratios of the selected companies have been discussed in Table No.6.9. and with the application of Kruskal Wallis one way analysis of variance test on this ratio. Table No.6.9 describe that the calculation value of 'H' equals to which is less than the table value of hence the null hypothesis based on Kruskal Wallis one way Analysis of variance test at 5 percent level of significant rejected.

$$H = \frac{12}{N(n+1)} \sum_{I=1}^{K} \frac{Ri1}{Ni} - 3(n+1)$$

Where n=n1+n2+n3…nk and RI=sum of the rank

Table No:-6.9

Comparative material productivity ratios of selected companies with Kruskal Wallis one-way analysis of variance

year	Cham	R1	Coro	R2	GNFC	R3	God	R4	IFFCO	R5	Nat	R6	Mad	R7	M
1999-00	3.135	56	1.53	20	2.33	46	1.119	2	1.516	19	2.198	41	1.467	13	
2000-01	2.882	55	1.65	29	2.18	38	1.254	7	1.62	26	2.483	50	1.67	31	
2001-02	2.779	54	1.74	33	2.31	44	1.24	5	1.498	15	2.44	48	1.593	24	

							6				1				
2002-03	2.482	49	1.55	22	2.5	52	1.27	9	1.542	21	2.502	53	2.117	40	
2003-04	2.378	47	1.59	23	2.5	51	1.153	3	1.501	16	2.258	43	1.786	34	
2004-05	2.316	45	1.43	12	2.24	42	1.249	6	1.407	11	2.123	39	1.623	27	
2005-06	1.998	36	1.26	8	2.11	37	1.175	4	0.718	1	1.922	35	1.671	32	
R		**342**		**147**		**310**		**36**		**109**		**309**		**201**	

$$K = \frac{12}{56(56+1)}\left[\frac{(342)^2}{7} + \frac{(147)^2}{7} + \frac{(310)^2}{7} + \frac{(36)^2}{7} + \frac{(109)^2}{7} + \frac{(309)^2}{7} + \frac{(201)^2}{7} + \frac{(142)^2}{7}\right] - 3(56+1)$$

$$= 0.00376\ (57699.4)) - 171$$

$$= 45.72$$

Table No6.9 describe that the calculation value of 'H' equals to 45.72 which is more than the table value of 14.067 hence the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 percent level of significant accepted.

Comparative Analysis of Material Productivity:-

The Table No. 6.10 showed overall picture of material productivity. It includes Out-put input ratio with rank, co-efficient factory, input-output ratio, profitability index, growth rate and the value of chi-square.

Table No.:6.10
Comparative Analysis of Material Productivity

	O/I RATIO		PRO. INDEX		CO-EFF.		CHI-SQ.		I/O RATIO		GROWTH RATE		OVEI ALL
	AVE.		AVE.						AVE.				
COMPANY	VAL.	RANK	VAL.	RNK	VAL.	RNK	VAL. E	RNK	VAL.	RNK	VAL.	RNK	VAL.
Cham	2.57	8	81.88	1	15.06	7	0.311	1	0.4	1	-5.6	2	20
Coro	1.53	3	100.4	5	10.11	5	3.17	5	0.66	6	-3.3	3	27
GNFC	2.31	7	99.26	4	6.46	2	2.42	4	0.44	2	-0.5	7	26

GFCL	1.2	1	108.1	7	4.9	1	1.55	2	0.83	8	0.2	8	27
IFFCO	1.4	2	92.38	2	21.95	8	15.43	8	0.8	7	-6.6	1	28
NAT	2.28	6	103.5	6	9.43	4	3.32	6	0.44	3	-2.8	4	29
MAD	1.7	5	116.2	8	12.09	6	9.48	7	0.59	4	-1.7	5	35
MANG	1.54	4	94.43	3	6.72	3	1.69	3	0.65	5	-1.2	6	24
group	**1.8**		**99.5**		**10.8**		**4.67**		**0.6**		**-3**		**27**

LABOUR PRODUCTIVITY:-

The terms labour productivity is generally defined as the "ratio of physical amount of output achieved in a given period to the corresponding amount of labour expended"[14]. It may be true that any business organization all wage payments are directly or indirectly based on the skill and productivity of the workers, therefore labour productivity is considered as the most important factors in productivity computations. There are various types of methods for calculating the labour productivity. Very simple method describe in the above definition. 'Output divided by input' another method the output per man-years of man-hour and the input per man-years or per man-hour. In the present research study labour input calculated by cost/expenses labour productivity and capacity of utilization could be general indices, which are easily understandable and could be the basis for measurement of the employees.

STEPS IN ACCOUNTING FOR LABOUR PRODUCTIVITY:

HYPOTHESIS:-

For the purpose of measuring the labour productivity, two null hypotheses have been tested with two alternative hypotheses for the purpose of analysis labour productivity indices. The firth hypothesis shows whether the labour productivity indices can be approximately as a straight-line trend. The second hypothesis is whether there is any significant difference the labour productivity of the selected unit of fertilizer Group of companies

HYPOTHESIS BASED ON CHI-SQURE: -

Null Hypothesis: - The labour productivity indices may be represented by the straight line based on least square method.

Alternative hypothesis: the line of the fit can't describe -Labour productivity indices.

Level of significant: - 5 percent

Statistical tool used: -chi-square test

Critical value: - 12.592

If the calculated value of chi-square remains less than the critical value the null hypothesis would mean that the computed value of the indices is based on the least square straight line trend. It may represent the pattern and growth of the labour productivity.

HYPOTHESIS BASED ON KRUSKAL WALLIS ONE WAY ANALYSIS OF CARIANCE:

The second hypothesis is based on kruskal Wallis one-way analysis of variance distribution free test. The acceptance of null hypothesis would mean that there is no significant difference between the labour productivity of the fertilizer Group of companies. On the other hand the rejection of null hypothesis would be possible only if the calculated value exceeds the critical value. In case alternative hypothesis will be accepted which describe that there is significant difference between the labour productivity of fertilizer Group of companies and the null and alternative hypothesis describe below.

Null hypothesis:-There is no significant different between the labour productivity ratios of the selected units of fertilizer Group of companies.

Alternative hypothesis: -There is significant difference between the labour productivity of fertilizer Group of companies

Level of significant: - **5 percent**

Statistical tool used: **- Kruskal Wallis.**

Critical value**: -** 12.592

The rejection of null hypothesis describe that there is significant different between the labour productivity ratio of the selected companies. While acceptance of null hypothesis shows that there is no significance difference between labour productivity of selected birla fertilizer Group of companies

Labour productivity in selected companies: -

Table No. 6.11to 6.20 describes the labour productivity ratio and index of labour productivity average of labour indices, co-efficient of variation and value of chi-square for selected Birla fertilizer Group of companies under study.

Labour productivity in selected companies of fertilizer industry in India:-

(1) Godavari Fertilizer & Chemical Ltd.

Table No:-6.11 shows the data related to the analysis of the labour productivity in Godavari Fertilizer & Chemical Ltd. In a given period of the research study if we highlight the output of the given company, it shows the mixed and fluctuating trend.

Table No:-6.11

Analysis of Labour Productivity in Godavari Fertilizer & Chemical Ltd. **(Rs. In crores)**

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	1126.64	11.54	97.63	0.87748	100	78.208	0.01
2000-01	1020.42	16.32	62.53	0.92515	64.044	74.246	0.016
2001-02	1042.67	13.78	75.67	0.93105	77.503	70.285	0.013
2002-03	749.6	18.89	39.68	0.86358	40.646	66.324	0.025
2003-04	953.31	19.51	48.86	0.83201	50.049	62.362	0.02
2004-05	1143.68	22.77	50.23	0.88823	51.447	58.401	0.02
2005-06	1509.61	19.19	78.67	0.9077	80.577	54.44	0.013

Total	7545.93	122	453.3	6.22519	464.27	464.27	0.118
AVG.	1077.99	17.43	64.75	0.88931	66.324	66.324	0.017
STANDARD DEVIATION =20.868				A=66.3237	Chi Square=33.965		
Co.-Efficient of Variance=31.463				B=-3.961			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

The output of the company varies between Rs. 1509.61 crores to 749.6 crores. In the year 2002-03 the output of the company was very low and in the year 2005-06 the output of the company was good. Another side of the table is labour input. Labour input of the company is also varied time to time in the year 1999-00 it was 11.54 crores and it increase up to Rs. 16.32 crores in the year 2000-01. The highest labour consumed in the year 2004-05 i.e. Rs. 22.77 crores but highest output of the company is Rs. 1509.61 crores in the year 2005-06 with the consumption of labour Rs. 19.19 crores. The labour productivity ratio of the company varies from time to time In the year 1999-00 the ratio was 97.6291 and it decrease up to 39.6824 in the year 2002-03. In the year 2005-06 the ratio was 78.6665. The average value of the given ratio is 64.751329. The co-efficient of variation shows 31.46 percent and standard deviation also indicated 20.868 percent. So the fluctuated trend was there during the study period. The computed chi-square value describes 33.96 which are more than the critical value of 12.59. Therefore null hypotheses is rejected and alternative hypotheses accepted, its means that L.P indices and be described by the line of it bit.

The straight line trend showed a positive annual growth of 3.96 which indicates a good growth of labour productivity. Further above table showed the input requirement per rupees of output were lowest in 0.01 in 1999-2000.

(2) Gujarat Narmada Vally Fertilizers Company Ltd.

Table No:-6.12
Analysis of Labour Productivity in Gujarat Narmada Vally Fertilizers Company Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1177.45	82.28	14.3103	0.862177	100	96.847	0.07

2000-01	1348.15	93.08	14.4838	0.864428	101.212	97.60929	0.069
2001-02	1386.83	93.19	14.8817	0.893306	103.993	98.37157	0.067
2002-03	1371.1	104.8	13.083	0.868918	91.424	99.13386	0.076
2003-04	1437.52	126.83	11.3342	0.822176	79.203	99.89615	0.088
2004-05	1844.4	121.87	15.1342	0.910385	105.757	100.6584	0.066
2005-06	2150.99	133.79	16.0774	0.926848	112.348	101.4207	0.062
Total	10716.44	755.84	99.3046	6.148239	693.939	693.937	0.499
AVG.	1530.92	107.9771	14.18637	0.87832	99.134	99.13386	0.071
TANDARD DEVIATION =10.83				A=99.133	Chi Square=6.87		
Co.-Efficient of Variance =10.925				B=0.7622			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table No.:-6.12 showed the analysis of the Labour productivity in Gujarat Narmada Vally Fertilizers Company Ltd. The analysis period for the given company is 1999-00 to 2005-06 which is the duration of the 7 years. The above table reveals that the out of the GNFC increases time to time. In the year 1999-00 the output of the GNFC was Rs. 1177.45 crores, it increases up to Rs. 1371.1 crores in the year 2002-03 and it reached up to 2150.99 crores in the year 2005-06. The average output of the company is Rs. 1530.92 crores. This is good to compare with the corresponding year. The input trend of the company is also in the direction of increase. In the year 1999-00 the input of the company was Rs. 82.28 crores it increase up to Rs. 104.8 crores in the year 2002-03 and it touched the highest rank in the year 2005-06.

In the beginning year of this research the ratio shows the decreasing trend but at the end of the study it shows the increase in the trend. In the year 1999-00 the labour productivity ratio of the company was 14.3103, it decreases up to 11.3342 in the year 2003-04. in the final year of this study this ratio increase up to 16.0774. The average value of the given ratio is 14.186367.

The productivity index shows the fluctuation in the given study period. The highest productivity of the company was in the year 2005-06. And the average productivity of the company was 99.134. At this productivity we can say that company's labour productivity is good. The co-efficient variation shows 10.83 percent. Computed Chi-square value highlights 6.87 which is less

than he table value of 12.592.Hence null hypotheses is accepted labour productivity indices can be approximated by the least square straight line trend. the straight line trend showed negative annual growth by 0.7622 of labour productivity, further above table showed the input requirement per rupees of output were lowest in 2005-06 at figured 0.062.

(3) Manglore Chemicals & Fertilizers Ltd.

Table No:-6.13
Analysis of Labour Productivity in Manglore Chemicals & Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	600.75	23.71	25.3374	0.914245	100.000	90.63696	0.039
2000-01	699.03	24.92	28.0510	0.874927	110.710	97.968	0.036
2001-02	560.05	21.92	25.5497	0.886715	100.838	105.2991	0.039
2002-03	589.24	25.53	23.0803	0.826743	91.092	112.6301	0.043
2003-04	592.43	24.05	24.6333	0.895748	97.221	119.9611	0.041
2004-05	870.36	25.38	34.2931	0.908416	135.346	127.2922	0.029
2005-06	1128.83	29.08	38.8181	0.879605	153.205	134.6232	0.026
Total	5040.69	174.59	199.7629	6.186399	788.411	788.4107	0.253
AVG.	720.0986	24.94143	28.537556	0.883771	112.630	112.6301	0.036
Standard deviation =22.97				A=112.63	Chi Square=14.32		
Co.-Efficient of Variance=20.394				B=7.33			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table No.:-6.13 showed the analysis of the Labour productivity in Mangalore Chemicals & Fertilizers Ltd. It reveals the output of the unit which ranged between 560.05 crores to 1128.83 crores. The output of the unit is Rs. 600.75 crores in the year 1999-00 and it decrease up to 560.05 crores in the year 2001-02, further it increase up to 1128.83crores in the year 2005-06. The output of the unit shows decreasing trend in the beginning and it ends with the increasing trend. The average out of the given period is 720.0986 crores.

The above Table No.:-6.13 describe the input of the company i.e. labour cost incurred to produce the given output. The input trend of the company is fluctuating. In the year 199-00 the input of the unit was Rs. 23.71 crores, in the year 2001-02 it was Rs. 21.92 crores and it increases up to Rs.

29.08 crores in the year 2005-06. The average value of the input is 24.941 crores so entire trend is fluctuating.

The labour productivity ratio varies from year to year. In the year 1999-00 the value of the ratio was 25.3374 and it decline in the year 2002-03 up to 23.0803. In the year 2005-06 the value of the given ratio was 38.8181, this shows the highest value of the ratio. The average value of the ratio is 28.5375.

Comparing to the base year the average index of the unit is 112.630. Labour productivity index also shows the mixed trend through the research. It ranged from 91.092 percent to 153.205 percent.

(4)IFFCo. Ltd.

Table no.:-6.14 describe that labour productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

It was apparent from the Table no.:-6.14 that labour productivity of IFFCo Ltd. Fluctuated through out the research study period. The out put of IFFCo Ltd. amounted to Rs. 5058.28 crores in the year 1999-00 which is increased up to Rs. 6171.51 crores in the year 2002-03 and once again it increases up to Rs. 7082.3 crores in the year 2004-05. The average value of the out put is Rs. 5741.756 crores during the study period. On the other hand the labour input also fluctuated during the study. The labour input varies between223.08 crores to 277.69 crores. In the year 2005-06 the labour input was the highest but output of corresponding year is not maximum. It shows the average ability of utilization of labour input in given unit. The average value of the labour input in a given period is 253.298 crores.

Table No:-6.14
Analysis of Labour Productivity in IFFCo Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	5058.28	241.18	20.9730	0.83927	100.000	105.6443	0.048
2000-01	5261.96	223.08	23.5878	0.90763	112.467	106.4517	0.042

2001-02	5165.82	234.48	22.0310	0.84356	105.044	107.2592	0.045
2002-03	6171.51	272.54	22.6444	0.8723	107.969	108.0666	0.044
2003-04	5760.02	256.37	22.4676	0.85423	107.126	108.874	0.045
2004-05	7082.3	267.75	26.4512	0.85312	126.120	109.6815	0.038
2005-06	5692.4	277.69	20.4991	0.47944	97.740	110.4889	0.049
Total	40192.29	1773.09	158.6541	5.64955	756.467	756.4662	0.311
AVG.	5741.756	253.2986	22.664870	0.80708	108.067	108.067	0.044
STANDARD DEVIATION =9.37				A=108.066	Chi Square=	4.65	
Co.-Efficient of Variance=8.67				B=0.807			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

As per the results of output and input the labour productivity ratio also fluctuated during the study. This ratio occurs from 20.4991 to 26.4512. The average value of the said ratio is 22.664870. So the ratio of the given unit fluctuates during the study period. Similarly the productivity index also fluctuate the average of the indices. The value of chi-square figured at 4.65 which is less than the table value of 12.592 therefore null hypotheses is accepted and an alternative hypothesis is rejected. The standard deviation is 9.37 and Co.-Efficient of Variance is 8.67. Overall labour productivity ratio is more than 100 so we can consider this as a good output for the given company in a given study period. It may also be seen from the table that the average labour input per rupees of output for the said industry amounted to 0.044. Input out put ratio was the lowest in the year2004-05. It shows that the company achieved its maximum efficiency in that year from the given time schedule.

(5) Madras Fertilizers Ltd.

Table No:-6.15
Analysis of Labour Productivity in Madras Fertilizers Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	739.85	21.96	33.6908	0.853902	100	82.29987	0.029682
2000-01	1434.87	51.35	27.94294	0.91461	82.93938	80.05451	0.035787
2001-02	1125.73	62.63	17.97429	0.788704	53.35074	77.80915	0.055635

2002-03	1097.45	47.72	22.99769	0.957391	68.26105	75.56379	0.043483
2003-04	1058.36	46.82	22.60487	0.868216	67.09508	73.31843	0.044238
2004-05	1266.76	45.5	27.84088	0.884462	82.63644	71.07307	0.035918
2005-06	1070.59	42.56	25.15484	0.84128	74.66382	68.82771	0.039754
Total	7793.61	318.54	178.2063	6.108566	528.9465	528.9465	0.284497
AVG.	1113.373	45.50571	25.45805	0.872652	75.56379	75.56379	0.040642
STANDARD DEVIATION =14.84				A=75.563	Chi Square=15.21		
Co.-Efficient of Variance=19.64				B=-2.25			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.15 describe that labour productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

It was apparent from the Table No .6.15 that labour productivity of Madras Fertilizers Ltd. Fluctuated through out the research study period. From the year 2000-01 to 2003-04 output shows the decreasing trend. In remaining year it varies time to time. In the year 1999-00 the output was 739.85 which are lowest and in the year 2004-05 the output was 1266.76 which are highest during the study period of this company. The average value of the output was Rs. 1113.373 crores.It was considered from the table that input has dual trend during the given study period i.e. from 1999-06. From 1999-00 to 2001-02 the trend was increasing and than up to 2005-06 the trend was declining. Input varies between 21.96 crores to 62.63 crores in given schedule. The average value of the input was 25.458 crores in a given time schedule for this research study. As per the results of output and input the labour productivity ratio also fluctuated during the study. This ratio occurs from 17.9743 to 33.6908. The average value of the labour productivity ratio of Madras Fertilizers Ltd. is 25.458046. So the ratio of the given unit fluctuates during the study period. Similarly the productivity index also fluctuate the average of the indices. The impact of labour productivity ratio was shown in above productivity index. The co-efficient of variation of 19.64 percent gives the comparative picture. The overall performance of MFL with regard to labour productivity can be satisfactory as is observed from the average of labour productivity indices.

So we can consider this as a poor output for the given company in a given study period. It may also be seen from the table that the average labour input per rupees of output for the said industry amounted to 0.041. Input out put ratio was the lowest in the year1999-00. It shows that the company achieved its maximum efficiency in that year from the given time schedule.

(6) National Fertilizer Ltd.

Table no.:6.16 describe that labour productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

The said Table no.:6.16 describe the output of the National Fertilizer Ltd. It is apparent from the table that output trend of the company varies from time to time and it shows the fluctuation during the given study period for the particular company. From the year 1999-00 to 2002-03 the trend of output is upward than it goes down bit and than it increases till the year 2005-06. The value of output in the year 199-00 was 2604.11 crores; it increases up to 3664.32 crores in the year 2002-03. The average value of the output is 3174.779 crores.

It was apparent from the table that movement of the input is varied during the given time schedule. In the year 2003.04 the input was Rs. 165.43 crores and in the year 2000-01 the input of National Fertilizer Ltd. was 206.49 crores. So the trend of the company is mixed and fluctuating. The average value of the input is 181.5129 crores. Depending on the output and input the productivity ratio has also mixed trend. In the year 1999-00 the labour productivity ratio is 15.6103 than up to the year 2001-02 the trend of the ratio was declining.

Table No:-6.16

Analysis of Labour Productivity in National Fertilizer Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	

1999-00	2604.11	166.82	15.6103	1.855571	100.000	90.13186	0.064
2000-01	2767.31	206.49	13.4017	1.707929	85.851	97.77477	0.075
2001-02	2938.57	199.94	14.6973	1.750336	94.151	105.4177	0.068
2002-03	3664.32	186.51	19.6468	2.126226	125.858	113.0606	0.051
2003-04	3239.22	165.43	19.5806	1.962293	125.434	120.7035	0.051
2004-05	3440.8	174.98	19.6640	2.125703	125.968	128.3464	0.051
2005-06	3569.12	170.42	20.9431	2.310052	134.162	135.9893	0.048
Total	22223.45	1270.59	123.5437	13.83811	791.424	791.4242	0.407
AVG.	3174.779	181.5129	17.649093	1.976873	113.061	113.0606	0.058
STANDARD DEVIATION =19.14				A=113.06	Chi Square=5.44		
Co.-Efficient of Variance=16.93				B=7.64			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

In the year 2005-06 the ratio was 20.943. The average value of the labour productivity ratio is 17.649 with a co-efficient of variation of 16.63 percent. The value of chi-square shows 5.44.It is less than the table value. Therefore a null hypothesis is accepted and an alternative hypothesis is rejected. The computed value of productivity indices showed a positive growth per year resulting in a downward trend. Similarly the productivity index also fluctuate the average of the indices. Overall labour productivity ratio is more than 100 so we can consider this as a good output for the given company in a given study period. It may also be seen from the table that the average labour input per rupees of output for the said industry amounted to 0.058. Input out put ratio was the lowest in the year2005-06. It shows that the company achieved its maximum efficiency in that year from the given time schedule.

(6) Coromandel Fertilizers Ltd.

Table no.:- 6.17 describe that labour productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

Table No:-6.17
Analysis of Labour Productivity in Coromandel Fertilizers Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	618.9	24.92	24.83547	0.890968	100	88.089	0.040265
2000-01	611.2	23.66	25.83263	0.939453	104.015	96.809	0.038711

2001-02	652.02	24.82	26.26994	0.934269	105.776	105.53	0.038066
2002-03	610.2	28.49	21.41804	0.849249	86.2397	114.25	0.04669
2003-04	1212.79	44.21	27.43248	0.925375	110.457	122.97	0.036453
2004-05	1535.1	46.73	32.85042	0.904626	132.272	131.69	0.030441
2005-06	1993.15	49.85	39.98295	1.003208	160.991	140.41	0.025011
Total	7233.36	242.68	198.6219	6.447149	799.751	799.75	0.255636
AVG.	1033.337	34.66857	28.37456	0.907324	114.25	114.25	0.036519
STANDARD DEVIATION =24.79			A=114.2501		Chi Square=13.31		
Co.-Efficient of Variance=21.70			B=8.720323				

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

It is apparent from the Table no.:- 6.17 that output trend of the company vary from time to time and it shows the fluctuation during the given study period for the particular company. The output of the company was 618.9 in the year 1999-00 and it is very similar up to the year 2002-03. From this year the output increase and it reached up to the 1993.15 in the year 2005-06. The average value of the output of above said company is 34.668.

The Table no.:- 6.17 showed the input trend of the Coromandel Fertilizers Ltd. From the year 1999-00 to the year 2002-03 the input trend is fluctuating and than up to the end of this study the trend of the input is upward. The value of the in put Varies from 23.66 to 49.85 and the average value of the input is 34.668. So the trend of the input is mixed.

Depending on the output and input the productivity ratio has also mixed trend. In the year 1999-00 the labour productivity ratio is 24.8355 than up to the year 2001-02 the trend of the ratio was declining. In the year 2005-06 the ratio was 39.9829. The average value of the labour productivity ratio is 28.374562 with a co-efficient of variation of 21.70 percent. The value of Chi-square shows 13.31which is more than the table value. Therefore a null hypothesis is rejected and an alternative hypothesis is accepted. The computed value of productivity indices showed a positive growth 8.72 per year resulting in a upward trend. The input requirements during period ranged 0.025 to 00467 per rupees of output with an average of 0.0365 per rupee. Input-output ratio was the lowest in 2005-06 which showed that above company achieved its maximum efficiency in that year.

(8) Chambal Fertilizers & Chemicals Ltd.

Table No:-6.18

Analysis of Labour Productivity in Chambal Fertilizers & Chemicals Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1314.23	24.18	54.3519	1.319887	100.000	100.572	0.018
2000-01	1849.3	32.7	56.5535	1.37335	104.051	97.2763	0.018
2001-02	1851.52	38.07	48.6346	1.016147	89.481	93.9804	0.021
2002-03	1923.25	42.67	45.0727	1.106335	82.927	90.6845	0.022
2003-04	2213.89	45.65	48.4970	1.190389	89.228	87.3887	0.021
2004-05	2750.97	55.47	49.5938	1.056249	91.246	84.0928	0.020
2005-06	2714.28	64.14	42.3181	1.078661	77.859	80.7969	0.024
Total	14617.44	302.88	345.0217	8.1410	634.792	634.792	0.143
AVG.	2088.206	43.26857	49.288809	1.163003	90.685	90.6845	0.020
STANDARD DEVIATION =9.07				A=90.6845	Chi Square=2.11		
Co.-Efficient of Variance=10				B=-3.295			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.18 describe that labour productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

It is apparent from the Table no.:-6.18 that output trend of the company vary from time to time and it shows the fluctuation during the given study period for the particular company. The output of the company was 1314.23in the year 1999-00 and it is upward up to the year 2002-03. From this year the output increase and it reached up to the 2714.28 in the year 2005-06. The average value of the output of above said company is 2088.206

The table shows the input trend of the Chambal Fertilizers & Chemicals Ltd. From the year 1999-00 to the year 2002-03 the input trend is fluctuating and than up to the end of this study the trend of the input is upward. The value of the in put Varies between 32.7to 64.14 and the average value of the input is 43.26857. So the trend of the input is mixed. Depending on the output and input the productivity ratio has also mixed trend. In the year 1999-00 the labour productivity ratio is 54.3519than up to the year 2002-03 the trend of the ratio was declining. In the year 2005-06 the ratio was 42.3181.

The average value of the labour productivity ratio is 49.29. The straight line based on trend values a upward trend with a positive growth rate of 3.295 per annum. It indicates that the good position. The co-efficient of variation remained 10 the value of chi-square remained at 2.11 which is much lower than the table value of 12.592. Hence the firm null hypothesis is accepted but an alternative hypothesis is rejected. Labour input requirement per rupees of output ranged between Rs. 0.018 and Rs. 0.024 for the unit. Similarly the productivity index also fluctuate the average of the indices. Overall labour productivity ratio is less than 100 so we can consider this as a poor output for the given company in a given study period. Input out put ratio was the lowest in the year1999-01. It shows that the company achieved its maximum efficiency in that year from the given time schedule.

HYPOTHESIS BASED ON KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIATION TEST:-

- **Null hypothesis: -** There is no significant difference between the labour productivity ratio of selected companies of fertilizer industry.

- **Alternative hypothesis: -** There is significant difference between the labour productivity of the selected companies of fertilizer industry.

- **Level of significant:- 5 percent**

- **Statistical tool used:- Kruskal Wallis**

- **Critical value:- 14.067**

Table No.:-6.19
Comparative Labour productivity ratios of selected companies from Fertilizer Industry of India and Kruskal Wallis one way analysis of variance test.

Year	Cham	Rank	CORO	Rank	GNFC	Rank	GOD	Rank	IFFCo	Rank	NAT	Rank	MAD	Rank
1999-00	54.4	51	24.8	27	14.3	4	97.6	56	21	17	15.6	9	33.7	39
2000-01	56.6	52	25.8	31	14.5	5	62.5	53	23.6	25	13.4	2	27.9	36
2001-02	48.6	47	26.3	32	14.9	7	75.7	54	22	19	14.7	6	18	11
2002-03	45.1	45	21.4	18	13.8	3	39.7	42	22.6	22	19.6	13	23	23
2003-04	48.5	46	27.4	34	11.3	1	48.9	48	22.5	20	19.6	12	22.6	21
2004-05	49.6	49	32.9	38	15.1	8	50.2	50	26.5	33	19.7	14	27.8	35
2005-06	42.3	44	40	43	16.1	10	78.7	55	20.5	15	20.9	16	25.2	28
		334		**223**		**38**		**358**		**151**		**72**		**193**

. **K**

$$H = \frac{12}{N(n+1)} \sum_{I=1} \frac{Ri1}{Ni} - 3(n+1)$$

Where n=n1+n2+n3…nk and RI=sum of the rank

$$K = \frac{12}{56(56+1)} \left[\frac{(334)^2}{7} + \frac{(223)^2}{7} + \frac{38)^2}{7} + \frac{(358)^2}{7} + \frac{(151)^2}{7} \right.$$

$$\left. \frac{(72)^2}{7} + \frac{(193)^2}{7} + \frac{(227)^2}{7} \right] - 3(56+1)$$

= 0.00376 (58236.57)) –171

= 47.93

The comparative position of labour productivity ratios of the selected companies of fertilizer industry have been discussed in table and with the application of Kruskal Wallis one way analysis of variance test on this ratio. Table No.-19 describe that the calculation value of 'H' equals to 47.93which is more than the table value of 14.067 hence the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 percent level of significant accepted.

COMPARATIVE ANALYSIS OF LABOUR PRODUCTIVITY

The table no.:-6.20 indicate the overall analysis of labour productivity of selected companies. It also shows labour productivity ratio, co-efficient of

co-relationship, productivity index, trend value, input-output ratio, value of chi-square, co-efficient of variation, and standard deviation.

Table No.:-6.20

COMPARATIVE ANALYSIS OF LABOUR PRODUCTIVITY

	O/I RATIO		PRO. INDEX		CO-EFF.		CHI-SQ.		I/O RATIO		GROWTH RATE		OV AL
	AVE.		AVE.						AVE.				
COMPANY	VAL.	RANK	VAL.	RNK	VAL.	RNK	VAL.E	RNK	VAL.	RNK	VAL.	RNK	VA
Cham	43.26	**7**	90.68	**3**	10	**2**	2.11	**1**	0.02	**2**	-3.29	**2**	1
Coro	28.37	**5**	114.25	**8**	21.7	**7**	13.31	**5**	0.036	**3**	8.72	**8**	3
GNFC	14.19	**1**	99.130	**4**	10.93	**3**	6.87	**4**	0.071	**8**	0.76	**4**	2
GOD	64.75	**8**	66.324	**1**	31.46	**8**	33.67	**8**	0.017	**2**	-3.96	**1**	2
IFFCO	22.7	3	108.1	5	8.67	1	4.65	2	0.04	5	0.807	**5**	2
NAT	17.65	**2**	113.06	**7**	16.93	**4**	5.44	**3**	0.058	**7**	7.64	**7**	3
MAD	25.46	**4**	75.56	**2**	19.64	**5**	15.21	**7**	0.041	**5**	-2.25	**3**	2
MANG	28.54	**6**	112.63	**6**	20.39	**6**	14.32	**6**	0.036	**4**	7.33	**6**	3
	30.6		**97.46**		**17.5**		**11.9**		**0.04**		1.97		**2**

OVERHEADS PRODUCTIVITY:-

"Overheads costs are the operating costs of a business enterprise, which can be traced directly to a particular unit of output. The term 'Overheads' is used interchangeably with such terms as burden, supplementary costs, manufacturing expenses, and indirect expenses"

The major part of total cost including total overheads, office overheads, selling and distribution overheads, thus primary aim of accounting for overhead is to controlling. Present study outlined output in constant prices divided by total overheads input it gives overheads productivity ratio. The productivity ratio indices, Co-efficiency of co-relationship, input output ratio etc.

STEPS IN ACCOUNTING FOR OVERHEADS PRODUCTIVITY:-

HYPOTHESIS:-

For the computation of overhead productivity following two hypothesis have been tested with two corresponding alternative hypothesis. The first hypothesis is shown whether the overhead productivity indices can be approximately as straight-line trend while the second hypothesis is whether there is any significant difference between the overheads productivity of the selected fertilizer Group of Companies. The hypothesis has been framed as under.

HYPOTHESIS BASED ON CHI-SQUARE: -

Null hypothesis:- The overhead productivity indices can be represented by the line of the best fit.

Alternative hypothesis: -The indices can't be represented by the line of the best fit.

Level of significant: - 5 percent

Statistical tool used: - chi-square

Critical value: - 12.592

If the found of chi-square is less than the critical value, the null hypothesis will be accepted. While value of chi-square is shown greater than the table value null hypothesis will be rejected and its alternative hypothesis is accepted. The acceptance of null hypothesis would mean that the calculated value of the indices is based on least square straight-line trend. It may represent the pattern and growth of the overhead productivity. Since no logical conclusions can be drawn from the original indices which are generally fluctuating with its negative or positive growth rate per year expressing the direction of productivity growth.

HYPOTHESIS BASED ON KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIATION TEST: -

Null hypothesis: - There is no significant difference between the overheads productivity ratios of selected fertilizer group of companies.

Alternative hypothesis:- There is significant difference between the overhead productivity of the fertilizer group of companies.

Level of significant: - 5 percent

Statistical tools used: - kruskal Wallis.

Critical value: - 14.067

The acceptance of null hypothesis would mean that there is no significance difference between productivity of selected fertilizer group of companies. The rejection of null hypothesis and acceptance of its alternative hypothesis would mean that there is significant different between the overhead productivity ratios of the selected Birla group of companies.

OVERHEAD PRODUCTIVITY IN SELECTED UNITS OF BIRLA GROUP OF COMPANIES: -

Table 6.21 to 6.30 describes the overhead productivity ratio and index of labour productivity, average of labour indices, co-efficiency of variation, and value of chi-square for selected companies under study.

(1) Godavari Fertilizer & Chemical Ltd.

Table no.:-6.21 present the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Godavari Fertilizer & Chemical Ltd.

As shown in the Table no.:-6.21 output of the Godavari Fertilizer & chemical Ltd. was stable in the year 1999-00 to 2001-02, it declines up to Rs. 767.52 crores in the year 2002-03 further it increases up to 1519.99 crores in the year 2005-06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 1075.514 crores.Input trend of the above company also shows the mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs. 158.65 crores and it declines up to Rs. 118.42 crores in the

year 2003-04. Further it increases to the value of Rs. 145.29 crores in the year 2005-06. The average value of the input is Rs. 140.3257 crores.

Table No:-6.21
Analysis of Overhead Productivity in Godavari Fertilizer & Chemical Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1041.25	158.65	6.563	0.05899	100	87.714	0.152
2000-01	1056.24	145.44	7.262	0.10746	110.65	97.759	0.138
2001-02	1033.64	168.02	6.152	0.0757	93.733	107.8	0.163
2002-03	767.52	124.98	6.141	0.13365	93.569	117.85	0.163
2003-04	909.91	118.42	7.684	0.13083	117.07	127.89	0.13
2004-05	1200.05	121.48	9.879	0.17469	150.51	137.94	0.101
2005-06	1519.99	145.29	10.46	0.12071	159.4	147.98	0.096
Total	7528.6	982.28	54.14	0.68132	824.94	824.95	0.942
AVG.	1075.514	140.3257	7.735	0.11458	117.85	117.85	0.135
STANDARD DEVIATION =26.88			A=117.84		**Chi Square=13.203**		
Co.-Efficient of Variance=22.81			B=10.045				

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

The Table no.:-6.21 showed the fluctuation in overhead productivity ratio. The ratio varies from 6.141 to 10.461. The value of above said ratio in the year 1999-00 was 6.563 and it was 10.461 in the year 2005-06. The average value of the ratio is 7.734 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 93.56949 and it was 159.4006 in the year 2005-06. The average value of the index is 117.8493 with the co-efficient of variation shows 22.81 percent during period study. In order to test the null hypotheses based on Chi-square statistics the value of $\mathbf{X^2}$ has also been calculated, which worked out to be 13.20 and more than the critical value of 12.592. Hence a hull hypothesis is rejected and alternative is accepted. More than 100 is a good sign for the company. The overheads input requirement per rupee of output for the Godavari Fertilizer & Chemical Ltd declines from Rs. 0.152365 in the year 1999-00 to RS. 0.095586. The lowest value of the overheads input was in the year 2005-06 and the average value of the overheads input is 0.13463.

(2) Gujarat Narmada Vally Fertilizers Company Ltd.

Table No:-6.22
Analysis of overhead Productivity in Gujarat Narmada Vally Fertilizers Company Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1153.06	406.16	2.83893	0.171042	100	108.4574	0.3522
2000-01	1339.39	425.02	3.151358	0.188081	135.5697	118.1787	0.3173
2001-02	1404.79	448.82	3.129963	0.187883	134.6493	127.9	0.3195
2002-03	1377.32	459.57	2.996975	0.199047	128.9282	137.6213	0.3337
2003-04	1446.84	473.85	3.053371	0.22149	131.3543	147.3426	0.3275
2004-05	1822.62	516.14	3.531251	0.212419	151.9125	157.0639	0.2832
2005-06	2147.57	510.61	4.205891	0.242466	180.9351	166.7852	0.2378
Total	10691.59	3240.17	22.90774	1.422427	963.349	963.3491	2.1712
AVG.	1527.37	462.8814	3.272534	0.203204	137.6213	137.6213	0.3102
standard deviation =24.57				A=137.62	Chi Square=7.22		
Co.-Efficient of Variance=17.8569				B=9.72			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.22 represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Gujarat Narmada Vally Fertilizers Company Ltd

As shown in the Table no.:-6.22 that the trend of the out put of GNFC was increasing till the year 2001.02 and it reached up to Rs. 2147.57 crores in the year 2005.06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 1527.37 crores. Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 406.16 crores and it increased up to Rs. 516.14 crores in the year 2004-05. Further it decreases to the value of Rs. 510.61 crores in the year 2005-06. The average value of the input is Rs. 462.8814crores.The table shows the fluctuation in overhead productivity ratio. The ratio varies between 2.83893 to 4.205891. The value of above said ratio in the year 1999-00 was

2.83893 and it was 4.205891 in the year 2005-06. The average value of the ratio is 3.272534 in a given time period of said company. The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 105.5671 and it was 148.1505 in the year 2005-06. The average value of the index is 115.27. the value co-efficient of variation showed 17.86 percent. In order to measure the null hypotheses based on Chi-Square method, the value of chi-square has also been calculated. Which is worked out to be 7.22 and is less than the critical value of 12.592, hence the null hypothesis is accepted and alternative hypotheses is rejected that overheads productivity indices of GNFC, is rejected. More than 100 is a good sign for the company. The overheads input requirement per rupee of output for the GNFC declines from Rs0.352245 in the year 1999-00 to RS. 0.237762. The lowest value of the overheads input was in the year 2005-06 and the average value of the overheads input is 0.310169.

(3) Mangalore Chemicals & Fertilizers Ltd.

Table No:-6.23
Analysis of Overhead Productivity in Mangalore Chemicals & Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	615.65	145.61	4.228075	0.152561	100	89.65631	0.2365
2000-01	680.63	179.11	3.800067	0.118526	89.877	90.05777	0.2632
2001-02	571.18	160.29	3.5634163	0.12367	84.2799	90.45922	0.2806
2002-03	562.79	164.67	3.4176839	0.122422	80.8331	90.86068	0.2926
2003-04	614.21	172.87	3.5530167	0.1292	84.0339	91.26214	0.2815
2004-05	878.02	208.16	4.2180054	0.111734	99.7618	91.66359	0.2371
2005-06	1082.31	263.25	4.111339	0.093162	97.239	92.06505	0.2432
Total	5004.79	1293.96	26.891603	0.851275	636.025	636.0248	1.8347
AVG.	714.97	184.8514	3.8416576	0.121611	90.8607	90.86068	0.2621
STANDARD DEVIATION =8.11				A=90.86	Chi Square=4.30		
Co.-Efficient of Variance=8.93				B=0.401			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.24represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Mangalore Chemicals & Fertilizers Ltd

As shown in the Table no.:-6.24 that the trend of the out put of Mangalore Chemicals & Fertilizers Ltd were mixed and fluctuating. It was 615.65 crores in the year 1999-00and it reached up to Rs. 1082.31crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 714.97crores.Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 145.61 crores and it increased upto Rs. 208.16 crores in the year 2004-05. Further it increases to the value of Rs. 263.25 crores in the year 2005-06. The average value of the input is Rs. 184.8514 crores.

The table shows the fluctuation in overhead productivity ratio. The ratio varies from 4.228075 to 3.417684. The value of above said ratio in the year 1999-00 was 4.228075 and it was 4.111339 in the year 2005-06. The average value of the ratio is 3.841658 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 80.83309 and it was 97.23903 in the year 2005-06. The average value of the index is 90.86068, the coefficient of variation describe 8.93 percent. In order to test the null hypotheses based on chi-square statistics the value $\mathbf{X^2}$ has also been measured which worked out to be 4.30 and is less than the table value of 12.592 hence null hypotheses is accepted and the alternative hypotheses is rejected. The straight line trend showed a positive pattern of overheads with a positive rate of 0.401 change pr year. Overhead input requirement per rupees of output was ranged between Rs. 0.2365 to Rs. 0.2926

(4) IFFCo Ltd.

Table no.:-6.24 represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for IFFCo Ltd.

As shown in the Table no.:-6.24 that the trend of the out put of IFFCo Ltd. were mixed and fluctuating. It was 4804.96 crores in the year 1999-00and it reached up to Rs. 5452.71 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 5715.557 crores. Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 1002.08 crores and it increased up to Rs. 1640.96 crores in the year 2005-06. The average value of the input is Rs1181.341 crores.

Table No:6.24
Analysis of overhead Productivity in IFFCo Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	4804.96	1002.08	4.794986	0.19188	100	107.5396	0.208551
2000-01	5424.05	1098.44	4.937957	0.19001	102.98	105.9471	0.202513
2001-02	5093.37	1076.41	4.731812	0.18118	98.682	104.3547	0.211336
2002-03	6090.99	1111.68	5.479086	0.21106	114.27	102.7622	0.182512
2003-04	5918.9	1063.67	5.564602	0.21157	116.05	101.1698	0.179707
2004-05	7223.92	1276.15	5.660714	0.18257	118.05	99.5773	0.176656
2005-06	5452.71	1640.96	3.322878	0.07772	69.299	97.98485	0.300944
Total	40008.9	8269.39	34.49204	1.24599	719.34	719.3354	1.462219
AVG.	5715.557	1181.341	4.927434	0.178	102.76	102.7622	0.208888
STANDARD DEVIATION =16.67				A=102.76	Chi Square=16.22		
Co.-Efficient of Variance=16.32				B=-1.59			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

The Table no.:-6.24 showed the fluctuation in overhead productivity ratio. The ratio varies from 5.660714 to 3.322878. The value of above said ratio in the year 1999-00 was 4.794986 and it was 3.322878 in the year 2005-06. The average value of the ratio is 4.927434 in a given time period of said company. The value of co-efficient was 16.32 and the value of chi-square

was 16.22 which was higher than the table value of 12.592. Therefore null hypothesis is rejected and it can be inferred that the trend value has not followed the index. The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 114.267 and it was 69.29901 in the year 2005-06. The average value of the index is 102.7622. More than 100 percent is good sign for the company.

The overheads input requirement per rupee of output for the IFFCo Ltd. varies from time to time. The lowest value of the overheads input was in the year 2004-05 and the average value of the overheads input is 0.208888.

(5) Madras Fertilizers Ltd.

Table No:-6.25
Analysis of Overhead Productivity in Madras Fertilizers Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	636.95	203.18	3.134905	0.079455	100	104.7557	0.318989
2000-01	1404.43	406.24	3.457144	0.113157	110.2791	102.2723	0.289256
2001-02	1097.63	353.03	3.109169	0.136429	99.17906	99.78891	0.321629
2002-03	1139.06	387.85	2.936857	0.122261	93.68249	97.30552	0.3405
2003-04	1139.75	401.07	2.841773	0.109148	90.64942	94.82213	0.351893
2004-05	1286.22	400.31	3.21306	0.102074	102.4931	92.33874	0.31123
2005-06	1084.22	407.58	2.66014	0.088966	84.85553	89.85535	0.37592
Total	7788.26	2559.26	21.35305	0.75149	681.1386	681.1386	2.309417
AVG.	1112.609	365.6086	3.050435	0.107356	97.30552	97.30552	0.329917
STANDARD DEVIATION =8.35				A=97.30	Chi Square=2.56		
Co.-Efficient of Variance=8.58				B=-2.48			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.25 represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Madras Fertilizers Ltd.

As shown in the table output of the Madras Fertilizers Ltd**.** was downward in the year 1999-00 to 2005-06, it declines up to Rs. 636.95 crores in the year 1999-00. Further it increases up to 1084.22 crores in the year

2005-06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 1112.609 crores.

Input trend of the above company also shows the mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs. 203.18 crores and it increases up to Rs. 407.58 crores in the year 2005-06. The average value of the input is Rs. 365.6086 crores.

The table shows the fluctuation in overhead productivity ratio. The ratio varies from 3.457144 to 2.66014. The value of above said ratio in the year 1999-00 was 3.134905 and it was 2.66014 in the year 2005-06. The average value of the ratio is 3.050435 in a given time period of said company. The average index has been 97.30 percent with a co-efficient of variation of 8.58 which showed less fluctuation in indices. The chi-square value is 2.56 which is less than the critical value and a null hypothesis is accepted. Therefore it can be said that the productivity indices is accepted. The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 93.68249 and it was 84.85553 in the year 2005-06. The average value of the index is 97.30552. Less than 100 are question marks for the company.

The overheads input requirement per rupee of output for the Madras Fertilizers Ltd. increase from Rs**.** 0.318989 in the year 1999-00 to RS. 0.37592. The lowest value of the overheads input was in the year 2000-01 and the average value of the overheads input is 0.329917.

(6) National Fertilizer Ltd.

Table no.:- 6.26 represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for National Fertilizer Ltd.

As shown in the Table no.:- 6.26 output of the National Fertilizer Ltd. was mixed in the year 1999-00 to 2005-06, it declines up to Rs. 2604.11 crores

in the year 1999-00. Further it increases up to 3569.12 crores in the year 2005-06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 3174.779 crores.

Input trend of the above company also shows the mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs. 1083.95 crores and it increases up to Rs. 1259.07 crores in the year 2005-06.

Table No:-6.26

Analysis of Overhead Productivity in National Fertilizer Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	2604.11	1083.95	2.4024263	0.285572	100	100.2866	0.416246
2000-01	2767.31	1192.82	2.3199728	0.295661	105.545	104.6193	0.43104
2001-02	2938.57	1268.27	2.3169909	0.275937	105.4094	108.9521	0.431594
2002-03	3664.32	1363.27	2.6878901	0.290891	122.2831	113.2848	0.372039
2003-04	3239.22	1331.7	2.4323947	0.243765	110.6596	117.6175	0.411117
2004-05	3440.8	1303.02	2.6406348	0.285456	120.1333	121.9503	0.378697
2005-06	3569.12	1259.07	2.8347272	0.312674	128.9633	126.283	0.352768
Total	22223.45	8802.1	17.635037	1.989957	792.9936	792.9936	2.793501
AVG.	3174.779	1257.443	2.519291	0.28428	113.2848	113.2848	0.399072
STANDARD DEVIATION =10.64				A=113.28	Chi Square=1.33		
Co.-Efficient of Variance=9.39				B=4.33			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

The average value of the input is Rs.1257.443 crores. The co-efficient of variation is 9.39 which indicate low fluctuation. The straight-line assumption for the productivity indices is accepted On the basis of chi-square test the computed value of productivity indices showed a positive growth of 4.33 resulting in an upward trend. The table shows the minor fluctuation in overhead productivity ratio. The ratio varies between 2.316991to 2.834727. The value of above said ratio in the year 1999-00 was 2.402426 and it was 2.834727 in the year 2005-06. The average value of the ratio is 2.519291 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was

111.8823 and it was 117.9943 in the year 2005-06. The average value of the index is 104.8644.The overheads input requirement per rupee of output of the National Fertilizer Ltd. increased from Rs**.** 0.416246 in the year 1999-000 to Rs. 0.352768 in 2005-06. The lowest value of the overheads input was in the year 20005-06 and the average value of the overheads input is 0.399072.

(7) Coromandel Fertilizers Ltd.

Table No.6.27 represents the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Coromandel Fertilizers Ltd.

Table No:-6.27
Analysis of Overhead Productivity in Coromandel Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF. FACTOR	PROD. INDEX	TREND VALUE	I/O
1999-00	606.27	103.88	5.836253	0.209375	100	81.308	0.171343
2000-01	611.69	123.75	4.942949	0.17976	84.6939	82.965	0.202308
2001-02	663.58	166.69	3.980923	0.178768	68.2102	84.622	0.251198
2002-03	590.21	140.57	4.198691	0.166483	71.9415	86.279	0.238169
2003-04	1240.4	267.98	4.628704	0.156139	79.3095	87.936	0.216043
2004-05	1554.39	281.23	5.527113	0.152204	94.7031	89.593	0.180926
2005-06	1877.27	306.07	6.133466	0.030979	105.093	91.25	0.16304
Total	7143.81	1390.17	35.2481	1.073708	603.951	603.95	1.423028
AVG.	1020.544	198.5957	5.035443	0.153387	86.2787	86.279	0.20329
STANDARD DEVIATION =14.12			A=86.27869		Chi Square=13.14		
Co.-Efficient of Variance=16.37			B=1.656975				

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

As shown in the Table no.:-6.27 that the trend of the out put of Coromandel Fertilizers Ltd. mixed and fluctuating. It was 606.27 crores in the year 1999-00and it reached up to Rs. 1877.27 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 1020.544 crores, Input trend of the above company also shows the upward trend in a given time

schedule of a given company. In the year 1999-00 the input of the said company was Rs 103.88 crores and it increased up to Rs. 306.07 crores in the year 2005-06. The average value of the input is Rs198.5957 crores. The table shows the fluctuation in overhead productivity ratio. The ratio varies from 3.980923 to 6.133466. The value of above said ratio in the year 1999-00 was 5.836253 and it was 6.133466 in the year 2005-06. The average value of the ratio is 5.035443 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 71.94155 and it was 105.0925 in the year 2005-06. The average value of the index is 86.27869 with co-efficient of variation being 16.37 percent. The calculated value of chi-square 13.14 which is less than the critical value of 12.592 therefore null hypotheses is rejected and alternative hypotheses is accepted. The assumption for productivity indices is not accepted. The overheads input requirement per rupee of output for the Coromandel Fertilizers Ltd. varies from time to time.. The lowest value of the overheads input was in the year 2005-06 and the average value of the overheads input is 0.20329.

(8) Chambal Fertilizers & Chemicals Ltd.

Table No:-6.28
Analysis of Overhead Productivity in Chambal Fertilizers & Chemicals Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	COEF.	PROD.	TREND	I/O
				FACTOR	INDEX	VALUE	
1999-00	1361.58	469.13	2.9023512	0.070481	100	99.0579	0.34455
2000-01	1794.59	731.32	2.4539053	0.059591	78.2662	95.762	0.40751
2001-02	1909.45	655.77	2.9117678	1.106335	92.8696	92.4661	0.34343
2002-03	1888.56	731.83	2.5805993	0.063342	82.3071	89.1702	0.38751
2003-04	2217.26	815.13	2.7201305	0.066767	86.7574	85.8743	0.36763
2004-05	2679.31	1104.35	2.4261421	0.051672	77.3807	82.5784	0.41218
2005-06	2741.62	820.21	3.342583	0.0852	106.61	79.2825	0.29917
Total	14592.37	5327.74	19.337479	1.503389	624.191	624.191	2.56198
AVG.	2084.624	761.1057	2.762497	0.21477	89.1702	89.1702	0.366
STANDARD DEVIATION =11.15				A=89.170	Chi Square=13.49		
Co.-Efficient of Variance=12.50				B=0.4266			

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.28 represent the details of overheads productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Chambal Fertilizers & Chemicals Ltd.

As shown in the Table no.:-6.28 that the trend of the out put of Chambal Fertilizers & Chemicals Ltd**.** mixed and fluctuating. It was 1361.58 crores in the year 1999-00and it reached up to Rs. 2741.62 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 2084.624 crores.Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 469.13 crores and it increased up to Rs 820.21 crores in the year 2005-06. The average value of the input is Rs 761.1057 crores. The table shows the fluctuation in overhead productivity ratio. The ratio varies between 2.426142 to 3.342583. The value of above said ratio in the year 1999-00 was 2.902351and it was 3.342583 in the year 2005-06. The average value of the ratio is 2.762497 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2002-03 was 88.9141 and it was 115.1681 in the year 2005-06. The average value of the index is 95.18135 with the value of co-efficient of variation showed 12.50 percent. In order to measure the null hypotheses based on chi-square method the value of chi-square has been calculated which was worked out to be 13.49 and is more than the critical value of 12.592 hence the null hypotheses is rejected and the alternative hypotheses that over

The overheads input requirement per rupee of output for the Chambal Fertilizers & Chemicals Ltd. varies from time to time. The lowest value of the overheads input was in the year 2005-06 and the average value of the overheads input is 0.365997.

OVERHEAD PRODUCTIVITY RATIO OF THE SELECTED COMPANIES OF FERTILIZER INDUSTRY AND KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIATION TEST:

$$H = \frac{12}{N(n+1)} \sum_{I=1}^{K} \frac{Ri1}{Ni} - 3(n+1)$$

Where n=n1+n2+n3…nk and Ri=sum of the rank

$$K = \frac{12}{56(56+1)} \left[\frac{(101)^2}{7} + \frac{(292)^2}{7} + \frac{(167)^2}{7} + \frac{(371)^2}{7} + \frac{(286)^2}{7} \right] - 3(56+1)$$

$$= 0.00376 \ (55606)) - 171$$

$$= 38.04$$

TABLE NO.:-6.29
COMPARATIVE OVERHEAD PRODUCTIVITY RATIO OF SELECTED COMPANIES OF FERTILIZER INDUSTRY WITH KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST

Year	Cham	R1	Coro	R2	GNFC	R3	God	R4	IFFCO	R5	Nat	R6	Mad	R7	Mang	R8
1999-00	2.9	16	5.84	48	2.84	14	6.563	52	4.794	41	0.96	6	3.13	23	4.23	37
2000-01	2.45	9	4.94	43	3.15	24	7.262	53	4.937	42	0.89	4	3.46	29	3.8	32
2001-02	2.91	17	3.98	33	3.13	22	6.151	51	4.731	40	0.82	3	3.11	21	2.56	10
2002-03	2.58	11	4.2	35	3	19	6.141	50	5.479	44	0.56	1	2.94	18	3.42	28
2003-04	2.72	13	4.63	39	3.05	20	7.683	54	5.564	46	0.68	2	2.84	14	3.55	31
2004-05	2.43	8	5.53	45	3.53	30	9.878	55	5.66	47	0.92	5	3.21	25	4.22	36
2005-06	3.34	27	6.13	49	4.27	38	10.46	56	3.322	26	1.27	7	2.66	12	4.11	34
		101		**292**		**167**		**371**		**286**		**28**		**142**		**208**

The comparative position of overheads productivity ratios of the selected companies of fertilizer industry have been discussed in table and with the application of Kruskal Wallis one way analysis of variance test on this ratio. Table No.6.29 describe that the calculation value of 'H' equals to 38.04 which is more than the table value of 14.067 hence the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 percent level of significant accepted.

The comparative position of overhead productivity ratios of the selected companies of fertilizer industry have been given in the table No.:-6.30 along with application of Kruskal Wallis one way analysis of variance test on the above ratios.

COMPARATIVE ANALYSIS OF OVERHEAD PRODUCTIVITY:

The table No.:6.30 explain the input-output ratio efficiency of co-relationship, productivity index, average indices, and trend value of indices, standard deviation, co-efficient of variation, chi-square and input output ratio of the selected companies from fertilizer industry.

The table no.:6.30
COMPARATIVE ANALYSIS OF OVERHEAD PRODUCTIVITY:

	O/I RATIO		PRO. INDEX		CO-EFF.		CHI-SQ.		I/O RATIO		GROWTH RATE		OVER ALL
	AVE.		AVE.						AVE.				
COMPANY	VAL.	RANK	VAL.	RNK	VAL.	RNK	VAL. E	RNK	VAL.	RNK	VAL.	RNK	VAL.
Cham	2.76	**2**	89.17	**2**	12.5	**4**	13.49	**7**	0.66	**1**	0.43	**6**	22
Coro	5.03	**7**	86.28	**1**	16.4	**6**	13.14	**5**	0.203	**4**	1.66	**5**	28
GNFC	3.27	**4**	137.6	**8**	17.9	**7**	7.2	**4**	0.31	**6**	9.72	**7**	36
GOD	7.74	**8**	117.8	**7**	22.8	**8**	13.2	**6**	0.135	**2**	10	**8**	39
IFFCO	4.93	6	102.8	5	16.3	5	16	8	0.21	4	-1.59	**2**	30
NAT	2.51	**1**	113.3	**6**	9.39	**3**	1.33	**2**	0.399	**8**	4.33	**6**	26
MAD	3.05	**3**	97.3	**4**	8.58	**1**	2.56	**3**	0.329	**7**	-2.48	**1**	19
MANG	3.84	**5**	90.87	**3**	8.93	**3**	0.74	**1**	0.262	**5**	0.4	**3**	20
	4.14		104.4		14.1		8.5		0.31		2.81		28

OVERALL PRODUCTIVITY:

It has already been mentioned the productivity is a ratio of output to input. Productivity ratio is said to be a measure of efficiency. The various inputs are material, manpower, capital goods and expense of manufacturing, selling and distribution etc. When all the input is added together and the productivity ratio is calculated it is termed as overall productivity ratio. In order to revolve the problem of calculation of the overall productivity ratio the data needed are: output and total input. Total input includes the elements of costs such as material, manpower and overhead. "When a number of factors are not valued in the production process but the output is related to any single factor unit. Productivity thus measured is called factor or partial productivity.

According to Shrivastava J. P. "There is a general agreement among different writes that the over all productivity ratio measure the total productivity efficiency of the combined resources input used by an enterprise.''

The present research study outlined total input includes labour, material, and overhead calculated with base year 1997-98 prices to indicate the change in productivity efficiency over the base year.

$$\text{OVERALL PRODUCTIVITY RATIO} = \frac{\text{TOTAL OUTPUT}}{\text{TOTAL INPUT}}$$

Total Inputs = Total Material Input + Total Labour Input
+ Total Overhead Input

STEPS IN CALCULATION FOR TOTAL PRODUCTIVITY

HYPOTHESIS:-

For the calculation in present study two hypotheses (null and alternative) have been framed and tested. The first hypothesis is shown whether the total productivity indices can be approximately as a straight-line

trend. While second hypothesis describe whether there is any significant difference between the overall productivity of the selected Birla group of companies.

HYPOTHESIS BASED ON CHI-SQUARE:

- **Null hypothesis**: The total productivity indices can be represented by the line of the best-fit based on least square methods.
- **Alternative hypothesis**:-The productivity induces can't be represented by the straight line
- Level of significant: 5 percent
- Statistical tool used: chi-square
- Critical value: 12.592

When the calculated value of chi-square remains less than the table or critical value the null hypothesis is accepted otherwise it is rejected. The acceptance of null hypothesis would mean that the indices could be represented by straight line. It may represent the pattern and growth of the total productivity.

NULL HYPOTHESIS BASED ON KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST:

- **Null hypothesis:** The difference between the total productivity of the selected fertilizer group of companies.
- **Alternative hypothesis:** The total productivity ratio of the selected fertilizer Group of companies difference significantly.
- Level of significant: 5 percent
- Statistical tool used: kruskal Wallis
- Critical value: 14.06

The acceptance of null hypothesis would mean that there is no significant difference between total productivity of selected fertilizer Group of companies the rejection of null hypothesis and acceptance of its alternative hypothesis would mean that there is significant difference between the overall productivity ratios of the selected fertilizer Group of companies.

OVERALL PRODUCTIVITY IN SELECTED COMPANIES

Table 6.31 to 6.40 describes the overall productivity ratio and index of overall productivity, average of overall indices, co-efficient of variation, and the value of chi-square for selected fertilizer Group companies under study.

(1) Godavari Fertilizer & Chemical Ltd.

The table 6.31 showed the variation facts about the total productivity in Godavari Fertilizer & Chemical Ltd. from the period of 1999-00 to 2005-06 of this study. Table also represents the details of Overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Godavari Fertilizer & Chemical Ltd.

As shown in the table 6.31 output of the Godavari Fertilizer & chemical Ltd. was stable in the year 1999-00 to 2001-02, it declines upto Rs. 767.52 crores in the year 2002-03 further it increases upto 1519.99 crores in the year 2005-06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 1075.514 crores.

Table No: - 6.31
Analysis of Overall Productivity in Godavari Fertilizer & Chemical Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD. INDEX	TREND VALUE	I/O
1999-00	1041.25	1100.94	**0.946**	100	104.49	1.057
2000-01	1056.24	1004.27	**1.052**	111.204	105.71	0.951
2001-02	1033.64	1011.44	**1.022**	108.053	106.92	0.979
2002-03	767.52	748.44	**1.026**	108.428	108.13	0.975
2003-04	909.91	923.04	**0.986**	104.229	109.35	1.014
2004-05	1200.05	1104.89	**1.086**	114.839	110.56	0.921

2005-06	1519.99	1458.63	**1.042**	110.18	111.77	0.96
Total	7528.6	7351.65	7.159	756.933	756.93	6.857
AVG.	1075.514	1050.236	1.023	108.133	108.13	0.98
STANDARD DEVIATION =4.83				A=108.133	Chi Square=0.919	
Co.-Efficient of Variance=4.468				B=1.213		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Input trend of the above company also shows the mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs. 1100.94 crores and it declines up to Rs. 923.04 crores in the year 2003-04. Further it increases to the value of Rs. 1458.63 crores in the year 2005-06. The average value of the input is Rs. 1050.236 crores. The table 6.31 showed the fluctuation in overall productivity ratio. The ratio varies from 0.9458 to 1.0861. The value of above said ratio in the year 1999-00 was 0.9458 and it was 1.0421 in the year 2005-06. The average value of the ratio is 1.022706 in a given time period of said company. The productivity index of the unit shows the fluctuation in a research study period. The productivity index in the year 2002-03 was 108.428 and it was 110.180 in the year 2005-06. The average value of the index is 108.133 with a co-efficient of variation showed 4.468 percent. The index shows moderate fluctuation through the period of study with remains at 108.13 percent over the base year. However the value of null hypothesis based on Chi-square statistic 0.919 was less than table value of 12.592. The null hypothesis assumes straight line approximation to the productivity index with upward direction and average annual positive 1.213 percent. It is apparent that the total input requirement per rupees of output of for the Godavari Fertilizer & Chemical Ltd declined from Rs**.** 1.057 in the year 1999-000 to Rs. 0.960 in the year 2005-06. The lowest value of the overall input was in the year 2004-05 and the average value of the overall input is 0.980.

(2) Gujarat Narmada Vally Fertilizers Company Ltd.

Table No:-6.32

Analysis of Overall Productivity in Gujarat Narmada Vally Fertilizers Company Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD. INDEX	TREND VALUE	I/O
1999-00	1153.06	984.48	**1.1712**	100.000	73.41201	0.854
2000-01	1339.39	1133.34	**1.1818**	50.841	68.88253	0.846
2001-02	1404.79	1150.47	**1.2211**	52.529	64.35305	0.819
2002-03	1377.32	1115.8	**1.2344**	53.102	59.82357	0.810
2003-04	1446.84	1180.62	**1.2255**	52.720	55.29409	0.816
2004-05	1822.62	1450.57	**1.2565**	54.053	50.76461	0.796
2005-06	2147.57	1664.05	**1.2906**	55.520	46.23513	0.775
Total	10691.59	8679.33	8.5810	418.765	418.765	5.716
AVG.	1527.37	1239.904	1.225861	59.824	59.82357	0.817
STANDARD DEVIATION =17.77				A=59.82	Chi Square=19.48	
Co.-Efficient of Variance=29.71				B=-4.53		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.32 represent the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Gujarat Narmada Vally Fertilizers Company Ltd

As shown in the Table no.:-6.32 that the trend of the out put of GNFC was increasing till the year 2001.02 and it reached up to Rs. 2147.57 crores in the year 2005.06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 1527.37 crores.Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs984.48 crores and it increased up to Rs. 1450.57 crores in the year 2004-05. Further it increases to the value of Rs. 1664.05 crores in the year 2005-06. The average value of the input is Rs. 1664.05 crores.

The Table no.:-6.32 showed the static trend in overall productivity ratio. The ratio varies from 1.1712 to 1.2906. The value of above said ratio in the year 1999-00 was 1.1712 and it was 1.2906 in the year 2005-06. The average value of the ratio is 1.225861 in a given time period of said company.

The productivity index of the unit shows the upward trend in a research study period. The productivity index in the year 2002-03 was 105.391 and it

was 110.188 in the year 2005-06. The average value of the index is 104.664. More than 100 is a good sign for the company. The co-efficient of variation is 29.71 which showed high fluctuation and the value of chi-square calculated at 19.48 percent which was much higher than the table values of 12.592 therefore the null hypothesis is rejected. It could not be assumed that the straight line approximation for the productivity indices. The straight line in the case of GNFC showed an increasing trend of productivity efficiency with an average annual positive rate of change (4.53).The overall input requirement per rupee of output for the GNFC declined from Rs 0.854 in the year 1999-000 to RS. 0.775 in the year 2005-06. The lowest value of the overall input was in the year 2005-06 and the average value of the overall input is 0.775

(3) Mangalore Chemicals & Fertilizers Ltd.

Table no.:-6.33 represent the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Mangalore Chemicals & Fertilizers Ltd

As shown in the Table no.:-6.33 that the trend of the out put of Mangalore Chemicals & Fertilizers Ltd was mixed and fluctuating. It was 615.65 crores in the year 1999-00and it reached up to Rs. 1082.31crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 714.97crores.Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 546.3 crores and it increased up to Rs. 828.7 crores in the year 2004-05. Further it increases to the value of Rs. 1079.27 crores in the year 2005-06. The average value of the input is Rs. 681.5771 crores.

Table No:-6.33
Analysis of Overall Productivity in Manglore Chemicals & Fertilizers Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD.	TREND	I/O

				INDEX	VALUE	
1999-00	615.65	546.3	**1.1269**	100.000	96.5852	0.887
2000-01	680.63	654.76	**1.0395**	92.241	95.595	0.962
2001-02	571.18	535.1	**1.0674**	94.719	94.6048	0.937
2002-03	562.79	562.04	**1.0013**	88.854	93.6146	0.999
2003-04	614.21	564.87	**1.0873**	96.486	92.6244	0.920
2004-05	878.02	828.7	**1.0595**	94.017	91.6342	0.944
2005-06	1082.31	1079.27	1.0028	88.985	90.644	0.997
Total	5004.79	4771.04	7.3849	655.302	655.302	6.646
AVG.	714.97	681.5771	1.054985	93.615	93.6146	0.949
STANDARD DEVIATION =4.001				A=96.61	Chi Square=0.74	
Co.-Efficient of Variance=4.281				B= -0.99		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

The Table no.:-6.33 the normal fluctuation in overall productivity ratio. The ratio varies from 1.0013 to 1.1269. The value of above said ratio in the year 1999-00 was 1.1269 and it was 1.0028 in the year 2005-06. The average value of the ratio is 1.054985 in a given time period of said company.

The productivity index of the unit shows the high fluctuation and declining trend in a research study period. The productivity index in the year 2000-01 was 92.241 and it was 88.985 in the year 2005-06. The co-efficient of variation is 4.28 which showed low fluctuation and the value of chi-square calculated at 0.74 percent which was much lower than the table values of 12.592 therefore the null hypothesis is accepted. It is assuming that the straight line approximation for the productivity indices. The straight line in the case of GNFC showed a decline trend of productivity efficiency with an average annual positive rate of change (-0.99).The average value of the index is 93.615. Less than 100 is not a good sign for the company.

The overall input requirement per rupee of output for the Mangalore Chemicals & Fertilizers Ltd varies from time to time.. The lowest value of the overall input was in the year 1999-00 and the average value of the overall input is 0.949.

(4) IFFCo Ltd.

Table no.:-6.34 represent the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for IFFCo Ltd.

Table No:-6.34
Analysis of Overall Productivity in IFFCo Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD. INDEX	TREND VALUE	I/O
1999-00	4804.96	7713.01	**0.622968**	100	160.19	1.605218
2000-01	5424.05	4669.1	**1.161691**	186.477	158.63	0.860814
2001-02	5093.37	4710.19	**1.081351**	173.58	157.07	0.924769
2002-03	6090.99	5333.55	**1.142014**	183.318	155.52	0.875646
2003-04	5918.9	5292.13	**1.118434**	179.533	153.96	0.894107
2004-05	7223.92	6676.75	**1.081952**	173.677	152.4	0.924256
2005-06	5452.71	9511.9	**0.573251**	92.0194	150.84	1.744435
Total	40008.9	43906.63	6.781662	1088.6	1088.6	7.829246
AVG.	5715.557	6272.376	0.968809	155.515	155.52	1.118464
STANDARD DEVIATION =40.98				A=155.52	Chi Square=64.36	
Co.-Efficient of Variance=26.35				B=-1.56		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

As shown in the Table no.:-6.34 that the trend of the out put of IFFCo Ltd. was mixed and fluctuating. It was 4804.96 crores in the year 1999-00and it reached up to Rs. 5452.71 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 5715.557 crores.Input trend of the above company also shows the mixed and upward trend in a given time schedule of a given company. In the year 2000-01 the input of the said company was Rs 4669.1 crores and it increased upto Rs. 9511.9 crores in the year 2005-06. The average value of the input is Rs 6272.376 crores. The Table no.:-6.34 showed the fluctuation in overall productivity ratio. The ratio varies from 0.5733 to 1.1617. The value of above said ratio in the year 1999-00 was 0.6230 and it was 0.5733 in the year 2005-06. The average value of the ratio is 0.968809 in a given time period of said company.

The productivity index of the unit shows the mixed fluctuation in a research study period. In the year 2005-06 the index was below 100. The productivity index in the year 2002-03 was 183.318 and it was 92.019 in the year 2005-06. The average value of the index is 155.515. More than 100 is good sign for the company. The value of chi-square calculated at 64.36 which was much higher than the table value of 12.592 therefore the null hypothesis is rejected and assumed that straight does not followed the index. The co-efficient of variation showed 26.35 percent.The overall input requirement per rupee of output for the IFFCo Ltd**.** varies from time to time. The lowest value of the overall input was in the year 2000-01 and the average value of the overall input is 1.118.

(5) Madras Fertilizers Ltd.

Table no.:-6.35 describe that overall productivity, co-efficiency of relationship, productivity index, trend value input-output ratio, standard deviation, co-efficient of variation and value of chi-square.

It was apparent from the Table no.:-6.35 that overall productivity of Madras Fertilizers Ltd. Fluctuated through out the research study period and the trend was decreasing. From the year 2000-01 to 2005-06 output shows the decreasing trend. In remaining year it varies time to time. In the year 2000-01 the output was 1404.43 which is highest and in the year 2005-06 the output was 1084.22 which is highest during the study period of this company. The average value of the output was Rs1112.609 crores.It was considered from the Table no.:-6.35 that input has dual trend during the given stuy period i.e. from 1999-06. From 1999-00 to 2001-02 the trend was increasing and than up to 2005-06 the trend was declining. Input varies between 659.34 crores to 1298.57 crores in given schedule. The average value of the input was 1065.64 crores in a given time schedule for this research study.

Table No:- 6.35

Analysis of Overall Productivity in Madras Fertilizers Ltd.

(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD. INDEX	TREND VALUE	I/O
1999-00	636.95	659.34	0.966042	100	107.3893	1.035152
2000-01	1404.43	1298.57	1.08152	111.9538	107.5071	0.924624
2001-02	1097.63	1104.67	0.993627	102.8555	107.6249	1.006414
2002-03	1139.06	973.59	1.169959	121.1085	107.7427	0.854731
2003-04	1139.75	1086.07	1.049426	108.6315	107.8605	0.952902
2004-05	1286.22	1238.32	1.038681	107.5193	107.9783	0.962759
2005-06	1084.22	1098.92	0.986623	102.1305	108.0961	1.013558
Total	7788.26	7459.48	7.285878	754.1991	754.1989	6.75014
AVG.	1112.609	1065.64	1.04084	107.7427	107.7427	0.964306
STANDARD DEVIATION =7.22				A=107.74	Chi Square=2.90	
Co.-Efficient of Variance=6.70				B=0.1178		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

As per the results of output and input the overall productivity ratio also fluctuated during the study. This ratio occurs from 0.9660 to 1.1700. The average value of the overall productivity ratio of Madras Fertilizers Ltd. is 1.040840. Value of co-efficient of variation 6.70 percent and the value of standard deviation at figured 7.22 percent during the period of study as in shown in the above in table no.6.35. It is further confirmed by chi-square test. Further in order to measure the null hypothesis by the norms of straight line based on least square method it was found that the value of chi-square figured at 2.90 which is less than the table value of 12.592 therefore null hypothesis is accepted and alternative hypotheses is rejected. The computed value of productivity index showed positive annual growth of 0.1178 which shows good pattern of material productivity of Madras fertilizer ltd. So the ratio of the given unit fluctuates during the study period. Similarly the productivity index also fluctuate the average of the indices. Overall productivity index is more than 100 so we can consider this as a good output for the given company in a given study period. It may also be seen from the table that the average overall input per rupees of output for the said industry amounted to 0.964. Input out put ratio was the lowest in the year2002-03. It shows that the

company achieved its maximum efficiency in that year from the given time schedule.

(6) National Fertilizer Ltd.

Table No:-6.36
Analysis of Overall Productivity in National Fertilizer Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD. INDEX	TREND VALUE	I/O
1999-00	2604.11	2380.57	1.0939	100	101.2515	0.914
2000-01	2767.31	2551.8	1.0845	99.136	101.2461	0.922
2001-02	2938.57	2700.05	1.0883	99.491	101.2408	0.919
2002-03	3664.32	3010.09	1.2173	111.285	101.2354	0.821
2003-04	3239.22	2997.08	1.0808	98.802	101.23	0.925
2004-05	3440.8	3114.56	1.1047	100.991	101.2247	0.905
2005-06	3569.12	3297.6	1.0823	98.943	101.2193	0.924
Total	22223.45	20051.75	7.7519	708.648	708.6478	6.331
AVG.	3174.779	2864.536	1.107417	101.235	101.2354	0.904
STANDARD DEVIATION =4.49				A=101.23	Chi Square=1.20	
Co.-Efficient of Variance=4.44				B=-0.005		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:- 6.36 present the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for National Fertilizer Ltd.

As shown in the table output trend of the National Fertilizer Ltd**.** was mixed in the year 1999-00 to 2005-06, it declines up to Rs. 2604.11 crores in the year 1999-00. Further it increases up to 3569.12 crores in the year 2005-06. So the trend of output is mixed during the period of the study. The average value of the out put of above said company is 3174.779 crores.Input trend of the above company also shows the mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs. 2380.57 crores and it increases up to Rs. 3297.6crores in the year 2005-06. The average value of the input is Rs. 2864.536 crores.

The Table no.:-6.36 showed the minor fluctuation in overall productivity ratio. The ratio varies from 1.0823 to 1.2173. The value of above

said ratio in the year 1999-00 was 1.0939 and it was 1.0823 in the year 2005-06. The average value of the ratio is 1.107417 in a given time period of said company.

The productivity index of the unit shows the fluctuation in a research study period. The productivity index in the year 2002-03 was 111.285 and it was 98.943 in the year 2005-06. The average value of the index is 101.235 with a co-efficient of variation of 4.44 percent and the value of standard deviation at figured 4.49 percent. It is further confirmed by chi-square test. Further in order to measure the null hypothesis by the norms of straight line based on least square method it was found that the value of chi-square figured at 1.20 which is lower than the table value of 12.592 therefore null hypotheses is accepted and alternative hypothesis is rejected. The computed value of productivity index showed positive annual growth of 0.005 which showed good pattern of over all productivity of National Fertilizer Ltd.

The overall input requirement per rupee of output for the National Fertilizer Ltd. increase from Rs. 0.914 in the year 1999-00 to Rs 0.924 in the year 2005-06. The lowest value of the overall input was in the year 2002-03 and the average value of the overall input is 0.904.

(7) Coromandel Fertilizers Ltd.

Table no.:-6.37 represent the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Coromandel Fertilizers Ltd.

As shown in the Table no.:-6.37 that the trend of the out put of Coromandel Fertilizers Ltd. mixed and fluctuating. It was 606.27 crores in the year 1999-00and it reached up to Rs. 1877.27 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 1020.544 crores.

Table No: - 6.37
Analysis of Overall Productivity in Coromandel Fertilizers Ltd.
(Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD.	TREND	I/O
				INDEX	VALUE	
1999-00	606.27	525.33	1.154075	100	102.295	0.8665
2000-01	611.69	518.75	1.179161	102.1738	100.452	0.8481
2001-02	663.58	573.12	1.157838	100.3261	98.6085	0.8637
2002-03	590.21	548.76	1.075534	93.19449	96.7651	0.9298
2003-04	1240.4	1091.67	1.136241	98.45471	94.9216	0.8801
2004-05	1554.39	1417.5	1.096571	95.01738	93.0781	0.9119
2005-06	1877.27	1844.5	1.017766	88.18896	91.2346	0.9825
Total	7143.81	6519.63	7.817186	677.3554	677.355	6.2826
AVG.	1020.544	931.3757	1.116741	96.76505	96.7651	0.8975
STANDARD DEVIATION =4.91			A=	96.76505	Chi Square=0.0516	
Co.-Efficient of Variance=5.07			B=	-1.84347		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Input trend of the above company also shows the upward mixed trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 525.33 crores and it increased up to Rs. 1844.5 crores in the year 2005-06. The average value of the input is Rs 931.3757 crores.The Table no.:-6.37 showed the fluctuation in overall productivity ratio. The ratio varies from 1.1792 to 1.0178. The value of above said ratio in the year 1999-00 was 1.1541 and it was1.0178 in the year 2005-06. The average value of the ratio is 1.116741 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2001-02 was 102.174 and it was 88.189 in the year 2005-06. The average value of the index is 96.765. The co-efficient of variation shows 5.07 percent and standard deviation also indicated 4.91 percent so the trend fluctuated was there during the study period. The computed chi-square value describes 0.0516 which is less than the critical value of 12.592 therefore null hypotheses is accepted and alternative hypothesis is rejected. It means L.P. indices and be described by the line of it fit. The overall input requirement per rupee of output for the Coromandel Fertilizers Ltd. varies from time to time.. The lowest value of the

overall input was in the year 2000-01 and the average value of the overall input is 0.898.

(8) Chambal Fertilizers & Chemicals Ltd.

Table No:-6.38
Analysis of Overall Productivity in Chambal Fertilizers & Chemicals Ltd. (Rs. In crores)

YEAR	OUTPUT	INPUT	O/I	PROD.	TREND	I/O
				INDEX	VALUE	
1999-00	1361.58	927.58	1.4679	100.000	70.7883	0.681
2000-01	1794.59	1386.63	1.2942	41.278	63.3682	0.773
2001-02	1909.45	1380.82	**1.3828**	44.105	55.9481	0.723
2002-03	1888.56	1535.44	**1.2300**	39.230	48.528	0.813
2003-04	2217.26	1793.03	**1.2366**	39.441	41.1079	0.809
2004-05	2679.31	2316.67	**1.1565**	36.887	33.6878	0.865
2005-06	2741.62	2256.2	**1.2151**	38.757	26.2677	0.823
Total	14592.37	11596.37	8.9832	339.6976	339.696	5.486
AVG.	2084.624	1656.624	1.283314	48.52822	48.528	0.784
STANDARD DEVIATION =22.81				A=48.528	Chi Square=30.35	
Co.-Efficient of Variance=47				B=-7.042		

SOURCE: COMPILED FROM ANNUAL REPORTS AND ACCOUNTS

Table no.:-6.38 represent the details of overall productivity ratio indices, co-efficiency of co-relationship, input-output ratio as well as chi-square test for Chambal Fertilizers & Chemicals Ltd.

As shown in the Table no.:-6.38 that the trend of the out put of Chambal Fertilizers & Chemicals Ltd. mixed and fluctuating. It was 1361.58 crores in the year 1999-00and it reached up to Rs. 2741.62 crores in the year 2005.06. So the trend of output is mixed and increasing during the period of the study. The average value of the out put of above said company is 2084.624 crores.Input trend of the above company also shows the upward trend in a given time schedule of a given company. In the year 1999-00 the input of the said company was Rs 927.58 crores and it increased up to Rs 2256.2 crores in the year 2005-06. The average value of the input is Rs 1656.624 crores.

The table shows the fluctuation in overall productivity ratio. The ratio varies from 1.4679 to 1.1565. The value of above said ratio in the year 1999-00 was 1.4679 and it was 1.2151 in the year 2005-06. The average value of the ratio is 1.283314 in a given time period of said company.

The productivity index of the unit shows the high fluctuation in a research study period. The productivity index in the year 2000-01 was 88.168 and it was 82.782 in the year 2005-06. The average value of the index is 87.426 with a co-efficient of variation of 47 percent. The chi-square value is 30.35 which is much higher than the critical value of 12.592. Therefore null hypothesis is rejected and alternative hypothesis accepted. It means that P.L indices and be described by the line of it fit. The overall input requirement per rupee of output for the Chambal Fertilizers & Chemicals Ltd. varies from time to time. The lowest value of the overall input was in the year 1999-00 and the average value of the overall input is 0.784.

OVERALL PRODUCTIVITY RATIO OF THE SELECTED COMPANIES OF FERTILIZER INDUSTRY AND KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIATION TEST:

Table No.-6.39 showed the comparative total productivity ratios in selected companies of the fertilizer industry in India. On the basis of Kruskal Wallis one way analysis of variance test for the period of seven years, this is under study.

$$H = \frac{12}{N(n+1)} \sum_{I=1}^{K} \frac{Ri1}{Ni} - 3(n+1)$$

Where n=n1+n2+n3…nk and Ri=sum of the rank

$$K = \frac{12}{56(56+1)}\left[\frac{(348)^2}{7} + \frac{(214)^2}{7} + \frac{(336)^2}{7} + \frac{(90)^2}{7} + \frac{(160)^2}{7} + \frac{(209)^2}{7} + \frac{(110)^2}{7} + \frac{(129)^2}{7}\right] - 3(56+1)$$

$$= 0.00376 \ (55131.10) - 171$$
$$= 36.36$$

Table No.-6.39 describe that the calculation value of 'H' equals to 36.36which is more than the table value of 14.067 hence the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 percent level of significant accepted.

TABLE NO.:-6.39

COMPARATIVE OVERALL PRODUCTIVITY RATIO OF SELECTED COMPANIES OF FERTILIZER INDUSTRY WITH KRUSKAL WALLIS ONE WAY ANALYSIS OF VARIANCE TEST

Year	Cham	R1	Coro	R2	GNFC	R3	God	R4	IFFCO	R5	Nat	R6	Mad	R7	Mang	R8
1999-00	1.47	56	1.15	37	1.17	42	0.946	3	0.623	2	1.09	30	0.97	4	1.13	34
2000-01	1.29	54	1.18	43	1.18	44	1.052	17	1.162	41	1.09	26	1.08	23	1.04	14
2001-02	1.38	55	1.16	39	1.22	47	1.022	11	1.081	22	1.09	29	0.99	7	1.07	19
2002-03	1.23	49	1.08	20	1.23	50	1.026	12	1.142	36	1.22	46	1.17	41	1	8
2003-04	1.24	51	1.14	35	1.23	48	0.986	5	1.118	33	1.08	21	1.05	16	1.09	28
2004-05	1.16	38	1.1	30	1.26	52	1.086	27	1.082	25	1.11	32	1.04	13	1.06	18
2005-06	1.22	45	1.02	10	1.29	53	1.042	15	0.573	1	1.08	25	0.99	6	1	8
		348		214		336		90		160		209		110		129

COMPARATIVE ANALYSIS OF OVERALL PRODUCTIVITY:-

Table no. -6.40 shows overall ratio, co-efficiency of co-relationship, productivity index, average indices, trend value of indices, standard deviation, co-efficient of variation, chi-square and input output ratio for selected companies of the fertilizer industry.

TABLE NO.:-6.40

COMPARATIVE ANALYSIS OF OVERALL PRODUCTIVITY

	O/I RATIO		PRO. INDEX		CO-EFF.		CHI-SQ.		I/O RATIO		GROWTH RATE		OVER ALL	
	AVE.		AVE.						AVE.					
COMPANY	VAL.	RANK	VAL.	RNK	VAL.	RNK	VAL.E	RNK	VAL.	RNK	VAL.	RNK	VAL.	
Cham	1.28	8	48.5	1	47	8	30.4	7	0.784	1	-7	1	26	
Coro	1.12	6	96.8	3	5.1	4	0.05	1	0.897	3	-1.8	3	20	
GNFC	1.22	7	59.8	2	30	7	19.5	6	0.817	2	-4.5	2	26	
GOD	1.02	2	108	7	4.5	3	0.92	3	0.98	7	1.21	8	30	
IFFCO	0.97	1	156	8	26	6	64	8	1.12	8	-1.6	4	35	
NAT	1.11	5	101	5	4.4	2	1.2	4	0.904	4	0	6	26	
MAD	1.04	3	108	6	6.7	5	2.9	5	0.964	6	0.12	7	32	
MANG	1.05	4	96.6	3	4.3	1	0.74	2	0.949	5	-1	5	20	
group	**1.101**		**96.8**		**16**		**15**		**0.93**		**-1.8**		**27**	

CONCLUSION:

As conclusion point of view chapter titled "Analysis of productivity" described the concept, importance and measurement of poductivity. The term productivity is using for interchangeably behavior and achievement, refers to ratio of output divided by input it is noted that "productivity improvement concerns itself with the goals and objective of the organization as well as with the manner in which they are to be achieved, It involves both 'doing the right things' which is effectiveness but also 'doing them right' (efficiency)" **14** according to above Para it can be said that productivity concerned with to effectiveness and efficiency and it is a semi healthy parameter for measuring the performance of business organization.

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CHAPTER – 7
SUMMARY, CONCLUSION AND SUGGESTIONS

CHAPTER–1:
Profile of the fertilizer industry in India

The fertilizer Group of Companies in India plays an important role to develop the Indian economy. Which are mainly engaged in manufacturing the fertilizer, So the brief profile of fertilizer industry is also given in this chapter, which includes the Introduction: Fertilizer, Fuel for Growing Plants, Past performance of the fertilizer industry , Role of fertilizer industry in economic development, Brief history of fertilizer industry, Development & progress of fertilizer industry in India, Problems related to fertilizer Industry, Government policy v/s fertilizer industry, Types of fertilizer & fertilizer manufacturing process, Scope and implications for the future, Conclusions, Recent development and brief news of fertilizer industry, Current status of the fertilizer industry in India. In the last the brief introduction of selected units has been given, which included the ownership of the industry, main product, and incorporation of years.

CHAPTER-2:
Conceptual framework of performance efficiency

Present research dealt with the study of **"**Comparative analysis of performance efficiency of fertilizer industry in India", which are mainly engaged in the production of different types of fertilizer.

The study is made to analyze operational efficiency, financial efficiency and partial productivity effectiveness of various activities in deferent areas of operation of an organization. In the interest of getting good working results, every enterprise should have a periodical analysis of its performance of efficiency. The areas of the analysis are operational efficiency,

financial efficiency, and partial productivity. For that the conceptual framework of Performance, Efficiency, Financial Efficiency, Performance Efficiency, Performance Appraisal, and productivity is given. The objective of this study is detailed cause and effect study of the efficiency and effectiveness in the use of resources available in the business enterprise. The importance and usefulness of operational efficiency financial efficiency analysis and productivity of business are different for various users of the information such as for Financial managers, investor, and shareholders, creditors, employees, Big business Houses, Government, Society etc. For Financial managers this study is devises to measure the over all effectiveness of their own plans and policies. Investors and Shareholders are interested in the current and long term profitability of their investment. The employees, Shareholders, and Government are interested in the profits of a company. The society also expects to know about the social performance such as environmental obligations, employment, avenues, Social welfare etc.

The techniques, which are commonly used for the study, are such as ratio analysis, trend analysis, comparative statement analysis etc. Statistical techniques are also used for the purpose and they generally include the average, index, Kruskal Wallis one-way analysis of variance, Chi-quare test, Standard deviation, variance etc. Diagrams, Graphs and Charts are also prepared and made use of.

CHAPTER-3: Research Methodology:

The subject of the present study is **"**Comparative analysis of performance efficiency of fertilizer industry in India", which covers the period of the last seven years from 1999-2000 to 2005-06. The study covers the large plants of fertilizer group of companies. The study is based on secondary data published by the fertilizer group of companies in their annual reports and accounts. The main objective of the study is to know the operational

efficiency, financial efficiency, analysis of productivity of the 8th selected units of fertilizer group of companies. The chapter covers the Problems related to public sector enterprise, Relevance of the study, Review of the literature, Statement of problem, Objectives of study, Hypothesis of the study, Universe of the study, Period of the study, Sampling design, Data collection method, Tools and Techniques which included Various statistical measures like mean, standard deviation, regression, index number, have been used and least-square trend, qui-square of productivity have been fitted, Kruskal Wallis one way-analysis of variance test and 'X' test have been applied to test the validity of two hypotheses namely (1) Null hypothesis (2) Alternative hypothesis., Outline of Study, Finally the limitations of present study have been shown.

CHAPTER-4: Operational efficiency analysis:

This chapter deals with operational efficiency and activity analysis in term of size of investment. The main conclusions drawn are as under:

1. The total assets turnover ratio, which indicates the effectiveness of the utilization of assets, registered a fluctuating trend in almost all the companies under study. The ratio of IFFCO was the lowest 0.63 times in 2005-06 while it was the highest 4.88 times in GFCL in 1999-2000. The ratio was in most of years less one in CFCL and GNFC whereas it was always more than on in MCFL, NFL and CFL during the study period. The reason responsible for the lower ratio was the increase in the amount of assets because of huge expansion and development programmes. Thus, the addition to investment in various assets could not be resulted in proportionate in sale.
2. The result showed by ANOVA test (F) reveals the difference in total assets turnover ratio were significant in all selected companies at the 5 percent level of significant.

3. The fixed assets turnover ratio of IFFCO ranged from 1.12 times 2005-06 and 3.57 times in 2004-05.The ratio showed fluctuating and mixed trend in almost all the selected fertilizer companies under study during the period under review. The ratio was always more than two times in CFL, MCFL and GFCL while it was always less than two times in GNFC an CFCL. Thus, the ratio suggests that the GFCL, MCFL, CFL and NFL were able to utilize its fixed assets properly in generating sales whereas GNFC and CFCL failed to maintain the rate on increase in sales as compared to that in fixed assets CFL, MCFL and GFCL succeeded to a large extent on this front.
4. It is evident from Table no.4.4 that the difference between Fixed Assets Turnover Ratio in between groups and within groups was significant because the calculated value of 'F' (41.39) was higher than the critical value of 'F' (2.20) so, null hypothesis is rejected and alternative hypothesis is accepted. So, it indicates a high deviation in Fixed Assets Turnover Ratio of Fertilizer units under study.
5. The current assets turnover ratio of GFCL ranged between 7.91 times in 2002-03 and 20.03 times in 2000-01 indicating a mixed trend in almost all the selected fertilizer companies under study during the period under review. The combined average ratio 4.02 times. All the companies made excessive investment in current assets particularly in the form of inventory and sundry debtor. The ratio was always more than three times in GFCL and, MCFL indicated efficient utilization of current assets.
6. It is evident from Table No.4.6. that the difference between Current Assets Turnover Ratio in between groups and within groups was significant because the calculated value of 'F' (4.42) was higher than the critical value of 'F' (2.20) so, null hypothesis is rejected and alternative hypothesis is accepted. Therefore, it indicates a high

deviation in Current Assets Turnover Ratio of Fertilizer units under study.

7. Analysis of capital turnover ratio reveals that the GFCL showed the highest turnover ratio followed MCFL, MFL, NFL, CFL and GNFC. Other companies like IFFCO, and CFCL showed ratio below one, which was not showing efficiency in the utilization of the capital employed.
8. ANOVA test of capital turnover explains that there is significant difference in capital turnover ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the capital turnover ratio of fertilizers units under study.
9. The material consumed to net sales ratio of fertilizer group of industries was 59.70 percent. The highest ratio of 139.30 percent in the years of 205-06 was found in IFFCO whereas in GFCL the average ratio was 82.87 percent. The lowest average ratio was found in NFL thus this company has good command over the consummation of material.
10. Table No.4.9 indicates there is significant difference Raw material to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the Raw material to net sales ratio fertilizers units under study.
11. Wages and salaries to net sales ratio was the highest in GNFC followed by IFFCO, and MFL. The ratio was the lowest in GFCL. It can be concluded that amount of wages and salaries was increasing year on account of regular increment in the wages and salaries and increased in

dearness allowance which is linked with the cost of living index number. It is suggested that wages should be linked with labour productivity.

12. The result showed by ANOVA test (F) reveals the difference in Wages and salaries to net sales ratio were significant in all selected companies at the 5 percent level of significant.
13. Power- fuel to net sales ratio of fertilizer group was showing fluctuating trend through out the study period. The ratio was 13.02 percent in 1999-2000 to 14.2 percent in 2000-01. It further went down to 13.79 percent in 2001-02 and rose to 14.29 percent in 2002-03. The ratio was 14.28 percent in 2003-04 and stabled at the lowest level of 13.21 percent in 2005-06. The average ratio was 13.90 percent. In compare to group average the ratio of NFL, CFCL, MFL GNFC and GFCL had the above average ratio.
14. Table No.4.12 indicates there is significant difference in energy (power-fuel)/net sales of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted
15. The percentage of selling & marketing to net sales ware observed the highest In GFCL during the most of the years of the study compared to the other fertilizer companies. The share of these expenses was less than 7.51 percent in GNFC, MCFL, MFL, NFL, and CFCL.
16. The result showed by ANOVA test (F) reveals the difference in Wages and salaries to net sales ratio were significant in all selected companies at the 5 percent level of significant.
17. The financial charges to net sales ratio indicated a declining trend during the study period. It varied from 1.86 percent in 2004-05 to 5.49percent in 2000-01.The ratios in the companies like GNFC MFL and

CFCL, had the ratio higher than the fertilizer group. While the companies like IFFCO, GFCL, MCFL NFL and CFL had the ratio lower than the fertilizer group of companies.

18. Table No.4.16 indicates there is significant difference in financial charges to net sales ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the financial charges to net sales ratio of fertilizers units under study.
19. Inventory turnover ratio express the frequency with which average level of inventory it turned through operations. The ratio in selected fertilizer companies taken as a whole increasing during the study period. It varied from 5.775 times in 2002-03 and 8.44 times in 2005-06. The inventory turnover ratio was the highest in CFCL and in MCFL among all selected companies under study respectively. The companies should plan a policy to maintain a defined proportion of inventory to avoid heavy short term investment in it.
20. On the basis of analysis of ANOVA test (F) there is significant difference in inventory turnover ratio of fertilizers units under study because the calculated value of 'F' is higher than table value so, null hypothesis is rejected and alternative hypothesis accepted. It can be concluded that there is a high deviation in the in inventory turnover ratio of fertilizers units under study.
21. On the basis of the calculated value of H works out at 30.42, being more than the critical value of 9.488. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the inventory turnover ratios of the fertilizers units under study. It may also lead to the

conclusion that the profitability of fertilizers units is differ for units to units.

22. Debtor turnover ratio shows the firms efficiency in realizing the debtors. The debtor turnover ratio in selected fertilizer companies taken as whole revealed in increasing trend during the study period. It varied from 7.43 times in2002-03 to 33.77 times in 2005-06 times. Generally, this ratio was highest in MFL, MCFL, IFFCO, and CFL companies. Most of unit ratio was more than 8 times indicated efficient management of current assets.
23. On the basis of analysis of ANOVA test (F) it is clear that difference in between groups and within groups was not significant because the calculated value of 'F' (2.009451) was lower than the table value of 'F' (2.20). Analysis indicates that there were similarities in debtor turn over ratio of Fertilizer units under study.
24. On the basis of Kruskal Wallis analysis the calculated value of H works out at 37.97, being more than the critical value of 14.067. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the debtor turn over ratio of the fertilizers units under study. It may also lead to the conclusion that the debtor turn over ratio of fertilizers units is differ for units to units.

CHAPTER-5: Analysis Of Financial Efficiency:

Financial efficiency is a measure of the organizations ability to translate to its financial resources into mission related activities. Financial efficacy is desirable in all organization of individual mission. It measures the intensity with which a business uses it assets to generate gross revenue and the

effectiveness of producing, purchasing, pricing, financing, and marketing decisions. At the micro level financial efficiency refers to the efficiency with which resources are correctly allocated among competing uses at a point of time. Financial efficiency is a measure of how well an organization has managed certain trade of (risk and return, liquidity and profitability) in the use of its financial efficiency. The present study has been made in order to analysis the efficiency through the profitability ratio of the Birla group of companies in India and also of the individual Birla Group of company. The profitability ratios which have been discussed in this chapter are: (1) Gross profit ratio: (2) Operating profit ratio: (3) Net profit ratio: (4) Return on gross capital employed (5) Return on net capital employed (6) Return on net worth (7) A study of earning per equity share of the company under study has been also made

1. The gross profit in terms relative terms as percent of net sales. As regard the fertilizer group, the gross profit ratio ranged from 12 percent in 1999-2000 to 7.665 percent in 2000-01. After first year of study period the ratio showed a decreasing trend from 2000-01 to 2005-06 with an average of 9.10 percent. In this ratio, the managemnt was very interest. As regards this ratio the GFCL IFFCO CFL and NFL fertilizer showed good profitability followed by NFL and MCFL It is suggest that the GFCL and MFL Should reduce the cost of goods sold.
2. The calculated value of kruskal Wallis one-way analysis is more than the critical value. So it is concluded that there has been significant difference between operating ratio of the regions.
3. The one way ANOVA test reveals that the calculated value is more than the table value, hence it is concluded that the Gross Profit ratio does differ significantly.

4. The operating ratio of fertilizer Companies of India, which showed fluctuated trend during the study period. The average ratio 88.6 percent which was satisfactory. The ratio varied from 85 percent in 2001-02 to 100 percent in 2005-06. The ratio was not good except in 2005-06 the trend in fertilizer Companies of India fluctuated during the study period. However it was more than the standard. In general manufacturing concerns, the operating ratio was expected to touch a percentage of 75 to 85 percent.
5. The operating ratio was the highest in NFL. Among all the companies and the lowest ratio seen in the GNFC. A higher operating ratio is unfavorable for the company. Further it can be said that GNFC has achieved good remarks in the case of operating ratio.
6. ANOVA test for operating ratio showed the significant between the groups and within the group. And the result of krusal Wallis test was also same.
7. The Net profit ratio in fertilizer industry in was satisfactory. The average ratio of GNFC was highest among all the fertilizer companies. The average ratio of CFCL (7.41 percent) followed by IFFCO (6.02) MCFL (6.12)) and CFL (5.77).The average ratio of MFL showed negative profit margin. The average ratio of GFCL and NFL indicated a very low profitability.
8. ANOVA (F) test indicates that there is significant difference in Net Profit ratio of fertilizers units under study. Hence It can be concluded that there is a high deviation in the Net Profit ratio of fertilizers units under study
9. The calculated value of H works out at 38.51, being more than the critical value of 9.488. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted. Rejection of the null hypothesis and the acceptance of alternative hypothesis reveal that there has been significant difference between the net profit ratios of the fertilizers units under study.
10. The earning per share registered a fluctuated trend during the period under study. The highest earning per share was in CFL and IFFCO. The

combined average earning per share of GFCL, MCFL, MFL, NFL and CFCL indicated a worst profitability position of unit.

11. ANOVA Test indicates the calculated value was higher than the table value. Hence null hypothesis is rejected and alternative hypothesis is accepted. The calculated value of kruskal Wallis (H) test was 41.22 which were higher than the critical value hence that different in EPS of fertilizer companies was significant.
12. The study shows that return on the capital employed in the fertilizer companies India has marked fluctuating trend during the whole year of the study period. The average was 13.90 percent. In the group this ratio was satisfactory.
13. The analysis of the return on gross capital employed in individual fertilizer Companies of the study period reveals that it was the highest return on gross capital employed in MCFL. Followed by CFL. GNFC. NFL and CFCL. In MFL and GFCL Return on Gross Capital Employed Ratio of the company was not satisfactory during the study period.
14. As compared to the fertilizer companies the performance of IFFCO, GNFC MCFL CFL and CFCL was better while the performance of GFCL MFL and NFL was lower. ANOVA test for operating ratio showed the insignificant between the groups and within the group. The calculated value of H works out at 22.62, which is higher than the critical value of 14.067. Hence the rejection of the null hypothesis and acceptance of its alternative hypothesis would mean that there is significance difference between the Return on gross capital employed of fertilizer companies.
15. Return on Net Capital Employed is the best test of overall profitability and efficiency of the business firm. A company with high rate of return on capital employed would be in a position to capitalize; e.g. it can take advantage of all favorable market opportunities.

16. The study shows that returns on capital employed in the fertilizer companies in India had marked a fluctuated trend. The average was 53.46 percent in fertilizer companies in India. This ratio was satisfactory. On the whole CFL had the highest return net on capital employed of 21.90 percent on an average in a span of seven years followed by GNFC, CFCL, IFFCO, MCFL and NFL. Followed by other selected units. As compared to the fertilizer companies in India the performance of IFFCO, GNFC, CFL and CFCL were better. While the performance of GFCL, MCFL, and MFL, was lower. In the light of the above discussion it is suggested that GFCL, MCFL, and MFL should undertake cost control measure so that increase net profit before interest and taxes of the company might enhance the return on net capital employed
17. Since F calculated value is higher than F critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded that the Return on Net Capital Employed ratio does differ significantly.
18. Kruskal Wallis test for return on net capital employed reveals that the calculated value of H equal to 23.61 is more than the critical value 14.067. Therefore, the null hypothesis based on Kruskal Wallis one way analysis of variance test at 5 per cent level of significance is rejected and hence it is concluded that the Return on Net Capital Employed ratio does differ significantly.
19. Return on net worth indicates how well the company has used the resources of the owners. On making an analysis of the performance of the Birla Group, the return had been on average 11.43. It showed highly fluctuated trend during the whole years of study period. The return on net worth in the covered period ranged between 7.11 in 2002-03 and 15.92 in 2005-06 the fertilizer group of companies under study. GFCL, MFL and NFL had to make a struggle for achieving the standard. Other companies under study

had however, come up to the standard. On the whole CFL had the highest return on net worth of 20.44 percent on an average in span of seven years followed by GNFC, CFCL and MCFL.

20. The calculated value of H is more than the critical value. Therefore, the null hypothesis based on Kruskal Wallis one-way analysis test at 5 percent level of significant is rejected. The rejection of null hypothesis would mean that there is significant different between the Return on net- worth of fertilizer group of companies and one was ANOVA test also explains that Return on Net worth Ratio of fertilizers units under study are highly deviated.

Chapter-6: Productivity analysis

Productivity:

Productivity may be defined as the ratio of output to input. Higher the productivity also stands for proper utilization of available resources to achieve the best result with the minimum cost of expenditure. Measurement of productivity is pre-requisite of improvement of productivity in the present study.

MATERIAL PRODUCTIVITY:

Productivity accounting in the case of material involves the following:

1. Material output (net sale)
2. Material input

Computation of material productivity ratio, material productivity indices, co- efficient factor, and material input required per rupees of output. Productivity ratio reveals output per rupees of any specific or total whatever the case may be as such the ratio indicates the present productivity of fertilizer Group of Companies. However it does not tell us about the efficiency

achieved during the period, which is the main point of concern in this study. So the productivity indices are worked out as percent of base year productivity ratio. The percentage index comes to more than 100; it means the efficient utilization of resources as compared to the base year or vice-versa. It may, however be noted that the changes in productivity data have been worked out with reference to the base year of 1999-2000

1. The Material productivity ratio of fertilizer group of companies was on an average 1.82. The productivity ratio was found highest in GFCL (1.20) followed by IFFCO, CFL, MCFL MFL GNFC and CFCL all these companies were efficient in utilizing its material. Other companies like GFCL CFL MFL MCFL and IFFCO showed Material productivity ratio on an average below the fertilizer group of companies and low material productivity ratio.
2. As pointed out earlier the indices are the true indicators of the progress made during the period. For material productivity the highest average index (116.15) was recorded for MFL Ltd. This means the MFL Ltd substantially improved its material productivity during the period over the index of base year 100. On the other hand, CFL GFCL and NFL showed the index more than the 100 and also more than the group's average. CFCL (81.88), GNFC Ltd. (99.264), IFFCO. (92.38), MCFL (94.43), performed below the combined average (98.065). It is a matter of great three fertilizers Group of Companies under study that the comparative performance of CFCL and IFFCO in this regard had been very low. It is suggested that the all two companies should take necessary steps to improve their material productivity by aggressive and economical material management.
3. The co-efficient of variation was found the lowest in GFCL and the highest in IFFCO. The chi-square test support the assumption of the material productivity indices follows trend value in CFCL, CFL, GNFC, GFCL,

NFL, MFL, and MCFL. Whereas chi-square test did not support the assumption of material productivity indices follows trend value in IFFCO. The input out ratio was also found very lowest in CFCL. Thus this company's achieved good mark for material productivity. The highest growth rate has been seen in GFCL (0.21) and it was negative in CFCL, CFL, GNFC, IFFCO, NFL, MFL and MCFL.

LABOUR PRODUCTIVITY:

Labour productivity is considered to be the most important factor in productivity accounting. Labour productivity is calculated by convert input and output to the monetary terms. The ratio between the output and input expressed in terms of money output per rupee of input is the measure of labour productivity. Output per rupee of input shows the efficiency in utilizing the manpower resources input in the production.labour productivity and capacity utilization could be general indices, which are easily understandable and could be the basis for measurement by mass of the employee. Apparently there is some substance in the contention that labour productivity may be regarded as one of the basic indicators of economic development. It is rightly considered to be one of the major determinants of national income.

1. On the basis of labour productivity analysis It is found that the average of labour productivity ratio was the highest among the selected units in GFCL (64.75) followed by CFCL (43.26) MCFL, (28.54), CFL (28.37), MFL (25.46), IFFCO. (22.7), NFL (17.65), and GNFC. (14.19), while other units such as GNFC and CFCL have very low labour productivity ratio. So these companies have not been utilizing its manpower efficiency.
2. The co-efficient of variation was seen very lowest in IFFCO (8.67 percent), CFCL (10 percent), and GNFC (10.93). Whereas input out ratio was the lowest in GNFC, NFL, MCFL, IFFCO, and CFL. The chi-square test support the assumption of the labour productivity indices follows trend value in CFCL, GNFC, IFFCO, and NFL. Whereas it was against in CFL, GFCL,

MFL and MCFL. The growth was found very high and positive in CFL,NFL,and MFL,

OVERHEAD PRODUCTIVITY:

Accounting for overhead costs should be done in such a manner that would help management in controlling cost and decision-making. Thus efficiency in overhead is one of the basic objectives of accounting for overheads. It should be noted that net sales divided by total overhead input gives overhead productivity ratio indices, input-output ratio etc. For the fertilizer Group of Companies in India for the seven periods covered under this study.

1. In the fertilizer Group overhead productivity the ratio was 4.414 while the average index of the fertilizer Group of Companies was 104.40 percent, which was more than the base year index100. The overhead input required per rupee of output was 0.31 and the chi-square value was 8.5, which was less than the table value supporting the null hypothesis. The co-efficient was 14.10. However the fertilizer Group of Companies was efficient in utilizing the overheads.
2. It can be concluded that the overhead productivity ratio on an average in GFCL Was found the highest of (7.74), then after it was 5.03 In CFL, 4.93 In IFFCO, and 3.27 in GNFC All these units have been efficient in utilizing the overheads in production. While other units like MFL, CFCL and NFL have the on average overhead productivity ratio was very low. So these companies should try to be efficiency in utilizing the overhead in production.
3. The productivity index of fertilizer group of companies showed highly fluctuated trend during the study period. The index was more than 100 in GNFC, GFCL, IFFCO, and NFL. The chi-square test support the assumption of over heads productivity indices follows trend value in GNFC, NFL, MFL, and MCFL. The highest growth rate has been found in GFCL which more than 10 percent, followed by GNCF, NFL, CFL and CFCL. The lowest

productivity index was manifested in NFL, followed by in ascending order MFL, MCFL, GNFC and IFFCO. Over all overheads productivity performance was very good in GFCL followed by GNFC, IFFCO, CFL, NFL and NFL.

OVER-ALL PRODUCTIVITY:

Overall productivity ratio measures the total productivity of the combined resources input used by an enterprise. In order to resolve the problems of calculation of the overall productivity ratio the data needed are: output (net sales) and total input Total input includes the elements of costs such as material, manpower and overhead. Total input calculated with the base year 1999-2000 prices to indicate the change in productivity efficiency over the base year.

1. The average of overall productivity in the fertilizer Group of companies was 1.10 and the overall productivity average index was 96.79. The CFCL. Was the best in utilizing the overall productivity resources followed by GNFC, MCFL, NFL, MCFL, MFL and GFCL. Other units like IFFCO had very lower and below than one overall productivity ratio hence overall performance was not good in this unit.
2. The overall productivity was the highest in CFCL (1.28) and it was found very lowest in IFFCO (0.97), Thus fertilizer Group of Companies CFL, GNFC, NFL, MFL, and MCFL except IFFCO was efficient and effective to utilize the overall components of men machine and material. In this connection it may be suggested that in order to increase productive efficiency, the cost reduction programme currently in operation should be intensified. It should be ensured that the level of efficiency once achieved does not go out of hand. There should be continuous measurement of efficiency for each and every aspect. The productivity data should be supplied in periodic reports with standard, actual and variance together with causes responsible for such variance.

3. The index analysis of fertilizer group of companies showed that the index was more than 100 percent in GFCL, IFFCO, NFL, and MFL. And it was below than 100 percent of base year in CFCL, CFL, and MCFL.The chi-square test accepted null hypothesis in CFL, NFL, MFL, MCFL and GFCL and this test accepts alternative hypothesis in CFCL, GNFC, and IFFCO. The growth rate was found the highest and positive in GFCL.other units of fertilizer companies showed negative growth rate. The lowest input output ratio was found in CFCL and the highest input out ratio has been seen in IFFCO which was more than one, indicating inefficiency of overall productivity.

SUGGESTIONS:

SUGGESTIONS:

As a researcher on the basis of analysis I have found the following suggestions for the betterment of the selected fertilizer group of companies.

1. The company should try to increase the production so as to get economies of large-scale production. It will assist in raising the rate of return on capital employed.
2. In order to increase the financial efficiency of the companies, it is suggested to control the cost of goods sold and operating expenses.
3. The management should try to adopt cost reduction techniques in their companies to get over this critical situation.
4. The quantum of sales generated should be improved impressively in order better to enjoy better operational efficiency of the assets and capital employed.
5. The selected fertilizer Group of Companies is the capital intensive in nature but the policy of purchase of fixed assets should be carefully planned and reviewed so that the funds may be properly utilized.
6. To reduce power and fuel Cost Company should find out other alternative for this.

7. The selected fertilizer companies should try to match the amount of working with the sales trends. Where there is a deficit of working capital, they should try to build on adequate amount of working capital. Where, there is an excessive working capital, it should be invested either in trade securities or should be used to replay borrowings.
8. The management should try to utilize their production capacity fully in order to reduce factory overheads and to utilize their fixed assets properly.
9. The burden of interest has produced a deteriorating effect and reduced the percentage of net profit. It is suggested that the companies should try to reduce the interest burden gradually by increasing the owner's fund.
10. The few companies, which did not follow a definite policy of financing fixed assets, should follow such policy.
11. To strengthen the financial efficiency, long-term funds have to be used to finance core current assets and a part of temporary current assets. It is better if the companies can reduce the over sized short- term loans and advances eliminates the risk arranging finance regularly.
12. The policy of borrowed financing in selected fertilizer group of companies under study was not proper. So the companies should use widely the borrowed funds and should try to reduce the fixed charges burden gradually by decreasing borrowed funds and by enhancing the owner's fund. For this purpose companies should enlarge their equity share capital by issuing new equity shares.
13. For regular supply of raw materials and the final product infrastructure facilities are required further improvement.
14. Cost accounting and cost audit should be made mandatory for this units and cost sheet along with annual financing statement should be prepared.

15. The public sector enterprises set up in backward areas were not guided by commercial considerations. They were set up to fulfill the aim of balanced regional development.
16. There has been too much of government interference in policy and day-to-day working and decisions. This leads to delays in decision-making. this should be abolished.
17. There is no incentive to the employees to perform better. Also there is no accountability because no one is held responsible for a failure in achieving targets. for this kind of problem responsibility centre should be created
18. Improper planning and delays in implementation of projects lead to rise in their cost. So properly planning should be made.
19. Public sector enterprises have long enjoyed a monopolistic position. Private sector was not allowed entry. This, in the absence of any competition, means that any performance was good performance. Due to absence of competitor there was no incentive to cut down costs or improve the quality of the product.
20. There is overstaffing in public enterprises. The number of persons employed is more than what is required to run the public enterprises efficiently. This increases the cost and reduces profitability of these enterprises.
21. The labour productivity should be increased by adopting modern manufacturing process and productivity based wages policy should be implemented by fertilizer companies.
22. The fertilizer companies should reduce power and fuel consumption by using low as content coal (imported coal), lignite and agro waste product especially ground nut husk and beggass should be used as coal substitute.
23. To regularize and optimize the use of cash balance proper techniques may be adopted for planning and control of cash. The investments in

inventories should be reduced and need to introduce a system of prompt collection of debts.

24. Selected fertilizer companies should try to use properly their operating assets and should try to minimize their non-operating expenses.
25. The government should minimize the subsidy and encourage the capital market for the fertilizer companies.

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