CHAPTER-1

AN OVERVIEW OF FERTILIZER INDUSTRY

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CHAPTER-1
AN OVERVIEW OF FERTILIZER INDUSTRY

1.1 INTRODUCTION

In India, agriculture is the largest sector of economic activity. It provides food, raw materials and above all, the employment to a very large proportion of population. The national output depends on the output in agriculture, as it is one of the most dominating sectors in India. For the same reason, it has to provide the capital required for its own development and make available surplus for national economic development. At the same time, the exports of primary produce earn valuable foreign exchange which can be used to import capital goods for the development of industry and infrastructure. Because of all these reasons, an improved and efficient agriculture is a dire necessity in our economy. The vital role of agriculture arises out of the position the agrarian sector occupies in the overall economy of the country. 80 percent per cent of the population resides in the rural areas and 72 per cent of the work force depends on agriculture for their livelihood. Agriculture is the back-bone of the Indian economy, and hence, the very existence of economic activities of entire people in the country is dependent on the state and health of its agriculture sector.

Since last 30 years, the fertilizer industry in India has grown tremendously. The Government is keen to see that fertilizer reaches the farmers in the distant and hilly areas. This is the reason why it has been decided to decontrol the prices, distribution and movement of phosphatic and potassic fertilizers. Some steps are implemented to assure an increase in the supply of nonchemical fertilizers at reasonable prices. In India, there are 53 fertilizer quality control laboratories. Since bio-fertilizers are regarded as an effective, cheap and renewable supplement to chemical fertilizers, the Government is implementing a National Project on Development and Use of Bio-fertilizers. This scheme covers one national and six regional centers for organizing training, demonstrating programs and quality testing of bio-fertilizers.

It was a challenging decision of the Government to take Bombay High gas through a 1,700-km pipeline to feed fertilizer plants located in the consumption centers of North India. However, the major policy which has ensured the growth of the fertilizer
industry is the push on accelerating fertilizer consumption by fixing, on the one hand, low and similar price for fertilizers, and on the other hand providing the manufacturers ample compensation through the retention price and subsidy scheme. Due to such corrective steps, the fertilizer nutrient demand has gone up from 0.29 million tons in 1960-61 to 13.9 million tons at the end of 1995-96, compared to 12.15MT during 1992-93.

1.2 IMPORTANCE OF AGRICULTURE IN INDIA

Following points shows the importance of agriculture in India.

(1) Contribution in National Income:
Agriculture contributes the major share to the national income of India. Before Independence, the contribution to India’s National Income used to be 65 per cent. After Independence, it began to decline proportionately, as the policy followed then was to pay more attention to the non-agricultural sectors in the India economy. The contribution of agriculture to India’s national income declined from 57.3 per cent in 1950-’51 to about 16 per cent during the last decade. And yet, agricultural sector continues to hold a governing place. This indicates that the agricultural productivity can be improved by raising our national income and per capita income to a significant extent. This is possible by devoting more resources to the development programs in the agricultural sector in such a manner that it directly contributes to the improved agricultural productivity.

The share of agriculture in national income of a country is an indicator of the stage of its economic development. This is because the general tendency of share of agriculture in national incomes is to decline with industrial and economic development. The share of agriculture in national income is 2 per cent in Germany and U.S.A., 3 per cent in England and 4 per cent in France.

(2) Employment
Not just that the agriculture is the main source of livelihood in India, but it also provides employment and work to a large majority of the Indian people. At the same time, a large number of people get their living by working in related occupations in agriculture such as storage, processing, trade and transport of agricultural products etc. Thus, agricultural sector provides employment to about 62 per cent of the
working population. This means, at least six out of every ten persons depends directly or indirectly on agriculture. Heavy dependence of population on agriculture has a lesson. Unless we develop and build up the agricultural sector, we cannot hope to remove poverty of the masses.

In order to develop agricultural sector, it is necessary, however, to reduce the pressure of population on it. This can be done by picking up the pace on the development of non-agriculture sectors such as industry and services etc., so that the labor released from agricultural sector gets fully absorbed in them. It is the most commonly observed experience of advanced countries that the proportion of labor force engaged in agricultural sector gradually diminishes with industrial and economic development. Even if we observe it at percent, the proportion of labor force engaged in agricultural sector is low in advance countries as compared to that in developing countries. For example, it is 3 per cent in Canada, 5 per cent in Australia and 7 per cent in France and Japan.

(3) Contribution in Industrial Development
Agriculture provides essential raw materials to a number of industries like textile, jute, sugar and vanaspati ghee. Moreover, the most important product of agriculture is food grains which can be distributed to whole population, even to the workers engaged in Industries. It also provides a market for industrial products like fertilizers, pesticides, agricultural machinery and equipments etc. Thus industrial sector is dependent on agriculture in many ways. Hence it cannot be denied that the growth of agricultural sector would accelerate the growth of industries.

(4) Export
Majority of the produce exported by India are agriculture based products. India exports most of the agriculture products like Coffee, tea, cocoa, sugar, hides and skins, cotton, raw wool, and fruits, jute, spice and vegetables etc. It also exports some manufactures with agricultural content such as sugar products, cloth and jute. Thus, the contribution of agriculture to India’s foreign exchange earnings is substantial. Exports of agriculture and related products accounted for about 12 per cent of the total exports.
(5) Consumption
It is estimated that about 60 per cent of goods used by the people in India originate in the agricultural sector. The per capita income in India is quite less. Hence a major part of it gets spent on the basic consumption requirements for livelihood, such as pulses, cereals, foot wears, cloth and vegetables etc.

(6) Strong means to remove poverty
Agricultural development helps us remove the poverty mainly in three ways:
With the development of agriculture, employment opportunities will also increase simultaneously. Agricultural development will encourage the development of small related industries in rural areas. Therefore, there will be an increase in employment opportunities in these industries also. The development of agriculture will push up more output of agricultural goods and this will decrease in turn, their prices. It will also result in the higher income and higher living standards.

(7) Price constancy
In India, agricultural prices, specifically, the prices of food grains set the trends of general level of prices. When prices of agricultural goods rise, similar rise in the general price level is observed. If prices of food grains increase, cost of living would increase and industrial workers would ask for high wages. In the same way, if an increase in prices of raw materials happens, the production cost of the final output in would go high and hence, prices of their products would also increase. Right now, the shortage and high prices of agricultural goods such as food grains and raw materials are, to a large extent, responsible for the current inflationary situation in the country. It follows that when the prices of agricultural goods are stabilized, it would not be very difficult to control inflationary forces in the Indian economy.

(8) Contribution to government revenue
The tax revenue of government is strongly linked with the output level of the agricultural sector. With increase in agricultural output, industrial output also tends to increase and the result is the expansion in the total volume of exchange. All these results into large tax revenue of the government increase movement of agricultural and industrial goods.
Thus, it can be concluded that the agriculture occupies a central place in the Indian economy. Growth of economy as a whole depends on the performance of agricultural sector. A strong foundation of agriculture is necessary condition for the rapid economic development of the country.

1.3 NEED FOR FERTILIZERS IN INDIA

Fertilizer is a substance to soil to improve plants’ growth and yield. First used by ancient farmer’s fertilizer technology developed significantly as the chemical needs of growing plants were discovered. Modern synthetic fertilizers are composed mainly of nitrogen, phosphorous and potassium compounds us the secondary nutrients added. The use of synthetic fertilizers has significantly improved the quality and quantity at the food available today but their long term use is debated by environmentalists. Following points shows need for fertilizers in India:

(1) Its universally accepted that the use of chemical fertilizer in an integral of the package of practice for raising the agricultural production to a higher place. Studies continued by the Food and Agricultural Organization (FAO) of the United Nations have established beyond about that there is a close relationship between the Gerry crop yields and fertilizer consumption level. Moreover the nutritional requirement of different crops could not be fully met with the use of organic manures like FYM and other bulky organic manures like cack, neem, groundnutcack costor, etc. for want of their availability in adequate quantities.

(2) Increasing agriculture production in Indian by area increasing process is no longer possible as cultivable and left over is only marginal. Further a considerable cultivable land is being diverted year after year for housing and industrial etc. Hence self-sufficiency in food lies in increasing the field per unit area per unit time through adoption of modern agricultural technology.

(3) Fertilizer have the advantages of smaller bulk easy transport relatively quick in an availability at plan- food constituents and the facility of their application in proportion suited to the actual requirements of crops and soils.
(4) There is need for an efficient use of fertilizers as major plant nutrient resource in enhancing the farm productivity.

(5) Other resource of plant nutrients like organic manures bio-fertilizers etc. Also should be integrated to get the maximum agriculture output term every kilogram of applied nutrient in the form of fertilizers.

(6) To improve our agriculture output India needs more fertilizers.

1.4 ABOUT FERTILIZER

1.4.1 Introduction

The fertilizer industry in India consists of three major players; The Government owned Public Sector undertakings, Cooperative Societies like KRBHCO, IFFCO and units from Private sector. There are about 33 major producers producing N, NP and NPK fertilizers in the country at present. The fertilizer industry of India had made constructive use of the fertilizer subsidy provided by the Government of India to ensure that the country achieved reasonable self-sufficiency in food grain production.

The fertilizer industry has organized itself through Fertilizer Association of India to coordinate with the Government of India to achieve the macro-economic objectives related to agricultural sector and to provide other services. Indian fertilizer industry has succeeded in meeting almost fully the demand of all chemical fertilizers except for MOP. The industry had a very humble beginning in 1906, when the first manufacturing unit of Single Super Phosphate (SSP) was set up in Ranipet near Chennai with an annual capacity of 6000 MT.

The Fertilizer & Chemicals Travancore of India Ltd. (FACT) at Cochin in Kerala and the Fertilizers Corporation of India (FCI) in Sindri in Bihar were the first large sized-fertilizer plants set up. The installed capacity as on 30.01.2003 has reached a level of 121.10 lakh MT of nitrogen (inclusive of an installed capacity of 208.42 lakh MT of urea after reassessment of capacity) and 53.60 lakh MT of phosphatic nutrient, making India the 3rd largest fertilizer producer in the world. The rapid build-up of fertilizer production capacity in the country has been achieved as a result of a
favorable policy environment facilitating large investments in the public, co-operative and private sectors. Presently, there are 57 large sized fertilizer plants in the country manufacturing a wide range of nitrogenous, phosphatic and complex fertilizers. Out of these, 29 units produce urea, 20 units produce DAP and complex fertilizers 13 plants manufacture Ammonium Sulphate (AS), Calcium Ammonium Nitrate (CAN) and other low analysis nitrogenous fertilizers. Besides, there are about 64 medium and small-scale units in operation producing SSP.

1.4.2 Fertilizers

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 supplied 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. 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$_2$O$_5$) and soluble (K$_2$O). Thus, ammonium sulphate contains 20.6 per cent N; single super phosphate 16 per cent P$_2$O$_5$ and nitrate of
potash 60 per cent K₂O. The grade of a fertilizer is expressed as a set of three numbers in the order of per cent N, P₂O₅ and K₂O. 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), nitrate 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 P₂O₅ 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 percent N, 15 per cent P₂O₅ and 15 per cent K₂O.

Table No. 1.1

**Essential Elements for Plant Growth**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of element</th>
<th>Nomenclature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbon</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Oxygen</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hydrogen</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Nitrogen</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Phosphorus</td>
<td>Primary nutrients</td>
</tr>
<tr>
<td>6</td>
<td>Potassium</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Calcium</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Magnesium</td>
<td>Secondary nutrients</td>
</tr>
<tr>
<td>9</td>
<td>Sulphur</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Boron</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Chlorine</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Copper</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Iron micro nutrients</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Manganese</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Molybdenum</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Zinc</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Fertilizer manufacturer’s association publication
India today is the third largest producer of nitrogenous fertilizers in the world. There are 63 fertilizers units manufacturing a wide range of nitrogenous and complex fertilizers, including 38 units producing urea and 9 units producing ammonium sulphate as a by-product. Besides, there are about 79 units producing single super phosphate. The production capacity of nitrogen has increased from a modest 85,000 tonnes in 1951-52 to 105.20 lakh tonnes as on 30 November 1998 and that of phosphatic fertilizers from 63,000 tonnes to 31.70 lakh tonnes of P₂O₅ during the same period. Against the nominal production of 16,000 tonnes of nitrogen and 11,000 thousand tonnes of P₂O₅ in 1951-52, the country produced 100.86 lakh tonnes of nitrogen and 29.76 lakh tonnes of P₂O₅ during 1997-98. The public sector has been playing a dominant role in the fertilizer industry. The first State-owned fertilizer unit was set up in 1951 at Sindri in Bihar which was followed by another plant at Nangal in Punjab. With the coming up of another fertilizer plant at Trombay, the government decided to bring all the public-sector fertilizer units under the management of a single undertaking and the Fertilizer Corporation of India (FCI) was accordingly incorporated in January 1961. At present, there are nine public sector undertakings under the administrative control of Department of Fertilizers. FCI has now four units, one each at Sindri (Bihar), Gorakhpur (U.P), Talcher (Orissa) and Ramagundam (Andhra Pradesh). Other fertilizers plants under the control of other undertakings are located at Bhatinda, Panipat, Vijapur, Trombay, Namrump, Durgapur, Cochin, Paradeep, Talcher and Rourkela.

The Indian fertilizer industry has succeeded in meeting almost fully the demand of all chemical fertilizers except for MOP. The industry had a very humble beginning in 1906, when the first manufacturing unit of Single Super Phosphate (SSP) was set up in Ranipet near Chennai with an annual capacity of 6000 MT. The Fertilizer & Chemicals Travancore of India Ltd. (FACT) at Cochin in Kerala and the Fertilizers Corporation of India (FCI) in Sindri in Bihar were the first large sized -fertilizer plants set up in the forties and fifties with a view to establish an industrial base to achieve self-sufficiency in food grains. Subsequently, green revolution in the late sixties gave an impetus to the 56 growth of fertilizer industry in India. The seventies and eighties then witnessed a significant addition to the fertilizer production capacity.
The fertilizer industry in India has grown tremendously in the last 30 years. The Government is keen to see that fertilizer reaches the farmers in the remote and hilly areas. It has been decided to decontrol the prices, distribution and movement of phosphatic and potassic fertilizers. Steps have been taken to ensure an increase in the supply of non-chemical fertilizers at reasonable prices. There are 53 fertilizer quality control laboratories in the country. Since bio-fertilizers are regarded as an effective, cheap and renewable supplement to chemical fertilizers, the Government is implementing a National Project on Development and Use of Bio-fertilizers. Under this scheme, one national and six regional centers for organizing training, demonstrating programs and quality testing of bio-fertilizers has been taken up. It was a challenging decision of the Government to take Bombay High gas through a 1,700-km pipeline to feed fertilizer plants located in the consumption centers of North India. However, the major policy which has ensured the growth of the fertilizer industry is the thrust on accelerating fertilizer consumption by fixing, on the one hand, low and uniform price for fertilizers, and on the other hand providing the manufacturers adequate compensation through the retention price and subsidy scheme. As expected, fertilizer nutrient demand has gone up from 0.29 million tons in 1960-61 to 13.9 million tons at the end of 1995-96, compared to 12.15MT during 1992-93.

The main objective of the fertilizer industry is to ensure the supply of primary and secondary nutrients in the required quantities. Indian fertilizer industry is one of the largest in the world and has played a significant role in the development of agriculture in the country. The main categories of fertilizer used are nitrogenous (N), phosphatic (P) and potassic (K). While N and P fertilizers are manufactured in India, the entire requirement of K fertilizers is imported due to absence of viable deposits of raw material viz. potash. Limited availability of cultivable land along with increasing population is conducive to fertilizer demand growth. There is always huge unmet demand in India which is met through imports. The main issues confronting the fertilizer industry at present are with regards to feedstock and government policy for pricing & distribution. Naphtha and natural gas are main feedstock in manufacture of major fertilizers. Pricing and availability of feedstock play significant part in profitability of the units. The new price scheme (NPS) came into effect from Apr.01, 2003 replacing the retention price scheme. As per notification of the policy for the stage-III of the NPS for urea in March 2007, the policy is applicable retrospectively.
from Octo.01, 2006 till Mar.31, 2010. Some of the major changes in the NPS are that the cost plus approach has been replaced with Import Parity Price (IPP) concept on urea projects for debottlenecking and expansion and existing DAP plants. On the back of high international prices of DAP in H1FY 09 the fertilizer subsidy bill of the Government of India has increased substantially. Some of the positive initiatives by government like assured incentives for establishment of new plants joint ventures abroad, prompt payment of subsidies and issuances of bonds, uniform freight policy, etc. are likely to form better industry prospects.

Fertilizer is defined as any substance which is organic or inorganic, natural or artificial, Supplies one or more of the chemical elements required for plant growth. Carbon, oxygen and hydrogen are directly supplied by air and water and therefore not treated as nutrients by the fertilizer industry. One of the vital industries for the Indian economy is the Indian Fertilizer Industry as it manufactures a very critical raw material for agriculture which is the major occupation of the country. The fertilizers especially like the ammonia urea plants are energy demanding in their operation.

Indian fertilizer industry's main objective is to ensure the supply of primary and secondary nutrients in the required quantities. The Indian Fertilizer Industry is the most energy intensive sectors according to the context of environmental discussions. As there is increasing productivity through the implementation of competent and pollution free technologies in the manufacturing sector it would be desirable in combining economic, environmental and social development objectives. Today the Indian fertilizer industry in the past 50 years has grown in size and stature as it ranks third in the world.

1.4.3 Meaning of Fertilizer

Any one of large number of natural and synthetic material including manure and compounds containing nitrogen, phosphorus and potassium spread on of worked into soil to increase its capacity to support plant growth synthetic fertilizer can greatly increase the productivity of soil but have high energy costs since fossil fuels are required as a source of hydrogen which is necessary to fix Nitrogen Ammonia Fertilizer. Any substance such as manure added to soil to increase its productivity is called fertilizer.
1.4.4 Fertilization:

We often see quotes by various agricultural sources in NZ, the amount of the likes of phosphorus, sulphur and calcium that are removed from the soil in meat, milk, bone and wool.

This illustrates the importance of replacing these elements as they go out the farm gate, with the likes of superphosphate, which supplies phosphorus and sulphur. Tissue studies of plants have found more than 60 different mineral elements, although it has generally been accepted that 16-17 elements are essential for plant growth.

Many farmers in NZ are well aware of the consequences of low levels of copper or cobalt in pasture, and in some areas selenium, as well as magnesium (grass staggers), even iodine and zinc and in many cases calcium (as in milk fever). There are many cases where several of the nutrients are missing or are at such low levels that supplementation of the animal is necessary, otherwise the animal would die or be severely undernourished.

Subclinical trace mineral deficiencies occur more frequently than recognized by many livestock producers and can be a bigger problem than acute mineral deficiencies, because the specific symptoms that are characteristic of a trace mineral deficiency are not seen.

Instead, the animal grows or reproduces at a reduced rate, uses feed less efficiently and operates with a depressed immune system. The end result is inefficient production and lower profitability. When micro-nutrients become a limiting factor, water, fertilizer and other high-energy production inputs are wasted. In most cases the elements needed by the plant are also needed by the animal which feeds on the plant.

Some elements needed by the animal are not required by the plant, but plants takes them up and make them available to the animal, and therefore plays a significant role in animal health. Selenium, iodine and cobalt are examples. Seven trace minerals have been shown to be needed in supplementing animal diets. They are iron, copper, zinc, manganese, cobalt, iodine and selenium.
The role of chemical fertilizers for increased agricultural production in particular in developing country is well established. Some argue that fertilizer was as important as seed in the Green Revolution contributing as much as 50% of the yield growth in Asia. Others have found that one-third of the cereal production worldwide is due to the use of fertilizer and related factors of production. Fertilizer consumption in India has been increasing over the years and today India is one of the largest producer and consumer of fertilizers in the world. By 2012-13 total fertilizers consumption in the country was approx. 27.79 million M.T.

Importance of fertilizers in yield improvement which is essential for achieving increased agricultural production further increases because there is little scope for bringing more area under cultivation as well as majority of Indian soils are deficient in many macro and micro nutrients. The application of essential plant nutrients particularly major and micro nutrients in optimum quantity and right proportion through correct methods and time of application is the key to increased and sustained crop production. Therefore, it is important to understand fertilizers use behavior in the country over time as well as role of factors influencing fertilizer consumption at the national and regional / state level because intensity of fertilizer use varies from state to state and area to area. Several studies have attempted to examine the role of price and none-price factors in the growth of fertilizer use in India.

However, most of these studies pertain to pre-reforms period. Therefore, there is a need to examine the likely impacts of the socio-economic, technical and institutional factors on fertilizers consumption and agricultural growth. Some of the problems of fertilizer consumption vary from region to region and need to be studied in their local context but there are others which confront most stakeholders all over the country. In this paper an attempt has been made to understand the factors affecting fertilizers demand at macro level and forecast demand for fertilizers in the country by 2020. By estimating for fertilizers one can understand the implications of fertilizer price policy including subsidy and agricultural product price for fertilizer use and their interrelationship.
1.4.5 Types of Fertilizer

Indian agriculture is based on rain because irrigation facility is very limited so the farmers have to use fertilizers. These fertilizers can be distributed mainly on two bases.

**Fertilizer on the Basis of Consumption (Use)**

**(I) Direct Fertilizer:**

The direct fertilizers are those which the green plants directly absorb from the land like nitrogen phosphorous etc. the green plants may take all nutrients from those fertilizers.

**(II) Indirect Fertilizers:**

The indirect fertilizers provides not only necessary nutrients to land but also it provides the fertilizer which increases the fertility of land by mixing potash and hydrogen inside the land and it is necessary for the development of plant. That type of fertilizers is termed as indirect fertilizer. Line, silicone and boron are main examples of these fertilizers.

**(III) Complete Fertilizer:**

The fertilizer which provides necessary every element like Carbon, Hydrogen, and Oxygen etc for the healthy development of plants is termed as complete fertilizer.

**(IV) Incomplete Fertilizer:**

The fertilizer which consist only one of two necessary nutrients elements is called incomplete fertilizers. Ammonia phosphate is one of the best examples of this fertilizer.

**Fertilizer on the Basis of Source:**

The fertilizers which are used in the farming are included in this type there are mainly two types of fertilizers as below:

**(I) Natural Fertilizes:**

It is also called traditional fertilizers. This fertilizer is obtained normally by the way of naturally. In which human beings and animal dung and urine is used. Besides this
oil cake fertilizer, fish fertilizers chilly salt fertilizers and potassium fertilizers are also included. In this fertilizers chemical are not added.

(II) Chemical Fertilizer:

In this fertilizer many chemical are included. This fertilizer mainly created in factories. Many material combines together to form mix fertilizers. But in practice the fertilizer contain nitrogen phosphorus and potash used widely.

Types of Chemical Fertilizer:

Four types of chemical fertilizers available in the market chemical fertilizer include elements like nitrogen, phosphorus and potash. They are used to increase the productivity of land. For better growth and development mixed fertilizer are prepared. Nitrogen fertilizer, phosphate fertilizer, potassium fertilizer and mixed fertilizer are chemical fertilizer. Brief explanation about these fertilizers is as under:

(1) Nitrogenous Fertilizer:

This fertilizer is used to meet the deficiency of nitrogen in the land. For the plant this is the most useful fertilizer. It will provide nutrients to both land and plants.

There are mainly two types of nitrogen fertilizer viz. in organic fertilizer and organic fertilizer. The in organic nitrogenous fertilizer divided into sub parts. They are nitrate containing ammonia and mixed nitrate and ammonia contrition. The nitrate containing fertilizer includes nitrate of soda, nitrate of potash and calcium nitrate. The ammonia containing nitrogenous fertilizer includes ammonium sulphate, ammonium phosphate aqueous chloride mixed nitrate and ammonia containing fertilizer includes ammonium nitrate calcium ammonium nitrate and ammonium sulphate nitrate.

The organic nitrogenous fertilizer is also divided into sub group viz. animal and vegetables source and synthetic or amide constrains. The animal and vegetable sores included dried blood, meat, meal, horn and hoof slaughter house waste bone meal and oil cakes while synthetic or amide containing fertilizer includes calcium cyanide and
urea. Liquid Ammonia contains highest nutrients 82.3% Aqueous Ammonia contains 16.5 to 20.5% nutrients Ammonium nitrate contains 32 to 35% nutrients. Ammonium sulphate contains 19.9 to 21% nutrients sodium nitrate contains 15 to 16% nutrients calcium nitrate contains the least nutrients and it is 13 to 15% urea contains 46 to 46.5% nutrients and urea formula derail contains 33 to 42% nutrients. Though all nitrogenous fertilizer have nutrients in different proportions, they all are useful for the better productivity and production.

**Elements of Nitrogenous Fertilizer:**

(A) The effectiveness of ammonium sulphate is somewhat more than urea due to its wastage at the primary level.

(B) Nitric Nitrogen fertilizer is found to be more effective when applied as top dressing during the commencement of reproductive phase of paddy pant.

(C) The paddy plat can absorb 30-35% of total nitrogen when the land is ploughed after application of ammonium nitrogen. But the nutrient becomes more available when the fertilizers are applied at a depth of 5.10 cm.

(D) In acid soil or calcium deficient soil continuous of ammonium sulphate urea ammonium chloride and ammonium sulphate nitrate should be avoided as they are acid forming fertilizers or lime should be applied at least 15 days before the sowing at the crop to reclaim the acidity of the soil.

(E) The nitrogenous fertilizer is easily soluble in water and move rapidly in all directions from the place of its application. The nitrogenous fertilizer should be applied as per the demand of the crop.

(F) All nitrogenous fertilizers are equally effective in rainy season. The nitrogenous fertilizers should be selected on the basis of cost availability and easier in application.

(G) The nitrogen should be applied in more quantity as TOP dressing in long duration variety of proudly.
Table No. 1.2
Type of Fertilizers Production in India

<table>
<thead>
<tr>
<th>Type of fertilizers</th>
<th>Grade</th>
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<tbody>
<tr>
<td><strong>Straight Nitrogenous</strong></td>
<td></td>
</tr>
<tr>
<td>Ammonium Sulphate (SP)</td>
<td>20.6% N</td>
</tr>
<tr>
<td>CALCIUM Ammonium Nitrate (CAN)</td>
<td>25% N</td>
</tr>
<tr>
<td>Ammonium Chloride</td>
<td>25% N</td>
</tr>
<tr>
<td>Urea</td>
<td>46% N</td>
</tr>
<tr>
<td><strong>Straight Phosphatic</strong></td>
<td></td>
</tr>
<tr>
<td>Single Super Phosphate (SSP)</td>
<td>16% P2O5</td>
</tr>
<tr>
<td>Triple Super Phosphate (TSP)</td>
<td>46% P O</td>
</tr>
<tr>
<td><strong>NP\NPK Complex Fertilizers</strong></td>
<td></td>
</tr>
<tr>
<td>Urea Ammonium Phosphate</td>
<td>24-24-0</td>
</tr>
<tr>
<td></td>
<td>28-28-0</td>
</tr>
<tr>
<td></td>
<td>14-35-14</td>
</tr>
<tr>
<td>Ammonium Phosphate Sulphate</td>
<td>16-20-0</td>
</tr>
<tr>
<td></td>
<td>20-20-0</td>
</tr>
<tr>
<td>Diammonium Phosphate (DAP)</td>
<td>18-46-0</td>
</tr>
<tr>
<td>Mono Ammonium Phosphate (MAP)</td>
<td>11-52-0</td>
</tr>
<tr>
<td>Nitro Phosphate</td>
<td>20-20-0</td>
</tr>
<tr>
<td></td>
<td>23-23-0</td>
</tr>
<tr>
<td>Nitro Phosphate with Potash</td>
<td>15-15-15</td>
</tr>
<tr>
<td>NP\NPKs</td>
<td>17-17-17</td>
</tr>
<tr>
<td></td>
<td>14-28-14</td>
</tr>
<tr>
<td></td>
<td>19-19-19</td>
</tr>
<tr>
<td></td>
<td>10-26-26</td>
</tr>
<tr>
<td></td>
<td>12-32-16</td>
</tr>
</tbody>
</table>

Source: Department of Fertilizers
Phosphate Fertilizer:

Phosphate fertilizer is an essential fertilizer for the land. The need of this fertilizer is low in comparison to nitrogenous fertilizer. In the early age of plant this fertilizer is used for the health of green plants. There are three sub types of phosphate fertilizer viz: Water Soubise Phosphoric Acid, Citric Acid Soluble Phosphoric Acid and Insoluble in Water or Citric Acid. Super phosphate is the main example of water soubise phosphates acid. Di-calcium phosphate is the main example of citric acid soluble phosphoric acid. The main examples of insoluble phosphoric fertilizer in water are rock phosphate raw Bone meal, steamed bone meal and by product of basic slag.

Characteristics of Phosphate Fertilizer:

(A) Jointly use of nitrogenous and phosphate fertilizer increases the uptake capacity of the plant.

(B) Rock phosphate basic slag phosphates fertilizer is most suitable for application in acidic soils.

(C) Low paddy shorts considerable less response to phosphate fertilizers.

(D) The phosphate fertilizer like as super phosphate should be applied near the root zone of the crop or in soil layer.

(E) The phosphate fertilizer namely super phosphate should be used in neutral to alkaline soil.

(F) The phosphate fertilizer should be placed deep with deep cultivator in fruit trees like guava, citrus, apple etc.

Proportion of Nutrients & Elements of Phosphate Fertilizer:

Common super phosphate, Triple calcium phosphate, Di-calcium phosphate, Ground phosphate rock, Phosphate Slag, Di phloriented phosphate are the phosphate fertilizer. Its main elements are Ca (H₂PO₄) H₂O + H₃PO₄ + CaSO₄, CaCH₂PO₄ H₂O + H₃PO₄, CaHPO₄2H₂O, Ca₅ F (PO₄)₃, 4CaO. P₂O₅ + 5CaO. P₂O₅ + SiO₂, 3CaO. P₂O₅ + 3CaO. P₂O₅ respectively. And proportion of nutrients (in %) are respectively 14 to 21, 40 to 52, 27 to 40, 16 to 35, 14 to 20 and 20 to 38. It is seen that triple calcium
phosphate fertilizer contains highest nutrients and it is 40 to 52% while phosphate slag contains the least nutrients and it is 14 to 20.9%.

**Potassic Fertilizer:**

Potassium Sulphate is a potassic fertilizer. It is very essential for the healthy development of plants. With the help of potassium preparation of carbohydrate in the plants is possible. It increases resistance power of green plants. Classification of Potassic fertilizer is divided in two way viz, pots and chloride from and potash in non-chloride from. Marinate of potash is the best example of potash in chloride from and sulphate of potash is the only example of potash in non-chloride nature.

**Main Elements**

Potassium chloride M 50% to 62% KCL Mix potassium salt 30% to 42% KCL + NaCL Sulfuric of Potash 48% to 52% K$_2$SO$_4$, It is seen from the above table that out of all potassic fertilizer potassium chloride contains the highest nutrients and it is 50% to 62%, mix potassium salt, the least nutrients and it is 30% to 42 % sulphate of potash contains 48% to 52% nutrients.

**Characteristics of Potassic Fertilizer:**

- It can be used for all crops and for all types of soils.
- In potassic fertilizer named potassium sulphate is better than nitrate of potash for crops like tobacco, potatoes, fruit trees etc.
- Now a days the application of potassic fertilizer namely potassium chloride or nitrate of potash as top creasing is considered good as nitrogenous fertilizer.
- The potassic fertilizer are water soluble but not hydroscopic in nature and potassium is readily available to plant.
- On application of potassic fertilizer it dissociates to Kt irons and get absorbed in the soil and absorbed by growing plant.

**Mixed Fertilizer:**

In mix fertilizer nitrogen potash and phosphorus are included. All types of mixed fertilizer:

(1) Open Formula Fertilizer Mixture.
(2) Closed Formula Fertilizer Mixture.

(1) **Open Formula Fertilizer Mixture:**

The ingredients mixed in this type of fertilizer mixture in forms of kinds and quantity is disclosed by the manufactures. This will be helpful for the cultivators to know the ingredients of fertilizer for the use of the same in particular crop in satiable amounts.

(2) **Closed Formula Fertilizer Mixture:**

The ingredients or straight fertilizer used in these fertilizer mixtures are not disclosed. It is called as a trade secret of the industry. So it is not possible for farmers to know the type and quantity of ingredients used in this fertilizer mixture. The farmer cannot select a correct mixture for their use in production of crops.

Table No. 1.3

**Nutrient Consumption**

<table>
<thead>
<tr>
<th>Nutrient Consumption</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>TOTAL</th>
<th>N:P:K(Desired 4:2:1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-96</td>
<td>9.82</td>
<td>2.90</td>
<td>1.16</td>
<td>13.88</td>
<td>8.47:2.50:1</td>
</tr>
<tr>
<td>2009-10</td>
<td>15.58</td>
<td>7.27</td>
<td>8.63</td>
<td>26.18</td>
<td>4.29:2:1</td>
</tr>
<tr>
<td>2010-11</td>
<td>16.89</td>
<td>8.00</td>
<td>3.39</td>
<td>28.28</td>
<td>4.98:2.36:1</td>
</tr>
</tbody>
</table>

Source: working Group Report on Fertilizer Industry for Twelfth Five-Year Plan

By annualizing of table no. 1.4 it is seen that the proportion of nutrients and main elements of mixed chemical fertilizer. The elements like nitrogen phosphorus and potash are the main chemical elements of mixed fertilizer and land receives most of nutrients from it and it is also seen that proportion of nitrogen is relatively higher than other chemical in the fertilizer. Only mixed fertilizer which does not consists nitrogen is magnesium ammonium phosphate. Phosphate is available in all mixed chemical fertilizer except potassium nitrate proportion of phosphate is reactively less than nitrogen. Potash is not available in mixed chemical fertilizer proportion of potash is as the proportion of nitrogen and phosphorus in some mixed fertilizer. The mixed fertilizer like Ammonium, Potassium Phosphate,
Ammonium Potassium Nitrate, Urea Potassium Phosphate consist nitrogen phosphorous and Potash in equal proportion. Chemical fertilizer as like Ammoniated Super Phosphate, Ammonium Phosphate, Di- Ammonium Phosphate and Ammonium Phosphate Nitrate did not contain Potash.

**Natural Fertilizers:**

In this manure no chemicals are added. It is consists of waste product of human being and animal. In natural fertilizer substance are less fertile than artificial fertilizers. Natural fertilizers can be used in abundant quality. This fertilizers increase fertility and physical condition of land. The natural fertilizers divided into two sub division viz organic fertilizers and inorganic fertilizers. The explanation of various types of natural fertilizers and its subparts are as under:

1. **Organic Fertilizers:**

   It is homemade fertilizers. The use of this fertilizer does not affect the structure of land. This fertilizers needs in excess quantity and it takes five to mix with land. This fertilizer induces all types of organic elements which hold the fertility of the land for longer period of time. This fertilizer also called the complete fertilizer. This fertilizer includes cow dung, manure of human being urine, manure of various types of cake, fish manure bone, mill manure and bio-fertilizer.

2. **Inorganic Fertilizer:**

   The fertilizer which obtains as a mineral from the land and which obtains from the wooden ash is called as in organic fertilizer. It is insoluble in water. So it can be used directly into the land. The main benefit of this fertilizer is that, after using this fertilizers there is no need of giving water to land so it is used extensively an Gujarat and other States of India where there is always in irrigation problem. This fertilizer includes Chile squat pitter rock phosphate manure of wooden ash and potassium squat.
1.4.6 Importance of Fertilizer

Fertilizer is a substance to soil to improve plants’ growth and yield. First used by ancient farmers fertilizer technology developed significantly as the chemical needs of growing plants were discovered. Modern synthetic fertilizers are composed mainly of nitrogen, phosphorous and potassium compounds us the secondary nutrients added. The use of synthetic fertilizers has significantly improved the quality and quantity at the food available today but their long term use is debated by environmentalists.

**Following points shows need for fertilizers in India:**

(1) Its universally accepted that the use of chemical fertilizer in an integral of the package of practice for raising the agricultural production to a higher place. Studies continued by the Food and Agricultural Organization of the United Nations (FAO) have established beyond about that there is a close relationship between the Gerry crop yields and fertilizer consumption level. More over the nutritional requirement of different crops could not be fully met with the use of organic manures like FYM and other bulky organic manures like neem cack, castor cack, groundnut cack etc. for want of their availability in adequate quantities.

(2) Increasing agriculture production in Indian by area increasing process is no longer possible as cultivable and left over is only marginal. Further a considerable cultivable land is being diverted year after year for housing and industrial etc. Hence self-sufficiency in food lies in increasing the field per unit area per unit time through adoption of modern agricultural technology.

(3) Fertilizer have the advantages of smaller bulk easy transport relatively quick in an availability at plan- food constituents and the facility of their application in proportion suited to the actual requirements of crops and soils.

(4) There is need for an efficient use of fertilizers as major plant nutrient resource in enhancing the farm productivity.
(5) Other resource of plant nutrients like organic manures bio-fertilizers etc. Also should be integrated to get the maximum agriculture output term every kilogram of applied nutrient in the form of fertilizers.

(6) To improve our agriculture output India needs more fertilizers.

1.5 HISTORICAL BACKGROUND OF FERTILIZER INDUSTRY

1.5.1 Fertilizer Industry at Global Level

1950 to 1989 During this period, with temporary setbacks notably due to the oil crises in the 1970s, there was a sustained increase of world mineral fertilizer consumption, which increased from 14 to 143 million tonnes N+P₂O₅+K₂O, nitrogen, phosphate and potash, or almost 6% per annum. 1989-90 to 1993-94. During these four years world fertilizer consumption fell by 23 Mt, from 143 to 120 Mt total nutrients. The reduction was due to a 23 Mt. decline of fertilizer nutrient use in the countries of Central Europe and of the Former Soviet Union, the FSU, and also, to a lesser extent, a fall of almost 5 Mt. in West Europe. The falls were partly offset by increases in Asia. 1993-94 to 1999-2001.

During this period, world nutrient consumption increased from 120 to an average of 138 Mt. Consumption in Socialist Asia, South Asia and Latin America increased, that of West Europe stabilized while demand in the FSU fell again. By 1996 world nitrogen consumption had regained its 1989 level, with increases in developing countries offsetting falls in Europe and the FSU. However, world phosphate consumption remains below its 1988/89 peak (33 versus 38 Mt P₂O₅), as does that of potash (22 versus 28 Mt K₂O).

During the period 1998-99 to 2000-01 Socialist Asia, mostly China, accounted for 27% of world fertilizer consumption, South Asia, mostly India for 16%, North
America, mostly the USA also for 16%, West Europe for 12% and Latin America for 8% i.e. all together for almost four fifths of total world consumption. Sub-Saharan Africa excluding South Africa accounted for 1%.

Thirty-Year Outlook: Since the end of the 1970s, The Food and Agriculture Organization of the United Nations, the FAO, has prepared forecasts of worldwide yields and areas. According to the latest survey, the projected absolute increment in world crop production from 1995-97 to 2030, i.e. 34 years, will be 57%. The rate of increase will be greater in developing countries than in developed countries. The developing countries should account for 72% of world crop production in 2030 compared with 53% in 1961-63.

Future fertilizer requirements have been related to FAO's latest forecasts of worldwide crop yields and areas. In order to attain the yields projected by the FAO, it is forecast that fertilizer consumption will have to increase from the present level of 138 million tonnes N+ P₂O₅+ K₂O to between 167 and 199 million tonnes per year by 2030. This represents an annual growth rate of between 0.7 and 1.3 percent per annum, which compares with an average annual increase of 2.3% p.a. between 1970 and 2000. Most of the increase will be in South and East Asia and in North and South America.

**Fertilizer nutrient consumption, by South Asia, 1970-71 to 2000-01**

India accounts for 80% of fertilizer consumption in the region, but Pakistan and Bangladesh also have large fertilizer requirements. This region is facing considerable population pressures, with very limited reserves of good agricultural land. Economic progress is boosting the demand for agricultural products. The region depends on adequate and efficient fertilization for its economic well-being.
Last twelve years of favorable monsoons fertilizer use in India decreased by 8% in 2000-01 mostly as a result of adverse weather conditions, but recovered partially in 2001-02. Fertilizer use in Pakistan is hampered by a nutrient imbalance in favour of nitrogen, and in Bangladesh by periodic floods.

Global Demand And Supply Scenario
7.1 Global fertilizer demand is projected to grow at an average annual rate of 2.4% between 2010 and 2015. World fertilizer consumption is projected to be close to 190 million tonnes nutrients in 2015. Nitrogen demand growth will be the strongest initially but the lowest in longer term. Phosphate demand growth will be higher in the medium term as nutrient imbalances are addressed in key market areas. Potash demand growth will be slow to recover but eventually growth will be stronger than the other nutrients.

Table No. 1.4

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>2010</th>
<th>2011</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen N</td>
<td>102.6</td>
<td>105.2</td>
<td>112.4</td>
</tr>
<tr>
<td>Phosphorous P₂O₅</td>
<td>39.9</td>
<td>41.4</td>
<td>44.9</td>
</tr>
<tr>
<td>Potash K₂O</td>
<td>27.2</td>
<td>27.2</td>
<td>32.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>169.7</td>
<td>175.3</td>
<td>189.9</td>
</tr>
</tbody>
</table>

Source: IFA

Nitrogen (Urea)
The Table no. 1.5 presents the world supply demand balance for urea during 2011 to 2015. Between 2010 and 2015, 58 new plants are planned to come on stream, of 41 will be located outside China. World urea capacity will increase by 45 million tonnes, 222.08 million tonnes in 2014. Outside china, the main addition will mostly occur in South Asia.
Table No. 1.5

Worldwide Urea Capacity by Region (1000 mt. of Urea)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>4.754</td>
<td>4.961</td>
<td>5.056</td>
<td>5.056</td>
<td>5.386</td>
<td>5.386</td>
<td>5.386</td>
<td>5.386</td>
<td>5.386</td>
</tr>
<tr>
<td>ESTERN Europe</td>
<td>5.850</td>
<td>5.860</td>
<td>5.860</td>
<td>5.933</td>
<td>5.933</td>
<td>5.933</td>
<td>5.933</td>
<td>5.933</td>
<td>6.036</td>
</tr>
<tr>
<td>Asia</td>
<td>94.365</td>
<td>97.221</td>
<td>103.223</td>
<td>105.630</td>
<td>119.093</td>
<td>121.681</td>
<td>125.491</td>
<td>125.491</td>
<td>140.355</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.475</td>
<td>0.475</td>
<td>0.475</td>
<td>0.475</td>
<td>1.135</td>
<td>1.135</td>
<td>1.135</td>
<td>2.615</td>
<td>2.615</td>
</tr>
<tr>
<td>World Total</td>
<td>138.096</td>
<td>142.480</td>
<td>149.935</td>
<td>154.957</td>
<td>173.091</td>
<td>177.188</td>
<td>182.533</td>
<td>184.673</td>
<td>208.367</td>
</tr>
</tbody>
</table>

Source: IFDC Surveys and published reports
Phosphatic Fertilizers

**Di-Ammonium Phosphate (DAP)**

Over the next five years, 40 new MAP, DAP and TSP units are planned to come on stream. New facilities are planned in Africa (Algeria, Morocco and Tunisia), West Asia (Saudi Arabia), Asia (Bangladesh, China, Indonesia and Vietnam), Latin America (Brazil and Venezuela) and EECA (Kazakhstan). Global capacity is projected to be 44.4 million tonnes of $\text{P}_2\text{O}_5$ in 2015, representing a net increase of 7.8 million tonnes $\text{P}_2\text{O}_5$. Expansion of DAP capacity would account for three-quarters of this increase.
### Table No. 1.6

**Worldwide DAP/MAP Capacity by Region (1000 mt. of P₂O₅)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>1.466</td>
<td>1.671</td>
<td>1.671</td>
<td>1.754</td>
<td>2.286</td>
<td>2.286</td>
<td>2.286</td>
<td>2.286</td>
<td>2.637</td>
</tr>
<tr>
<td>Western Europe</td>
<td>0.323</td>
<td>0.323</td>
<td>0.323</td>
<td>0.323</td>
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<td>0.323</td>
<td>0.323</td>
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<tr>
<td>ESTERN Europe</td>
<td>0.703</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
<td>0.870</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
<td>0.662</td>
</tr>
<tr>
<td>World Total</td>
<td>30.482</td>
<td>31.389</td>
<td>31.332</td>
<td>32.135</td>
<td>34.936</td>
<td>36.306</td>
<td>36.490</td>
<td>36.490</td>
<td>38.519</td>
</tr>
</tbody>
</table>

Source: IFDC Surveys and published reports
Phosphoric Acid
Global phosphoric acid capacity is forecast to increase by 9.2 million tonnes to 57.6 million tonnes $P_2O_5$ between 2010 and 2015. Expansions in China account for one-third of this increase. Close to 34 new acid units are planned for completion between 2010 and 2015, of which 15 would be located in China, 6 in Morocco and 3 in Saudi Arabia. On a global basis, the net addition to 90 merchant grade acid capacity is estimated at 1 million tonnes $P_2O_5$, of which 0.86 million tonnes will come from two large stand-alone units in Tunisia and Jordan.

Between 2011 and 2015, the global phosphoric acid supply/demand balance shows a very small potential surplus in 2011 of less than 3% of available supply. This imbalance will increase very moderately to 2.4-3.5 million tonnes per annum between 2012 and 2014. It will expand to 3.5 million tonnes $P_2O_5$ in 2014 with the commissioning in 2014-15 of large-capacity projects planned in Morocco.
### Table No. 1.7

Worldwide Phosphoric Acid Capacity by Region (1000 mt. of $P_2O_5$)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>1.716</td>
<td>1.920</td>
<td>1.920</td>
<td>1.920</td>
<td>2.420</td>
<td>2.420</td>
<td>2.420</td>
<td>2.420</td>
<td>2.540</td>
</tr>
<tr>
<td>Western Europe</td>
<td>1.365</td>
<td>1.400</td>
<td>1.400</td>
<td>1.400</td>
<td>1.250</td>
<td>1.250</td>
<td>1.250</td>
<td>1.250</td>
<td>1.400</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>1.735</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
<td>1.878</td>
</tr>
<tr>
<td>West Asia</td>
<td>2.993</td>
<td>2.993</td>
<td>2.993</td>
<td>2.993</td>
<td>4.493</td>
<td>4.988</td>
<td>4.989</td>
<td>5.402</td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>2.458</td>
<td>2.458</td>
<td>2.503</td>
<td>3.003</td>
<td>3.003</td>
<td>3.003</td>
<td>3.003</td>
<td>3.128</td>
<td></td>
</tr>
<tr>
<td>Oceania</td>
<td>0.475</td>
<td>0.520</td>
<td>0.550</td>
<td>0.550</td>
<td>0.600</td>
<td>0.600</td>
<td>0.600</td>
<td>0.600</td>
<td>0.600</td>
</tr>
<tr>
<td>World Total</td>
<td><strong>45.833</strong></td>
<td><strong>46.392</strong></td>
<td><strong>45.330</strong></td>
<td><strong>46.457</strong></td>
<td><strong>49.953</strong></td>
<td><strong>52.233</strong></td>
<td><strong>52.728</strong></td>
<td><strong>52.729</strong></td>
<td><strong>55.008</strong></td>
</tr>
</tbody>
</table>

Source: IFDC Surveys and published reports
Potash Outlook

World potash sales showed a marked recovery in 2010, due to stronger than expected worldwide demand for fertilizers and anticipated purchases in late 2010 prior to seasonal demand in 2011. Around 30 potash-related projects are currently being undertaken by existing producers, with completion planned between 2011 and 2015. Global potash capacity is forecast to increase from 43.8 million tonnes K₂O in 2011 to 54.7 million tonnes in 2014. The bulk of new potash capacity will be in the form of MOP. North America will be the world's largest supplier in 2015, with a 39% share of the potential world supply, followed by EECA (29%), East Asia (10%), West Asia (8%) and Latin America (5%).

The global potash supply/demand balance shows a reduced potential surplus in 2011, moving to large potential surpluses after 2012. A potential imbalance of close to 15 million tonnes K₂O may emerge in 2015, assuming all planned projects are completed on schedule.
Table No. 1.8

Worldwide Potash Capacity by Region (1000 mt. of K$_2$O)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>1.319</td>
<td>1.469</td>
<td>1.469</td>
<td>1.495</td>
<td>1.495</td>
<td>1.495</td>
<td>1.495</td>
<td>1.495</td>
<td>1.605</td>
</tr>
<tr>
<td>East Asia</td>
<td>1.369</td>
<td>1.484</td>
<td>1.644</td>
<td>1.936</td>
<td>2.863</td>
<td>2.863</td>
<td>3.463</td>
<td>3.463</td>
<td>6.988</td>
</tr>
<tr>
<td>Africa</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.025</td>
<td>0.025</td>
<td>0.373</td>
<td>0.373</td>
<td>0.373</td>
</tr>
<tr>
<td>World Total</td>
<td>40.642</td>
<td>41.418</td>
<td>42.646</td>
<td>43.976</td>
<td>45.279</td>
<td>46.754</td>
<td>49.502</td>
<td>49.502</td>
<td>52.698</td>
</tr>
</tbody>
</table>

Source: IFDC Surveys and published reports
1.5.2 Growth of fertilizer industries in India

The Indian fertilizer industry has come a long way since the setting up of the manufacturing unit of Single Super Phosphate (SSP) near Chennai in 1906. A new impetus to the growth of Indian fertilizer Industry was provided by the set up the two fertilizer plants -Fertilizer and Chemicals Travancore of Indian Limited (FACT) in Kerala and the Fertilizer Corporation of India (FCI) in Bihar. This was during the forties and the fifties. The aim was to create an Industrial base that would provide India with self reliability in food grains. With the effect from 25th July 1991, the government implemented three major policy decisions.

- Decontrol of Ammonium Sulphate CAN and ammonium chloride
- Increase in the selling prices of all other fertilizer by 40% and
- Introduction of a subsidy ceiling on SSP.

However within a span of three weeks, the government revised the extent of the price like to 30% with effect from 14th August 1991 and exempted the small and marginal farmers from it completely. With effect from 25th August 1952, the government decontrolled all phosphate and potassic fertilizers and abolished the RPS covering the farmers brought back ammonium sulphate. An ammonium chloride with the purview of the control and subsidy and rescued the selling price of urea by 10% while returning this under control of the RPS. These policy changes were expected to achieve

- Reduction in subsidy
- Continued growth in food grain production and
- Keeping healthy soil intact.

Unfortunately none of these could be achieved. India witnessed significant growth of the fertilizer Industry during the sixties and the seventies. By 2003, India has an installed capacity of 12.11 million MT of nitrogen and 5.36 million MT of phosphate. Today with 57 large sized fertilizer plants manufacturing a wide variety of the nitrogen, complex phosphate. Fertilizers the India fertilizer industry is the 3rd largest producer in the world. One of the major factors that have led to the rapid increase in the production capacity of fertilizers in India is the policy environment. With the
formulation and implementation of investor friendly policies large investment poured in to the private public and co-operative sector’s and this and this propelled the growth of the Indian fertilizer industry. Reports showed the total installed capacity of fertilizer production in 2004 to be 119.60 LMT of nitrogen and 53.60 LMT of phosphate. These figures went up to 120.61 LMT of nitrogen and 56.59 LMT of phosphate in 2007. The production of fertilizers was 113.54 LMT of nitrogen and 42.21 LMT of phosphate during 2005-06. The target of production for 2006-07 was set of 114.48 LMT of nitrogen and 48.20 LMT of phosphate. Though the target production was not met, there was a growth in production during 2006-07 as compared to the production during 2005-06. Indian fertilizer has reached international levels of capacity utilization by adopting various strategies for increasing the productions of fertilizers. These includes as under:

- Expansion and increase in efficiency through modernization and revamping of existing fertilizer units.
- Using alternative source such as coal or liquefied natural gas for the production of fertilizer especially urea.
- Reviving some of the closed fertilizers plants.
- Establishing joint venture projects with companies in countries.

In order to meet the demand for gas this is one of the prime requirement for the production of nitrogenous fertilizers. India has entered into joint ventures with foreign companies in number of countries. Joint ventures have also been established for the supply of phosphoric acid. Indian fertilizer manufacturing companies has joined hands with companies in Senegal, Jordan, Oman, Tunisia, Morocco, Egypt and other countries. It is therefore evident that the Indian fertilizer industry has witnessed extensive growth and development in a short span of time. With such extensive growth it is not surprising that the India ranks Germany, the leading fertilizer manufacturing countries of the world.

The India government has devised policies conducive to the manufacture and consumption of fertilizers. Numerous committees have been formed by the Indian
government to formulate and determine fertilizer policies. The dramatic development of the fertilizer industry and the rise in its production capacity has largely been attributed to the favorable policies. This has resulted in large scale investment in all three sector viz. public, private and co-operative. Presently, there are 30 large size fertilizer plants in the country manufacturing urea (as on date 29 are functioning) 21 units produce DAP and complex fertilizers, 5 units produce low analysis straight nitrogenous fertilizers and the 9 manufacture ammonium sulphate as by-product. Besides, there are about 84 medium and small-scale units in operation producing SSP. There are also about 12 medium and small scale industries in operation. The department of fertilizer is responsible for the planning promotion and development of the fertilizer industry. It also takes into account the import and distribution of the fertilizer and also the financial aspect. There are four main divisions of the department. These include fertilizer imports, movement and distribution, finance and accounts fertilizers projects and planning and administration and vigilance. It makes an assessment of the individual requirements of the States and Union Territories and those lays out an elaborate supply plan. Though the soil of India is rich slit, it lacks chief plant nutrients like potassium nitrogen and phosphate. The increase in the production of fertilizer and its consumption acts as a major contributor to overall agricultural development.

The Indian fertilizer industry started operating in a big scale since 1940, when the Fertilizer and Chemical Travancore of India Limited and the Fertilizer Corporation of India were set up in Kerala and Bihar respectively. The fertilizers industry in India increased to a considerable extent in 1970 and 1980 after the emergence of the green revolution in the late sixties. India has reached self reliance in the food-grain production. The country also generates surpluses to an extent that it can export. This massive production owes largely to the public sector as well as the cooperative sector of the fertilizer industry. Under the administrative control of the department of fertilizers there are 9 public sector undertakings. The co-operative societies count two in number. The private sector has also contributed to the Indian fertilizer industry. Some of the notable private companies to contribute to the production are Chambal Fertilizer and Chemicals Limited and Tata Chemical Limited. The private sector
produced 44.73% of nitrogenous fertilizers and 62.08% of phosphate fertilizers in 2006-07.

As per government of India records as on 31-1-2007 the Indian Fertilizer Industry has made a production at 120.61 MT of nitrogen (N) and 56.59 MT of phosphate (P) nutrient. The installed capacity of urban India is estimated to be 210.61 MT. These successes in the production by fertilizer companies of India have groaned India, the 3rd largest fertilizer producer in the world.

Agriculture is the back bone at Indian Economy. It earns about 14% of the India’s foreign exchange and its contribution is about 21% of GDP, and 65% of the population agriculture employs. The development of industry, commerce, trade, infrastructure, communication, transportation etc depends upon agriculture. Fertilizer plays an important role for increasing agricultural production and productivity of land. After green revolution the use of chemical fertilizer and insecticides are increased.

Indian economy is based on five year plan and the government gave adequate emphasis in all five year plan in the area of agriculture. The tenth plan has assessed that agriculture production in world grows at the rate of 4% but in the next 3 year of plan the country was able to ensure about 1.5% rate of growth. The use of chemical fertilizer is considered as the basic tool to increase the agricultural production.

Comparing the hector vise agricultural production of India with other developed nation is very low. The use of chemical fertilizer is necessary to increase the productivity. For the purpose the central and state government declared various scheme for the development of Indian agricultural production. Due to Indian government highly support there is significant increase in production of chemical fertilizer The Indian fertilizer industry has helped in the growth of the Indian economy. The fertilizer sector by enhancing the agriculture productivity has in turn resulted in providing a major support to the farmers who are primarily depend on agriculture. Fertilizers have played a pivotal role in Indian food security.
Table No.1.9

List of Fertilizer Industry in India

| CFL        | Coromandal Fertilizer Limited               |
| DMCC       | Dharmsi Morarji Chemicals Company Limited  |
| FACT       | Fertilizers and Chemical Travancore Limited|
| FCI        | Fertilizer Corporation of India Limited    |
| GFC        | Godavari Fertilizers and Company           |
| GNVFC      | Gujarat Narmada Velly Fertilizer Company Limited |
| GSFC       | Gujarat State Fertilizers Company Limited  |
| HCL        | Hindustan Copper Limited                   |
| HFCL       | Hindustan Fertilizer Corporation Limited   |
| IFFCO      | Indian Farmers Fertilizer Co-operation Limited |
| IISCO      | Indian Iron Steel Company Limited         |
| JCF        | Jayshree Chemicals and Fertilizers        |
| KRIBHCO    | Krishak Bharti Co-operative Limited       |
| MCFL       | Mangalore Chemical and Fertilizer Limited  |
| MFL        | Madras Fertilizer Limited                 |
| MMTC       | Minerals and Metals Trading Corporation   |
| NFL        | National Fertilizers Limited              |
| RCFL       | Rashtriya Chemical and Fertilizers Limited |
| SAIL       | Steel Authority of India Limited          |
| SFC        | Shriram Fertilizers and Chemical          |
| SPIC       | Southern Petrochemicals Industries Co-operative Limited |
| TISCO      | Tata Iron and Steel Company Limited       |
| JAEL       | Juari Agro Chemicals Limited              |
The Indian large size fertilizer units manufacture wide varieties of nitrogenous and phosphate complex fertilizers. In 2005-06 large fertilizer units were 56. In addition to the nitrogenous and phosphates complex fertilizers the large scale units produce urea and ammonium Sulphate as by product. The single super phosphate is produced in India by 9 units. These are 72 small and medium scale fertilizer units. These unite operate mainly to produce SSP.

The production of urea in India has reached near self-sufficiency. The requirement of the nitrogenous fertilizers is met through the indigenous industry. In the case of phosphate fertilizer the raw materials and intermediates are imported in large scale. With the aid of the imported raw material prophetic fertilizers are produced to meet the requirements for the domestic market. The requirement of potash (K) is met entirely through imports. No fertilizer unit of India has any reserve of potash. The growth of the fertilizer industry was at its peak in the 1970s and 1980s. The growth was a bit stagnant in the last decade of the 20th century. With many radical steps been taken by the government of India the industry is expected to grow again.

The installed capacity as on 31-03-2010 has reached a level of 120.61 lakh MT of nitrogen and 56.59 lakh MT of phosphatic nutrient, making India the 3rd largest fertilizer producer in the world. The rapid build-up of fertilizer production capacity in the country has been achieved as a result of a favourable policy environment facilitating large investments in the public, co-operative and private sectors.

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.

- Excludes k$_2$O in NPK’$'$s, blends.
- 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, and 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 tons 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 cyanamide 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.

**Table No. 1.10**

**NPK Consumption Ratio**

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Year</th>
<th>NPK Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1985-86</td>
<td>7.0:2.5:1</td>
</tr>
<tr>
<td>2</td>
<td>1986-87</td>
<td>6.7:2.4:1</td>
</tr>
<tr>
<td>3</td>
<td>1987-88</td>
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<td>4</td>
<td>1988-89</td>
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</tr>
<tr>
<td>5</td>
<td>1989-90</td>
<td>6.3:2.6:1</td>
</tr>
<tr>
<td>6</td>
<td>1990-91</td>
<td>6.0:2.4:1</td>
</tr>
<tr>
<td>7</td>
<td>1991-92</td>
<td>5.9:2.4:1</td>
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<td>8</td>
<td>1992-93</td>
<td>9.5:3.2:1</td>
</tr>
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<td>9</td>
<td>1993-94</td>
<td>9.7:2.9:1</td>
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<tr>
<td>10</td>
<td>1994-95</td>
<td>8.4:2.6:1</td>
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<td>1995-96</td>
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<td>12</td>
<td>1996-97</td>
<td>10.0:2.9:1</td>
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<tr>
<td>13</td>
<td>1997-98</td>
<td>7.9:2.8:1</td>
</tr>
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<td>14</td>
<td>1998-99</td>
<td>8.5:3.1:1</td>
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<td>15</td>
<td>1999-00</td>
<td>6.9:2.9:1</td>
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<tr>
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<td>2010-11</td>
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</tr>
<tr>
<td>27</td>
<td>2011-12</td>
<td>6.5:2.9:1</td>
</tr>
</tbody>
</table>

Source: Department of Agriculture & Cooperation
1.5.2.1 Fertilizer Consumption Trends in India

Fertilizer consumption trends expressed in terms of aggregate quantity consumed and intensity of use (i.e. kg per hectare of total cropped area) reflect both demand and supply decision. Therefore, it is essential to understand fertilizer situation in the country. India is the second largest consumer of fertilizers in the world after China. It accounted for 15.3% of the world’s N consumption. 19% of phosphatic and 14.4% of potassic nutrients in 2008 (FAI, 2010) Fertilizer consumption was around 78 thousand tonnes in 1965-66 and it picked up very fast during the late-1960s and 1970s. At the times of onset of green revolution in 1966-67 consumption of fertilizers was about 1 million tonnes. In 1970-71 total fertilizers consumption increased to 2.26 million tonnes which further
increased to 12.73 million tonnes in 1991-92. During 1990s total fertilization consumption fluctuated between 12.15 and 16.8 million tonnes with the exception in 1990-00 when fertilization consumption was over 18 million tonnes. Total fertilization consumption reached record level of 26.5 million tonnes 2009-10. This increased to 27.79 M.T. in 2011-12. The entire requirement of potassic fertilizers is met through imports as India does not have commercially viable source of potash. During 1950s and 1960s about two third of domestic requirement of N fertilizers was met through imports. The level of P imports was very low in the fifties which increased significantly during the sixties and seventies. The fertilizer imports increased significantly in 1977-78 and 1978-79 1984-85 and thereafter. The fertilizer imports increased dramatically in 1977-78 and 1978-79 1984-85 and again in 1988-89 and 1989-90. However during the decade of 1990s imports were at low levels except in 1995-96 and 1997-98. Due to low/no addition in domestic capacity coupled with rise in demand for fertilizers during the last two decades, imports have increased significantly in the 2000s. India imported about 13.02 million tonnes (about 41% of total consumption) of NPK fertilizer nutrients in 2011-12 as against 1.93 million tonnes in 2002-03.

This was decline to 8.48 M.T. in 2012-13. The growth of imports was rather slow in the eighties and nineties but accelerated in 2000s. The share of imports in total consumption (N+P+K) declined from 57 per cent in 1960s to 43 per cent in 1970s, further to about 24.8 per cent in 1980s, 21.3 percent in 1990s but increased to 26.2 per cent in 2000s again increased to almost 3 times in 2012-2013. Almost similar trend was observed in case of nitrogenous and phosphatic fertilizers. The share of imports in total consumption was 13.8 percent in case of N and 23.8 percent in P during the 2000s. This rose to 30.8 percent in case of N and 42.40 percent in case of P in 2012-13. However, in terms of volume of imports, N fertilizer imports declined during the 1980s compared with 1970s,
which marginally increased during the 1990s (1.1 million tonnes) and further increased (1.79 million tonnes) in the 2000s, which considerably increased in 4.5 MT in 2012-13. While in case of phosphatic fertilizers imports have consistently increased over time from 243.2 thousand tonnes in 1970s to 511.3 thousand tonnes in 1980s, 736.9 thousand tonnes in 1990s and 1.25 million tonnes in 2000s and in 2013 it rose to 27.21 M.T. Rising share of imports is matter of concern as world fertilizer markets are highly volatile and imperfect. So there is need to increase domestic production to insulate from international markets.

Sixteen plant food nutrients are essential for proper crop development. Each is equally important to the plant, yet each is required in different amounts. These differences have led to the grouping of these essential elements into three categories; primary (macro) nutrients, secondary nutrients, and micronutrients. Primary (macro) nutrients are nitrogen (N), phosphorus (P), and potassium (K). They are the most frequently required in a crop fertilization programme and are needed in the larger quantity by plants as fertilizer. The secondary nutrients include calcium, magnesium, and sulphur. For most crops these three are needed in lesser amounts than the primary nutrients. The micronutrients such as boron, chlorine, copper, iron, manganese, molybdenum, and zinc are used in small amounts, but they are as important to plant development and profitable crop production as the major nutrients. However, major focus of the Indian fertilizer sector policy has been on primary (macro) nutrients. The changing pattern of three primary nutrients is presented in Figure 4. Nitrogenous fertilizers account for nearly two-third of total nutrient consumption in the country. The share of N was 78.5 per cent in 1950s, which declined to 68.6 per cent in the sixties, 67.9 per cent in the seventies and further to 65.7 per cent in the eighties. However, the share of N increased to 67.9 per cent in the 1990s, which fell to 62.9 per cent in the 2000s which again noted 63.21 percent in 2012.
<table>
<thead>
<tr>
<th>Period</th>
<th>Growth rate in fertilizer consumption</th>
<th>Growth rate in food grain (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Per Hac.</td>
</tr>
<tr>
<td>Pre green revolution period (1950-51 – 1966-67)</td>
<td>19.41</td>
<td>18.11</td>
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<td>Post green revolution period</td>
<td>8.75</td>
<td>8.49</td>
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<td>Phase I (1967-68 – 1980-81)</td>
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<td>9.29</td>
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<tr>
<td>Post Reform period (1991-92 to 2009-10)</td>
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<td>3.69</td>
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<td>8th Five Year Plan</td>
<td>4.51</td>
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<td>10th Five Year Plan</td>
<td>7.57</td>
<td>7.40</td>
</tr>
</tbody>
</table>

Sources: Indian Fertilizer Industry Annual Report 2012-13
CHART 1.2

Food grain Production, Area under and yield

Sources: Indian Fertilizer Industry Annual Report 2012-13

The growth rates in consumption of fertilizers and food grains during different time periods at all-India level are given in Table 2. The table shows that fertilizer consumption increased by more than 19 per cent in the pre-green revolution period (1950-51 to 1966-67) while food grains production increased by only 2.56 per cent. The reason for such high growth unfertilized consumption was that consumption in the base year (1950-51) was very low. This significant increase in total fertilizer consumption increased per hectare fertilizer use formless than one kg in 1951-52 to about 7 kg in 1966-67. In the post-green revolution period, fertilizer use increased by 9.9 per cent per year during the first phase of green revolution (1967-68 to 1980-81) when spread of high yielding varieties was limited to mainly Punjab, Haryana, western part of Uttar Pradesh and some southern states. Per hectare fertilizer consumption increased from 9.4 kg in 1967-68 to 31.9 kg in 1980-81. Increase in fertilizer use along with increase in
area under irrigation and high yielding varieties increased food grains production from 95.5 million tonnes in 1967-68 to about 130 million tonnes in 1980-81 at an annual compound growth rate of 2.27 per cent. However, food grains productivity increased at a faster rate (1.87%) in the first phase of green revolution compared with pre-green revolution period (1.45%). During the second phase of green revolution (1981-82 to 1990-91), when technology spread to other parts of the country, total fertilizer consumption increased an annual growth rate of 7.39 per cent. Per hectare fertilizer consumption more than doubled from 34.3 kg in 1981-82 to 69.8 kg in 1991-92. Total food grains production increased by about 2.8 per cent. The impressive growth of consumption of fertilizer in India in the post-green revolution period ensured increase in food grains production from 74.3 million tonnes in 1966-67 to 176.4 million tonnes during 1990-91. However, in 1991-92, certain policy reforms were initiated in fertilizer sector as part of macro-economic reforms. The potassic and phosphatic fertilizers were decontrolled w.e.f. August 25, 1992, the low analysis nitrogenous fertilizers viz. calcium ammonium nitrate, ammonium chloride and ammonium sulphate were decontrolled and brought under control several times in the past. These fertilizers were last decontrolled w.e.f. June 10, 1994. These policy interventions led to a serious slowdown in fertilizer consumption in the post-reforms period. Total fertilizer consumption declined from about 12.7 million tonnes in 1991-92 to 12.1 million tonnes in 1992-93. Similarly, per hectare fertilizer use also declined from 69.84 kg in 1991-92 to 65.45 kg in 1992-93. This reduction was more pronounced in case of phosphatic and potassic fertilizers. Total P consumption fell by about 14 per cent (from 3321.2 thousand tonnes in 1991-92 to 2843.8 thousand tonnes in 1992-93) and K by 35 percent (1360.6 thousand tonnes in 1991-92 to 883.9 thousand tonnes in 1992-93). Similar trend was observed in case of per hectare fertilizer consumption. Due to introduction of concession scheme on decontrolled phosphatic and potassic fertilizers in 1992-93, fertilizer consumption started picking up and reached a level of 18.1 million tonnes in 1999-00, declined to 16.7 million tonnes in 2000-01 and remained below this level up to 2003-04. Per hectare fertilizer consumption reached a level of 95.87 kg in 1999-00 but remained below this level during the next four years. Last six years viz., 2004-05 to 2009-10 have seen significant recovery unfertilized use in the country and total consumption
reached a record level of 26.5 million tonnes and per hectare consumption at 135.25 kg in 2009-10. The impact of slow growth of fertilizer consumption on growth of food grains production and crop output in the post-reforms period is quite evident from growth rates presented in Table 1. In post-reforms period (1991-92 to 2009-10) growth rate in fertilizer consumption was 3.98 percent compared with over 8.75 per cent during 1966-67 to 1991-92. Total fertilizer consumption recorded the lowest growth (1.35%) during the 9th five year plan compared with about 7.57 percent during 10th plan. There seems to be a very high positive association between growth rates of fertilizer consumption and food grains production. During 8th plan period, fertilizer consumption increased at an annual growth rate of about 4.51 per cent and food grains production increased by 1.26 per cent. Fertilizer consumption growth rate fell to 1.35 percent during 9th plan and food grains production growth rate also declined to -2.87 percent. During 10th five year plan, fertilizer consumption grew by 7.57 percent and food grains production growth rate increased to about 2.52 per cent. In the post-reforms period (1991-92 to 2009-10) growth rate in fertilizer consumption turned out to be less than half of what was achieved during the post-green revolution period (1966-67 to 1991-92). Similar trend was observed in case of food grains production. Growth rate in food grains production declined to about half (1.33%) during 1991-92 to 2009-10 compared with 2.65 percent during 1967-68 to 1991-92.

### 1.5.2.2 Intensity of Fertilizer Use

Looking at the total fertilizer consumption is not a good indicator as there are large differences in total cropped area across states. It would be more appropriate to examine trends in fertilizer consumption per hectare of cropped area. On per hectare basis, fertilizer consumption was less than 2 kg during the 1950s and increased to about 5 kg in 1965-66. However, after introduction of green revolution in 1966-67, per hectare fertilizer consumption more than doubled in the next five years from about 7 kg in 1966-67 to about 16 kg in 1971-72, which further increased and reached a level of 50 kg in mid-1980s. Average fertilizer consumption on per hectare basis crossed 100 kg in 2005-06 and reached a record level of 135 kg in 2009-10. However, per hectare fertilizer consumption fell during 1973-74 and 1974-75 due to oil shock of 1973 when oil prices quadrupled.
almost overnight. The next reversal in intensity of fertilizer use came in 1992-93 when government decontrolled phosphatic and potassic fertilizers and increased fertilizer prices significantly. The decline in use of fertilizers was the highest (36.3%) in case of potassic and about 16 per cent in phosphatic fertilizers. The total fertilizer consumption (N+P+K) fell by about 6 per cent from 69.84 kg per hectare to 65.45 kg per hectare. Due to severe drought in many parts of the country, per hectare fertilizer consumption declined from 91.64 kg in 2002-03 to 88.38 kg per hectare in 2003-04. However, during the last five years, intensity of fertilizer use has increased substantially (53%) from about 88 kg in 2005-06 to 193 kg per hectare in 2012-13.

1.5.2.3 Factors Affecting Fertilizer Use

The regression estimates for total fertilizer consumption equation are reported; the high R2 value (0.99) indicates that explanatory variables in the model have accounted for 99 per cent variation in fertilizer use and the model best fits when predicting fertilizer demand. The model was significant at 1 per cent level. All explanatory variables used in the model were statistically significant and had theoretically expected signs. Price of fertilizers was negatively related with fertilizers demand while area under high yielding varieties, irrigation, cropping intensity, price of output, and credit had a positive relationship with fertilizer demand. The results show that non-price factors were more important determinants of fertilizer use. Among the non-price factors, irrigation was the most important factor influencing fertilizer demand, followed by cropping intensity. The price of fertilizers was the third important determinant of fertilizer use in the country. Price of output is less important compared with input price. The results clearly indicate that increase in area under irrigation, and cropping intensity will accelerate fertilizer consumption in the country. In case of pricing policy instruments, increase in prices of fertilizers would lead to reduction in fertilizer use while output price had a positive impact on fertilizer consumption but was less powerful than input prices. Therefore, it is necessary to prioritize input price policy mechanism over higher output prices as high output price benefits a small proportion of farmers while low input price will increase fertilizer consumption on millions of marginal and small farmers. The results from this model suggest that the regression model provided the best fit to the
fertilizer consumption data. The $R^2$ value was highly significant at one per cent level of significance with the value ranging from 0.97 for K fertilizers to 0.99 for N fertilizers, indicating that over 97 per cent of variation in demand for fertilizers was explained by the explanatory variables included in the model. As expected, technological factors such as high yielding varieties, irrigation, and cropping intensity and agricultural prices had positive impact on N fertilizer consumption. Availability of capital also influenced N consumption positively. Price of fertilizer had a significant negative impact on N fertilizer use. Nonprime factors, namely, irrigation and cropping intensity, were more powerful in influencing N consumption compared with price factors. Price of N fertilizers was the third important determinant of fertilizer demand. Between, input price and price of agricultural output, price of input (N fertilizer) was more powerful in influencing the consumption. These results were very similar to total fertilizer consumption results. For P fertilizers, the variables included in the model explained about 98 per cent of the variation in consumption of phosphatic fertilizers in the country. All the variables included in the model had expected sign (except for credit) and were statistically significant except for high yielding varieties which had expected sign but statistically no significant. Price factors were more powerful in influencing P consumption compared with non-price factors. The variables included in the K fertilizers consumption model explained about 97 percent of the total variation in fertilizer use. As expected, irrigation and cropping intensity had significant positive impact on K fertilizer consumption. This is logical and expected, as farmers grow fertilizer-intensive crops under irrigated conditions and there is high degree of complementarities between irrigation and fertilizer consumption. Price of K fertilizers was the third important factor affecting fertilizer demand while price of output was less powerful than fertilizer prices in influencing fertilizer demand. The above results clearly indicate that non-price factors such as irrigation, high yielding varieties, and cropping intensity were more powerful in influencing demand for fertilizers compared with price factors. Within price factors, price of fertilizers had an adverse affect on fertilizer consumption and was more powerful than output price. The results suggest that in order to increase fertilizer consumption in the country, policymakers should prioritize non price factors like better irrigation facilities, high yielding varieties, etc. over pricing policy as an
instrument. Second, between output and input prices, there is a need to keep fertilizers prices at affordable level as they are more powerful in influencing fertilizer demand than higher output prices.

An estimate of the demand and supply till the end of the 11th five year plan is given in the table below:

Table No. 1.12

**Estimate of the Demand and Supply of N P K**

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply N+P</th>
<th>Demand N+P+K</th>
<th>Demand Supply Gap N+P+K</th>
<th>Demand of K</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>16950</td>
<td>23125</td>
<td>8835</td>
<td>2660</td>
</tr>
<tr>
<td>2008-09</td>
<td>17585</td>
<td>24085</td>
<td>9305</td>
<td>2805</td>
</tr>
<tr>
<td>2009-10</td>
<td>18595</td>
<td>25035</td>
<td>9405</td>
<td>2965</td>
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<tr>
<td>2010-11</td>
<td>19912</td>
<td>25960</td>
<td>9178</td>
<td>3130</td>
</tr>
<tr>
<td>2011-12</td>
<td>19965</td>
<td>26900</td>
<td>10235</td>
<td>3300</td>
</tr>
</tbody>
</table>

[N = Nitrogen, P = Phosphate, K = Potassium]

*Sources: Indian Fertilizer Industry Annual Report 2012-13*

Today, India stands as the third largest fertilizer consumer and producer of the world. It has been observed that the subsidies on Indian fertilizer have been rising at a constant rate. This is due to the rise in the cost of production and the inability of the government to raise the maximum retail price of the fertilizers.

The increase in the production of fertilizers and its consumption acts as a major contributor to overall agricultural development.
1.5.2.4 Contribution of fertilizer industry in the Indian economy:

Fertilizer industry has a significant good impact on the development of the Indian agriculture sector. The following points may reflect its contribution.

1. **Agricultural development:**

With the development of fertilizer industry, Indian agricultural development has been made possible. It has played a vital role in the green revolution.

2. **Capital Investment:**

Fertilizer industry today has more than Rs. 5700 Cr investment and has become one of the important industries of the economy.

3. **Corporate Development:**

In the last 30-40 years this industry has become a structured industry. It has made many joint ventures, multinationals and co-operatives which is one of the unique characteristic of this industry development in the nation.

4. **Regional development:**

Gujarat, Maharashtra, Punjab, Uttar Pradesh, Andhra, Assam, Bengal, Rajasthan, Bihar are the states who have many plants of fertilizers. (These states’ economy has a high impact of fertilizer units.)

5. **Employments:**

This industry has provided shelter to 3.5 lakh families in the last fifty years directly and a number of supporting industry during the last three decades.

1.5.2.5 Investment in the Fertilizer Sector:

The fertilizer sector attracted huge investment in the past, particularly between mid 70’s and 90’s. However, there was hardly any investment during the 10th Plan. The total investment in the fertilizer sector by the end of 2005-06 was Rs.25, 923 crore. With the accelerated growth in the Indian economy, other sectors have high rates of return on investment, but the fertilizer sector has failed to attract more investment due to low returns.
To increase the capacity of urea by about 12 million tonnes to a total of 31.5 million tonnes by 2011-12, India will need to invest at least Rs.36,000 crore in the sector at current capital costs.

1.5.2.6 Infrastructural Requirements of the Fertilizer Sector

(a) Ports:

Most ports face severe capacity constraints in handling high volumes on a sustained basis. Accepting the Mundra port, no other port is currently able to handle with Panamax vessels. With the movement by sea from the CIS countries and the US gulf increasingly being taken up through these large vessels, accepting and handling them at Indian ports has become a severe limitation. To supplement the efforts of major ports that handle 60-70% of the finished fertilizers, improvements in the existing minor ports will be more economical than creating new ports.

(B) Road transportation:

The development and maintenance of road transport will have to be substantially increased by way of widening and proper meeting of road to withstand increasing load on the national and state highways which should be able to take high capacity trucks.

(C) Railway:

Railway facilities and port-rail connectivity need to be strengthened significantly during the Plan period if timely availability of fertilizers is to be ensured.

(D) Waterways:

There is a need to provide a thrust to the development of inland waterways and coastal shipping for movement of fertilizers.

(E) Storage:

In view of the competing demands for a number of agro-products, it will be desirable to strengthen the warehousing infrastructure to meet the changing needs of the country during the Eleventh Five Year Plan. This is more so because
fertilizer demand has a definite peak and non peak distribution of demand and is not amenable to JIT (Just in Time) inventory planning.

1.5.2.7 Challenges of Fertilizer Units Working In India

Efficient performance:

The demands of fertilizers have increased and are increasing day by day. To meet the requirement the units have to increase its productivity through effective performance, reducing wastages and by handling the material carefully. It is also found that the productivity of the Indian units is not in the line of the developed countries.

Investment:

Considering the high demand world over, this industry is required to invest more capital. The co-operative sector has its own limitations for the investment but other units can generate funds through the open market.

Capacity:

The demand of the fertilizer industry is increasing and to meet the demand of the market, the industry is required to expand its capacity. There is a high potential demand even from the underdeveloped countries for the fertilizers and to meet them there is an urgent need to increase the capacity of the plants. Again it requires more investment.

Subsidy:

According to the agreement with the WTO, Indian industry is required to reduce the subsidy given on the price of fertilizers. Due to this the prices of the fertilizers will go up and it may not be within the reach of the poor farmers. This may affect the industry adversely.

1.5.2.8 New fertilizer policy

The new fertilizer policy of the Indian government is also one of the important challenging factors for the industry. The main provisions of the policy are as follows:
AN OVERVIEW OF FERTILIZER INDUSTRY

- Make Urea free from control by 2006
- Introduction of group reward of 2001
- Increased prices of Urea every year by 7%

**Productivity:**

It is found that the agricultural productivity of Indian land is inferior to the developed countries. Even the size of the farm in India is small so the use of the fertilizer is not found proper by the Indian farms.

**Liquidity:**

The fertilizer industry in India is depended on the Government subsidy, Moreover the efficient usage of the various resources is not found proper among the various units. This results in the insufficient financial liquidity for the units.

**Competition:**

After globalization Indian market is open for the foreign companies. This results in high competition for the Indian companies. Indian production cost is very high as well quality is also required to improve to match the international standard. This affects the industry adversely. The installed capacity as on 31-03-2012 has reached a level of 120.41 lakh MT of nitrogen and 56.19 lakh MT of phosphatic nutrient, making India the 3rd largest fertilizer producer in the world. The rapid build-up of fertilizer production capacity in the country has been achieved as a result of a favorable policy environment facilitating large investments in the public, cooperative and private sectors\(^\text{13}\).

Presently, there are 30 large size urea plants in the country manufacturing urea (as on date 29 are functioning), 21 units produce DAP and complex fertilizers, 5 units produce low analysis straight nitrogenous fertilizers and the 2 manufacture Ammonium Sulphate as by-product. Besides, there are about 85 medium and small-scale units in operation producing SSP. The sector wise installed capacity is given in the table below: -
India's food grain requirement to feed the estimated population of 1400 million by 2025 will be 300 million tonnes (based on rice, i.e. unhooked paddy rice). There will be a corresponding increase in requirement of other crops such as cotton, sugarcane, fruits and vegetables. The country will require about 45 million tones of nutrients (30 million tonnes of food grains and 15 million tonnes of nutrients for other crops) from various sources of plant nutrients, i.e. fertilizers, organic manures and bio fertilizers.

The further increase in crop production will have to come from an increase in yields as there is limited scope for increasing cultivated area. The yields of the majority of the crops are relatively low and there is great potential for increasing them through the increased use of inputs such as fertilizers. Fertilizer use will remain key to the future development of agriculture.

The handling of increasing quantities of fertilizers will put pressure on storage, handling facilities and transport. Fertilizer promotion will have to include activities that promote not only increased rates of use but also better balances between the nutrients and higher efficiency. Attention also needs to focus on the availability of credit, an essential factor in ensuring the availability of fertilizers to farmers.

India will continue to be a major importer of raw materials, intermediates as well as finished products. The fertilizer product pattern is unlikely to change in the near future, and urea and DAP will continue to dominate fertilizer production. Attention will need to be focused on ensuring the availability of good-quality micro nutrient fertilizers.
### Table No. 1.14

**Production, Imports and Consumption of Fertilizers** (Thousand tones of nutrients)

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Production</td>
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<tr>
<td>Production</td>
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<tr>
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<td><strong>All Fertilizers</strong></td>
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</tr>
<tr>
<td>Production</td>
<td>14468</td>
<td>14265</td>
<td>15405</td>
<td>15575</td>
<td>16095</td>
<td>14706.5</td>
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<td>Imports</td>
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<td>2752</td>
<td>5254</td>
<td>6080</td>
<td>7750.16</td>
<td>10221</td>
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<tr>
<td>Consumption</td>
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<td>16798</td>
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<td>20340</td>
<td>21651</td>
<td>22570</td>
<td>24909</td>
<td>26486</td>
<td>28122</td>
<td>27567</td>
</tr>
</tbody>
</table>

Source: Department of Agriculture & Cooperation & Department of Fertilizers
1.5.2.9 Current Scenario

- Most companies are expecting approval for the huge capital expenditure plans from the department of fertilizer and industry.
- Indian fertilizer companies joined hands with Jordan, Senegal, Oman, Morocco, Egypt etc.
- In India, production of urea was 21.8 million tones whereas the consumption was 28.2 million tones in 2010-11, so 6.4 million tones of urea26 is imported by India in 2010-11. 02-26-2013.
- Indian fertilizer companies joined hands with Jordan, Senegal, Oman, Morocco, Egypt etc.
- The demand of Chemical fertilizer is expected to increase by 4% in 2012-13. 27 02-26-2013.
- Fertilizer subsidy has taken a large share of 35.9% (62301/173420 Crore) of total subsidies in 2010-11.
- In the same way, production of DAP in India was 7.76 million tones whereas the consumption was 11.4 million tones in 2010-11, so 3.64 million tones of DAP is imported by India in 2010-11.

1.5.2.10 Fertilizer Regulation 28, 02-26-2013

(Central Fertilizer Quality Control and Training Institute)

- Providing technical guidance to the central and state government on Fertilizer Quality Control Laboratories.
- Acting as a referee laboratory
- Training of fertilizer enforcement officers and analysts
- Standardization and development of method of analysis
- Undertaking inspection and analysis of imported and indigenous fertilizers.
- There are 67 Fertilizer Quality Control Laboratories in the Country which includes 4 set up by Central Government as CFQC & TI, Faridabad and its three Regional Laboratories (Chennai, Mumbai, and Kolkata).
• Fertilizer Control Order (1985) was promulgated under Section 3 of Essential Commodities Act, 1955
• A set of regulations on the manufacture of fertilizer mixtures.
• Specifications for all fertilizer produced, imported or sold in India.
• Compulsory registration of fertilizer makers, importer and sellers.
• Banning of the manufacture or import and sale of non-30, 02-26-2013 standard, spurious or adulterated fertilizers.
• Appointment of enforcement agencies and creation of quality control laboratories.
• Packing and labeling of fertilizer bags.

1.5.2.11 Strategies for Industry Expansion

• In the case of phosphatic fertilizer, the raw materials and intermediates are imported in large scale.31, 02-26-2013
• Joint ventures for phosphoric acid procurement.
• Establishment of joint ventures where cheaper raw materials can be procured
• Alternative sources for urea production
• Reviving some the closed fertilizer units
• Modernization and revamping of existing fertilizer units.

1.5.3 Development of Fertilizer Industry in Gujarat

There are main four companies which produce chemical fertilizer in Gujarat. Out of them the Gujarat State Fertilizer Chemical Limited established the first ever chemical fertilizer factory in Gujarat at Baroda in 1967. GSFC was first joint sector industrial unit in India with equity capital of State government 49% and public 51%. It was also first unit to manufacture DAP. Fertilizer in India them in nine years later, in 1976 the Gujarat Narmada Valley Fertilizer Company Limited popularly known as GNFC established a chemical fertilizer factory at Barouche. GNFC promoted by the government of Gujarat and GSFC. After the establishment of these two companies in Gujarat, in 1975 Indian Farmers Fertilizer Co-operative Limited (IFFCO) set up its plants at Kalol and Kandla in Gujarat. Krushak Bharti Co-operative Limited
(KRIBHCO) established its manufacturing unit in Gujarat. First used by ancient farmers fertilizer technology developed significantly as the chemical needs of growing plants were discovered. The use of synthetic fertilizer has significantly improved the quality and quantity of the food available today. Their long term use is harmful the environmentalists.

1.6 PROFILE OF SELECTED FERTILIZER COMPANIES

1.6.1 GSFC

The facet of care can be expressed in thought and action. And since its beginning, in 1962, GSFC has consistently translated the facet of care in its every activity. Unfolding before you is the epic of the Gujarat State Fertilizers & Chemicals Ltd, an organization, in the annals of Indian Corporate history, founded on the single minded principle of offering the best to the customer.

GSFC is taking its philosophy of care and extending it to every facet of its existence, employees, suppliers, services, society and even the environment.

In offering its care to an even larger section of society, GSFC has transcended the boundaries of the ordinary to be able to truly fulfill its goal of being “Basic to India’s Progress”.

Initially with the equity structure, comprising of 49% of State Government participation and 51% of Public and Financial Institutions, today the Government’s involvement has come down to 38.4%.

As an organization formed for supporting the farmers, GSFC’s every act revolves around the avowed goal of “not only selling fertilizers, but also offering happiness.” Translating this belief has been the constant standard that its every act must measure up to.

Since its inception, GSFC has constantly striven to re-define its role in a dynamic environment. In the process, earning a commendable reputation as an organization that not only provides just products but also the knowledge to use them wisely.
But this performance would not have been possible without a strong technical capability. And in creating that firm bedrock of technological superiority, GSFC has once again created an enviable track record.

It is rightly said that you need to take one step backwards if you want to stride forward and this adage equally applied to GSFC and the phase between 1999 to 2002 was a phase of one step backwards which in fact facilitated endless strides forward. GSFC never ever then looked back. The period between 1999 to 2001 was a phase where it was veering on the brink of a cash crunch. This phase of GSFC was attributed to many reasons. To name a few are increased energy costs, technical hiccups and delayed commissioning of new Ammonia plant after a gestation period of eight years and resultant increased project cost, excess outflow of interest etc. This new Ammonia plant continued with technical snags which could stabilize only by end of 2003. The liquidity problems further compounded due to expansion of DAP capacity at Sikka (1999-2003) which required infusion of Rs. 180 Crores. The Government of India also recovered subsidy amounting to Rs. 375 Crores. The drought during this period further depressed prices and demand for all products. There was also a shortage of gas that resulted into use of costly LSHS and Naphtha. The margins in Melamine and Caprolactam, GSFC’s blue chip products, were low in this period due to depressed industrial demand internationally.

The turnaround story of the Company began from FY 2003-2004. Under able leadership and timely intervention of Hon. Chief Minister Shri Narendra Modi in taking certain bold policy decisions, the company could work on the strategies to enhance its productivity, bring down costs through technical innovations and improved management information systems. The revival measures were fully supported by Govt. of Gujarat and the Company was given complete autonomy to roll back to the track. Finally the major factors that brought company out of red were improvement in the Operational Efficiency, Reducing Cost of Sales, Regenerating Confidence in Suppliers & Customers, Moral boosting of employees, strategizing foray in the global market, consolidating through further Expansions, focusing on ideal product mix to insulate performance from downtrends etc.
Govt. of Gujarat provided the proactive support to GSFC, which brought out a scheme of deferred sales tax of an amount up to Rs. 45 Crores per year for five years, thus improving the Company's cash flow position. Another important breakthrough was the increased availability of natural gas in Gujarat, from GAIL, GSPC and Gujarat Gas, which substituted costly Naphthta and LSHS.

All these measures finally resulted into GSFC becoming a financially strong, profitable and stable Company. Coming out of Corporate Debt Restructuring (CDR), GSFC approached the CDR Cell, this time to accelerate the debt repayment. The debt, which was scheduled to be completely paid by 2013, was re-paid in 2006.

As a step towards backward integration as well as a part of global trotting for feed-stocks has participated in a joint venture in Tunisia viz. Tunisian Indian Fertilizers S.A. (TIFFERT), this would ensure the consistent supply 1,80,000 TPA of additional Phosphoric Acid per annum required for the production of DAP. GSFC has also acquired a strategic stake in M/s Karnalyte Resources Incorporation in Canada. This secures availability of Potash for the Company in long run.

The Company during the period of past half decade has entered the Second Green Revolution phase by developing alternative energy generation facilities and initiating the spread of driп irrigation systems in Gujarat. The Company has provided valuable services to farmers by way of agricultural inputs and marketing support.

Entering the second green revolution, GSFC continued its role of encouraging agricultural growth by developing and supplying Bio-Fertilizers and Biotechnology products to the farmers under one roof. The Company has also advanced Tissue Culture facilities to support horticulture and other crops. In order to provide farmers with high-tech inputs, GSFC has formed 100% subsidiary GSFC Agrotech Limited for research and production of liquid bio-fertilizers, Plant Growth Promoters-Sardar Amin Granules/liquid, Tissue culture and Seeds.
GSFC also promoted Gujarat Green Revolution Company Limited (GGRC) to promote drip-irrigation and sprinkler irrigation systems amongst farmers so as to optimize the usage of water and implementation/monitoring the Government subsidy scheme in co-ordination with GSFC.

GSFC is also contemplating an investment outlay of approx. Rs. 8,000 Crores for setting up an integrated fertilizer and petrochemicals complex at Dahej.

The major achievements of the company during the able leadership of Shri Narendra Modi, as Chief Minister can be summarized below:

1. GSFC could achieve consistent profitability record and it has touched its highest profits during the period 2001-02 to 2012-13. Its net profit touched ever highest level of Rs.759 Crores during 2011-12 and the total profit after tax during 2001-02 to 2012-13 was Rs.3594 Crores, as compared to total profit after tax of Rs. 1166 Crores earned during the period 1988-89 to 1999-2000.

2. Significantly, GSFC, which was under loss in the year 2001-02 and 2002-03 on account of various factors, not only turned around but also earned its highest ever profit. Turn-over per share increased from Rs.255/- to Rs.665/- per share.

3. During this period, GSFC diversified into new chemicals like MEK-Oxime and other raw materials such as Phosphoric Acid, Potassic Acid, etc. It also diversified and increased significantly its Fertilizers portfolio. Its Fertilizers manufacturing capacity today stands at 1.7 Million Tons. It also added significantly to its wind energy portfolio which stands at over 150 MW. The total project invested by GSFC during the period of Hon’ble Chief Minister is Rs. 8340 Crores.

4. This performance of the company is brought out amply by investments made by domestic institutional investors as well as foreign institutional investors which stand at close to 40% of its total paid up capital.

All these steps are in line with GSFC's mission of becoming a world-class, multi-product, eco-friendly global company contributing to the nation as well as for the welfare of society at large.
Main products of the company in the fertilizer section are Urea, Ammonium Sulphate, Di-Ammonium Phosphate APS-20:20:0:13, NPK - 12:32:16 , NPK - 10_26_26, Water Soluble Fertilizers , Micro Mix , Gypsum

Achievements of the Company

- First joint sector Industrial Complex in India -Equity Capital of State Government 49% and public 51%.

- First to erect the fertilizer plants within the shortest project completion period - Completed within a period of two years of the day of its inception.

- First Fertilizer unit to be assisted by IDBI's Development Assistance Fund -As GSFC was an industrial project to secure direct and active participation of farmers in the share Capital through equity subscription of over Rs 1 crore - GSFC launched a massive door to door drive and collected Rs. 1 Crore.

- First to adopt the Steam Naphtha Reforming process for manufacture of Ammonia. It is the biggest technical contribution.

- First to manufacture DAP complex fertilizer in India.

- First to develop and use the Phospho-Gypsum Process for manufacture of Ammonium Sulphate.

- First to develop indigenous catalyst for manufacture of Cyclohexane. It is an intermediate for manufacture of caprolactam.

- First to set up the caprolactam Plant in India - in 1974 decided to diversify to caprolactam production which is a raw material for Nylon Yarn and Tyre Cord.

- First to utilize indigenous Rock Phosphate for manufacture Phosphoric Acid.

- First to set up effluent treatment facilities for removing Phosphate and Fluoride from liquid effluent.

- First to use indigenous Primary Steam Naphtha Reformer Tubes and indigenous Primary Steam Naphtha reforming Catalyst in the Ammonia plants.
• First to Recover Argon from Purge Gas In 1981 Company entered market of industrial gases by making Argon Gas used for Welding in Engg. & Fabrication industries.

• First to establish the Melamine Plant.

• First largest Nylon -6 Plant for Eng., Plastics Based on know of M/s Inventa of Switzerland - Build at a cost of Rs. 14 Crore the product has a variety of application in number of industries.

• First to launch its own chain of marketing outlets and agriculture extension services to farmers for optimum selection of fertilizers seeds and other inputs.

• First to adopt DCDA (Double Contact Double Absorption) technology in Sulphuric Acid production to avoid Sulphur Dioxide emission.

• First to adopt Enriched Air Technology for Cyclohexanone Plant in Asia.

1.6.2 GNFC

Gujarat Narmada Valley Fertilizers & Chemicals Limited (GNFC) is an Indian manufacturer of fertilizers and Chemicals. GNFC was founded in 1976 and it is listed on Mumbai Stock Exchange. The company was jointly promoted by the Government of Gujarat and the Gujarat State Fertilizer Company Limited (GSFC). It was set up in Bharuch Gujarat. Located at Bharuch in an extremely prosperous industrial belt, GNFC draws on the resources of the natural wealth of the land as well as the industrially rich reserves of the area.

GNFC started its manufacturing and marketing operations by setting up in 1982, one of the world's largest single-stream ammonia-urea fertilizer complexes. Over the next few years, GNFC successfully commissioned different projects - in fields as diverse as chemicals, fertilizers and electronics.

Since inception, GNFC has worked towards an extensive growth as a corporation: A growth which respects the environment and springs from the progressive vision of GNFC.

GNFC today has extended its profile much beyond fertilizers through a process of horizontal integration. Chemicals/Petrochemicals, Energy Sector, Electronics/Telecommunications and Information Technology form ambitious and challenging additions to its corporate portfolio. GNFC has an enterprising, strategic view towards expansion and diversification.
GNFC has drawn on the world’s leading technologies and systems for its various production culmination of enterprise and initiative, resourcefulness and resolve, technology at GNFC common vision for continuous growth.

GNFC has always shown a dedication to standards of production and environment safeguards, qualified research acumen, and 100% capacity utilization for more than two decades.

**Table No. 1.15**

**GNFC Plants Installed Capacity of Different Products**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Installed Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>4,45,500 MTA</td>
</tr>
<tr>
<td>Urea</td>
<td>6,36,900 MTA</td>
</tr>
<tr>
<td>Ammonium Nitro phosphate</td>
<td>1,42,500 MTA</td>
</tr>
<tr>
<td>Calcium-Ammonium Nitrate</td>
<td>1,42,500 MTA</td>
</tr>
<tr>
<td>Methanol-I</td>
<td>50,000 MTA</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>10,000 MTA</td>
</tr>
<tr>
<td>Methanol-II</td>
<td>1,88,100 MTA</td>
</tr>
<tr>
<td>MSU</td>
<td>30,600 MTA</td>
</tr>
<tr>
<td>Weak Nitric Acid (I &amp; II)</td>
<td>3,47,500 MTA</td>
</tr>
<tr>
<td>Concentrated-Nitric Acid (I)</td>
<td>1,16,000 MTA</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>1,00,000 MTA</td>
</tr>
<tr>
<td>Synthesis Gas Generation</td>
<td>201.960 Million NM3 per annum</td>
</tr>
<tr>
<td>Captive Power Plant I &amp; II</td>
<td>3,96,000 MWH per annum</td>
</tr>
<tr>
<td>Nitrobenzene (NB)</td>
<td>47250 MTPA</td>
</tr>
<tr>
<td>Aniline</td>
<td>35000 MTPA</td>
</tr>
<tr>
<td>Toluene Di-isocynate (TDI)</td>
<td>14000 MTPA</td>
</tr>
<tr>
<td>Di Nitro Toluene (DNT)</td>
<td>18356 MTPA</td>
</tr>
<tr>
<td>Meta Toluene Di-amine</td>
<td>11804 MTPA</td>
</tr>
<tr>
<td>CPSU</td>
<td>2,84,515 MWH</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>50,000 MTA</td>
</tr>
<tr>
<td>ASGP</td>
<td>369,600 MTA Eq. Ammonia</td>
</tr>
<tr>
<td>TDI-II Dahej Project</td>
<td>50,000 MTA</td>
</tr>
</tbody>
</table>

Sources: Annual Report 2012-13
### Table No. 1.16

**Production Performance of GNFC Plants For the Year 2012-2013**

<table>
<thead>
<tr>
<th>PLANTS</th>
<th>ACTUAL</th>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>5,91,861</td>
<td>132.85</td>
</tr>
<tr>
<td>Urea</td>
<td>7,08,795</td>
<td>111.29</td>
</tr>
<tr>
<td>Methanol-I</td>
<td>2,569</td>
<td>5.14</td>
</tr>
<tr>
<td>Methanol-II</td>
<td>1,30456</td>
<td>69.35</td>
</tr>
<tr>
<td>MSU</td>
<td>20</td>
<td>0.07</td>
</tr>
<tr>
<td>Methyl Formate</td>
<td>25,604</td>
<td>112.30</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>20,153</td>
<td>201.53</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>1,57,093</td>
<td>157.09</td>
</tr>
<tr>
<td>WNA-I</td>
<td>2,87,307</td>
<td>116.08</td>
</tr>
<tr>
<td>WNA-II</td>
<td>1,12,690</td>
<td>112.69</td>
</tr>
<tr>
<td>CNA-I</td>
<td>29,784</td>
<td>90.26</td>
</tr>
<tr>
<td>CNA-II</td>
<td>28,908</td>
<td>87.60</td>
</tr>
<tr>
<td>CNA-III</td>
<td>49,408</td>
<td>98.82</td>
</tr>
<tr>
<td>Ammonium Nitro phosphate</td>
<td>2,00,895</td>
<td>140.98</td>
</tr>
<tr>
<td>Calcium Ammonium Nitrate</td>
<td>1,06,401</td>
<td>74.67</td>
</tr>
<tr>
<td>Aniline</td>
<td>41,717</td>
<td>119.19</td>
</tr>
<tr>
<td>Toluene Di-isocynate (TDI)</td>
<td>17,875</td>
<td>127.68</td>
</tr>
<tr>
<td>Nitrobenzene (NB)</td>
<td>58,601</td>
<td>124.02</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>15,387</td>
<td>70.65</td>
</tr>
</tbody>
</table>

*Sources: Annual Report 2012-13*

**ACHIEVEMENTS**

- Set up the world's largest single stream, fuel oil based Ammonia - Urea plant
- All fertilizers under the brand name of Narmada, along with extensive support activities, have been well accepted by the country's farmer community.
- India's largest producer of Formic Acid, Acetic acid and Methanol.
• India's only manufacturer of Glacial Acetic Acid through the cutting-edge Methanol route.
• India's largest single stream plant of Aniline.
• The only manufacturer of Toluene Di-isocyanate in South East Asia.
• Record capacity utilisations in all plants, defying the vintage through ingeniously innovative maintenance measures.
• Development of the first indigenous, eco-friendly technology for H₂S removal, CATSOL, a much awarded product of the Company's R&D labs

1.6.3 IIFCO

During mid-sixties the Co-operative sector in India was responsible for distribution of 70 per cent of fertilizers consumed in the country. This Sector had adequate infrastructure to distribute fertilizers but had no production facilities of its own and hence dependent on public/private Sectors for supplies. To overcome this lacuna and to bridge the demand-supply gap in the country, a new cooperative society was conceived to specifically cater to the requirements of farmers. It was a unique venture in which the farmers of the country through their own Co-operative Societies created this new institution to safeguard their interests. The number of Co-operative Societies associated with IFFCO has risen from 57 in 1967 to 39,824 at present.

Indian Farmers Fertilizer Co-operative Limited (IFFCO) was registered on November 3, 1967 as a Multi-unit Co-operative Society. On the enactment of the Multi state Co-operative Societies act 1984 & 2002, the Society is deemed to be registered as a Multi state Co-operative Society. The Society is primarily engaged in production and distribution of fertilizers. The byelaws of the Society provide a broad framework for the activities of IFFCO as a Co-operative Society.

IFFCO commissioned an ammonia-urea complex at Kalol and the NPK/DAP plant at Kandla both in the state of Gujarat in 1975. Ammonia-urea complex was set up at Phulpur in the state of Uttar Pradesh in 1981. The ammonia and urea at Aonla was commissioned in 1988.
In 1993, IFFCO had drawn up a major expansion programme of all the four plants under overall aegis of IFFCOVISION 2000. The expansion projects at Aonla, Kalol, Phulpur and Kandla were completed on schedule. All the projects conceived as part of VISION 2000 had been realized without time or cost overruns. All the production units of IFFCO have established a reputation for excellence and quality. Another growth path was chalked out to realize newer dreams and greater heights through Vision 2010. As part of this vision, IFFCO has acquired fertilizer unit at Parade pin Orissa in September 2005. As a result of these expansion projects and acquisition, IFFCO's annual capacity has been increased to 3.69 million tonnes of Urea and NPK/DAP equivalent to 1.71 million tonnes. In pursuit of its growth and development, IFFCO had embarked upon and successfully implemented its Corporate Plans, ‘Mission 2005’ and ‘Vision 2010’. These plans have resulted in IFFCO becoming one of the largest producer and marketer of Chemical fertilizers by expansion of its existing Units, setting up Joint Venture Companies Overseas and Diversification into new Sectors.

IFFCO has now visualized a comprehensive plan titled ‘Vision-2015’ which is presently under implementation. IFFCO has made strategic investments in several joint ventures. Indian Potash Ltd (IPL) in India, Industries Critiques du Senegal (ICS) in Senegal, Oman India Fertilizer Company (OMIFCO) in Oman and Jordan India Fertilizer Company (JIFCO) are important fertilizer joint ventures. As part of strategic diversification, IFFCO has entered into several key sectors. IFFCO-Tokio General Insurance Ltd (ITGI) is a foray into general insurance sector. Through ITGI, IFFCO has formulated new services of benefit to farmers. 'Sankat Haran Bima Yojana' provides free insurance cover to farmers along with each bag of IFFCO fertilizer purchased. To take the benefits of emerging concepts like agricultural commodity trading, IFFCO has taken equity in National Commodity and Derivative Exchange (NCDEX) and National
Collateral Management Services Ltd (NCMSL). IFFCO Chattisgadh Power Ltd (ICPL) which is under implementation is yet another foray to move into core area of power. IFFCO is also behind several other companies with the sole intention of benefiting farmers.

The distribution of IFFCO's fertilizer is undertaken through over 39824 Cooperative Societies. The entire activities of Distribution, Sales and Promotion are co-ordinate by Marketing Central Office (MKCO) at New Delhi assisted by the Marketing in the field. In addition, essential agro-inputs for crop production are made available to the farmers through a chain of 158 Farmers Service Centre (FSC). IFFCO has promoted several institutions and organizations to work for the welfare of farmers, strengthening cooperative movement, improve Indian agriculture. Indian Farm Forestry Development Cooperative Ltd (IFFDC), Cooperative Rural Development Trust (CORDET), IFFCO Foundation, Kisan Sewa Trust belong to this category. An ambitious project 'ICT Initiatives for Farmers and Cooperatives' is launched to promote e-culture in rural India. IFFCO obsessively nurtures its relations with farmers and undertakes a large number of agricultural extension activities for their benefit every year.

At IFFCO, the thirst for ever improving the services to farmers and member cooperatives is insatiable, commitment to quality is insurmountable and harnessing of mother earths' bounty to drive hunger away from India in an ecologically sustainable manner is the prime mission. All that IFFCO cherishes in exchange is an everlasting smile on the face of Indian Farmer who forms the moving spirit behind this mission.

IFFCO, to day, is a leading player in India's fertilizer industry and is making substantial contribution to the efforts of Indian Government to increase food grain production in the country.

The main products of the company used in India are
Nitrogenous Fertilizers

Urea 46% N
Ammonium Sulphate (As) 21% N
Ammonium Chloride (ACL) 26% N
Calcium Ammonium Nitrate (CAN) 25% N

Phosphatic & Potassic Fertilizers

Single Super Phosphate (SSP) 16% P2O5
Muriate of Potash (MOP) 60% K2O
Sulphate of Potash (SOP) 48% K2O
Di-ammonium Phosphate (DAP) 18 - 46

Rock Phosphate (RP)

PRODUCTION CAPACITY OF IFFCO

Installed capacity of the IFFCO as on march-2013 in (‘000 MT)

- UREA 4242.2
- NP/NPK/DAP 4335.4
- TOTAL ‘N’ 2628.2
- TOTAL ‘P2O5’ 1712.8
- WSFs 15.0
- ZINC SULPHATE MONOHYDRATE 30.0
Mission and Vision of IFFCO

IFFCO’s mission is "to enable Indian farmers to prosper through timely supply of reliable, high quality agricultural inputs and services in an environmentally sustainable manner and to undertake other activities to improve their welfare”

- To provide to farmers high quality fertilizers in right time and in adequate quantities with an objective to increase crop productivity.
- To make plants energy efficient and continually review various schemes to conserve energy.
- Commitment to health, safety, environment and forestry development to enrich the quality of community life.
- Commitment to social responsibilities for a strong social fabric.
- To institutionalize core values and create a culture of team building, empowerment and innovation which would help in incremental growth of employees and enable achievement of strategic objectives.
- Foster a culture of trust, openness and mutual concern to make working a stimulating and challenging experience for stakeholders.
- Building a value driven organization with an improved and responsive customer focus. A true commitment to transparency, accountability and integrity in principle and practice.
- To acquire, assimilate and adopt reliable, efficient and cost effective technologies.
- Sourcing raw materials for production of phosphatic fertilizers at economical cost by entering into Joint Ventures outside India.
- To ensure growth in core and non-core sectors.
- A true Cooperative Society committed for fostering cooperative movement in the country.

Emerging as a dynamic organization, focusing on strategic strengths, seizing opportunities for generating and building upon past success, enhancing earnings to maximize the shareholders' value
Company Vision

To augment the incremental incomes of farmers by helping them to increase their crop productivity through balanced use of energy efficient fertilizers, maintain the environmental health and to make cooperative societies economically & democratically strong for professionalized services to the farming community to ensure an empowered rural India.

To achieve our mission, IFFCO as a cooperative society, undertakes several activities covering a broad spectrum of areas to promote welfare of member cooperatives and farmers. The activities envisaged to be covered are exhaustively defined in IFFCO’s Bye-laws.

1.6.4 KRIBHCO

Krishak Bharati Cooperative Ltd. (KRIBHCO) was incorporated on 17th April 1980 and is a Multi-State Cooperative Society deemed to be registered under the Multi-State Cooperative Societies (MSCS) Act, 2002.

KRIBHCO is primarily a fertilizer production cooperative having production unit at Hazira (Surat) in the state of Gujarat. The Government of India through the Department of Fertilizers was a member of KRIBHCO but its equity holding was reduced to NIL on 4th July 2013 under the provisions of the MSCS Act 2002. KRIBHCO is not owned nor controlled nor financed by the Government of India / Any State Governments.

The Plant has been revamped to produce additional quantity of 4.65 Lakh MT of Urea. The enhanced capacity of the revamped plant now stands at 21.65 Lakh MT of Urea.

KRIBHCO had also entered into Logistics Business, Oman India Fertilizer Complex (OMIFCO), Diversification into Power Sector, Insurance Sector etc.
OMIFCO is the first overseas JV project of the company in which KRIBHCO holds 25% equity. Besides, KRIBHCO has also made realignment in its corporate strategy and internal operations revamping to meet the challenges in the liberalized/globalized economy. Illustration for this is turn-around of loss making Krishak Bharati Seva Kendra (KBSKs) and Seed Processing Units (SPUs) into profit centers.

Marketing Division of the society, besides marketing about 18.00 Lakhs MT of urea produced annually at our plant in HAZIRA since commencement of production in 1986, is also handling and marketing about 10.00 Lakhs MT of Urea produced by OMIFCO (KRIBHCO is one of the promoter of the company) annually since 2005-06. In 2006, KRIBHCO also acquired Sahajanpur Fertilizer Complex through its joint venture company KSFL (KRIBHCO holds 85% of the share in the JV), and about 10.00 Lakhs MT of urea produced annually by this plant is being marketed by KRIBHCO since 2006. At present KRIBHCO is marketing about 38.00 Lakhs MT of urea annually which is about 14% of the total urea consumption of the country. The marketing division of the society is fully geared up to market the likely additional quantities of about 5.00 Lakhs MT of urea from next year after revamp of our plant at HAZIRA.

The operation of fertilizer industry particularly indigenous manufacturers changed significantly on implementation of NPS-stage –III policy and implementation of NBS (from 01-04-2010). In Light of conducive and stable policy frame work, KRIBHCO is perusing import and marketing of other fertiliser material like DAP and MOP. The Society plans to import and market about 4.00 Lakhs MT of DAP during 2010-11. Society is planning to increase import of DAP and MOP to about 9.00 Lakhs MT annually in next 3 years.

Keeping in view importance of the Quality Seeds in enhancing the agricultural production, KRIBHCO initiated Seed Multiplication Programme in the year 1990-91 to provide quality seeds of the crops and varieties of Public Hybrid (Public Varieties) to the farmers through KBSK’s in the State of UP, Punjab and
Haryana. Encouraging response of farmers towards KRIBHCO Seed has prompted the Society to expand its activities in 6 States and have 14 production units. The Society stepped up production programme from 2926 Qtls. in 1991-92 to 2.29 lakh Qtls. in 2009-10. KRIBHCO has plan to almost double the certified seed production and marketing in next 3-5 years.

To promote the organic agriculture in the country, Government has initiated several initiatives like promotion of use of bio-fertilizers, bio-compost etc. KRIBHCO has been promoting the use of bio-fertilizers since many years. The society has three units to manufacture bio-fertilizers at Hazira (Gujarat), Varanasi (Uttar Pradesh) and Lanjha (Maharashtra). All four popular bio-fertilizers i.e Rhizobium, Azotobactor, Azosprillium and Phosphate Soluable are produced and marketed by KRIBHCO. The Society has plans to sell around 1000 MT of bio-fertilizers during 2010-2011, which is likely to increase to about 1200 MT in next 3-5 years.

Organic Agriculture has emerged as a feasible option to concern relating to land degradations. As per the GOI directives, all fertilizer suppliers are expected to promote the use of Bio-Compost by involving actively in the marketing of the product. KRIBHCO has sufficient human resources and credible brand image to market Bio-compost. This will also help the society to generate additional margins. During the year 2010-2011 we plans to market about 19,000 MT of bio-compost which is expected to increase to about 50,000 MT in next 3 years.

In a nut shell KRIBHCO, world’s premier fertilizer producing cooperative has an outstanding track record to its credit in all spheres of its activities. KRIBHCO has fully imbibed the cooperative philosophy and has made sustained efforts towards promoting the cause of modern agriculture and cooperatives in the country. Kribhco stands for commitment sincerity and high standards of excellence. In our endeavor towards achieving our goals we are impelled by the ideals set by our predecessors and the devotion and dedication of our employees.
Krishak Bharati Cooperative Limited (KRIBHCO) is an Indian cooperative society, that manufactures fertilizer, mainly urea. It registered under the Multi-State Cooperative Societies Act in 1985, and was promoted by the Government of India, and some agricultural co-operative societies spread all over the country. Its main plant is located in Surat, Gujarat.

Oil & gas findings in Bombay High and South Basin triggered the birth of eight new generation fertilizer plants to fulfill the ever-growing food needs of the country. KRIBHCO was among the first two projects in the first phase.

KRIBHCO manufactures urea, ammonia Argon, bio-fertilizers, hybrid seeds & heavy water at Hazira in the State of Gujarat, on the bank of the Tapti River near Kawas village, 15 km from Surat and 20 km from the Surat Railway Station, on the Surat-Hazira State Highway.

Hazira Fertilizer Complex has 2 Streams of Ammonia Plant and 4 Streams of Urea Plant. Annual re-assessed capacity for Urea and Ammonia is 1.729 million MT and 1.003 million MT respectively.

Production of Bio-fertilizer plant commenced plant of 100 MT per year capacity was commissioned at Hazira in 1995. An additional capacity of 150 MT was
added to that plant in 1998. Subsequently, two more Bio-fertilizer plants, each of 100 MT capacities, were installed at Varanasi, Uttar Pradesh and Lanja, Maharashtra in 2003 and 2004 respectively.

Dr. Chandrapal Singh Yadav has been chairman of KRIBHCO since 1996 under his leadership KRIBHCO achieved the turnover of Rs. 2400 crore in the financial year 2007-08. Sh. Vaghjibhai Rugnathbhai Patel took charge as Chairman of KRIBHCO and Dr. Chandrapal Singh Yadav is acting as Vice-Chairman at present.

**Objectives of the Company**

1. To strengthen cooperative system
2. To enhance the urea installed capacity and increasing its market share
3. To ensure optimum utilization of existing plant and machinery
4. To diversify into other core sectors like Power, Port, Infrastructure, Rural Retail, Transfer of technology for modern farming and improving farmer life etc.
5. To educate and train farmers, provide free testing facilities for soil Nutrients and irrigation water

**PRODUCTS**

The main products of the KRIBHCO in fertilizer section are urea and ammonia.

**UREA**

Urea is a white crystalline substance with the chemical formula CO (NH2)2; it is highly water soluble and contains 46% nitrogen. It was the first organic compound ever synthesized by chemists; this was accomplished in the early 1800s. It is produced in Pilled as well as in Granular forms.

**BIO FERTILIZERS**

Bio-fertilizers, more commonly known as microbial inoculants, are artificially multiplied cultures of certain soil organisms that can improve soil fertility and crop productivity. Although the 3 beneficial effects of legumes in improving soil fertility was known since ancient times and their role in biological nitrogen
fixation was discovered more than a century ago, commercial exploitation of such biological processes is of recent interest and practice.

**CHART 1.4**

![Chart showing Bio-Fertilizer Production (MT) from 2006-07 to 2010-11]

**1.7 CONCLUSIONS**

Fertilizer is the important factor to increase agricultural productivity. Thus it is necessary to reach the population of the country by becoming self-reliant, which will make economy stronger. It is necessary to study the financial condition of the fertilizer companies, to boost up the agricultural progress. If the position of fertilizer companies is sound, in future the demand of fertilizer can be met and the production can be done according to the requirements. The study will also throw light on the new positive scheme of fertilizers, which may be implemented in future.

This study done in light of the operations of fertilizers in India will certainly be helpful to the government and fertilizer companies to reframe and design its policies especially in context of the development of various fertilizer companies. It will also provide necessary guidelines to understand exactly the potentiality and the problems faced by various fertilizers to raise the funds and also to employ the funds in the desired directions.
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