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SCOPE OF FERTILIZER INDUSTRY IN AGRICULTURE

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Abstract: *The increasing population growth has led to food security concern and increased awareness among the farmers about the uses of fertilizers. Some of the other factors driving the growth of the market are high government subsidies and growing investments in the fertilizer industry. There is a shortage of raw materials in the country and the consequent dependency on imports is leading to volatile prices in the fertilizer industry. However, the new policies will help in stabilizing the raw material prices during the coming years. It includes crop production (farming and contract farming), seed supply, agrochemicals, farm machinery, distribution, processing, marketing, and retail sales. They help the farming operations by supplying high value seeds, innovative chemical and biological crop protection solutions, solutions to control pests, plant diseases and weeds, for modern, sustainable agriculture. The efficiency of fertilizer use could be improved through fertilization practices that include an application of macronutrients and micronutrients according to crop requirements. An adequate supply of credit for farmers and distributors is necessary to ensure the availability of fertilizers when and where they are required.*

Keywords: *Fertilizers Industry, Farming, Practices, Sustainable Agriculture and Plant.*

Introduction: Indian Fertilizer Industry is supporting Indian agriculture since 1960. It has grown in the last 50 years and at present ranks third in the World. It has succeeded in meeting the demand of nearly all chemical fertilizers over the year and now become an important segment of Indi an economy. Statistical data shows that, total capacity of the industry as in 2011 has reached a level of 12.28 million MT of nitrogen and 4.37 million MT of phosphatic nutrient production [1]. Today, India ranks second in the production of nitrogenous fertilizers and third in phosphatic fertilizers. However, total requirement for potash (K) is fulfilled through import since there are no viable sources or reserves of potash in the country.

Importance of Fertilizers: Fertilizer is defined as any organic or inorganic substance, natural or artificial in nature supplying one or more of the chemical elements/nutrients required for plant growth. Sixteen plant nutrients are necessary for proper plant development. These are classified into three categories viz; primary (macro) nutrients, secondary nutrients, and micronutrients. Application of essential plant nutrients in right proportion, through correct method and time of application is helpful to increase crop production. 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. So, major focus of the Indian fertilizer sector policy has been on primary (macro) nutrients.

Fertilizer Consumption: India is the second largest consumer of fertilizers in the World, after China. It accounted for 15.3 per cent of the World's consumption of nitrogenous (N), 19 per cent of phosphatic (P) and 14.4 per cent of potassic (K) nutrients in 2008 [2]. To ensure the availability of adequate quantity and proper quality of fertilizers to farmers, Government of In dia has declared 'fertilizer' as an essential commodity under Essential Commodities Act, 1957. Fertilizer (Control) Order (FCO), 1985 was promulgated to regulate the price, quality and distribution of fertilizers in the country.

Fertilizer consumption trends in India from the year 1951-52 to 2009-10 are depicted. The graphical representation of the data from Fertilizer Association of India (FAI) shows that, total fertilizer consumption in India increased to 2.26 million tons in 1970-71 from that of 1 million ton recorded in 1966-67 (green revolution era).

It further increased to 12.73 million tons in 1991-92. The rapid expansion of irrigation, new hybrid varieties, introduction of Retention Price Scheme and improvement in fertilizer availability were major reasons for increase in fertilizer consumption during 1971 to 1990. During 1990s, total fertilizer consumption fluctuated between 12.15 and 16.8 million tonnes with the exception in 1999-00, when fertilizer consumption was over 18 million tonnes. Total fertilizer consumption reached a record level of 26.5 million tonnes during 2009-10.

Top Players in Indian Fertilizer Industry: Fertilizer industry in India began in 1906 by the establishment of first manufacturing unit of Single Super Phosphate (SSP) with an annual capacity of 6000 MT. It was set up in Ranipet near Chennai. However, The Fertilizer & Chemicals Travancore of India Ltd. (FACT) was the first large sized fertilizer plant established at Cochin (Kerala) in 1943 [3]. FACT started production of Ammonium Sulphate in 1947 with an installed capacity of 50,000 MT per annum. Presently there are approximately 57 large fertilizers plants producing Urea, DAP, Complex fertilizer, Ammonium Sulphate (AS) and Calcium Ammonium Nitrate (CAN). Below is the list of some leading public and private sector companies representing Indian fertilizer industry [4]:

- Bharat Fertilizer Industries Limited, Mumbai
- Chambal Fertilizers & Chemicals Limited, New Delhi
- Coromandal Fertilizers Limited, Secunderabad
- Deepak Fertilizer and Petrochemicals Corporation Limited, Pune
- Fertilizers & Chemicals Travancore Limited, Kochi
- Godavari Fertilizers & Chemical Limited, Secunderabad
- Gujarat Narmada Valley Fertilizer Co. Limited, Bharuch
- Gujarat State Fertilizers & Chemicals Ltd., Vadodara
- Hindustan Fertilizer Corporation Limited, New Delhi
- Indian Farmers Fertilizer Co-op Ltd., Bangalore
- Indo-Gulf Fertilizers & Chemicals Corporation Limited, New Delhi
- Karnataka Agro Chemicals, Bangalore
- Madras Fertilizers Limited, Chennai
- Maharashtra Agro Industrial Development Corporation, Mumbai
- Meerut Agro Chemicals Private Limited, New Delhi
- National Fertilizers Limited, Noida
- Neyveli Lignite Corporation Limited, Cuddalore
- Paradeep Phosphates Limited, Bhubaneswar
- Pyrites, Phosphates & Chemicals Limited, Noida
- Rashtriya Chemicals & Fertilizers Limited, Mumbai
- Shri Amba Fertilizers (I) Private Limited, Amravati
- Southern PetroChemical Industries Corporation Limited, Chennai
- Steel Authority Of India Limited, New Delhi
- Tuticorin Alkali Chemi & Fertilizer Limited, Chennai
- Zuari Industries LimitedFertilizer Limited, Goa

Government Contribution: Government of India is actively involved in supporting fertilizer industry. Department of Fertilizers which comes under the ambit of Ministry of Chemicals & Fertilizers looks after overall sectoral planning and development and regulation of the industry, as well as monitoring of production pricing and distribution of the output [5]. The main objective of Department of Fertilizers is to ensure adequate and timely availability of fertilizers at affordable prices for maximizing agricultural production in the country [6]. This Department also administers 9 Public Sector Undertaking and one Multi-State Co-operative Society.

Government is involved in providing financial assistance to the farmers for training and field demonstrations on balanced use of fertilizers. In addition, Government introduced Nutrient Based Subsidy (NBS) policy from April 2010 to encourage balanced use of fertilizers. Department of Fertilizer offers fixed rate of subsidy (NBS) on annual basis for nitrogen (N), phosphate (P), potash (K) and sulphur (S) fertilizers.

Currently, Agricultural Technology Management Agency (ATMA) Scheme is under implementation in 614 districts of 28 State & 3 Union Territories (UTs) of the country. The activities taken up under the scheme includes

capacity building of extension functionaries and farmers, front line demonstrations, exposure visits, kisan melas, group mobilization, farm schools and farmers-scientists interaction. Through these activities, latest agriculture technologies are disseminated to farmers of the country including creating awareness among farmers for the balanced use of fertilizers. Over 24 million farmers have benefitted since 2005-06 in different innovative agricultural production technologies under the Scheme. Information on judicious use of fertilizers is broadcast through focused advertisement campaign under Mass Media scheme implemented by this Ministry. Government is also engaged in the quality checking of the fertilizers sold in the country. Today there are nearly 74 Fertilizer Quality Control Laboratories functioning under the control of different State Governments.

Future Perspective: Chemical fertilizers have played key role in modern agriculture and in improving crop productivity of India. In spite of ranking second largest nitrogenous fertilizer producer and third largest phosphatic fertilizer producer in the World, day by day the demand-supply gap of fertilizers in India is increasing [7]. It is leading to increased dependency on fertilizer imports. Recently, India has imported 8.04 million MT Urea and 5.42 million MT DAP in the year 2012-13.

According to the report of Department of Fertilizers, by the year 2016-17, fertilizer demand in the country is projected to increase to about 336.77 lakh tons (33.67 million tons) urea, 124.13 lakh tons (12.41 million tons) DAP, 59.48 lakh tons (5.94 million tons) SSP and 47.93 lakh tons (4.79 million tons) MOP. To meet the projected demand, additional fertilizer production capacity along with a conducive and stable policy environment, availability of raw materials, capital resources and price incentives will play a critical role in near future of Indian Fertilizer Industry.

Trends in Fertilizer Growth in India: The total indigenous capacity utilization of N was 99.2% and capacity utilization of P2O5 was 76.5% in 2009-10. The domestic production of N and P2O5 was 29 000 and 10 000 tonnes, respectively, in 1951/52. By 1973/74, this had increased to 1.05 million tonnes N and 0.325 million tonnes P2O5. As a result of the oil crisis in the mid-1970s and the consequent sharp increase in the international prices of fertilizers, the Government of India encouraged investment in domestic fertilizer production plants in order to reduce dependence on imports. It introduced a "retention price" subsidy in 1975/76. The scheme led to a sharp increase in domestic capacity and production between the mid- 1970s and the early 1990s. The total production of N and P2O5 rose from 1.51 million and 0.32 million tonnes respectively in 1975/76 to 7.30 million and 2.56 million tonnes in 1991/92. In 1992/93, phosphatic and potassic fertilizers were decontrolled. As a consequence, the rate of growth in the demand for these products slowed. Domestic production during 1998-99 of nearly 13.6 million tonnes of nitrogenous and phosphate fertilizers (NP) fell short of consumption by over 12%Domestic production trends is shown in Table 11. Domestically produced nitrogenous fertilizer urea is still price controlled and involves a heavy subsidy. The shortfall in domestic production of N and P is met from imports, which invariably involves a subsidy since domestic selling prices are kept low compared to the landed cost of imported fertilizers. In case of potash, the entire requirement is imported. The total production of N reached 11.9 million tonnes and that of P2O5 reached 4.3 million tonnes in 2009-10. Availability of raw material/intermediates has been a major bottleneck in the increase in production of fertilizers.

There has been a shift in the product pattern over the years. SSP and AS dominated fertilizer production before the 1960s whereas urea and DAP dominate production at present. In 2008/09, urea accounted for 84.6 percent of total N production and di-ammonium phosphate (DAP) accounted for 59.9 percent of total P2O5 production. India imports mainly urea, DAP and potassium chloride (MOP).

There are 56 large size fertilizers plants in the country manufacturing a wide range of nitrogenous, phosphatic and complex fertilizers. Out of these, 30 units produce urea, 21 units produce DAP and complex fertilizers, 5 units produce low analysis straight nitrogenous fertilizers and the remaining 9 manufacture ammonium sulphate as product. Besides, there are about 72 medium and small-scale units in operation producing SSP. In case of phosphates, the paucity of domestic raw material has been a constraint in the attainment of self-sufficiency in the country. Indigenous rock phosphate supplies meet only 5-10% of the total requirement of P2O5. A policy has therefore been adopted which involves mix of three options, viz,domestic production based on indigenous/

imported rock phosphate, imported sulphur and ammonia; domestic production based on indigenous / imported intermediates, viz. ammonia and phosphoric acid; and third, import of finished fertilizers.

Factors Affecting Fertilizer Consumption: The use of fertilizers is affected by a number of factors like irrigation, high yielding variety seeds, size of the farm credit etc. Increased area under high yielding varieties led to increased food grains production. These high yielding varieties respond more to the use of chemical fertilizers. There exists a large gap between actual and potential level in fertilizers use. Increased fertilizer use efficiency leads to a number of benefits to Indian agriculture. They are economy in use of fertilizers, reduction in unit cost of production, prevention of fall in agricultural productivity, production of environmental quality and efficient use of other inputs such as irrigation and high yielding varieties in developing countries actual fertilizer use is usually below the economic potential.

In the production process in agriculture cultivator□s demand for fertilizers generally depends on three factors, viz., (a) Decision on fertilizer application, (b) Choice of crop (i.e., for which crop fertilizer should be applied); and (c) Rate of application (per unit of cropped area). The first factor is basically a state of awareness and knowledge of the farmer regarding fertilizer use on crops he commonly grows. The other two issues are generally governed by profitability of fertilizer use at farm level. The level of fertilizer use increases with increased response to the use of fertilizers. The level of fertilizer use is influenced by the price of fertilizer relative to the price of the product. Agro-climatic factors like rainfall and its distribution, irrigation and its quality, genetic characteristics of seeds, fertility of the soil, proportion of area under fertilizer intensive crops (cropping pattern) etc and technological factors like method of application of fertilizers, time of application and choice of fertilizer material also influence usage of fertilizers.

Government Policy towards Fertilizer Usage: The economic reforms initiated since 1991 has put the economy on a high growth path. Agricultural liberalization and deregulation would lead to change in relative prices, better accordance efficiency and improved incentive. Globalization of the Indian economy has opened access to new markets and new technology. Industrial countries liberalize their agricultural trade; new opportunities are being opened for India□s agricultural exports. Agricultural liberalization has placed India in a better position for food grains trade. On the agricultural front although food production increased, it was lower than the growth rate of population.

According to Motsara (2002), the New Economic Policy of the government decontrolled the marketing of chemical fertilizers and cut down subsidies given for chemical fertilizers. This resulted in price hike in the retail level, which is expected to directly affect the fertilizer consumption at farm level.

There is a positive correlation between the application of balanced fertilizers and the yield rate. Soil fertility (capacity of a soil to provide crops with essential nutrients) is to be increased to raise crop productivity given the limitation for extensive cultivation. Realizing the importance of application of fertilizer, the Government extends subsidy to the farming community. After 1975-76, both imported and domestic fertilizers were subsidized. In the recent past, subsidy on domestic fertilizer has become several times larger than on imported fertilizers.

The semi medium and medium farms which account for about 60% of the total NPK consumption in the country enjoy the maximum share of fertilizer subsidy. In order to step up fertilizer consumption, a series of measures were undertaken in 1987-88. These include arrangement for ensuring supply of fertilizer, promotion of sales of fertilizers through the District Lead Fertilizer Scheme, extension support of fertilizer industry and TV system analysis and advice by a network of soil testing laboratories on the judicious use of fertilizers based on the results of soil analysis, (Economic survey 1990-91).

The Fertilizer Retention Price and Subsidy Scheme was started in Nov 1977. Under this scheme the fertilizers were supplied at subsidized prices to farmers throughout the country. As for manufacturers, the price was fixed in such a way that their cost of production including cost of marketing was covered and they got a 12% post-tax return on the net worth of the unit. Norms were fixed for the consumption of raw material, utilities and services, capacity utilization and depreciation etc. The price so fixed was called “Retention Scheme”. The scheme was instituted for nitrogenous fertilizers initially and was extended to phosphatic complex fertilizers in 1979.

How fertilizers are used: Sustainable agriculture relies on providing the necessary growing conditions for optimal crop production over the long term. It requires Europe's farmers to adopt the best agricultural practice to optimize crop yields and reduce the environmental impact of agriculture. Fertilizer selection and use are an integral part of this process.

Agricultural experts, legislators and providers of agricultural inputs all have a role to play in ensuring the availability of suitable fertilizers and in promoting good agricultural practice. The European fertilizer industry plays an active role in explaining the specific attributes of its products and in the development of advanced farm management strategies.

Techniques such as crop rotation, minimum tillage and cover crops can help maintain the structure and nutritional quality of the soil, while the basic rule of thumb for the correct selection and application of fertilizers is given by the right product, at the right place, at the right rate, at the right time.

Product Innovation: Modern fertilizer products are increasingly tailor-made to meet specific crop requirements and cater for different locations and soil types, as well as for the different weather conditions encountered. Best practice in fertilizer application takes advantage of these characteristics to optimize nutrient-use efficiency. Modern application machinery is often equipped with satellite technology such as GPS soil and biomass mapping, which can define nutrient demand down to within a few metres on a particular field. Smart sensors enable highly targeted application patterns, with small coefficients of variation, improving crop productivity and greatly reducing nutrient losses. While investment in the very latest farm equipment takes time to become a reality, the fertilizer industry continues to focus on developing practical tools, including GSM based mobile applications, for improving on-farm nutrient management. Over the years, it has also built up a comprehensive range of information for farmers that addresses the issues of productivity, energy efficiency and the management of emissions.

Plant Growth : Organic fertilizers can be easily produced by fertilizer granulator. It provides nutrients necessary for plant growth, with the benefit of being slower-acting and gentler than chemical fertilizers, so that you are less likely to overfeed and chemically burn your plants. Organic fertilizers are not in a form that is immediately absorbed by plants, but rather must be first broken down by soil bacteria and fungi into forms that plants can absorb. This means that, unlike chemical fertilizers, organic fertilizers are not easily washed away in a heavy rainstorm or irrigation session, and that the plants get the benefit of nutrients for growth more evenly over a longer period of time rather than all at once.

Soil Improvement: Increasing organic matter content & the nutrient uptake and utilization in crops, reducing soil hardening, improving soil fertility. Applying organic fertilizer into the soil, organic matter can efficiently improve physical and chemical properties of soil, preserve fertility, and create sound soil-environment for the growth of crops. While chemical fertilizers simply add water-soluble chemicals which are either absorbed by the plant roots or leach away, potentially polluting water resources, organic fertilizers add organic matter that helps the soil to retain moisture and nutrients.

Conclusion: Sustainable agriculture relies on providing the necessary growing conditions for optimal crop production over the long term. It requires farmers to adopt the best agricultural practice to optimize crop yields and reduce the environmental impact of agriculture. Fertilizer selection and use are an integral part of this process. Agricultural experts, legislators and providers of agricultural inputs all have a role to play in ensuring the availability of suitable fertilizers and in promoting good agricultural practice. The European fertilizer industry plays an active role in explaining the specific attributes of its products and in the development of advanced farm management strategies. Techniques such as crop rotation, minimum tillage and cover crops can help maintain the structure and nutritional quality of the soil, while the basic rule of thumb for the correct selection and application of fertilizers is given by the right product, at the right place, at the right rate, at the right time.

Global food production would be insufficient without fertilizers. In fact, my personal experience in West Africa taught me what happens in agricultural systems without fertilizer inputs. While I was in Cameroun, there was a food shortage on the high plains area in which I lived. The shortage was due to population pressure (which seemed strange, since the area appeared to be sparsely populated). However, fields which were normally left fallow for up to 23 years had to be put into production

many years sooner, with the resulting lower fertility. To make up for the food shortfall, people on the high plateau with money purchased food from the valley areas. Since people in the valley areas were not accustomed to getting significant money for their crops, they sold all of their food - and suffered a famine! The irony in the story is that there was a source of fertilizer: manure from the grazing herds. Unfortunately, cultural differences prevented a symbiotic relationship between the farming and the herding tribes.

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