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CONSUMPTION PATTERN OF CHEMICAL FERTILIZERS AND ITS HAZARDS

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Abstract

The chemical fertilizer intensive technology so long promoted in agriculture produced a green revolution but has brought long-term damages to soil quality as well as to human health. The technology now appears unsustainable for future agricultural development in India both on account of its ecological implications and the burden on the budget. There is now a need to revisit the traditional methods once used in agriculture and to look for a judicious blend of chemical fertilizer based technology with organic manure. In the present paper the production, imports and consumption pattern of chemical fertilizers in India is studied. This is secondary data based study. This paper also deals with the implications of the excess use of chemical fertilizers and therefore suggests adopting organic farming.

Keywords: Chemical Fertilizer, Organic Fertilizer, micro-organisms, nutrients, nitrogen, phosphorus, and potassium.

Introduction

Soils naturally contain many nutrients like nitrogen, phosphorous, calcium, and potassium. These nutrients allow plants to grow. When soil nutrients are missing or in short supply, plants suffer from nutrient deficiency and stop growing. When the nutrient level is too low, the plant cannot function properly and produce the food necessary to feed the worlds' population. Once crops are harvested for human consumption, the natural supply of nutrients in the soil must be "re-filled". This is why farmers add nutrients to their soils. Nutrients can be added from a variety of sources—organic manure, chemical fertilizers, and even by some plants. This maintains the soil fertility, so the farmer can continue to grow nutritious and healthy crops. But it is found that most of the farmers turn to chemical fertilizers because chemical fertilizers facilitate the adoption of yield- increasing technologies and thereby promote sustainable growth of food production on limited cultivable land. These substances contain plant nutrients such as nitrogen, phosphorus, and potassium. So they help to replenish nutrients removed by crops and therefore prevent soil degradation and preserve the resource base.

But due to lack of awareness about scientific fertilizer management and less penetration of availability of soil health card, it become pre-requisite that Government at Centre and State level take effective and adequate steps for scientific management of fertilizers in agriculture sector. This aspect become more important as our country is yet to achieve self sufficiency in production of different types of fertilizers and India has to depend upon import to meet the demands of fertilizers. Further, negative environmental impact of unscientific use of fertilizers also necessitates the need of scientific analysis and management of fertilizers. There are so many hazards of chemical fertilizers. Chemical fertilizers destroy the friability of soil. Chemical fertilizers leach away into our ground water without fully benefiting the plant. They also encourage plant disease. Use of chemical fertilizers may decrease fertility of the soil. Excessive use of chemical fertilizers effect the human health very adversely. Therefore, economic as well as environmental aspects of fertilizer sector require us to analyse aspects associated with its production, import and use in agriculture sector in India as well as the need of organic farming.

Objectives

The present study aims to meet the following objectives:

1. To analyse the production, imports and consumption of chemical fertilizers in India.

2. To suggest the hazards of chemical fertilizers.

Analytical Technique

The present study is a secondary data based study. Various research journals, books, websites, publications and newspapers have been referred to meet the various objectives of the study.

Consumption Pattern of Chemical Fertilizers in India

India has diverse types of soil but most of them are deficient in nitrogen and phosphorus. As a result, farmers turn to fertilizers because these substances contain plant nutrients such as nitrogen, phosphorus, and potassium. Over the years, the increased usage of chemical fertilizers has played

a significant role in increasing the farm productivity. But we are not self-sufficient in the production of these chemical fertilizer and we have to import to fulfil our requirements. The production, imports and consumption of different type of chemical fertilizers (NPK) is shown in the following table 1 and the graphics.

Table 1

Production, Imports and Consumption of Fertilizers (NPK) in India

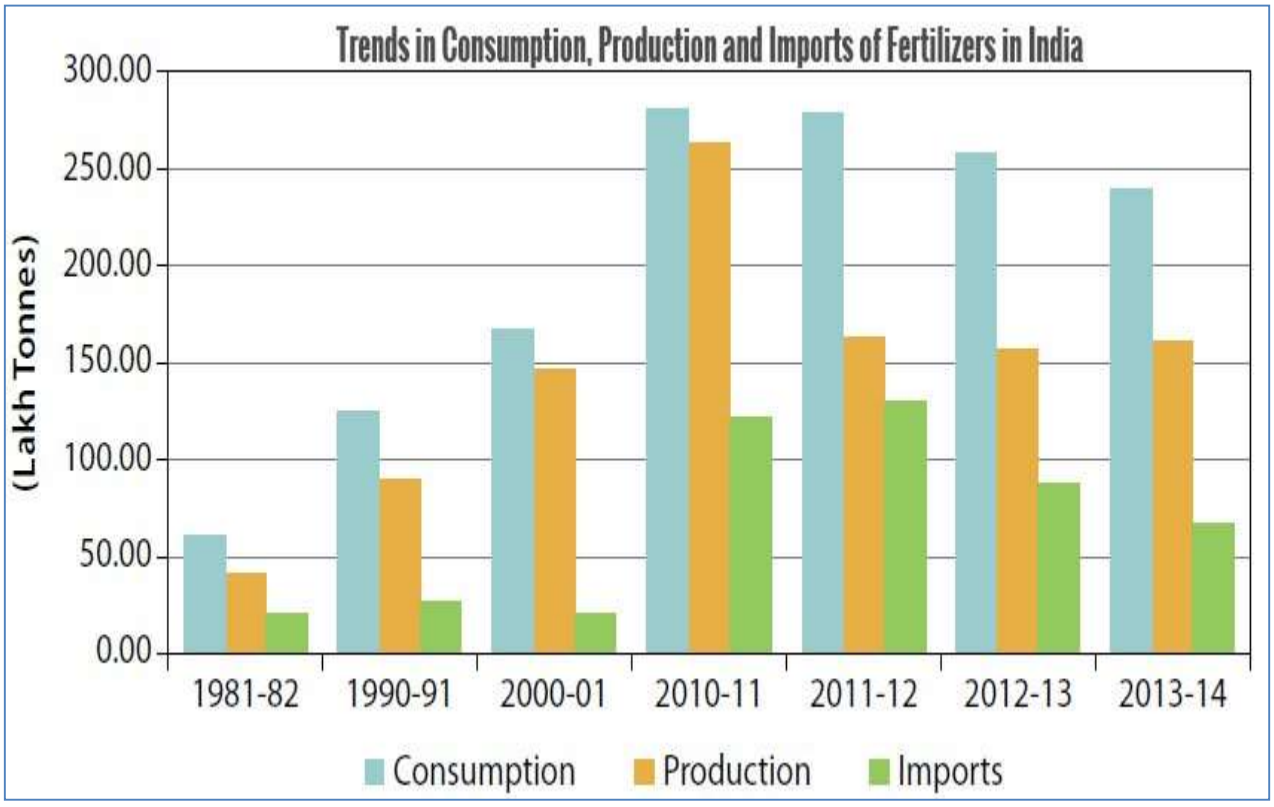
Source: Ministry of Chemicals &Fertilizers

The total consumption of different type of chemical fertilizers has significantly increased in past few decades. But the production of these fertilizers in our country could not be paced with the consumption of these fertilizers. Total production of all fertilizers was 30.06 Lakh tonnes in 1980-81 which increased to 67.31 lakh tonnes in 2013-14 which is almost double that of in 1980-81 whether the consumption during this period increased almost five times. As a result, we have spent a big amount on the imports of these fertilizers. We imported 67.31 lakh tonne of fertilizers in 2013-14 while the imports of all fertilizers were only 27.59 lakh tonnes in 1980-81.The biggest share in the imports of fertilizers is that of Nitrogenous fertilizers that is 38.08 lakh tonnes in 2013-14 whether the imports of Phosphatic Fertilizers and Potassic Fertilizers is 1.59 and 13.33 lakh tonnes in this year, respectively.

Thus the above table shows that in all kinds of fertilizers, India need to import to fulfil the domestic demand. Although Fertiliser industry has made rapid progress and there has been considerable increase in the domestic production of fertilisers over the years but it is not sufficient to keep pace with the growth in consumption of these fertilizers.

		1980-81	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14
A	**Nitrogenous Fertilizer**							
	Production	21.64	69.93	110.04	121.56	122.59	121.94	123.78
	Import	15.10	4.14	1.54	44.92	52.40	35.05	38.08
	Consumption	36.78	79.97	109.20	165.58	172.61	168.20	165.25
B	**Phosphatic Fertilizer**							
	Production	8.42	20.52	37.48	42.22	41.04	35.41	37.14
	Import	4.52	13.11	3.96	38.02	44.27	26.25	1.59
	Consumption	12.14	32.21	42.15	80.50	76.48	66.53	54.58
C	**Potassic Fertilizer**							
	Production	-	-	-	-	-	-	-
	Import	7.97	13.28	15.41	40.69	33.35	11.78	13.33
	Consumption	6.24	13.28	15.67	35.14	26.58	20.62	19.76
D	**All Fertilizers**							
	Production	30.06	90.45	147.52	163.78	163.63	157.35	160.92
	Import	27.59	27.58	20.90	123.63	130.02	73.08	67.31
	Consumption	55.16	125.46	197.02	281.22	275.67	255.36	239.59

The production-consumption imbalance in the fertilizer sector of our country is also depicted in the below graphics:



The consumption of different fertilizers is explained in **Table 2**. This table also shows the Per Hectare consumption of fertilizers in our country in different time periods. Per hectare consumption of chemical fertilizers was 69.84 Kg in 1991-92 which increase to 128.08 Kg/Par Hectare in 2014-15. There is about two times increase in fertilizer consumption. The main chemical fertilizer used by the farmers is UREA. Its consumption was 140.04 lakh tonnes in 1991-92 which increased to 306.10 lakh tonnes in 2014-15. There is more than two time increase in the consumption of this fertilizer. The consumption of DAP was 45.18 lakh tonnes in 1991-92 whether it was 76.26 lakh tonnes in 2014-15. The consumption of MOP increased from 17.01 lakh tonnes to 28.53 lakh tonnes in this period. In the same way, the consumption of NPK complex increased to 52.78 lakh tonnes in 2014-15 while it was 32.21 lakh tonnes in 1991-92.

Table 2

Consumption of Fertilizers in India (In Lakh Tonnes)

Sr. No	Fertilizers	1991-92	2000-01	2012-13	2013-14	2014-15
1	**UREA**	140.04	191.86	300.02	306.00	306.10
2	**DAP**	45.18	58.84	91.54	73.57	76.26
3	**MOP**	17.01	18.29	22.11	22.80	28.53
4	**NPK Complex**	32.21	47.80	75.27	72.64	52.78
5	**SSP**	31.65	28.60	40.30	38.79	39.89
6	**Consumption of Fertilizers (Kg/Hectare)**	69.84	89.63	131.36	118.55	128.08

Source: State Government

Hazards of Chemical Fertilizers

Chemical fertilizers are substances that are either applied to soils or directly applied to plants; they provide optimal nutrients for their growth and development. These fertilizers are composed of raw chemicals that are manufactured at a factory either in liquid or solid form, these chemicals target plants specific nutritional needs. The nutrients that are contained in these fertilizers are nitrogen, phosphorus, and potassium and also other nutrients in smaller amounts. These nutrients are supplied to plants in form which can be easily absorbed and metabolized by plants. Chemical fertilizers are inorganic material which are completely or partially synthetic and are added to the plant for their growth. Inorganic fertilizers are easily dissolved in the soil. These synthetic fertilizers are applied at a rate dependent in the fertility of the soil. But the excess use of these fertilizers affects the soil and plant adversely. It is also harmful to human health and our environment. There are so many hazards of chemical fertilizers as:

1) **Chemical fertilizers degrade the Soil:** Chemical fertilizers contain acids, including sulphuric and hydrochloric acids. These acids dissolve soil crumbs, the material that holds rock particles together. While the fertilizers help a plant to grow, they do not do much for the soil. They do not help to improve the health or structure of the soil. Hence, when chemical fertilizers are used for prolonged duration, the soil gets damaged as the trace nutrients are not replenished in the soil.
2) **Chemical fertilizers affect micro-organisms living in the soil:** The acidity of chemical fertilizers also adversely affects the micro-organisms living in the soil. Thereby changing the kinds of micro-organisms that can live in the soil. Using chemical fertilizers for a prolonged period of time upsets the pH of the soil, causes an increase in pests and does away with the beneficial microbes present in the soil. These are beneficial micro-organisms that provide plants with natural immunity to diseases.

3) **Chemical fertilizers leach away into our ground water without fully benefiting the plant:** Chemical fertilizers leach away into our ground water without fully benefiting the plant. Highly soluble fertilizer dissolves into the soil quite rapidly. Since plants can only absorb a certain amount of nutrition at a time, much of the fertilizer simply leaches away.
4) **Chemical fertilizers encourage plant disease:** Fast-release chemical fertilizers have a high nitrogen content compared to slow-release organic fertilizers. When there is an overabundance of nitrogen (N) in relation to phosphate (P), plants are more susceptible to mosaic infections. Most of the artificial fertilizers have sulfuric acid and hydrochloric acid and when too much of these fertilizers are used, they tend to destroy the beneficial microbes present in the soil. These microbes help to increase the nitrogen level of the soil and the plant absorbs this natural nitrogen to facilitate its growth. High nitrogen, as well as a lack of trace elements, is also related to fungal and bacterial disease in plants and vegetables. Chemical fertilizers produce fruits and vegetables with lower nutritional value and less flavour. Repeated use of chemical fertilizers causes toxic chemicals, like cadmium, arsenic and uranium, to build up in the soil. These toxic chemical can ultimately find their way into the fruits and vegetables that a person grows. The lack of trace elements in chemical fertilizers not only means an increase incidence of plant diseases, but it also means there is less nutrition from the fruits and vegetables for the consumer. Trace minerals are an important component of healthy nutrition.
5) **Chemical Fertilizers Effect Human Healthy Adversely**: The nitrogen and other chemicals present in the fertilizers can also affect the ground waters and waters that are used for the purpose of drinking. One of the most common results for this can be the development of blue baby syndrome which occurs in infants whose skin tissues are low in oxygen, which is why their skin appears to be blue or purplish in colour. You would also be interested to know that studies reveal that the use of lawn fertilizers and pesticides can cause health risks like cancer and chronic diseases in humans, especially in children.
6) **Adversely Effects the Water Bodies:** Fertilizers contain substances like nitrates and phosphates that are flooded into lakes and oceans through rains and sewage. These substances prove to become toxic for the aquatic life, thereby, increasing the excessive growth of algae in the water bodies and decreasing the levels of oxygen. This leads to a toxic environment and leads to death of fish and other aquatic fauna and flora.
7) **Harmful Effects of Fertilizers on the Environment:** Fertilizers consists of substances and chemicals like methane, carbon dioxide, ammonia and nitrogen, the emission of which has contributed to a great extent in the quantity of greenhouse gases present in the environment. This in turn is leading to global warming and weather changes. In fact nitrous oxide, which is a by-product of nitrogen, is the third most significant greenhouse gas, after carbon dioxide and methane. Therefore, you can well imagine as to how harmful is the use of fertilizers for our environment.

Conclusion and Suggestions

Use of fertilizer in agriculture requires a scientific approach and its application should be based on scientific testing of soil. Only specific fertilizer should be used in field to augment missing or deficient nutrient in soil. However, use of fertilizers in our country was hardly scientific and done without knowing soil requirement based on scientific soil test. Further, there was indiscriminate use of Urea due to subsidy policy of the Government. Over reliance on Urea and improper nutrient management has led to multinutrient deficiencies in Indian soils.

The need is to aware the farmers about the adverse effects of chemical fertilizers. The farmers should be motivated to use organic fertilizers instead of these artificial fertilizers as Organic

fertilizers are a kinder, gentler way to give plants the nutrients they need. Organic fertilizers usually come from plants, animals, or minerals and contain a variety of nutrients to enhance the soil ecosystem. Synthetic fertilizers don't enhance soil life or add organic matter.

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