



**UTILIZATION OF CHEMICAL FERTILIZERS (NPK) IN
AGRICULTURE: A COMPARATIVE ANALYSIS BETWEEN ASSAM
AND MAHARASHTRA OF INDIA**

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Abstract:

Rising world population has created a great demand for food productivity. In order to mitigate the problem of food demand and hunger, malnourishment, India forwarded the step of introducing the Green Revolution. The use of chemical fertilizers was one of the agenda of the revolution. For healthy growth and development, plants primarily need the nutrients nitrogen (N) phosphorus (P), and potash (K). Lack of any of these nutrients during the life cycle has an adverse effect on the growth and development of plants. It's use leads to increase the agricultural productivity in India from 2015-16 to 2021-22. There has been seen some spatial variations in the applicability of fertilizers in several parts of India. Here an attempt has been made to study spatial variation to the context of the states off Assam and Maharashtra. Some variations are observed in the rise of NPK usage in the state of Maharashtra from 2015–16 to 2021–22. The average annual growth rate can calculate by compound annual growth rate (CAGR). This study focus to the annual growth rate of fertilizer using nitrogen, phosphate, and potassium in Maharashtra. The analysis reveals that, the growth rates for nitrogen, phosphorus, and potassium in Maharashtra are, 3.67%, 4.75%, and 7.18% and that of Assam is 3.22%, 0.41% and -7.97 respectively.

Keywords: Hunger, Green Revolution, Fertilizers, Nitrogen(N), Phosphorus(P), Potassium(K), Assam, Maharashtra, CAGR.

Introduction:

During the early 1950's the world started to realize the alarming issue of hunger and malnourishment. People were suffering and death was their only penalty. As compared to production of food grain

and population growth has been increasing at a fast pace. Scientist and the researches saw the only way to mitigate hunger was to increase the agricultural productivity. Application of chemical fertilizer particularly NPK (Nitrogen, Phosphorus,

Potash) has boosted the agricultural production worldwide. Crop yields were increased by 19 per cent to 41 per cent (rice) and 61 per cent –76 per cent (rapeseed) during the two years of rice-rapeseed rotation under NPK fertilization compared to PK fertilization across the study sites in China (Muhammad Yousaf, 2017)

India's place in Global Hunger Index is 107 out of 122 in 2022. To overcome problem of hunger India adopted the Green revolution in 1965. Since its inception, green revolution has created a breakthrough in the agricultural in India. With introduction of HYV (High Yielding variety of seeds), farm mechanization and chemical fertilizers, the revolution has helped India to grow at a fast pace.

The use of fertilizer is a vital component of agricultural practices in India. With the introduction of HYV seeds through the Green Revolution there has been a sharp increase in the consumption of fertilizers in India. The history of fertilizer dates back to 1906, when the first factory opened at Ranipet (Tamil Nadu), but it wasn't until the mid-1960's both the production and the consumption began to rise gradually. Introduction of Chemical fertilizers has been one of the agenda of the green revolution. According to the Fertilizer Association of India, India is the

2nd largest country in the world in terms fertilizer consumption after China. Among the states, Uttar Pradesh, Maharashtra, Madhya Pradesh, Karnataka, and Punjab were the top five fertilizer consumers. The green revolution pumped fertilizers into the cereal-centric cropping regions of the upper Indo-Gangetic Plains (IGP), and fertilizer use has long been high in these states and in southern states like Andhra Pradesh and Karnataka. (K V Praveen, 2020).

Although the use of fertilizers has boosted agricultural productivity. There has been observed a spatial variation in the consumption of fertilizers between the states in the country.

Objectives:

1. To study the comparative analysis of utilization of chemical fertilizers (NPK) between the states of Assam and Maharashtra in India.
2. To analyze the growth trend in the utilization of NPK in both the states.

Data base and Methodology:

This study is based on secondary data collected from the Statistical Handbook of Assam and The Economic Survey of Maharashtra conducted by the Directorate of Economic and Statistics of

Assam and Maharashtra respectively. Data on variables of Fertilizer consumption for the years of 2015-2021 are sourced from above said database.

To address the research objective, the Annual Growth rate of the fertilizer consumption of the respective states has calculated by following formula provided by the Food and Agriculture Organization of the United Nations in their report of World Fertilizer Trends and Outlook to 2020 is as under.

Compound Annual Growth Rate= [(End value Start Value)^{1/No of Years, -1}] x100

Study Area:

The states of Maharashtra and Assam lie in the South Western and North eastern part of India respectively. The Brahmaputra being a glacial fed river

flowing through the state of Assam has made it a fertile land for agricultural activity. Maharashtra state lies in the Deccan plateau which have black regur soil also notable as fertile soil for agricultural activity.

Analysis:

The analysis reveals that, the compound annual growth rate for utilization of chemical fertilizers for the years of 2015-21 in Maharashtra is 4.64% whereas Assam has share of 0.16% only. It shows a great difference in utilization of fertilizers in both the states. The agricultural area of Assam has alluvial deposits to the plains by Brahmaputra rivercauses to comparatively less utilization of chemical fertilizers.

Table 1.1

Compound Annual Growth Rates for the states of Assam and Maharashtra 2015-2021

States	CAGR (2015-2021)		
	Nitrogen	Phosphorus	Potassium
Assam	3.22	0.41	-7.97
Maharashtra	3.71	4.75	7.18

Source: Data compiled by researchers

The table 1.1 shows that, the demand of Nitrogenous fertilizers in the state of Assam is higher than other fertilizer like Phosphorus and Potash whereas, the demand for potassium is higher in Maharashtra. This accounts that there is a stark contrast in the demand of

NPK fertilizers among both the states. The soil type also highly affects the demand of chemical fertilizers in both the states. Maharashtra carrying black soils demands potassium more and Assam carrying alluvial soil demands more of nitrogen.

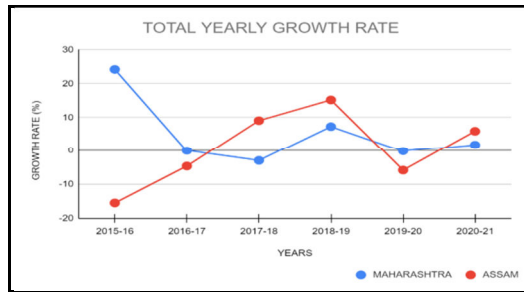


Figure 1.1: Growth Rate of Utilization of Fertilizers in Maharashtra and Assam

The graph 1.1, shows yearly growth rate of utilization of NPK fertilizers in Maharashtra and Assam. It is observed that, at the beginning Assam shows positive growth up to 15 per cent but Maharashtra shows very opposite situation and negative growth about utilization of chemical fertilizers. From 2016-17 Assam shows more growth rate than the Maharashtra.

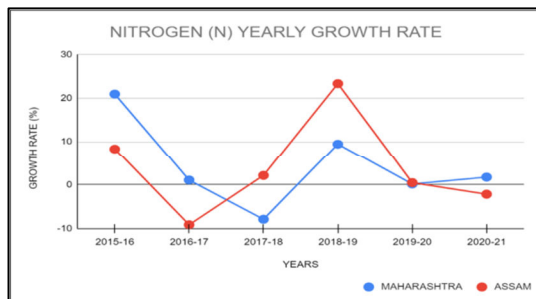


Figure 1.2: Nitrogen (N) Yearly Growth Rate of Maharashtra and Assam

The Fig.1.2 shows yearly growth rate of utilization of Nitrogenous fertilizers (N) in both the Maharashtra and Assam state. At the beginning the growth rate of utilization of nitrogen fertilizer in Maharashtra is higher than the Assam state but it decreases rapidly during 2017-18. The state Assam shows higher growth

rate is but it also decreases. At the end in 2020-21 Maharashtra states growth rate is more than the Assam state.

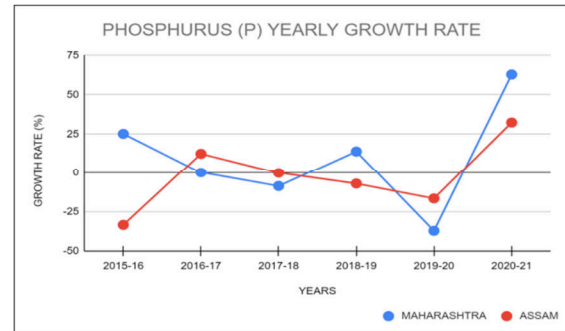


Figure 1.3: Phosphorus (P) Yearly Growth Rate of Maharashtra and Assam

The figure 1.3 shows utilization of Phosphorus (P) fertilizers and its yearly growth rate between Maharashtra and Assam state. where Maharashtra state shows that the yearly growth rate of phosphorus is higher than the Assam state.

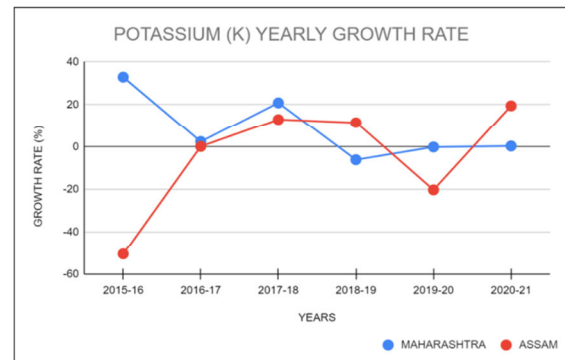


Figure 1.4: Potassium (K) Yearly Growth Rate of Maharashtra and Assam

The figure 1.4 shows yearly growth rate of utilization of Potassium (K) fertilizers in Maharashtra and Assam state. It is observed that, the Maharashtra shows higher growth rate at the beginning whereas during 2020-21 Assam shows higher growth rate than the Maharashtra

state. The growing growth rate of fertilizers consumption in Maharashtra shows the successful implementation of the Green Revolution.

Conclusion:

Over the years it has been a heavy rise in the consumption of fertilizers. However, soil productivity depends on the structure and mineral composition of the soil, soil depth and drainage facilities, organic matters, intensity of earthworm and microbial activities. Fairly productive soils in combination with assured irrigation and optimum supply of nutrients can enhance the crop yields by 200–300 percent. (Hegde, 2000). Hence there is a strong relationship between agricultural production and soil productivity, improper N–P–K ratio may cause adverse consequences on soil ecology, productivity and nutrients availability in the long-run. It is observed that, injudicious use of chemical fertilizers has made fertile lands barren in many areas. For example, soils in Punjab and Haryana has started showing signs of exhaustiveness (Pingali, 2001). Besides that, in Maharashtra thousands of hectare land becomes saline and alkaline due to excess use of chemical fertilizers, in Krishna and Panchaganga river basin of western Maharashtra.

The two most important crops in Maharashtra are sugarcane and cotton,

both of which require nitrogen fertiliser to accelerate their growth. Potassium fertiliser required less because Maharashtra's soil contains it already. Assam's main crop is tea. Potassium is utilised more frequently in Assam because it expands the length and breadth of their crops.

Although it has helped India to mitigate hunger through more productivity in agriculture, studies have shown reverse effects of use of chemical fertilizers which doesn't help us in the long run. Not only soil there has been evidence of human health deterioration through the unorganized use of fertilizers. Hence appropriate measures should be taken for the growth of agriculture in a sustainable way in the long run.

References:

1. A. Karthik, M. U. (2021):“Smart Fertilizer Strategy for Better Crop Production”, *Agricultural Reviews*, pp12-21.
2. Arvind Kumar Shukla, S. K. (2022):“Fertilizer Use in Indian Agriculture”, an *Indian Journal of Fertilisers*, pp218-237.
3. Hegde, N. (2000):“Sustainable agriculture for food security”, *Indian Farming*, pp12
4. K. V. Praveen, A. S. (2020):“Advancing with fertilizers

- in Indian agriculture”, *Advancing with fertilizers in Indian agriculture*, (pp. 49-60).
5. Muhammad Yousaf, J. L. (2017):“Effects of fertilization on crop production and nutrient supplying capacity under rice oilseed rape- rotation system”, *Nature*, pp1-9.
 6. Pingali, M. P. (2001):“Environmental impacts of productivity-enhancing crop research: a critical review”, *CGIAR Technical Dvisory Commitee Secretariat*. Rome: FAO.
 7. Singh, J. (2016):“The Relationship between Farm Size, Productivity and Profitability: A Case Study”, *Journal of Environmental Science, Computer Science and*, pp103-115.
 8. States, F. a. (2020):“World Fertilizer Trends and Outlook to 2020”,*Rome: Food and Agriculture Organisation of the United States*.
 9. Suman Patra, P. M. (2016):“Modelling impacts of chemical fertilizer on agricultural”, *Model. Earth Syst. Environ*, pp1-11
 10. ZHU Wei, Q. L.-x.-m. (2022):“The relationship between farm size and fertilizer use efficiency”, *Journal of Integrative Agriculture*, pp273-281.
 11. Department of Agriculture, Government of Assam
<http://www.rkvyassam.in>