



ECONOMIC ASSESSMENT OF FERTILIZER USE EFFICIENCY IN INDIA

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ABSTRACT

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This study investigates the macro-nutrient dynamics in India with a comprehensive analysis of fertilizer production, consumption, sales, imports, subsidies and capacity utilization from 2010-11 to 2022-23. Given the country's heavy dependence on agriculture, fertilizers—particularly NPK nutrients such as Urea, DAP and MOP play a pivotal role in ensuring food security. The research utilizes secondary data sourced from reputed organizations such as the Fertilizer Association of India, Indiastat, etc. Tools like Compound Growth Rate (CGR), Compound Annual Growth Rate (CAGR) were utilized. Findings reveal that while private agencies consistently dominate fertilizer sales, government subsidies, especially for Urea and nutrient-based fertilizers (NPK), have expanded substantially in recent years. Bio-fertilizer production and usage also witnessed a marked increase, with a significant shift towards liquid-based variants. Nutrient consumption trends indicate that Nitrogen dominates both Kharif and Rabi seasons, while Phosphorous and Potassium show variable patterns. Capacity utilization for Nitrogen has remained relatively high, whereas Phosphorous lags behind. The study highlights the growing demand, evolving subsidy structure, and a positive trajectory in nutrient management, providing policy insights for strengthening India's agricultural sustainability.

KEY WORDS: Fertilizer Consumption, Fertilizer Production, Subsidy, Capacity Utilization, Import

INTRODUCTION

Fertilizers play a crucial role in enhancing agricultural productivity and ensuring food security in India. The country, being predominantly agrarian, relies heavily on both chemical and bio-fertilizers to meet the nutrient requirements of its diverse crops. Major fertilizers like Urea, DAP (Di-Ammonium Phosphate), and MOP (Muriate of Potash) are vital for maintaining soil fertility and crop yields. Additionally, the use of bio-fertilizers has gained momentum in recent years, promoting sustainable and eco-friendly farming practices. Fertilizer consumption in India varies seasonally, driven by the Kharif and Rabi cropping patterns. The Government of India provides substantial subsidies to make fertilizers affordable for farmers, influencing production and sales trends. Over the years, fertilizer production capacities have expanded to meet growing demand. However, capacity utilization has fluctuated due to policy changes, raw material availability, and market dynamics. Studying fertilizer production, sales, consumption, and subsidies offers valuable insights into India's agricultural economy. This analysis also assesses capacity utilization

trends from 2010-11 to 2021-22, highlighting challenges and opportunities in the sector.

II. OBJECTIVES OF THE STUDY

- ✓ To analyze the sales and subsidy trends of NPK fertilizers and bio-fertilizers in India, including seasonal patterns
- ✓ To evaluate the capacity utilization of the fertilizer industry in India from 2010-11 to 2021-22.

III. METHODOLOGY

In this study, the Production, Consumption, Sales, Imports, Bio-Fertilizer, Season-wise fertilizer, Subsidies and Capacity Utilization of Fertilizer data has been collected from the period 2010-11 to 2021-22. The data has been collected from various secondary sources such as Fertilizer Association of India, India stat, Statista etc.

Tools of Analysis in this study are

- CGR
- CAGR
- Trend Analysis

IV. REVIEW OF LITERATURE

Suryawanshi (2015) The article examines the trends in chemical fertilizer consumption in India from 1981-82 to

2011-12, highlighting the essential role of fertilizer in enhancing agricultural productivity. It underscores the increasing demand-supply gap for fertilizers, which has resulted in a rising dependency on imports, escalating from 2 million tonnes in the early 2000s to 10.2 million tonnes by 2008-09. The analysis emphasizes the correlation between increased fertilizer consumption and the government's subsidy policies, which have substantially raised subsidy requirements. Furthermore, it situates Indian agriculture's challenges within the broader context of food security, noting that agricultural productivity must intensify to meet the growing population's needs. Overall, the findings illustrate the critical interplay between fertilizer usage, import dependency, and agricultural policy in India. **Srinivasarao (2021)** examined that Fertilizer Use Efficiency (FUE) underscores its vital role in enhancing food production, profitability, and environmental sustainability. Although

awareness about efficient fertilizer management has increased, low FUE remains a significant challenge due to imbalanced nutrient application. Studies reveal that while the Green Revolution boosted food grain production, vast rainfed regions did not experience its benefits, leading to persistent soil nutrient deficiencies. Research highlights the importance of advanced nutrient management techniques such as Site-Specific Nutrient Management (SSNM), Integrated Nutrient Management (INM), nano-fertilizers, and biofertilizers to improve FUE. Additionally, improper fertilizer use has contributed to soil degradation, groundwater contamination, and multi-nutrient deficiencies, posing a threat to food security. The findings suggest that adopting precision nutrient management and implementing well-structured policies are crucial for optimizing fertilizer use and ensuring sustainable agricultural practices.

V. RESULT AND DISCUSSION

Table 1: Number of Fertilizer Sales units in India from 2010-2022

(In 000' metric tonnes)

Year	Private Agencies	Per cent share to Private Agencies	Cooperative and Other Institutional Agencies	Percent Share Cooperative and Institutional agencies	Institutional and Private Sales Units
2010	215,666	78	60,647	22	2,76,313
2011	212,512	77	62,950	23	2,75,462
2012	206,538	77	62,637	23	2,69,175
2013	234,484	78	67,647	22	3,02,131
2014	232,962	77	71,373	23	3,04,335
2015	232,467	76	72,742	24	3,05,209
2016	228,516	76	71,852	24	3,00,368
2017	231,586	78	63,939	22	2,95,525
2018	228,738	79	59,262	21	2,88,000
2019	224,406	78	61,560	22	2,85,966
2020	219,552	79	58,262	21	2,77,814
2021	214,834	77	62,875	23	2,77,709
2022	227,691	78	64,792	22	2,92,483
CGR	0.24	0	0.005	0	0.11
CAGR	0.004	0	0.005	0	0.004

Source: Fertilizer India

Table 1 and Figure 1 reveal that the number of fertilizer sales points in India fluctuated between 2010 and 2022. Private agencies consistently dominated sales, showing relative stability with a marginal CAGR of 0.004, while cooperative and institutional agencies peaked in 2015 before declining, with a

similar low CAGR of 0.005. Despite minor variations, the overall trend indicates steady growth, with private agencies maintaining a significantly higher market share throughout the period.

Table 2: Central Subsidy on Fertilizer in India

(In Rs. Crore)

Year	Urea Subsidy				Nutrient based Subsidy		
	Indigenous	Imported	Freight	Total	Indigenous	Imported P&K	Total P&K
2010-11	15,081	6,454	-	21,535	-	-	40766 [41500]
2011-12	20,208	13,716	-	33,924	-	-	36089 [36,108]
2012-13	20,000	15,133	-	35,133	-	-	30480 [30576]
2013-14	26,500	11,538	-	38,038	-	-	29301[29427]
2014-15	38,200	12,223	-	50,423	-	-	20653 [20667]

2015-16	36,000	12,278	2,200	50,478	11,969	9,969	21938
2016-17	38,000	7,470	2,000	47,470	11,843	7,000	18843
2017-18	31,974	7,223	5000	44,197	14,337	7,900	22237
2018-19	29,300	14,318	-	50,433	14,820	9,260	24080
2019-20	43,050	11,699	-	54,749	15,906	10,429	26335
2020-21	66,807	21,732	-	90,539	22,288	15,015	37304
2021-22	56,534	44,174	-	1,00,768	31,931	20,795	52726
2022-23	1,18,457	35,625	-	1,54,082	42,090	29,033	71122
CGR	13.55	10.01	-	12.84	-	-	-
CAGR	0.17	0.14	-	0.16	-	-	-

Source: The Fertilizer Association of India

Table 2 highlights the trends in central fertilizer subsidies in India from 2010- 11 to 2022-23. Urea subsidies, both indigenous and imported, exhibited an overall upward trend, with notable surges in 2020-21 and a peak in 2022-23. Nutrient-

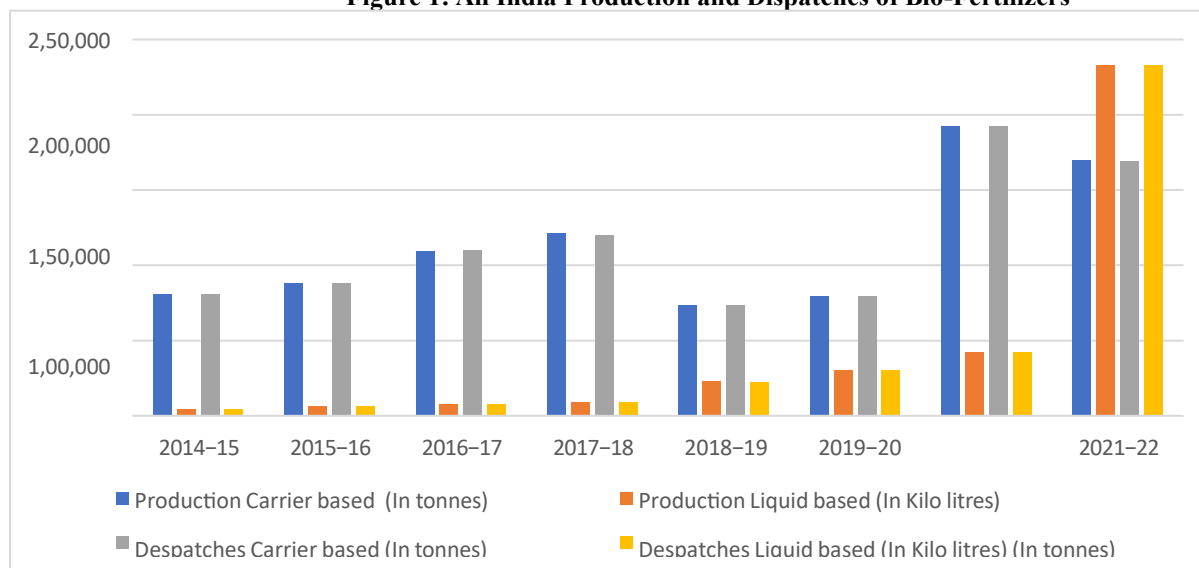
based subsidies (P&K) initially declined until 2016-17 but then steadily increased, reaching their highest level in 2022- 23, with all subsidy components showing positive CGR and CAGR.

Table 3: All India Production and Dispatches of Bio-Fertilizers

Year	Production		Despatches	
	Carrier Based (In tonnes)	Liquid Based (In Kilo litres)	Carrier Based (In tonnes)	Liquid Based (In Kilo litres)
2014-15	80,696	4,055	80,600	4,050
2015-16	88,029	6,241	88,000	6,240
2016-17	1,09,020	7,526	1,10,000	7,530
2017-18	1,21,067	9,033	1,20,000	9,000
2018-19	73,377	22,646	73,300	22,600
2019-20	79,447	30,106	79,400	30,100
2020-21	1,92,329	42,240	1,92,300	42,240
2021-22	1,69,379	2,32,934	1,69,300	2,32,900

Source: Fertilizer India

Figure 1: All India Production and Dispatches of Bio-Fertilizers



Source: Fertilizer India

Table 3 and Figure 1 highlights the Production and Dispatches of Bio-fertilizers in India showed fluctuating trends from 2014-15 to 2021-22. There was a steady increase from 2014-15 to 2017- 18, with carrier-based production peaking at 1,21,067 tonnes. However, in 2018-19, both carrier-based and liquid-based production declined significantly. The trend reversed in

2019- 20 and 2020-21, with production reaching its highest at 1,92,329 tonnes. In 2021-22, carrier- based production declined, but liquid-based bio-fertilizers saw a sharp rise to 2,32,934 kiloliters. This indicates a growing preference for liquid-based bio-fertilizers in recent years.

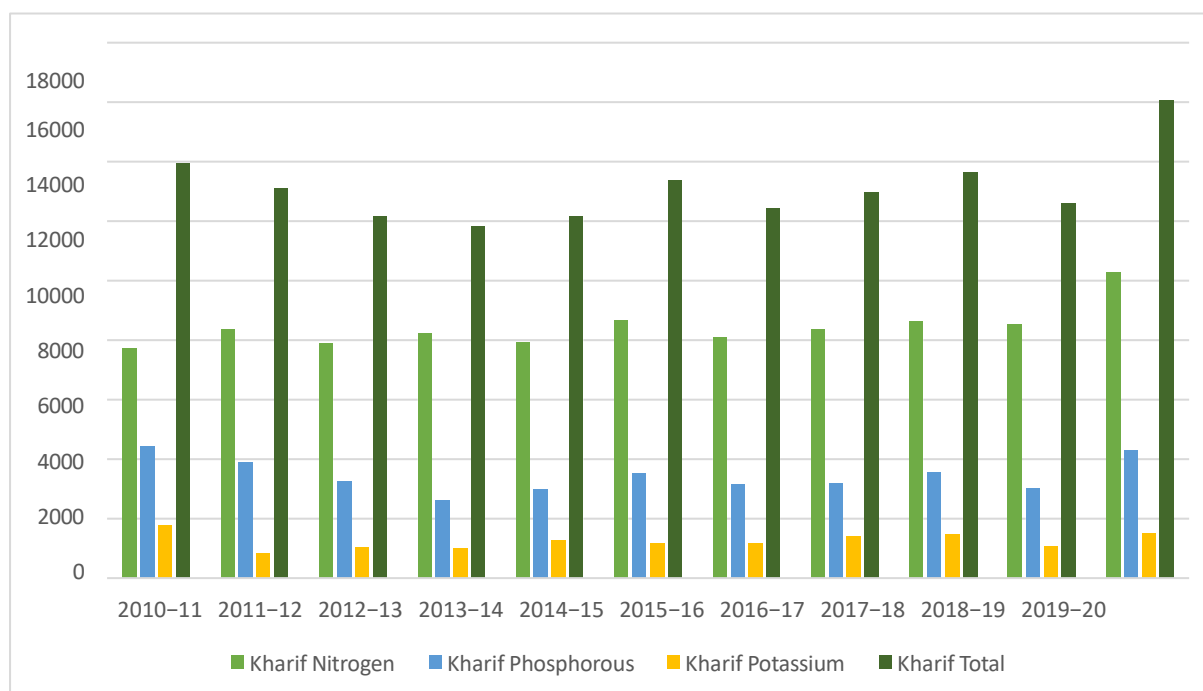
Table 4: All India Consumption of Nitrogen, Phosphorous and Potassium

(In thousand metric tonnes)

Year	Kharif			
	Nitrogen	Phosphorous	Potassium	Total
2010-11	7719.13	4,424.20	1,780.79	13,924.12
2011-12	8378.23	3,890.69	847.83	13,116.75
2012-13	7891.49	3,236.24	1,029.41	12,157.14
2013-14	8223.53	2,596.62	1,015.53	11,835.68
2014-15	7927.82	2,984.37	1,264.35	12,176.54
2015-16	8653.59	3,524.99	1,174.99	13,353.57
2016-17	8089.95	3,148.98	1,174.66	12,413.59
2017-18	8353.04	3,191.25	1,411.97	12,956.26
2018-19	8624.43	3,543.27	1,475.49	13,643.19
2019-20	8522.51	3,006.09	1,076.84	12,605.44
2020-21	10274.22	4,285.87	1,492.29	16,052.38
CGR	1.66	-0.41	1.59	1.00
CAGR	0.02	-0.002	-0.01	0.01

Source: Indiatat

Figure 2: All India Consumption of Nitrogen, Phosphorous and Potassium



Source: Indiatat

Table 4 and Figure 2 illustrate fertilizer consumption trends during the Kharif season in India from 2010-11 to 2020-21. Nitrogen usage showed a consistent rise, while Phosphorous declined after 2010-11, and Potassium consumption varied, peaking in 2020-21. CGR values indicate positive growth for Nitrogen (1.66) and Potassium (1.59), but a decline for

Phosphorous (-0.41). The CAGR reflects marginal growth in Nitrogen (0.02) and total consumption (0.01), with Phosphorous and Potassium showing negative trends. Overall, Nitrogen remained the dominant nutrient, and the spike in 2020-21 was largely driven by its increased use.

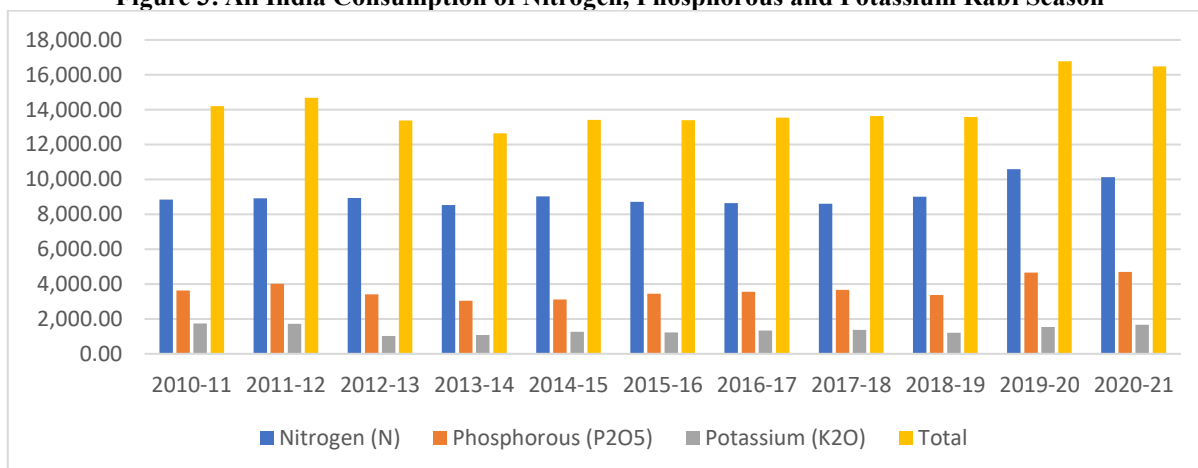
Table 5 All India Consumption of Nitrogen, Phosphorous and Potassium Rabi Season

(In thousand metric tonnes)

Year	Nitrogen	Phosphorous	Potassium	Total
2010-11	8,839.11	3,625.50	1,733.48	14,198.09
2011-12	8,922.02	4,023.61	1,727.62	14,673.25
2012-13	8,929.41	3,417.19	1,032.41	13,379.01
2013-14	8,526.55	3,036.84	1,083.34	12,646.73
2014-15	9,021.73	3,114.49	1,268.55	13,404.77
2015-16	8,718.74	3,453.78	1,226.51	13,399.03
2016-17	8,645.96	3,556.55	1,333.80	13,536.31
2017-18	8,606.28	3,663.11	1,367.73	13,637.12
2018-19	9,013.33	3,366.88	1,204.82	13,585.03
2019-20	10,578.80	4,655.95	1,530.16	16,764.91
2020-21	10,129.75	4,692.07	1,661.41	16,483.23
CGR	1.25	2.14	0.25	1.35
CAGR	0.01	0.02	-0.003	0.01

Source: Indiastat

Figure 3: All India Consumption of Nitrogen, Phosphorous and Potassium Rabi Season



Source: Indiasta

Table 5 and Figure 3 present Rabi season fertilizer consumption trends in India from 2010-11 to 2020-21. Nitrogen and Phosphorous usage generally increased, peaking in 2019-20, while Potassium showed fluctuations with a decline between 2012-13 and 2018-19, followed by a recovery. CGR values indicate positive growth for Nitrogen (1.25) and Phosphorous

(2.14), with Potassium showing only a slight rise (0.25). The CAGR reflects slow growth for Nitrogen (0.01) and Phosphorous (0.02), whereas Potassium experienced a marginal decline (-0.003). Nitrogen remained the most consumed nutrient, with overall fertilizer use rising sharply post-2017-18, reaching its peak in 2019-20.

Table 6: All India Capacity Utilization of Fertilizer Industry

(In 000' metric tonnes)

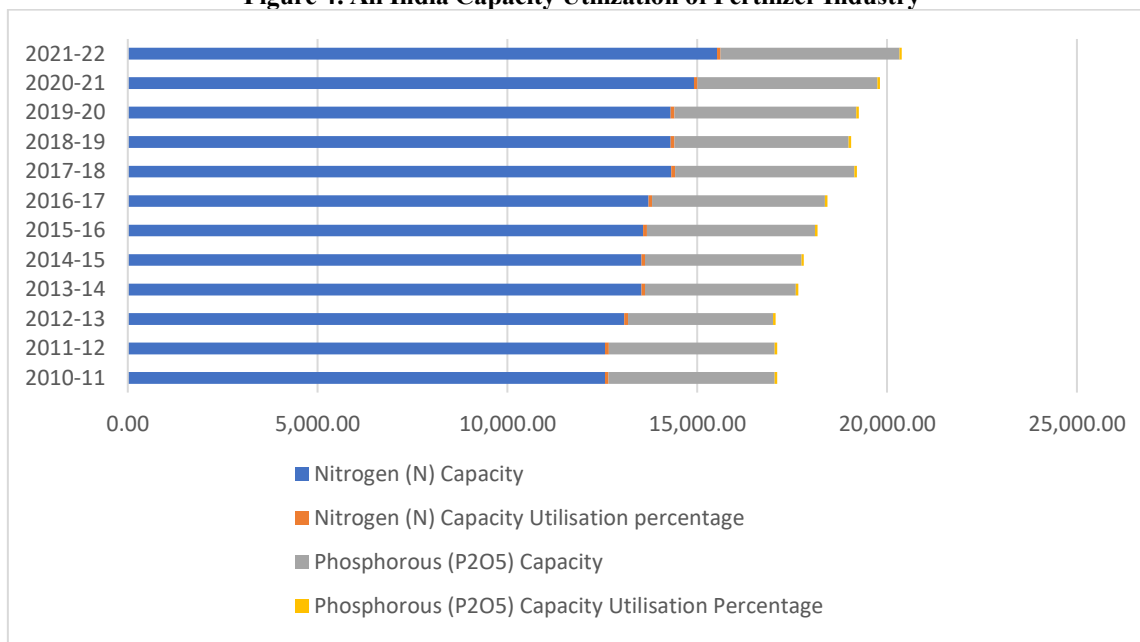
(In percentage)

Year	Nitrogen (N)		Phosphorous (P2O5)	
	Capacity	Capacity Utilization	Capacity	Capacity Utilization
2010-11	12,567.60	96.9	4,371.20	72.4
2011-12	12,572.80	97.7	4,363.70	71.7
2012-13	13,078.90	93.6	3,826.00	62.2
2013-14	13,533.30	92.1	3,972.00	60.3
2014-15	13,533.30	91.9	4,118.90	61.1
2015-16	13,574.10	99.5	4,425.80	64.4
2016-17	13,712.40	97.6	4,552.70	65.2
2017-18	14,317.50	97.1	4,724.40	66.6

2018-19	14,299.10	96.1	4,590.50	64.5
2019-20	14,299.10	96.0	4,790.70	68.1
2020-21	14,913.40	95.6	4,737.20	66.6
2021-22	15,520.90	90.8	4,711.70	65.4
CGR	1.74	-0.13	1.51	-0.18
CAGR	0.01	-0.005	0.006	-0.008

Source: Fertilizer India

Figure 4: All India Capacity Utilization of Fertilizer Industry



Source: Fertilizer India

Table 6 and Figure 4 depict trends in the consumption, production, and imports of N and P₂O₅ in India from 2010-11 to 2022-23. Consumption showed a general upward trend, peaking in 2020-21, followed by a slight dip in 2021-22 and a rebound in 2022-23. Production steadily increased, reaching its highest in 2022-23. Imports declined until 2016-17, then rose again after 2018-19, peaking in 2022-23. All three indicators—consumption, production, and imports—registered positive CGR and CAGR values. The chart also reflects consistent growth in Nitrogen and Phosphorous capacities, along with a gradual rise in Nitrogen capacity utilization.

CONCLUSION

The study analyzes fertilizer usage trends in India from 2010-11 to 2022-23, highlighting key developments in production, consumption, sales and policy. Agricultural production and productivity was increasing due to the input of fertilizer. Fertilizer sales points remained steady with private agencies dominating distribution. Government subsidies, especially for Urea and NPK nutrients have increased notably, enhancing affordability for farmers. Bio-fertilizer production particularly liquid-based types has grown indicating a shift toward sustainable practices. Nitrogen emerged as the most widely consumed nutrient across seasons, while Phosphorous and Potassium showed variable usage. Despite rising production capacities Phosphorous utilization remains relatively low. Import dependence persists, although domestic output has improved.

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