

# Logistics Management of Fertilisers in North India with special reference to Uttar Pradesh

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**Abstract:** After China, India is the largest consumer of fertiliser. Nevertheless, common depth of fertiliser use in India remains much less than other nations in the world but is extremely skewed, with vast inter-regional, inter-state, and inter-district editions. The results show that non-rate factors comparable to irrigation, excessive yielding varieties, have been more principal than rate explanations in influencing demand for fertilisers. Beside this the two price coverage devices, inexpensive fertiliser costs and larger agricultural commodity prices. Among the two, the previous is more robust in influencing fertiliser demand. According to the planning commission of India in a report stated, In India roughly two percentage of the GDP is spent on logistics, whereas this figure is 18 percent for developed nations. Deliver chain management and logistics are still within the embryonic stage in India. The current scenario of financial system is forcing many industries to compare their bills, and reduce it down in size. Today excellent logistics management has come to be fundamental for success of businesses. Logistics perform includes the whole float of material, from the acquisition of raw substances to delivery of completed merchandise to the best customers. As such, it entails the routine of sourcing and purchasing, conversion together with capability planning, technological know-how choice, operations administration, construction scheduling, materials planning, distribution planning and management of industry warehouse operations, inventory management, inbound, interior, and outbound transportation linkage with patron carrier, income, reverse logistics, promotion and advertising activities. Therefore, in order to analyse the effectiveness of fertilizer logistics in the state of U.P which is about 55% of consumption of fertilisers in all over India, two objectives have taken, firstly to study the logistic management of fertilisers in the state and secondly to study factors affecting consumption of fertilisers in the state. Past records show Fertiliser consumption in India is highly increased. At present the consumption of fertisers in India reched 239.59 Lakh Tonnes. Over the years, the increased usage of chemical fertilizers has played a significant role in increasing the farm productivity.

**Key Words:** Fertilisers, effectiveness, Distribution Planning, consumption pattern, logistics, advertising.

## I. INTRODUCTION

Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. It also contributes a significant figure to the Gross Domestic Product (GDP). Sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies such as soil conservation, sustainable natural resource management and biodiversity protection, are essential for holistic rural development. Indian agriculture and allied activities have witnessed a green revolution, a white revolution, a yellow revolution and a blue revolution. A vast part of the agri store network environment is either in the general population segment, or emphatically connected to it. The Indian government endeavours to protect the cultivator from value changes by getting their deliver at Minimum Support Prices (MSPs), chose by the Commission at Agricultural Costs and Costs in the wake of dissecting the expenses of growing a specific harvest. More than 7500 Agricultural Procurement and Marketing Committee (APMC) Mandi's provides a commercial centre to the exchange and the Food Corporation of India (FCI) plays important role as purchaser, and stored in the dedicated warehouse. They act as a company's distribution centre. Eventually, this gets disseminated through the Public Distribution System (PDS) shops and reaches to the buyer. For non-MSP crops, the manufacturer is relying on the customary private channels to market the manufactured product. In 1950-51, consumption of chemical fertilizers in India was negligible. In 2010-11, per hectare chemical fertilizer consumption was 144 Kilograms. This value is still low in comparison to some of the developed countries such as South Korea (400 kgs),

Netherlands (275 kgs), Belgium (225 kgs), Japan (340 kgs). The main reason of low per hectare consumption of chemical fertilizers is absence of assured water supply. Assured water supply is precondition for the usage of chemical fertilizers. Since most of the cultivated areas in India depends on rain, they consume only 20% of the total fertilizers.

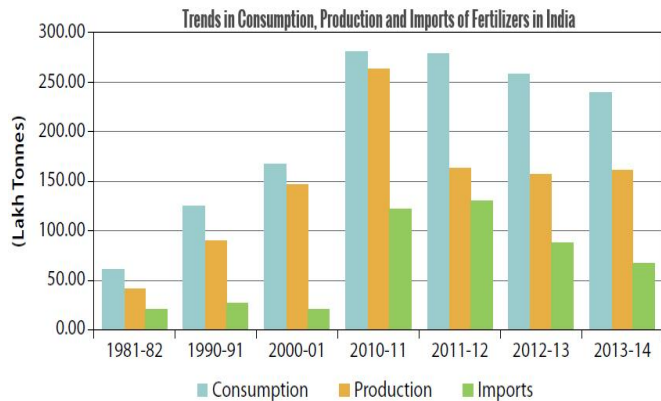
Consumption, Production and Import of Fertilisers (Lakh Tonnes)

Year	Consumption				Production			Imports				C & F Value of Imports (₹ Crore)
	N	P	K	TOTAL	N	P	TOTAL	N	P	K	TOTAL	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1981-82	40.69	13.22	6.73	60.64	31.44	9.49	40.93	10.54	3.43	6.44	20.41	716.62
1990-91	79.97	32.21	13.28	125.46	69.93	20.52	90.45	4.14	10.16	13.28	27.58	1335.82
2000-01	109.20	42.15	15.67	167.02	109.61	37.43	147.04	1.54	3.96	15.41	20.91	#
2010-11	165.58	80.50	35.14	281.22	221.56	42.22	263.78	45.64	37.38	38.81	121.83	8348.89
2011-12	173.00	79.14	25.76	277.90	122.59	41.01	163.60	52.40	44.27	33.35	130.02	15442.02
2012-13	180.36	59.55	18.13	258.04	121.94	35.41	157.35	46.90	27.78	12.30	86.98	15980.22
2013-14	165.25	54.58	19.76	239.59	123.78	37.14	160.92	38.08	15.9	13.33	67.31	-

# There was no import of Urea in 2000-01, 2002-03 and 2003-04 in Government account.

The above table shows that in all kinds of fertilizers, India need to import to fulfil the domestic demand. Although Fertilizer industry has made rapid progress and there has been considerable increase in the domestic production of fertilizers over the years but it is not enough to keep pace with the growth in consumption. India is deficient in primary sources of fertilizer inputs (such as natural gas, rock phosphate, potash); it has sizeable import

dependence for the intermediates like phosphoric acid and ammonia.



The above graph shows the production-consumption imbalance in the fertilizer sector. The key reasons as to why India was not able to increase the fertilizer production are as follows:

- Firstly, setting up a fertilizer plant in India is a long process which generally takes five to eight years from time of issue of letter of intent to start of production. There was an absence of clear policy of setting up fertilizer plant in the country.
- Secondly, the government policy towards private sector players in fertilizers has never been clear. The business environment for fertilizer companies has been hostile due to urea subsidy and erratic supply of natural gas, which is raw material.

Further, India could not attract foreign companies to produce fertilizers here because they earn huge profits in exports to India. Thus, since local production is low, India is dependent on fertilizer imports.

In view of importance of fertilisers in agricultural growth and the possibility of an emerging demand-supply gap, there is need to forecast future demand. If we take the case of chemical fertilisers, the increased agricultural production, in particular in developing countries, is well established. Some argue that fertiliser was as important as seed in the Green Revolution (Tomich et. al. 1995), contributing as much as 50 percent of the yield growth in Asia (Hopper 1993 and FAO 1998). Others have found that one-third of the cereal production world-wide is due to the use of fertiliser and related factors of production (Bumb 1995).

Fertiliser consumption in India has been growing through the years and in these days India is one in all the biggest producer and customer of fertilisers on this planet. By way of 2009-10, complete fertiliser consumption within the nation was 26.49 million nutrient tonnes. Value of fertilisers in yield growth, which is essential for achieving elevated agricultural production, further raises considering there is little scope for bringing extra discipline below cultivation as well as majority of Indian soils are deficient in many macro and micro vitamins and minerals. The

application of main plant nutrients, is important and micronutrients in large variety and proper proportion, provides a correct system and application time, is the key for sustainable development of crop production.

**Demand for Fertiliser**

After China, India is the largest consumer of fertiliser. Nevertheless, common depth of fertiliser use in India remains much less than other nations in the world but is extremely skewed, with vast inter-regional, inter-state, and inter-district editions. The results show that non-rate factors comparable to irrigation, excessive yielding varieties, have been more principal than rate explanations in influencing demand for fertilisers. Beside this the two price coverage devices, inexpensive fertiliser costs and larger agricultural commodity prices. According to a report on fertilizer industry for twelfth five-year plan all India demand forecast of fertilizer 2012-13 to 2015-16.

Year	Urea	DAP	NP/NPKs
2013-14	31192	11784	10577
2014-15	32029	12002	10861
2015-16	32858	12212	11142

Source: Krishi Jagran

The Indian Fertilizer companies produced around 32.4 million tons of fertilizer in the year 2012-13 However, the total availability was short of demand and was met through imports. Of total fertilizer production, urea output increased to 22.6 million tons in FY12-13 from 22.0 million tons in FY11-12 due to better capacity utilization. While production of di-ammonium phosphate (DAP) output down 3.6 million tons in FY12-13 from 4.0 million tons last year, output of NPK (nitrogen, phosphate and potassium) decreased 6.2 million tons in FY12-13 from 7.8 million tones in FY11-12.

**Logistics Management.**

In line with Lambert and inventory (1993) logistics, it is a commonly accepted time period by using present day authorities, had prior to now a type of names together with physical distribution, supply chain administration and industry logistics. The Council of Logistics administration defines logistics as "The procedure of planning, imposing and controlling the effective, cost-strong glide and storage of raw substances, in-procedure stock, finished goods and associated understanding from the factor of foundation to the factor of consumption for the purpose of conforming to client standards" consistent with the above definition logistics contains the following four flows:

**Material Flow:** Go with the flow of materials from the sources via critical approaches including their storage, retrieval and the delivery of raw materials.

**Merchandise Flow:** Flow of finished goods from the manufacturer to the end user through the distribution channels.

**Money Flow:** Float of money along with advances from firms to suppliers of raw materials, power, offerings, etc. And into firms from the wholesalers, distributors, consumers, and many others.

**Information Flow:** Flow of required information from and into the organization through various communication channels in the logistics system.

Considering the fact that, interruptions in any of the above four flows have an effect on an group's uncooked substances provide (buying), manufacturing (operations) and advertising (distribution) functions. Consistent with Fawcett and Fawcett (1995) there exists a ought to integrate these flows through mighty administration of infrastructure, materials, science and people. In this thesis, the predicament is with the provide chain administration of NFCL. Extra principally, it's involved with the inbound and outbound logistics of the enterprise. A effective logistic management is determined by mighty provide chain management, which is totally difficult considering the fact that of, huge number of gamers with varying curiosity or objectives are worried. Although the provide chain of each company has its own special elements, the next normal principles support in administration of give chains.

- Start with the customer
- Managing logistic assets
- Organizing customer management
- Integrate sales and operations planning
- Leverage manufacturing and sourcing
- Focusing on strategic alliances and relationship management
- Develop customer driven performance measures.

A significant new trend has been evolving in logistics management in the last decade - one that involves the collaboration of all participants in the supply chain in order to reduce the cost of total logistics system.

Previous models were given to control the cost of overall logistics. Companies worked to manage logistics as an entity and to lower the total logistics costs to the organization. The model evolved balancing trade-off among production run lengths, inventory, transportation, and warehousing and customer service.

logistics planning involves the development and management of all logistics resources in order to attain the desired cost-service performance consideration, it might include number and location of warehouses, type of warehouses, mode and carrier selection, inventory position, inventory levels, order entry technologies, information system etc. Opportunities for differentiation - based on operational, logistics, or customer services excellence are more likely to be exploited. Supply chain management tends to have a more visible and more important role in the Company. Investments in the supply chain function or infrastructure are more likely to be approved.

Prof. Bernard La Lode of Ohio State school (1998) logistics will not be a centered realistic endeavor however one who makes it possible for the mixing of pursuits across features. An amazing way to promote this multiplied role for logistics is to function logistics as a process, not as an activity or operate. These are three essential sub-techniques as a part of the logistic method. They're:

- Built-in creation and distribution method development
- The replenishment process
- The order management procedure: A well-designed forecasting process can make contribution enormously for

logistic performance. Many consumer merchandise corporations are seeking to operate with 25 to 60 percentage forecast error (on the inventory-keeping unit degree) of their one month- out forecasts. This error range wreaks havoc with inventory phases and client provider performance. Fertilisers corporations, alternatively, able to achieve 15 to 20 percent forecast errors. The fertiliser companies generally faces forecasting errors. And the most common errors of demand forecasting are as follows:

- Letting budget power forecasts
- Having no forecast "proprietor"
- Having insufficient analytical help
- making use of a single forecasting strategy for everything
- Having no earnings and operations planning meeting
- Failing to track forecast error. Many companies are discovering that distribution resource planning (DRP) techniques can lessen costs, enhance customer service, and higher their inventory administration. DRP programs furnish a full view into the warehouse network by first inspecting demand on the finish of the channel and gathering necessities back by way of the warehouse network. This technique allows for full visibility of desires and better administration of inventories. DRP entails both inventory administration and distribution planning. A module of distribution requirement planning (DRP) extends the concepts of substances requirements planning in to a multi-echelon-warehouse stock environment. The results are time-phased replenishment schedules for relocating inventories throughout the warehousing community. DRP presents an accurate simulation of distribution operations with elevated planning visibility, enabling logistics departments to control all resources higher.

#### Findings:

1. The road transport is tremendously increased and the leads of movement is dropped.
2. The market is properly defined and various companies settled down to their respective areas the situation is almost rail road modal mix at present.
3. Companies with less production costs have expanded their area of operation and made out way to secondary and tertiary markets in a big way.
4. There is still some areas of glut and scarcity. Due to lack proper demand forecasting.
5. Some rake points and railway routes as well as roads is more popular than others leading to traffic congestion.
6. New modes of transport such as inland and coastal water transport is planning to enter the fertiliser transport market.
7. Development of buffer godowns at nodal rake points have become a critical part of the fertiliser logistics.
8. Development of better quality transport to provide good quality of bags and product by introducing palletisation, containerisation and mechanisation of loading at siding points.
9. Industry and Railway will have to rely more on informal channels of coordination.



**Factors affecting consumption Trends of fertilisers in the state.**

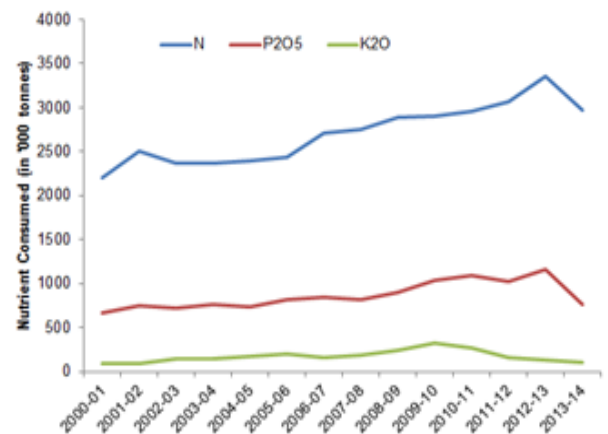
Many studies have attempted to examine the role of price and non-price factors in the growth of fertiliser use in India (Raju, 1989; Kundu and Vashist, 1991; Subramaniyan and Nirmala, 1991; Sharma, 1993; Sidhu and Sidhu, 1993; Dholakia and Majumdar, 1995, Sharma, 1999, Schumacher and Sathaye, 1999, Rabobank, 2005). However, most of these studies related to pre-reforms period. Therefore, there is a need to examine the likely impacts of the socio-economic, technical and institutional factors on fertiliser consumption and agricultural growth. Some of the problems of fertiliser 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 fertilisers demand at macro level and forecast demand for fertilisers to eradicate the shortages. By estimating demand for fertilisers, the implications of fertiliser price policy, subsidy and agricultural product price for fertiliser use and their interrelationship.

Fertiliser consumption trends expressed in terms of aggregate quantities consumed and intensity of use (i.e., kg per hectare of total cropped area) reflect both demand and supply decisions. Therefore, it is essential to understand fertiliser situation in the country. The share of total fertiliser consumption by region. With a total area of 24.09 million hectares, is India’s fifth largest state in terms of land area. The state has both a large population and a high population growth rate. It is the most populous state in India, with a population of 299.5 million as of 1 March 2016. The population density is 958 people per square kilometre, making it one of the most densely populated states in the country. During the decade from 1996 to 2016 its population increased by over 45.8%. Agriculture is the leading occupation in Uttar Pradesh. Wheat is the state's principal food crop and sugarcane is the main commercial crop. The figure below shows current area, productivity and production statistics of major crops in Uttar Pradesh.

Nutrient consumption in Uttar Pradesh in the past decade is given in Figure below. Uttar Pradesh continued to be the highest fertilizer consuming state in the country. The consumption of total fertilizer nutrients at 4.025 million MT during 2013-14 represented a negative growth of 13.5% over the previous year. Decline in consumption was noticed in both the seasons for all nutrients except K<sub>2</sub>O during Rabi season. Kharif and Rabi share in total fertilizer consumption changed from 43:57 during 2012-13 to 40:60 during 2013-14. During full year, 2013-14, consumption of N at 3.156 million MT, P<sub>2</sub>O<sub>5</sub> at 0.774 million MT and K<sub>2</sub>O at 0.095 million MT during 2013-14 witnessed negative growth of 5.8%, 33.6% and 28.4%, respectively over 2012-13. NPK use ratio changed from 25.2:8.8:1 during 2012-13. NPK use ratio improved marginally from 8.0:2.7:1 during 2013-14 to 6.8:2.4:1 during 2014-15. The per hectare consumption of fertilizer nutrients reduced from 180.2 kg to 156 kg during the period. Fertiliser consumption in Uttar-Pradesh has been increased over the years and today at present, the total consumption of fertiliser only in the

state of U.P which is the largest share (17.2%), followed by Maharashtra (10.8%), Madhya Pradesh (7.3%), Karnataka (7.2%), Andhra Pradesh (7.1%), Punjab (7%), Gujarat (6.4%) and West Bengal (5.8%). These 8 states accounted for 68.8% of the total fertiliser consumption in the country. India is one of the largest producer and consumer of fertilisers in the world. Importance of fertilisers 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 micronutrients in optimum quantity and right proportion, through correct method and time of application, is the key to increased and sustained crop production. Therefore, it is important to understand fertiliser use pattern in the state over time as well as role of factors influencing fertiliser consumption at the state level because intensity of fertiliser use varies from state to state and area to area. country. In fact, there is tremendously grown in fertiliser consumption over the years. There are some factors like agro-climatic characteristics, institutional and infrastructure variables and economic factors play a significant role in displaying fertiliser consumption patterns. According to Vijay Paul Sharma (2011) a models was constructed to link fertiliser consumption with price and non-price factors using national and state-level data. This model described various determinants affecting consumption pattern of fertilisers on state and regional levels.

- Organization of I/O sub-sectors: Structure, Conduct, Performance.
- Basic Services: Infrastructure, Quality control, Banks.
- Government Policies: Taxes & subsidies, Trade policies, Exchange rate, Investment in Research & Development.
- Financial Capital Formation: Income levels, Credit availability, Assets.
- Demographics: Education, Extension,



**Health/Nutrition**

- Agro-ecology & Technology: Rainfall, Irrigation.
- Price Factors: Output demand and prices, Fertiliser prices.

The fertiliser consumption in India has often exceeded domestic production in both nitrogen and phosphorus fertilisers besides for few years. The whole requirement of potassium fertilisers is met by means of imports as India does not have commercially plausible sources of potash. In the course of Nineteen Fifties and Nineteen Sixties, about two-third of home requirement of N fertilisers used to be met by means of imports. The level of P imports was very low within the fifties, which improved enormously for the duration of the sixties and seventies. With the introduction of the high yielding forms of wheat and rice in mid-Sixties, the fertiliser imports elevated enormously in 1966-67 and thereafter. The fertiliser imports elevated dramatically in 1977-78 and 1978-79, 1984-85 and once more in 1988-89 and 1989-90. However, throughout the decade of 1990s imports have been at low phases besides in 1995-96 and 1997-98. As a result of low/no addition in home capability coupled with upward push in demand for fertilisers for the duration of the final two decades, imports have extended tremendously within the 2000s. India imported about 10.24 million tonnes (about 41% of total consumption) of NPK fertiliser vitamins and minerals in 2008-09 as towards 1.93 million tonnes in 2002-03. 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) increased from 28.61 per cent from the year 2000 to 2013. As shown in the table below.

**Consumption, Production and Imports of Fertilizers from 2000-2014 (thousand tons of nutrients)**

Year	Consumption				Production				Imports			
	N	P	K	TOTAL	N	P	K	TOTAL	N	P	K	TOTAL
2000-01	1092	42.2	15.67	167	109.6	37.43	-	147	1.34	3.96	15.41	20.91
2001-02	1131	43.8	16.67	173.6	107.7	38.6	-	146.3	2.69	4.29	17.01	23.99
2002-03	1047	40.2	16.01	160.9	105.6	39.04	-	144.7	0.67	1.7	15.2	17.57
2003-04	1108	41.2	15.98	168	106.3	36.32	-	142.7	1.32	3.38	15.48	20.18
2004-05	1171	46.2	20.61	184	113.4	40.64	-	154	4.11	2.96	20.45	27.52
2005-06	1272	32	24.13	203.4	113.5	42.21	-	155.8	13.9	11.2	27.47	32.33
2006-07	1377	35.4	23.35	216.5	115.8	45.18	-	161	26.8	13.1	20.69	60.58
2007-08	1442	35.2	26.36	225.7	109	38.07	-	147.1	36.8	13.9	26.33	77.21
2008-09	1509	65.1	33.13	249.1	108.7	34.64	-	143.3	38.4	29.3	33.8	101.5
2009-10	1558	72.7	36.32	264.9	119	43.21	-	162.2	34.5	27.6	29.45	91.48
2010-11	1656	80.3	35.14	281.2	121.6	42.23	-	163.8	44.9	38	40.69	123.6
2011-12	173	79.1	26.76	277.9	122.6	41.04	-	163.6	32.4	44.3	33.35	130
2012-13	1682	66.5	20.62	255.4	121.9	35.41	-	157.4	35.1	26.3	11.78	73.08
2013-14	6726	2353	5745	1482.6	-	-	-	-	-	-	-	-

source: Fertilisers Corporation of India.

Consumption pattern of fertilisers also depends on subsidy provided by the government In the financial year FY 2013-14 the subsidy bill almost reach to Rs 67,971 crore. The government had increased the total fertilizer subsidy in the budget at Rs 72,970.30 crore for the entire 2014-15

fiscal from Rs 67,970 crore proposed in the Interim Budget. Fertilizer subsidy paid to the companies has declined by about 41 per cent to Rs 21,300 crore as against Rs 36,000 crore paid in the corresponding period the previous financial year.

While the subsidy is fixed by the government in case of phosphate and potassic (P&K) fertilisers like Muriate of Potash (MoP) and Di-ammonia phosphate (DAP), companies are free to decide prices for others. In case of urea, a controlled commodity, the retail price is fixed at Rs 5,360 per tons, and the difference between the cost of production/imported price is paid as subsidy to the companies.

**Limitation of Study**

This study is predicated on the secondary knowledge obtained from the complete survey of literature, elaborate Statistics on fertilizer trade covering Production, Consumption, Imports, Marketing. Prices, supplying etc., from the fertilizer statistics and different periodicals printed by the Fertilizer Association of India and elaborated with fertilizer promoting executives.

**Conclusion may be summarized as follows:**

A strong infrastructure exists for marketing of fertiliser throughout the country operated by one or the other company depending upon their area of operation. In the context of deregulation and decontrol by the Government, a self-regulatory approach by the industry will become essential in order to ensure that interests of all the fertiliser manufacturers and distribution are given due consideration. The companies will have to evolve some sort of working arrangements for distribution of fertiliser in view of the above objective. The exchange of product may acquire new relevance. In fact, the companies like IFFCO and KRIBHCO having the same cooperative channel of distribution may find the strategy to their mutual benefit and also to the benefit of the farmers in general. This will avoid a lot of unnecessary criss-cross movement of material. Production of N increased marginally by 0.2% and P2O5 recorded increase of 3.5% during 2014-15 over the previous year. Production of Urea, DAP and SSP showed decline of 0.6%, 5% and 0.6%, respectively, during 2014-15 over 2013-14. However, the production of NP/NPK complex fertilisers recorded a sharp increase of 12.7% during the period. The industry continued to suffer due to inadequate budget allocations with large amount of unpaid subsidy dues carried forward from one year to the next. The modified NPS-III policy for existing urea units was notified on 2nd April, 2014. Amendment to New Investment Policy 2012 was issued on 7th October, 2014. The rates of Nutrient Based Subsidy (NBS) per kg of nutrient for N, P, and S remained unchanged. However, NBS rates for K was reduced in 2014-15 over 2013-14.

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