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An overview of production and consumption of major chemical fertilizers in India

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Abstract

Fertilizer is one of the strategic inputs for enhancing productivity which enables to meet the growing demand for food in the country. The present study was conducted to know the growth and determinants of fertilizer in India. The secondary data on production and consumption major chemical fertilizer (NPK) etc. from 1980-81 to 2012-13 were collected from the Fertilizer Association of India (2014), Department of Fertilizers Ministry of Chemicals and Fertilizers Government of India (2013-14), www.Indiastat.com, www.fert.nic.in etc.

There was a substantial growth in production and consumption of chemical fertilizers in India and across the states over the years. The production of chemical fertilizer showed an increasing trend. The country witnessed an increase in the consumption of NPK. The consumption of fertilizer during kharif and rabi showed a positive and significant growth. The sectoral production of nitrogenous fertilizers from 2000-01 to 2012-13, the private sector ranks first which was having the average production of 527.2 lakh M.T. followed by co-operative sector (305.8 lakh M.T.) and public sector (303.6 lakh M.T.).

Keywords: Fertilizer, productivity, co-operative and private

Introduction

The process of economic development and its growth in the early stages of a developing country is mainly dependent upon the progress of agricultural sector. In India, this sector occupies a predominant position in the economy. It contributes about 13.7 per cent to the national income of the country and sustains two-thirds population of India. It is the single largest sector providing employment to the extent of 48.9 per cent of the country's work force. The role of agriculture in India is not restricted to its contribution to national income but also extends to food security of the nation because it has to feed her mammoth population at present and in future too. It was expected that the total food grain requirement will be 291 million tonnes and 377 million tonnes in 2025 and 2050, respectively.

The agricultural production can be increased either by bringing more area under the plough or through increased productivity. In the Indian context, land is becoming a shrinking resource for agriculture owing to competing demand for its use. Also the population growth has resulted in lower carrying capacity of land. Hence, in order to realize the need based targets of agricultural production, the pattern of production enhancement will have to rest heavily on increased yield. This essentially calls for optimizing the usage of the existing farm land by adopting new strategy for agricultural development. The new strategy among others includes judicious use of fertilizers. Fertilizer is one of the key elements to maintain the tempo of agricultural production as studies have indicated that it has contributed about 50 per cent of increased food grain production in the world.

All-India production of total fertilizer nutrients increased by 1.9% in 2013-14 compared to negative growth in the previous year. Production of Nitrogen (N) at 12.41 million MT in 2013-14 increased by 1.4% over the previous year. Production of Phosphorus (P_2O_5) at 3.97 million MT registered an increase of 3.6% during the period. In terms of products, the production of urea increased from 22.58 million MT in 2012-13 to 22.71 million MT in 2013-14. However, production of Di-ammonium Phosphate (DAP) declined from 3.64 million MT to 3.62 million MT during the same period. The production of complex fertilizers (other than Di-ammonium Phosphate) increased from 6.20 million MT to 6.94 million MT during the period. The production of Single Super Phosphate (SSP) went down from 4.43 million MT in 2012-13 to 4.16 million MT in 2013-14.

All- India consumption of total fertilizer nutrients ($N+P_2O_5+K_2O$) declined by 3.2%, from 25.54 million metric tonne (million MT) during 2012-13 to 24.72 million MT during 2013-14. N consumption at 17.02 million MT increased marginally by 1.2% during the period. P_2O_5 consumption 5.65 million MT registered sharp decline of 15.1%.

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Consumption of K_2O at 2.06 million MT was marginally down by 0.2% during the period. Per hectare use of total nutrients declined consistently from 142.3 kg during 2011-12 to 130.8 kg in 2012-13 and 126.6 kg in 2013-14. All-India NPK use ratio widened from 6.7:3.1:1 during 2011-12 to 8.2:3.2:2.1 during 2012-13 and 8.3:2.7:1 during 2013-14.

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.

The studies on the forecasting of consumption of fertilizers are very essential for perspective planning. In the context of fertilizer industry, level of consumption estimation is vital to monitor supply side, to plan the expansion of domestic capacities, to decide the volume of imports, to create the infrastructure for movement and storage and to know the magnitude of efforts to be put in to achieve desirable targets.

The present study has been undertaken to analyze production and consumption pattern of chemical fertilizers at macro level in India and to study various factors influencing the consumption pattern in a country. The results of the study will help formulating suitable policy measures to ensure uniform fertilizer consumption pattern.

Materials and methods

In the present study secondary data were used for evaluating the specific objectives of the study. The secondary data on production of major chemical fertilizer, consumption and production of major chemical fertilizer (NPK), consumption per gross cropped area etc. were collected from the Fertilizer Association of India (2014), Department of Fertilizers Ministry of Chemicals and Fertilizers Government of India (2013-14), Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, www.Indiastat.com, www.fert.nic.in etc.

Results and discussion

Consumption of fertilizer

Chemical fertilizers have been an important element of Indian agriculture. However, there have been wide variations in the use of fertilizers across states and districts as also over time it proved that there are differences in the pattern, growth and determinants of fertilizer use among states and districts in the country.

Nutrient-wise consumption of fertilizer materials in India

Growth rate and co-efficient of variation of nutrient-wise consumption of fertilizer materials in India (1981-82 to 2012-13) are presented in Table 1. In period I (1981-82 to 1990-91), the average consumption of nitrogenous fertilizer is 58.71 lakh M.T. which rose to 99.65 lakh M.T. and 140.33 lakh M.T. in period II (1991-92 to 2000-01) and period III (2001-02 to 2012-13) respectively. The average consumption of phosphorus fertilizers increased about 34.69 lakh M.T and 57.82 lakh M.T. in period II and III, respectively which was only 21.61 lakh M.T. in period I. The average consumption of

potassic fertilizers was very low compared to nitrogenous and phosphorus fertilizers. The total average NPK consumption has increased about three times which was 89.43 lakh M.T. in period I and increased to 222.48 lakh M.T. in period III. Overall (1981-82 to 2012-13) the average consumption of nitrogenous, phosphorus and potassic fertilizers in India were 102.04 lakh M.T., 39.19 lakh M.T. and 15.85 lakh M.T. respectively. The growth rate of consumption all the nutrients shown positive growth rate. Overall (1981-82 to 2012-13) the growth rate of nitrogen, phosphorus and potash were shown positive growth rate of 4.35 per cent, 5.08 per cent and 4.86 per cent respectively with one per cent level of significance.

The rapid expansion of irrigation, spread of HYV seeds, introduction of retention price scheme, distribution of fertilizers to farmers at affordable prices, expansion of dealer's network, improvement in fertilizer availability and virtually no much change in farm gate fertilizer prices for recent years were major reasons for increase in fertilizer consumption. The studies by Vijay and Hrima (2011) [15], Jayanthi *et al* (2013) also contributed the similar findings.

Overall (1981-82 to 2012-13) the instability index of nitrogen, phosphorus and potash were 37.92 per cent, 46.79 per cent and 52.26 per cent respectively, in which instability index was very high in overall NPK consumption (40.72 per cent). This highest variation of phosphorus and potassic fertilizers due to slow growth in consumption of P and K fertilizers compared with N fertilizers due to decontrol of P and K fertilizers and relatively high increase in their prices vis-à-vis N fertilizers, which remained almost stable during last decade.

Growth rate and co-efficient of variation of consumption ratio of fertilizers in India

Growth rate and co-efficient of variation of consumption ratio of fertilizers in India (1981-82 to 2012-13) has been presented in Table 2. The average share of nitrogen in total consumption ratio of fertilizers in relation to potash was 6.43 kg/ha in period I (1981-82 to 1990-91) which rose to 8.24 kg/ha in period II (1991-92 to 2000-01) and again got declined to 5.92 kg/ha in period III (2001-02 to 2012-13). Whereas, the average share of phosphorus in total consumption ratio of fertilizers in relation to potash was 2.33 kg/ha in period I (1981-82 to 1990-91) which rise to 2.81 kg/ha in period II (1991-92 to 2000-01) and it also decreased to 2.43 kg/ha in period III (2001-02 to 2012-13). The average share of nitrogen in total consumption ratio of fertilizers in relation to phosphorus was the highest in period II with 2.94 kg/ha of nitrogen followed by period I (2.77 kg/ha) and period III (2.42 kg/ha). Overall (1981-81 to 2012-13) the average share of nitrogen and phosphorus in total consumption ratio of fertilizers in relation to potash was 6.8 kg/ha and 2.51 kg/ha respectively. Whereas, the share of nitrogen in relation to phosphorus was 2.69 kg/ha. Overall (1981-82 to 2012-13) the growth rate in share of nitrogen and phosphorus in relation to potash was -0.56 per cent and 0.25 per cent respectively, where as growth rate of share of nitrogen in consumption ratio of fertilizers in relation to phosphorus shown negative growth rate of -0.80 per cent with one per cent level of significance. This disparities of share of different fertilizer products in total consumption due to unawareness about proper application of fertilizers to the farmers, variations in the cost of the fertilizer products, variations in state subsidies for different nutrients etc.

Growth rate and co-efficient of variation of season-wise consumption of N, P_2O_5 and K_2O

Growth rate and co-efficient of variation of season-wise consumption of N, P_2O_5 and K_2O (1981-82 to 2012-13) have

been presented in Table 3. In period I (1981-82 to 1990-91) the average consumption of nitrogenous fertilizer in kharif was 26.83 lakh M.T. which rose to 47.81 lakh M.T. and 66.11 lakh M.T. in period II (1991-92 to 2000-01) and period III (2001-02 to 2012-13) respectively. The average consumption of phosphorus fertilizers in kharif increased about 16.51 lakh M.T and 31.37 lakh M.T. in period II and III respectively which was only 8.84 lakh M.T. in period I. The average consumption of potassic fertilizers in kharif is very low compared to nitrogenous and phosphorus fertilizers. The highest average consumption of potassic fertilizer in kharif was recorded in period III (12.41 lakh M.T.) followed by period II (6.4 lakh M.T.) and period I (4.3 lakh M.T.) The total average NPK consumption in kharif is increased about more than twice, which is 39.98 lakh M.T. in period I to 109.89 lakh M.T. in period III. Overall (1981-82 to 2012-13) the average consumption of nitrogenous, phosphorus and potassic fertilizers in India during kharif was 48.12 lakh M.T., 18.43 lakh M.T. and 7.4 lakh M.T., respectively.

In period I (1981-82 to 1990-91) the average consumption of nitrogen fertilizer in rabi was 32.22 lakh M.T. which rose to 51.83 lakh M.T. and 77.87 lakh M.T. in period II (1991-92 to 2000-01) and period III (2001-02 to 2012-13) respectively. The average consumption of phosphorus fertilizers in rabi increased about 18.10 lakh M.T and 32.27 lakh M.T. in period II and III respectively which was only 12.75 lakh M.T. in period I. The average consumption of potassic fertilizers in during rabi was very low compared to nitrogenous and phosphorus fertilizers. The highest average consumption of potassic fertilizer during rabi was recorded in period III (14.85 lakh M.T.) followed by period II (6.36 lakh M.T.) and period I (4.81 lakh M.T.). The total average NPK consumption during rabi was increased about more than twice, which is 49.79 lakh M.T. in period I to 125.00 lakh M.T. in period III. Overall (1981-82 to 2012-13) the average consumption of nitrogenous, phosphorus and potassic fertilizers in India during rabi was 53.61 lakh M.T., 20.97 lakh M.T. and 8.5 lakh M.T., respectively.

Overall (1981-82 to 2012-13) the growth rate of nitrogen, phosphorus and potash during kharif season shown positive growth rate of 4.60 per cent, 6.01 per cent and 4.72 per cent respectively with one per cent level of significance, whereas during rabi the growth rate of same nutrients was 3.99 per cent, 4.45 per cent and 5.08 per cent respectively. The highest growth rate in NPK consumption during both kharif and rabi together recorder in period I (8.01 per cent.), followed by period III (5 per cent) and period II (4.53 per cent).

The results show that during the early 1980s kharif season accounted for less than 45 per cent of total fertilizer consumption. Whereas rabi crops accounted for much larger share. This has now changed and consumption was more evenly spread between the two seasons. Growth rate in consumption of fertilizers was positive in both the seasons during the last three and half decades, with more pronounced growth in Kharif season. The fertilizer consumption during kharif season grew at an annual compound growth rate of 10.6, 5.0 and 5.7 per cent during the 1980s, 1990s and 2000s. In contrast, fertilizer consumption in rabi season increased by 6.19, 4.1, and 4.39 per cent during the same period, lower than kharif season growth rates. Accordingly, *kharif:rabi* ratio in total consumption changed from 38:62 during 1981-82 to 49:51 during 2012-13. This might be due to better irrigation facilities and diversification of crops from food to cash crops during kharif season.

Growth rate in fertilizer consumption and food grains production

The growth rates in consumption of fertilizers and foodgrains during different time periods at all-india level has been presented in Table 4. The table shows that fertilizer consumption increased by more than 19 per cent in the pre-green revolution period (1950-51 to 1966-67) while foodgrains production increased by only 2.56 per cent.

In the post-green revolution period, fertilizer use increased by 9.9 per cent per year during the first phase of green revolution (1967-68 to 1980-81). There was a increased foodgrains production from 95.5 million tonnes in 1967-68 to about 130 million tonnes in 1980-81 at an annual compound growth rate of 2.27 per cent. However, foodgrains productivity increased at a faster rate (1.87%) in the first phase of green revolution compared with pre-green revolution period (1.45%). During the second phase of green revolution (1981-82 to 1990-91), total fertilizer consumption was increased an annual growth rate of 7.39 per cent. Per hectare fertilizer consumption more than doubled from 34.3 kg in 1981-81 to 69.8 kg in 1991-92. Total foodgrains production increased by about 2.8 per cent. The impressive growth of consumption of fertilizer in India in the post-green revolution period ensured increased in foodgrains production from 74.3 million tonnes in 1966-67 to 176.4 million tonnes during 1990-91.

The impact of slow growth of fertilizer consumption on growth of foodgrains production and crop output in the post-reforms period was quite evident from growth rates presented in Table 4. In post-reforms period (1991-92 to 2009-10) growth rate in fertilizer consumption was 3.98 per cent compared with over 8.75 per cent during 1966-67 to 1991-92. Total fertilizer consumption recorded the lowest growth (1.35%) during the 9th five year plan compared with about 7.57 per cent and 5.52 per cent during 10th and 11th five year plan respectively.

There seems to be a very high positive association between growth rates of fertilizer consumption and foodgrains production. During 8th plan period fertilizer consumption increased at an annual growth rate of about 4.51 percent and foodgrains production increased by 1.26 percent. Fertilizer consumption growth rate fell to 1.35 per cent during 9th plan and foodgrains production growth rate also declined to -2.87 per cent. During 10th five year plan, fertilizer consumption grew by 7.57 per cent and foodgrains production growth rate increased to about 2.52 per cent. The growth rate of total fertilizer consumption declined to 5.52 per cent in 11th five year plan, but the growth rate of per hectare fertilizer consumption, foodgrains production and yield of foodgrains increased at 7.55 per cent, 2.77 percent and 2.90 per cent respectively. In the post-reforms period (1991-92 to 2009-10) growth rate in fertilizer consumption turned out to be less than half of what was achieved during the post-green revolution period (1966-67 to 1991-92). Similar trend was observed in the case of foodgrains production. Growth rate in foodgrains production declined to about half (1.33%) during 1991-92 to 2009-10 compared with 2.65 per cent during 1967-68 to 1991-92

Production of fertilizer

Chemical fertilizers have been an important element of Indian agriculture. However, there have been wide variations in the fertilizers production over the periods. The Nutrient-wise production of fertilizer materials, Sector-wise production of nitrogenous and phosphatic fertilizers in India has been discussed below.

Nutrient-wise production of fertilizer materials in India

Growth rate and co-efficient of variation of nutrient-wise production of fertilizer materials in India (1981-82 to 2012-13) has been presented in Table 5. In period I (1981-82 to 1990-91) the average production of nitrogenous fertilizer is 49.62 lakh M.T. which rose to 89.7 lakh M.T. and 122.09 lakh M.T. in period II (1991-92 to 2000-01) and period III (2001-02 to 2012-13) respectively. There is a more than 2 times increase in the average production of nitrogen in period III compared to period I. The average production of phosphorus fertilizers increased about 27.55 lakh M.T and 39.71 lakh M.T. in period II and III respectively which was only 15.09 lakh M.T. in period I. Potassic fertilizers are not produced in India, so production is nil. The total average N and P production is increased about more than twice, which was 64.71 lakh M.T. in period I to 161.80 lakh M.T. in period III. Overall (1981-82 to 2012-13) the average production of nitrogenous and phosphorus fertilizers in India was 89.32 lakh M.T. and 28.22 lakh M.T. respectively. Overall (1981-82 to 2012-13) the growth rate of production of nitrogen and phosphorus were shown positive growth rate of 4.52 per cent and 4.77 per cent respectively with one per cent level of significance. The increase in the growth of fertilizer production over the period mainly because of technology initiated during the period to achieve more food grains production by applying more fertilizer to meet the needs of growing population. Farmers are realizing the importance of complex fertilizers as they supply more than one nutrients when compared to straight fertilizer. On the other hand the demand for chemical fertilizers increasing year by year.

Sector-wise production of nitrogenous and phosphatic fertilizers in India

Sector-wise Production of nitrogenous and phosphatic fertilizers in India (2000-2001 to 2012-2013) presented in a Table 6. The production of nitrogenous and phosphorus fertilizers (all the sectors together) in 2000-01 was 147.05 lakh M.T. which rose to 157.34 lakh M.T. in 2012-13 with the

growth rate of 0.85 per cent (five per cent level of significance). The sectoral production of nitrogenous fertilizers from 2000-01 to 2012-13, the private sector ranks first which was having the average production of 527.2 lakh M.T. followed by co-operative sector (305.8 lakh M.T.) and public sector (303.6 lakh M.T.). Whereas, in the production of phosphatic fertilizers again the private sector ranks first with average production of 265.1 lakh M.T. followed by co-operative sector (102.0 lakh M.T.) and public sector (2.94 lakh M.T.).

The growth rate of production of nitrogenous fertilizers by all the sectors together was 1.09 per cent with one per cent level of significance, where as public, co-operative and private sectors were 0.46 per cent, 2.54 per cent (one per cent level of significance) and 0.63 per cent respectively. The growth rate of production of phosphorus fertilizers by all the sectors together was 0.13 per cent. Whereas, the production of phosphorus fertilizers by the public and private sectors were shown negative growth rates of -7.15 per cent (one per cent level of significance) and -0.73 per cent respectively, and the growth rate of production of phosphorus fertilizers by co-operative sector was 5.02 per cent (one per cent level of significance).

The instability index of sector-wise and nutrient-wise production was presented in a Table 6. The growth of production of nitrogenous fertilizers by co-operative sector was less stable (10.1 per cent), followed by public sector and private sector with instability index of 4.23 per cent and 5.17 per cent respectively. whereas the growth of production of phosphorus fertilizers by public sector was less stable (43.66 per cent), followed by co-operative sector and private sector with the instability index of 20.81 per cent and 10.59 per cent respectively. The total fertilizer production (N and P) by all the sectors together were having the instability index of 5.02 per cent, in which instability index of production of total nitrogen was 5.23 per cent and phosphorus was 7.76 per cent by all the three sectors together.

Table 1: Growth rate and co-efficient of variation of nutrient-wise consumption of fertilizer materials in India (1981-82 to 2012-13)

Periods	Nutrients	Average (Lakh M.T)	CAGR (%)	CV (%)
Period I (1981-82 to 1990-91)	Nitrogen	58.71	7.40**	22.25
	Phosphorus	21.61	10.14**	29.62
	Potash	9.11	7.04**	22.96
	Total	89.43	8.01**	24.00
Period II (1991-92 to 2000-01)	Nitrogen	99.65	4.15**	12.57
	Phosphorus	34.69	5.51**	21.16
	Potash	12.41	5.06*	21.49
	Total	146.75	4.53**	14.34
Period III (2001-02 to 2012-13)	Nitrogen	140.33	5.14**	18.27
	Phosphorus	57.82	6.12**	21.23
	Potash	24.33	5.15*	26.54
	Total	222.48	5.47**	15.43
Overall (1981-82 to 2012-13)	Nitrogen	102.04	4.35**	37.92
	Phosphorus	39.19	5.08**	46.79
	Potash	15.85	4.86**	52.26
	Total	157.08	4.59**	40.72

Source: Indian fertilizer scenario, Department of Fertilizers, Ministry of Chemicals and Fertilizers, GOI, 2013.

Note: ** Significant at 1 per cent level, * Significant at 5 per cent level

Table 2: Growth rate and co-efficient of variation of consumption ratio of fertilizers in India (1981-82 to 2012-13)

Periods		Nutrients	Average (Kg/ha)	CAGR (%)	CV (%)
Period I (1981-82 to 1990-91)	N and P ₂ O ₅ in relation to K ₂ O	Nitrogen	6.43	0.36	6.13
		Phosphorus	2.33	3.05**	10.32
	N in relation to P ₂ O ₅	Nitrogen	2.77	- 2.35**	7.42
Period II (1991-92 to 2000-01)	N and P ₂ O ₅ in relation to K ₂ O	Nitrogen	8.24	-0.85	16.15
		Phosphorus	2.81	0.71	9.10

	N in relation to P ₂ O ₅	Nitrogen	2.94	-1.22	13.71
Period III (2001-02 to 2012-13)	N and P ₂ O ₅ in relation to K ₂ O	Nitrogen	5.92	-0.78	19.27
		Phosphorus	2.43	0.86	16.18
	N in relation to P ₂ O ₅	Nitrogen	2.42	-1.61*	8.45
Overall (1981-82 to 2012-13)	N and P ₂ O ₅ in relation to K ₂ O	Nitrogen	6.80	-0.56	20.94
		Phosphorus	2.51	0.25	14.45
	N in relation to P ₂ O ₅	Nitrogen	2.69	-0.80**	13.06

Source: Fertilizer Statistics, FAI, (2014).

Note: ** Significant at 1 per cent level, * Significant at 5 per cent level

Table 3: Growth rate and co-efficient of variation of season-wise consumption of N, P₂O₅ and K₂O (1981-82 to 2012-13)

Periods	Nutrients	Average (000 Tonne)			CAGR (%)			CV (%)		
		Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
Period I (1981-82 to 1990-91)	Nitrogen	2683.75	3222.40	5871.10	9.14**	5.54**	7.40**	26.47	18.00	22.25
	Phosphorus	884.24	1275.94	2160.19	12.97**	8.34**	10.14**	37.11	24.84	29.62
	Potash	430.32	481.62	911.95	9.36**	5.15**	7.02**	29.02	18.88	22.90
	Total	3998.31	4979.96	8943.24	10.60**	6.19**	8.01**	30.23	19.70	24.00
Period II (1991-92 to 2000-01)	Nitrogen	4781.61	5183.53	9966.15	5.24**	3.18**	4.15**	15.56	10.06	12.57
	Phosphorus	1651.78	1810.06	3467.85	5.39**	5.65**	5.51**	21.53	22.28	21.15
	Potash	604.61	636.71	1241.33	2.50**	7.80**	5.06**	20.40	29.24	21.50
	Total	7038.00	7630.30	14675.33	5**	4.1**	4.53**	15.86	13.43	14.34
Period III (2001-02 to 2012-13)	Nitrogen	6611.20	7787.47	14886.57	5.02**	4.78**	4.80**	14.00	12.78	12.80
	Phosphorus	3137.35	3227.44	6364.79	9.09**	4.13**	6.42**	26.81	13.35	19.19
	Potash	1241.24	1485.59	2726.84	1.86**	2.20**	2.25**	29.01	23.85	22.27
	Total	10989.79	12500.50	23978.20	5.7**	4.39**	5.00**	16.47	12.56	14.22
Overall (1981-82 to 2012-13)	Nitrogen	4812.13	5361.41	10162.91	4.60**	3.99**	4.30**	39.00	35.63	37.33
	Phosphorus	1843.18	2097.10	3940.28	6.01**	4.45**	5.14**	55.49	41.26	47.26
	Potash	740.88	851.00	1591.89	4.72**	5.08**	4.92**	52.67	55.21	52.23
	Total	7396.19	8309.51	15695.08	5.05**	4.22**	4.58**	43.65	38.26	40.65

Source: Fertilizer Statistics, FAI, (2014).

Note: ** Significant at 1 per cent level

Table 4: Growth rate in fertilizer consumption and food grains production (1950 to 2012)

Period	Growth rate in fertilizer Consumption (%)		Growth rate in food grains (%)	
	Total	Per ha.	Production	Yield
Pre-green revolution period (1950-51 to 1966-67)	19.41	18.11	2.56	1.45
Post-green revolution period	8.75	8.49	2.65	2.53
Phase I (1967-68 to 1980-81)	9.90	9.29	2.27	1.87
Phase II (1981-81 to 1991-92)	7.39	6.61	2.77	3.13
Post reforms Period (1991-92 to 2009-12)	3.98	3.69	1.33	1.38
8 th Five Year Plan (1992 to 1997)	4.51	5.63	1.26	1.10
9 th Five Year Plan (1997 to 2002)	1.35	0.43	-2.87	-0.98
10 th Five Year Plan (2002 to 2007)	7.57	7.40	2.52	2.05
11 th Five Year Plan (2007 to 2012)	5.52	7.55	2.77	2.90

Source: Fertilizer Statistics, FAI, (2012).

Agricultural Statistics at a Glance, Ministry of Agriculture, GOI, (2013).

Table 5: Growth rate and co-efficient of variation of nutrient-wise production of fertilizer materials in India (1981-82 to 2012-13)

Periods	Nutrients	Average (Lakh Tonne)	CAGR (%)	CV (%)
Period I (1981-82 to 1990-91)	Nitrogen	49.62	10.47**	30.16
	Phosphorus	15.09	10.17**	30.02
	Potash	0.00	0.00	0.00
	Total	64.71	10.41**	29.93
Period II (1991-92 to 2000-01)	Nitrogen	89.70	5.53**	16.85
	Phosphorus	27.55	5.86**	20.44
	Potash	0.00	0.00	0.00
	Total	117.25	5.59**	17.42
Period III (2001-02 to 2012-13)	Nitrogen	122.09	2.79*	26.09
	Phosphorus	39.71	0.02	8.21
	Potash	0.00	0.00	0.00
	Total	161.80	2.16	20.39
Overall (1981-82 to 2012-13)	Nitrogen	89.32	4.52**	42.15
	Phosphorus	28.22	4.77**	39.75
	Potash	0.00	0.00	0.00
	Total	117.54	4.60**	40.57

Source: Indian fertilizer scenario, Department of Fertilizers, Ministry of Chemicals and Fertilizers, GOI, 2014.

Agricultural Statistics at a Glance, Ministry of Agriculture, GOI, (2013).

Note: ** Significant at 1 per cent level, * Significant at 5 per cent level

Table 6: Sector-wise production of nitrogenous and phosphatic fertilizers in India (2000-2001 to 2012-2013), ('000 MT)

Year	Nitrogen (N)				Phosphate (P)				Grand Total
	Public Sector	Co-operative Sector	Private Sector	Total (Nitrogen)	Public Sector	Co-operative Sector	Private Sector	Total (Phosphate)	
2000-01	3219.7	2632.9	5109.2	10961.8	626.8	664.0	2452.1	3743.3	14705.1
2001-02	2879.5	2691.8	5196.7	10768.0	479.4	793.3	2587.3	3860.0	14628.0
2002-03	2854.1	2800.9	4906.5	10561.5	307.4	949.5	2647.3	3904.2	14465.7
2003-04	3007.9	2797.3	5130.5	10935.7	353.3	778.7	2668.4	3800.4	14736.1
2004-05	3051.0	2901.7	5382.5	11335.2	266.3	938.3	2862.7	4067.3	15402.5
2005-06	2958.6	2958.3	5437.6	11354.5	294.9	1035.8	2890.6	4221.0	15575.8
2006-07	3046.7	3004.3	5526.9	11577.9	232.7	1129.7	3154.8	4517.2	16095.1
2007-08	2887.0	3031.0	4982.0	10900.0	161.4	969.2	2676.7	3807.3	14707.3
2008-09	2925.2	3133.0	4811.5	10869.7	191.7	916.2	2356.4	3464.3	14334.0
2009-10	3118.1	3404.3	5378.0	11900.4	227.7	1194.1	2899.1	4320.9	16221.3
2010-11	3166.7	3459.1	5530.8	12156.6	227.2	1287.7	2707.8	4222.7	16379.3
2011-12	3176.6	3353.0	5729.1	12258.7	237.3	1329.8	2536.6	4103.7	16362.4
2012-13	3185.0	3592.2	5416.8	12194.0	223.0	1284.6	2033.1	3540.7	15734.7
Mean (000 Tonnes)	3036.62	3058.44	5272.16	11367.23	294.54	1020.83	2651.76	3967.14	15334.41
CAGR (%)	0.46	2.54**	0.63	1.09**	-7.15**	5.02**	-0.73	0.13	0.85*
CV (%)	4.23	10.10	5.17	5.23	43.66	20.81	10.59	7.76	5.02

Source: Fertilizer Statistics, FAI,(2012).

Note: ** Significant at 1 per cent level, * Significant at 5 per cent level

Conclusion

Over the last three and half a decades, production and consumption of fertilizers has increased significantly, wherein latter growth was more pronounced. The country witnessed an increase in the consumption of NPK. The consumption of fertilizer during kharif and rabi showed a positive and significant growth. The sectoral production of nitrogenous fertilizers from 2000-01 to 2012-13, the private sector ranks first which was having the average production of 527.2 lakh M.T. followed by co-operative sector (305.8 lakh M.T.) and public sector (303.6 lakh M.T.). The domestic markets need to be insulated from world markets. Therefore it is necessary to encourage domestic capacity additions and adequate & efficient distribution network to achieve self-sufficiency in fertilizer production in the country. The non-price factors mainly area under HYV crops and area under irrigation were the most important factors affecting fertilizer consumption in the country. Therefore, important measures required to increase consumption of fertilizers include development of irrigation facilities with better water use efficiency

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