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Fertilizer usage for Sustainable Agriculture: Study

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Abstract: This Paper tries to analyze the pattern of fertilizer use for sustainable agriculture. It is found that the role of fertilizer in increasing agricultural productivity, share in GDP extension of agriculture has paramount importance because Fertilizer considered as nutrient to the land of the country. India is one of the largest producers of fertilisers in the world next to China and USA and the second largest consumer after China.

Key words: agricultural strategy, high yield varieties, and Food grain

Introduction: During 1960s, the new agricultural strategy improved the way in which the inputs are effectively combined and agricultural operations managed so as to get maximum returns. Specifically, the new agricultural technology encompasses the use of high yielding variety seeds fertilizers, manures, pesticides, machines etc. Of the various components of agricultural technology, use of fertilizer is most important in boosting agricultural production and productivity. Introduction of HYVs and hybrid varieties brought optimism about fertilizer response superiority of modern varieties. Fertilizer is a substance to soil to improve plants' growth and yield. As of now, the country has achieved near self-sufficiency in production capacity of urea and DAP, with the result, India could manage its requirement of these fertilizers from indigenous industry. Since the adoption of the New Agricultural Strategy in the sixties the consumption of chemical fertilizers has been growing rapidly, because the Government has been promoting the consumption of fertilizers through heavy subsidies.

Growth of fertilizer industry

The fertilizer industry achieved phenomenal growth in eighties and now there are 34 static and 17 mobile laborites with capacity to analyze six lakh samples per annum and utilizing 73 percent of capacity of them. The highest utilization was 11.33 per cent in 2012-13 and lowest was 93.3 per cent. It was 100.5 per cent and 85.5 per cent in case of private sector. The Nitrogen (n) capacity of public, private and cooperative sectors was varied 89.6 percent to 101.8 percent in 2001-02 and 2012-13 and phosphate capacity varied from 58.5 percent in 2013-14 to 87.1 percent in 2000-01. Private sector has dominated place in this regard. Ultimately, this sector has a fluctuated trend during the study period. Table 1 explains the fertilizer consumption VIS-A-VIS food grain production and Fertilizers Consumption and Food grain Production ratio (in Million MT) during 1991-92 to 2013-14 in India

Table 1 Fertilizer consumption VIS-A-VIS Food grain production

Year	Fertilizers Consumption in Nutrients (in lakh MT)	Foodgrain Production (In Million MT)	Fertilizers Consumption and Food grain Production ratio (In Million MT)*
1991-92	127.28	168.4	1:0.76
1992-93	121.55	179.5	1:0.68
1993-94	123.66	184.3	1:0.67
1994-95	135.63	189.0	1:0.72
1995-96	138.77	180.4	1:0.77
1996-97	143.08	199.4	1:0.72
1997-98	161.88	192.3	1:0.84
1998-99	167.98	203.6	1:0.83
1999-00	180.69	209.8	1:0.86
2000-01	167.02	196.8	1:0.85
2001-02	173.59	212.9	1:0.82
2002 -03	160.94	174.78	1:1.09
2003-04	167.99	213.19	1:1.27
2004-05	183.98	198.36	1:1.08
2005-06	203.4	208.6	1:1.03
2006-07	216.52	217.28	1:1.00
2007-08	225.7	230.78	1:1.02
2008-09	249.09	234.47	1:0.94
2009-10	260.86	218.2	1:0.84
2010-11	281.22	244.5	1:0.87
2011-12	277.90	259.3	1:0.93
2012-13	255.36	257.0	1:1.01

Source: Various Economic Surveys and Ministry of Chemicals and Fertilizers, Government of India * calculations

The results of input (fertilizer) usage and agricultural food production shows that during 1991-92 to 2001-02 recorded at less than one i.e., output of food grains is less than that the fertilizer usage quantity at one. It is varied from 1:0.67 in 1993-94 to 1:0.86 in 1999-00. Later, up to 2007-08, the ratio of input output was recorded more are equal to one. It is varied from 1:1.00 in 2006-07 and 1:1.27 in 2003-04. Meanwhile, the ratio was declined to less than one until 2011-12 due to fluctuation in the agricultural production. However, it is observed that the food rain production has been increased with increase in usage of fertilizer.

Growth Rates in Fertiliser Consumption and Foodgrains Production

The growth rates in consumption of fertilisers and foodgrains during different time periods at all-India level

are given in Table 2. The table shows that fertiliser 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. The reason for such a high growth in fertiliser consumption was that consumption in the base year (1950-51) was very low. This significant increase in total fertiliser consumption increased per hectare fertiliser use from less than one kg in 1951-52 to about 7 kg in 1966-67.

In the post-green revolution period, fertiliser use increased by 9.9 per cent per year during the first phase of green revolution (1967-68 to 1980-81) when spread of high yield varieties was limited to mainly Punjab, Haryana, western part of Uttar Pradesh and some southern states. Per hectare fertilizer consumption increased from 9.4 kg in 1967-68 to 31.9 kg in 1980-81. Increase in fertilizer use along with increase in area under irrigation and high yielding varieties 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), when technology spread to other parts of the country, total fertiliser consumption increased an annual growth rate of 7.39 per cent. Per hectare fertiliser consumption more than doubled from 34.3 kg in 1981-82 to 69.8 kg in 1991-92.

Total foodgrains production increased by about 2.8 per cent. The impressive growth of consumption of fertiliser in India in the post-green revolution period ensured increase in foodgrains production from 74.3 million tonnes in 1966-67 to 176.4 million tonnes during 1990-91. However, in 1991-92, certain policy reforms were initiated in fertiliser sector as part of macro-economic reforms. Total fertiliser consumption declined from about 12.7 million tonnes in 1991-92 to 12.1 million tonnes in 1992-92. Similarly, per hectare fertiliser use also declined from 69.84 kg in 1991-92 to 65.45 kg in 1992-93. This reduction was more pronounced in case of phosphatic and potassic fertilisers. Total P consumption fell by about 14 per cent (from 3321.2 thousand tonnes in 1991-92 to 2843.8 thousand tonnes in 1992-93) and K by 35 per cent (1360.6 thousand tonnes in 1991-92 to 883.9 thousand tonnes in 1992-93). Similar trend was observed in case of per hectare fertiliser consumption. Due to introduction of concession scheme on decontrolled phosphatic and potassic fertilisers in 1992-93, fertiliser consumption started picking up and reached a level of 18.1 million tonnes in 1999-00, declined to 16.7 million tonnes in 2000-01 and remained below this level up to 2003-04. Per hectare fertilizer consumption reached a level of 95.89 kg in 1999-00 but remained below this level during the next four years. Last six years viz., 2004-05 to 2009-10 have seen

significant recovery in fertiliser use in the country and total consumption reached a record level of 26.5 million tonnes and per hectare consumption at 135.25 kg in 2009-10.

The impact of slow growth of fertiliser consumption on growth of foodgrains production and crop output in the post-reforms period is quite evident from growth rates presented in Table 2. In post-reforms period (1991-92 to 2009-10) growth rate in fertiliser 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 during 10th plan. There seems to be a very high positive association between growth rates of fertiliser consumption and foodgrains production. During 8th plan period fertiliser consumption increased at an annual growth rate of about 4.51 per cent and foodgrains production increased by 1.26 per cent. Fertiliser 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, fertiliser consumption grew by 7.57 per cent and Foodgrains production growth rate increased to about 2.52 per cent. 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).

Table 2 Growth rate in fertilizer consumption and food grains production

Period	Growth rate in fertilizer Consumption (%)		Growth rate in Foodgrains (%)	
	Total	Per ha.	Production	Yield
Pre-green revolution period (1950-51 – 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 – 1980-81)	9.90	9.29	2.27	1.87
Phase II (1981-82– 1991-92)	7.39	6.61	2.77	3.13
Post-reforms Period (1991-92 to 2009-10)	3.98	3.69	1.33	1.38
8th Five Year Plan	4.51	5.63	1.26	1.10
9th Five Year Plan	1.35	0.43	-2.87	-0.98
10th Five Year Plan	7.57	7.40	2.52	2.05
11th Five Year Plan				
12th Five Year Plan				

Source: Fertilizer Association of India (2010)

Conclusion: The average intensity of fertiliser use in India at national level is still much lower than in other developing countries but there are many disparities in fertiliser consumption patterns both between and within

regions of India. Therefore, in order to ensure self-sufficiency in foodgrains production in the country, availability of fertilizers at affordable prices to the producers is of utmost importance. The government should give due importance to non-price factors like better seeds, irrigation, credit, etc. to increase fertiliser use in the country.

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