ReSAKSS asia
FACILITATED BY IFPRI

POLICY NOTE 08 | NOVEMBER 2014

The Role of Fertilizers in Transforming of Agriculture in Asia

A CASE STUDY OF INDIAN FERTILIZER SECTOR

Vijay Paul Sharma

INTRODUCTION

The contribution of chemical fertilizers towards increased agricultural production is well established. Indian agricultural policy focused on increasing productivity and modern inputs such as improved seeds (HYVs), irrigation, chemical fertilizers, etc. have played an important role in increasing crop production and productivity. Increased fertilizer use will continue to play an important role in increasing agricultural productivity given the diminishing land available for cultivation. Therefore, it is important to understand fertilizer use patterns and efficiency over time, the changing structure of fertilizer markets, the current policy environment and the role of various factors influencing fertilizer consumption. This brief is an attempt to address some of these issues.

EVOLUTION OF FERTILIZER POLICY

The fertilizer policy environment can be broadly classified into four periods:

Table 1: Summary of Fertilizer Policy Regimes

Regime	Period	Characteristics
Pre-RPS	up to mid-1970s	A state controlled fertilizer pool was established to ensure equitable distribution of fertilizers, and due to shortages, the Fertilizer Control Order under the Essential commodities Act (ECA) was passed to regulate sales, prices and quality of fertilizers.
RPS Period	mid-1970s to 1980s	The Government of India constituted Fertilizer Pricing Committee (Marathe Committee) recommended the Retention Pricing Scheme (RPS). Under the RPS Retention Price (cost of production as assessed by the Government plus 12% post-tax return on networth) was fixed for each fertilizer unit by the government and the difference between the Retention Price and the statutorily notified sale price was paid as subsidy.
Post-Reforms Period		
Partial decontrol of fertilizers	1992-2003	Based on the recommendations of the Joint Parliamentary Committee on Fertilizer Pricing, pricing, movement and distribution of all phosphatic and potassic fertilizers was decontrolled from 25th August 1992. Due to significant increase in P & K prices, the Government of India introduced concessions on DAP, MOP and NP/NPK fertilizers to promote balanced use of nutrients from 1992-93 and this policy intervention led to decline in prices of many P, K and complex fertilizers.
New Pricing Scheme (NPS) for Urea	2003	The High Powered Fertilizer Pricing Policy Review Committee (HPC) and Expenditure Reforms Commission (ERC) recommended dismantling of existing RPS and the introduction of a Concession Scheme for urea units based on feedstock used and the vintage of plants to rationalize fertilizer subsidies. The New Pricing Scheme (NPS) for urea was introduced from 1st April, 2003 to be implemented in three Phases.
Nutrient Based Subsidy	2010 onwards	The 'Nutrient Based Subsidy' policy was introduced in 2010 by fixing subsidies on major nutrients i.e. N, P, K & S. To discourage exports and smuggling, and the subsidy paid thereon, the Government has put the export of fertilizers in the restrictive category. In order to limit high P and K prices, the government introduced the Reference Maximum Retail Price in June 2013 and mandated companies to fix MRPs based on the reference prices.

TRENDS IN TOTAL FERTILIZER USE

Beginning in 1966 at the onset of the green revolution, national fertilizer consumption was about 1 million tons. Since then the demand for fertilizer has grown exponentially and India is now the second largest consumer of fertilizers in the world with estimated consumption of 28.1 million tons in 2010, after China (49.8 million tons). The country accounted for 15.8 percent of the world's Nitrogen consumption, 19.9 percent of phosphatic fertilizers (P_2O_5) and 12.7 percent of potassic (K_2O) nutrients in 2008 (FAI, 2012).

The usage of different types of nutrients and fertilizer types is a reflection of the pricing policy developed by the government as described above. Nitrogen fertilizer has generally been the primary nutrient used but policy efforts to increase the usage of P and K fertilizers during the last decade through the Nutrient Based Subsidy (NBS) led to more balanced applications but deteriorated after introduction of nutrient based subsidy scheme, which led to steep increase in prices of phospahtic and potassic fertilizers and consequently reduction in their demand (Table 2). Urea is by far the most widely used fertilizer product in India, and along with other straight nitrogen fertilizers such as ammonium sulphate (AS), ammonium chloride (ACl), they make up over 60 percent of total market share. NP/NPK complex fertilizers (excluding DAP) are the second largest products accounting for about 14 percent of market share, followed by DAP (13.4 percent) and SSP (7.9 percent) (*FAI 2014).*

Table 2—Share (%) of fertilizer products in total sales

Product	1981-82	1991-92	2007-08	2011-12	2013-14
Urea	50.1	47.5	57.1	48.4	59.2
AS/CAN/ACl	6.8	3.5	1.3	1.1	1.3
MOP	8.3	8.0	8.8	5.0	4.3
SSP	8.7	10.9	4.8	7.5	7.9
DAP	5.4	17.2	14.6	18.0	13.4
NP/NPK	20.7	12.8	13.3	20.0	13.9

Source: FAI (2012) and Chanda & Sati (2014)

During the initial phase of the Green Revolution, per hectare fertilizer consumption more than doubled from about 7 kg in 1966-1967 to about 16 kg in 1971-1972, and by the mid-1980s it stood at 50 kg. Average fertilizer consumption was 100 kg per ha in 2005-2006, and reached a record level of 146.3 kg in 2010-2011 and then declined to 128.3 kg in 2012-2013 mainly due to steep increase in prices of phosphatic and potassic fertilizer after introduction of the NBS scheme in 2010-2011 (FAI 2012). Fertilizer consumption in India is highly skewed, with wide inter-regional, inter-state, inter-district and inter-crop variations. Intensity has generally been higher in the northern (192.3 kg/ha) and southern regions (153.2 kg/ha) and lower in the western (84.6 kg/ha) and eastern regions (161.1 kg/ha). The sustained growth in intensity of fertilizer use during the last 3-4 decades, however is apparent in all the regions (FAI 2012).

Rice was the largest user of fertilizer (about one third of total consumption), followed by wheat (24.2 percent) in 2006-2007. Fruits, vegetables, and sugarcane combined to represent another 11 percent of fertilizer use. Cotton accounts for about 5.6 percent of total use. Fertilizer intensity measured as average kg per hectare does not follow exactly the same pattern across crops; intensity tends to be higher on sugarcane (234.9 kg/ha), vegetables (253.8 kg/ha), cotton (183 kg/ha) and fruits (158.6 kg/ha) and lower on cereals (rice 129.2 kg/ha and wheat 162.6 kg/ha) and pulses. It is evident that farmers growing higher-value cash crops are the main beneficiary of fertilizer use (GoI 2007; 2008; 2012).

Table 3—Share of usage of fertilizer nutrients (N+P+K) by various crop groups (% share)

Crop	1996-97	2001-02	2006-07
Rice	36.5	36.8	32.6
Wheat	24.2	23.8	24.2
Pulses	1.4	3.0	3.3
Total Foodgrains	69.8	71.9	69.1
Oilseeds	7.9	8.6	9.5
Cotton	5.4	2.9	5.6
Sugarcane	4.9	5.1	5.6
Fruits & Vegetables	1.8	5.4	5.7
Other Crops	10.2	6.1	13.6

Source: GoI (2007), GoI (2008) and GoI (2012)

Average fertilizer consumption per hectare of gross cropped area was the highest (139.74 kg) on marginal farms and the lowest on large farms (67.64 kg) in 2006-2007. Moreover there has been a significant increase in fertilizer intensity on all farm size holdings between 1991-1992 and 2006-2007. However, the increase was the largest on small farms (95.9 percent), followed by marginal holdings (93.5 percent) and the lowest (47 percent) on large farms.

Table 4—Fertilizer consumption per hectare of gross cropped area (kg)

	Marginal	Small	Semi-medium	Medium	Large	All
1991-92	72.2	65.5	61.7	56.3	46.0	60.7
1996-97	103.8	82.6	75.3	68.1	51.1	77.1
2001-02	126.2	100.6	88.8	75.8	55.9	92.6
2006-07	139.7	128.3	108.3	95.1	67.6	112.8

Source: GoI (2007, 2008, 2012)

STRUCTURE OF THE FERTILIZER INDUSTRY

At present, there are 30 large size urea plants in the country manufacturing urea, 21 units produce DAP and complex fertilizers and 2 units manufacture Ammonium Sulphate as a by-product. Besides these, there are 97 medium and small scale units in operation producing Single Super Phosphate (GoI, 2014). Fertilizer production has grown from 38.7 thousand tons in 1951-52 to 16.4 million tons as of 2010-2011 and marginally declined (15.7 million tons) in 2012-2013.

Fertilizer consumption in India has almost always exceeded domestic production for both nitrogenous and phosphatic fertilizers. While fertilizer imports progressed at a relatively slow pace in the 1980s and 1990s, it quickly accelerated in the 2000s in terms of both the quantity and value of imported fertilizer nutrients (FAI 2012). Fertilizer imports grew at an annual compound growth rate of 9.2 percent during the 1970s and 3.9 percent the following decade. During the 1990s, growth rate in fertilizer imports was almost zero due to negative growth rate in N fertilizer imports. However, fertilizer imports grew at an annual compound growth rate of about 23 percent during the period 2001-2002 to 2011-2012. India mainly imports urea (7.8 million tons), DAP (6.9 million tons) and MOP (about 4 million tons) originating mostly from Oman (36.2 percent), China (22 percent), Iran (17.2 percent) and CIS (12.9 percent).

Currently, over 40 percent (up from about 13 percent in early 2000s) of total fertilizer nutrients used in India is sourced through imports. Capacity to produce more fertilizer in the country is currently limited due to availability and/or cost of raw materials and installed capacity has remained stagnant during the last decade. Several studies have found that the domestic industry, particularly urea, has been over-protected and is less efficient than imports (Gulati and Narayanan 2003), however, empirical evidence demonstrates that the average subsidy per ton of imported urea is much higher than indigenously produced urea, which is contradictory to general perception of over-protection to domestic industry (Sharma and Thaker, 2010).

FERTILIZER MARKETING AND DISTRIBUTION CHANNELS

Fertilizers are produced at 140 locations in the country and distributed among farmers in over 600,000 villages through a network of private sector, cooperative and other institutional agencies. Some quantities are also sold through the manufacturers' own outlets.

Private trade accounts for about 65 percent of the total fertilizers distributed in the country. Institutional agencies including cooperatives account for the remaining 35 percent while marginal quantities are distributed through manufacturers' own outlets. Transportation is a major cost component of fertilizer trade followed by packing and storage (Ramarao 1988, Patra, 2009). Approximately 75 percent of India's fertilizer was transported via railways in 2011-2012, and about 25 percent through road transport. Government subsidies primarily cover costs associated with the movement of fertilizers from port or plant by rail to various rake points.

FACTORS AFFECTING FERTILIZER USE AND PRICES

Subsidies were introduced in India as a tool to promote fertilizer use with two main goals: (i) to provide fertilizers to farmers at stable and affordable prices in order to increase agricultural production through higher fertilizer use, and (ii) to encourage domestic production by allowing fertilizer producers a reasonable return on their investments. In order to achieve these objectives, the government introduced the Retention Price cum Subsidy Scheme (RPS) which fixed the retail price of fertilizers making it uniform throughout the country and also ensured assured rate of returns to the manufacturers.

The RPS did increase consumption of fertilizer and brought about the development of a large domestic fertilizer industry and near self-sufficiency but this has been criticized for fostering inefficiency. The mounting burden of subsidies compelled policy planners to make a serious attempt to reform fertilizer price policy. This led to the implementation of the Nutrient Based Subsidy (NBS) Policy from April 1, 2010 for phosphatic, potassic and complex fertilizers and Single Super Phosphate (SSP). This policy has led to a decrease in the share of the subsidy cost in total fertilizer costs for a number of different fertilizer types including DAP and MOP but led to imbalanced use of nutrients. The government has decided that a complete withdrawal of subsidies is not possible and would cause an increase in the market price making fertilizers unaffordable even for large farmers but fertilizer subsidy needs to be rationalized (FAI 2012).

THE WAY FORWARD: FUTURE ROLE OF FERTILIZERS

It is expected that India's available arable land might drop below the current level of about 140 million hectares, if the use of farmland for commercial/non-agricultural purpose is not restricted in the near future. Increasing productivity through the use of modern inputs is therefore necessary. To this end, the Government of India has been consistently pursuing policies conductive to increased availability and consumption of fertilizers in the country.

The fertilizer subsidy has helped to increase the availability and consumption of fertilizers in the country and has increased agricultural production. However, it has also led to some unintended negative consequences such as imbalanced use of nutrients, declining fertilizer use efficiency, and adverse impact of land and water resources in certain areas. The level of government expenditures on subsidies has also not been sustainable. That being said, evidence has shown that withdrawal of subsidies will make farming unprofitable, particularly for small and marginal farmers and in less developed states/regions (Sharma, 2013). There is a need to contain the cost of subsidies to the government without hurting millions of farmers.

Targeting and rationing are two such options. Rationing may be more politically and administratively feasible compared to targeting. The price volatility of both fertilizer imports and domestic production means that the subsidy program will need to be monitored and further refined over time.

REFERENCES

Chnada, T K and Kuldeep Sati (2014), "Review of Production, Despatch and Sale of Nitrogen and Phosphatic Fertilizers in India during 2013-14", Indian Journal of Fertilizers, Vol. 10, No. 7, pp. 16-21.

FAI (2012), "Fertilizer Statistics 2011-12 and earlier issues", The Fertilizer Association of India, New Delhi.

GoI (2007, 2008, 2012), "All India Report on Input Surveys", Agricultural Census Division, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

GoI (2014), "Annual Report 2013-14", Department of Fertilizers, Ministry of Chemicals and Fertilizers, Government of India, New Delhi.

GoI (2014), "Indian Fertilizer Scenario 2013", Ministry of Chemicals and Fertilizers, Government of India, New Delhi.

Gulati Ashok and Sudha Narayanan (2003), "The Subsidy Syndrome in Indian Agriculture" Oxford University Press, New Delhi.

Kumar D.S. (2011), "Improving the Effectiveness, Efficiency and Sustainability of Fertilizer Use in India", Report prepared for the South Asia Regional Network for Economic Research Institutes and the Global Development Network (GDN), Dhaka and New Delhi.

Patra, D. P. (2009), "Logistics Planning for the Fertilizer Sector", FAI Workshop on Business Intelligence, Forecasts and Planning for the Fertilizer Sector, The Royal Plaza, Gangtok, Sikkim, July 12-15, 2009.

Raju, Sunitha. (1989), "Fertilizer Use in Andhra Pradesh: An Analysis of Factors Affecting Consumption", Artha Vijnana, 31 (4).

Ramarao, G.M. 1988, 'Cost Effectiveness in Marketing', Fertilizer News, 33 (8): 23-26.

Sharma Vijay Paul and Hrima Thaker (2010), "Fertilizer Subsidy in India: Who are the Beneficiaries?" Economic and Political Weekly, Vol. XLV, No 12, March 20, 2010, pp. 68-76.

Sharma, Vijay Paul (2013), "Withdrawal of Fertilizer Subsidy: Some Issues and Concerns for Farm Sector Growth in India", Indian Journal of Fertilizers, Vol. 9, No. 5, pp. 16-28.

About the Author

Vijay Paul Sharma is Professor and Chair of the Post Graduate Programme in Agribusiness Management of Centre for Management in Agriculture (CMA) at the Indian Institute of Management, India.

Acknowledgments

This brief was edited by Abigail Childs and Adam Kennedy based on the original paper prepared by the authors for the ReSAKSS-Asia conference entitled "Agricultural Transformation in Asia: Policy Options for Food and Nutrition Security" which took place on September 25–27, 2013 in Siem Reap, Cambodia. The authors benefited considerably from the valuable suggestions of Balu Bumb throughout the development of the paper and the comments received from the conference's participants. Financial support for the conference and the preparations of the paper/brief is from the United States Agency for International Development (USAID).