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Rationalising Fertiliser Subsidy in India: Key Issues and Policy Options

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Abbreviations Used

APM	Administrative Pricing Mechanism
CAGR	Compound Annual Growth Rate
DAP	Di-Ammonium Phosphate
ECA	Essential Commodities Act
ERC	Expenditure Reforms Commission
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FCO	Fertiliser Control Order
FMCO	Fertiliser Movement Control Order
FO/LSHS	Fuel Oil/Low Sulphur Heavy Stock
FY	Financial Year
GCA	Gross Cropped Area
GDP	Gross Domestic Product
GoI	Government of India
HYV	High Yielding Variety
IT	Information Technology
K	Potassic Fertilisers
m-FMS	Mobile Based Fertiliser Monitoring System
MMBTU	Million British Thermal Unit
MMT	Million Metric Tonnes
MOP	Muriate of Potash
MRP	Maximum Retail Price
MT	Metric Tonne
N	Nitrogenous Fertilisers
NBS	Nutrient-based Subsidy
NFSA	National Food Security Act
NPS	New Pricing Scheme
NUE	Nitrogen Use Efficiency
OIL	Oil India Limited
ONGC	Oil and Natural Gas Corporation Limited
P	Phosphatic Fertilisers
PDS	Public Distribution System
PMJDY	Pradhan Mantri Jan Dhan Yojana
PSC	Production-Sharing Contracts
PSE	Producer Support Estimate
PSU	Public Sector Undertakings
RPS	Retention Price Scheme
USA	United States of America
USD	United States Dollar

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Needless to say, the authors are fully responsible for the analysis carried and views expressed in the paper.

Abstract

Given the importance of agriculture in any sizable country to feed its people, most countries have subsidised agriculture in the past, be they developed countries like the United States of America or countries in the European Union or Japan and Korea, or now emerging economies like China and India. The type of support, of course, varies widely across countries. The Government of India (GoI) has supported agriculture through budgetary provisions as well as through revenues foregone and a sizeable portion of budgetary support goes towards fertiliser subsidy.

Fertiliser subsidy in India has succeeded in achieving its objective of increasing fertiliser consumption in agriculture and hence, raising food production, but it has also led to some problems because some fertiliser products have been priced very low. There are three key issues with regard to fertiliser subsidy in India: (1) rising amounts of fertiliser subsidy in the budget and how far they are financially sustainable; (2) extremely low prices of urea leading to imbalanced use of N, P and K, as also misuse of urea (like diversion to neighbouring countries and its use for non-agricultural purposes); and (3) lack of investment flows to the sector at home, leading to rising imports in the wake of uncertainty on fertiliser subsidy policy issues and delayed payments to industry.

This paper suggests the following alternative policy options: (a) switch to direct cash transfers to farmers on per ha basis (say between Rs 6000- 7500/ha), free up the urea sector with imports at zero duty, and let domestic prices be determined by demand and supply forces in open markets; (b) take up a soil health care programme seriously, and if desirable, tag cash transfers to this condition, and communicate that to farmers effectively; and (c) encourage Indian investments in nitrogenous fertilisers in Gulf countries (e.g., Iran, Kuwait, Oman, etc.) where gas prices are typically less than $3 per MMBTU compared to the pooled price of $10.5 per MMBTU in India, with some medium to long-term agreements for imports. This will promote not only efficiency in production but also in consumption, and provide a stable policy environment in the fertiliser sector to ensure efficient and sustainable growth, and contributing to India's overall food-feed-fibre security.

JEL Classification: *I38, Q15, Q18.*

Keywords: *Fertiliser, Subsidy, Agriculture, India, Cash Transfer*

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Rationalising Fertiliser Subsidy in India:
Key Issues and Policy Options

Ashok Gulati and Pritha Banerjee*

1. Introduction

With a large and rising population, India is likely to be the most populous country in the world by 2028 (United Nations 2014). It is also likely to register reasonably high growth rates in GDP between now and then, say at an average of 7-8 per cent per annum. Thus, with rising incomes, it is going to be a challenge to meet the demands for food, feed and fibre from limited land and water resources. The only answer for India is to raise agricultural productivity in a sustainable and cost effective manner. Fertilisers, along with better seeds and water, play a critical role in enhancing this productivity. Food grains being the basic staple in India, it is important to see how its production and availability have behaved over the long term, and what role fertilisers have played in that journey.

Food grain production in India has increased from a mere 52 million metric tonnes (MMT) in 1951-52 to 264 MMT in 2013-14 (Fourth Advanced Estimates) with the per capita net food grain availability increasing from 144.1kg per year in 1951 to 186.4 kg per year in 2013.[1] Much of this increase came in the post-green revolution period in India when high-yielding variety seeds (HYV seeds), along with irrigation and fertiliser usage, picked up pace. As a result, grain production increased from 80.6 MMT in 1963-64 to 264 MMT in 2013-14. During this period, much of the increase in grain production came from increasing yields of almost all principal crops like rice[2], wheat[3], pulses[4] and food grains overall.[5] Since the green revolution technology comprised the use of HYV seeds and more water and fertiliser, it is difficult to separate the effects of each of these inputs on yield increase. Nevertheless, there is no denying that chemical fertilisers have played an important role in increasing grain production in India. Given that cultivable land is limited, it is critical to ensure that the fertility of the soil remains intact in order to increase agricultural productivity. But the reality is that loss in soil fertility is already posing a challenge in many developing countries including India. According to a study by the Food and Agricultural Organization of United

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1 Table 10.1: Agricultural Statistics at a glance 2014;
The net availability of food grains is estimated to be gross production (-) seed, feed & wastage, (-) exports (+) imports, (+/-) change in stocks. The net availability of food grains per capita= The net availability of food grains/the population estimates for a particular year

2 from 1034 kg/ha in 1963-64 to 2424 kg/ha in 2013-14 (Fourth Advance Estimate)

3 from 730 kg/ha in 1963-64 to 3075 kg/ha in 2013-14 (Fourth Advance Estimate)

4 from 416 kg/ha in 1963-64 to 764 kg/ha in 2013-14 (Fourth Advance Estimate)

5 Agricultural Statistics at a glance 2014

Nations (FAO, 2005),[6] India's soils are nitrogen[7] deficient; phosphatic nutrient[8] content is low to medium, and over time, the deficiency of potassic nutrients[9] has also become widespread.[10] Not just the deficiency of primary macronutrients but the deficiency of micronutrients such as zinc[11] in Indian soil has also become cause for concern.[12] Balanced fertilisation of soil would mean application of all of these nutrients in the soil in the correct proportion, using appropriate methods and in a timely fashion so that the soil remains healthy and fertile to ensure increasing grain production on a sustainable basis.

Keeping in mind the importance of agriculture in any sizable country to feed its people, most countries have subsidised agriculture in the past, be they developed countries like the United States of America or countries in the European Union or Japan and Korea, or now emerging economies like China and India. However, the form of subsidisation has often varied, with most developed countries having moved/moving from price support to income support (with the notable exception of Japan and Korea), while China is still in the transition process. However, India extends support to agriculture primarily through price policy, be it for output or inputs. It is in this context that one should see fertiliser pricing and subsidy issues in India.

The fertiliser sector in India is subsidised by the central government. The amount of fertiliser subsidy according to the revised estimate of the union budget of FY2015 is Rs.709.67billion (USD11.60 billion approx) and it has increased almost 5 times over the last 15 years at current prices in rupees (fertiliser subsidy was Rs.138 billion or USD3.02 billion in 2000-01). The only other sectors that received as much or higher subsidy from the central government are food and petroleum. Together, they constituted almost 95 per cent of total subsidy expenditure in the central government's revised budget estimates in FY2015 with the share of fertiliser subsidy being almost 27 per cent. Lately, the government has initiated some steps to streamline and contain subsidy on petroleum products. Taking advantage of falling crude oil prices globally, diesel prices have been deregulated (as is already the case with petrol), and now the subsidy on cooking gas is being transformed through direct cash transfer under the Jan-Dhan Yojana to identified beneficiaries in 54 districts. Reports suggest that from January 1, 2015, it will be extended across the country.[13] This is a major move to contain cooking gas subsidy to deserving beneficiaries, and restrict diversion of subsidised gas to commercial users.

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6 FAO (2005): *Fertilizer Use by Crop in India*, Land and Plant Nutrition Management Service, Land and Water Development Division, FAO, Rome

7 Nitrogen is responsible for vegetative growth

8 Phosphorus is critical in root development, crop maturity and seed production

9 Potassium is required for the activation of over 80 enzymes throughout the plant. It is also important for a plant's ability to withstand extreme cold and hot temperatures, drought and pests. Potassium increases water use efficiency and transforms sugars to starch in the grain-filling process

10 Role of different nutrients are from: http://www.noble.org/ag/soils/back2basics/ accessed on 10.09.2014.

11 Zinc is essential for the normal healthy growth and reproduction of plants, animals and humans and when the supply of plant-available zinc is inadequate, crop yields are reduced and the quality of crop products is frequently impaired. Consuming food coming from crops grown in zinc deficient soil can result in physical and intellectual retardation and stunting among young children.

12 Role of Zinc is from International Zinc Association website: http://www.zinc.org/info/zinc_crops accessed on 10.09.2014.

13 Press Releases on October 18, 2014 and October 24,2014.

Given this backdrop, several questions arise with respect to fertiliser subsidy. Can fertiliser subsidy also be routed through direct cash transfers under the Jan Dhan Yojana to deserving farmers? This can help contain smuggling (of urea in particular) to neighbouring countries and promote balanced use of nitrogenous (N), phosphatic (P) and potassic (K) nutrients. It would also ensure a more equitable distribution of the subsidy. Coupled with the decontrol of fertiliser (especially urea) prices, this may give the right signal to fertiliser plants to plan their expansion based on efficiency principles. So, switching from price support (subsidy) to cash transfer (income support) with respect to fertilisers can open up possibilities of achieving efficiency in its production and consumption, a more equitable distribution of support to farmers, and perhaps more environment friendly and sustainable usage, besides saving resources. It is against these issues and possibilities that this study is undertaken with a focus on fertiliser subsidy.

In **Section 2**, we discuss India's position in the global fertiliser market. **Section 3** deals with the current subsidy situation in India with special focus on fertiliser subsidy. **Section 4** discusses the main cause for the rise in fertiliser subsidy – the fertiliser pricing policy and one of the main feedstock for its production, namely, gas. **Section 5** discusses the effects of fertiliser pricing and subsidy policy. Based on an analysis of these, in **Section 6**, we put forward a few policy suggestions that can ensure efficiency in the production and consumption of fertilisers, ensure equity with respect to small holders, and bring about greater certainty and transparency in this sector.

2. India's Position in Global Fertiliser Market

From the available data in fertiliser statistics, it is quite clear that India is an important player in the world market for fertilisers. For the last decade (2001-2012), India has been the second highest producer of nitrogenous fertilisers after China (producing 10-11 per cent of world production) and third highest producer of phosphatic fertilisers after China and USA (producing around 7 per cent of total world production in 2012). India is important as a consumer as well. It is the second biggest consumer of nitrogenous and phosphatic fertilisers after China (14.1 per cent and 14.5 per cent respectively of world consumption in 2012 for nitrogenous and phosphatic fertilisers) and the fourth biggest consumer of potassic fertilisers after China, Brazil and USA (7 per cent of world consumption in 2012). India is also an important importer of all the macronutrients. India is the second highest importer of N-nutrients after USA (11 per cent of world import in 2012), highest importer of phosphatic nutrients (7 per cent of world import in 2012) and third highest potassic nutrients importer (6 per cent of world import in 2012) after USA and China.[14] It is to be noted here that there is no known commercially extractable source of potassic nutrients in India. So, all the potassic fertilisers that India consumes are imported.

The share of the top five countries in world production, consumption and imports vis-à-vis the rest of the world in 2012 is shown in the following charts:

[14] Rankings are determined from the data in FAOSTAT

Chart 1A: Share of Different Countries in World N Consumption, 2012

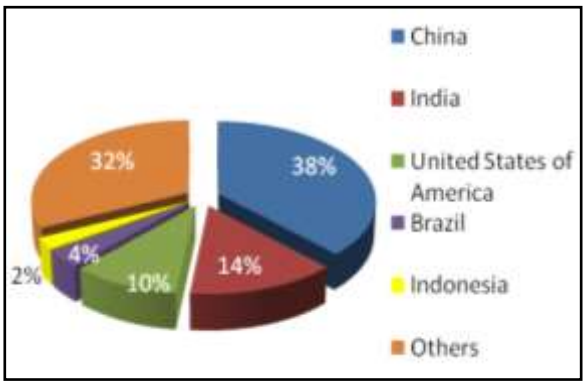


Chart 1B: Share of Different Countries in World N Production, 2012

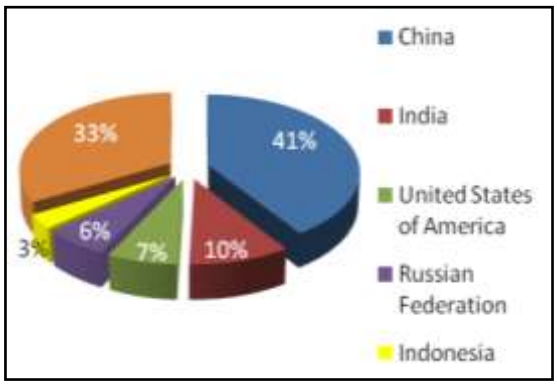


Chart 1C: Share of Different Countries in World N Import, 2012

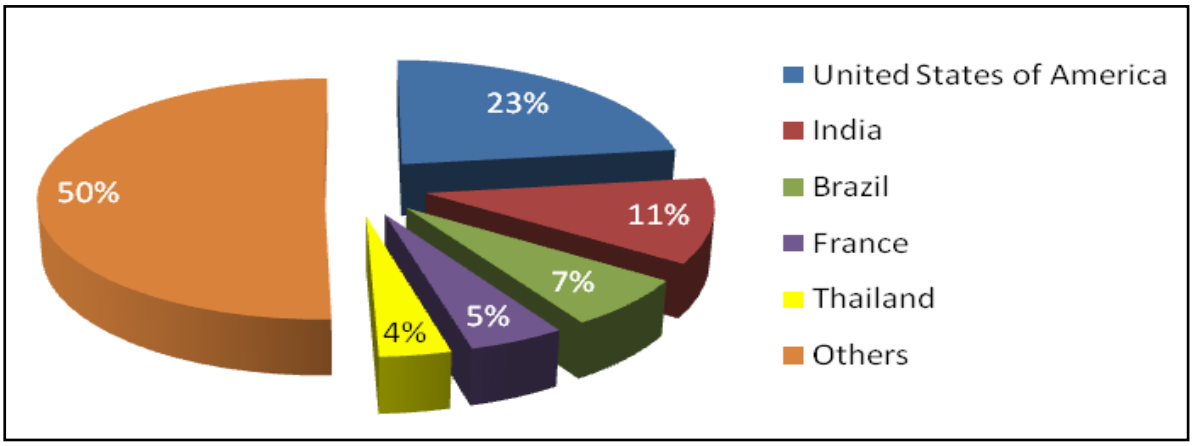


Chart 1D: Share of Different Countries in World P Consumption, 2012

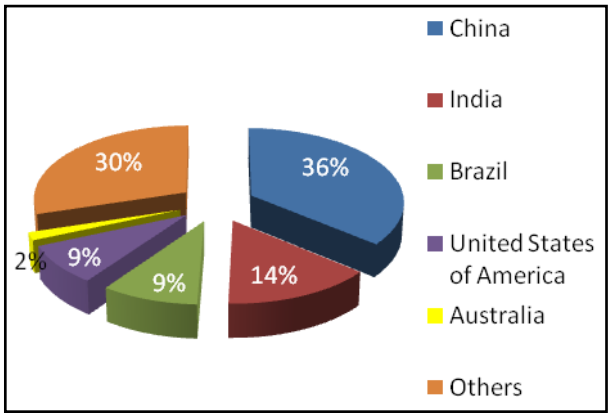


Chart 1E: Share of Different Countries in World P Production, 2012

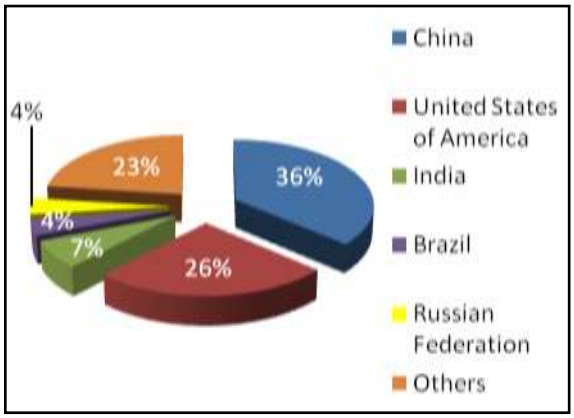


Chart 1F: Share of Different Countries in World P Import, 2012

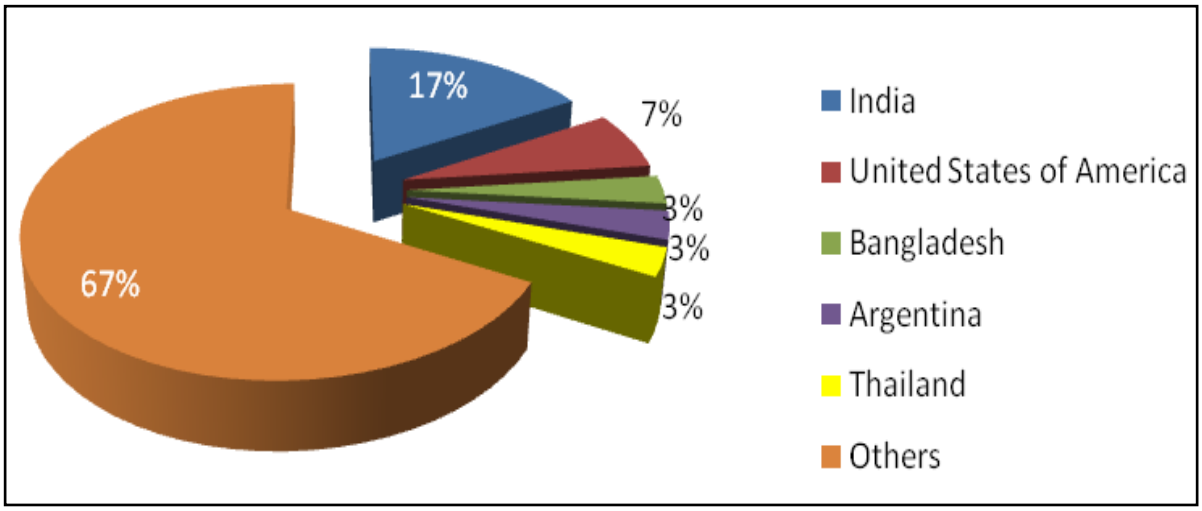


Chart 1G: Share of Different Countries in World K Consumption, 2012

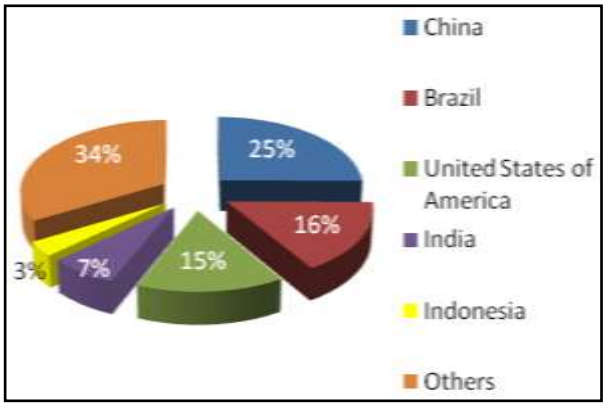


Chart 1H: Share of Different Countries in World K Production, 2012

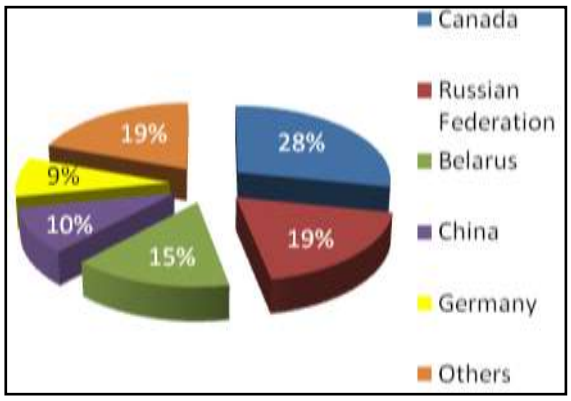
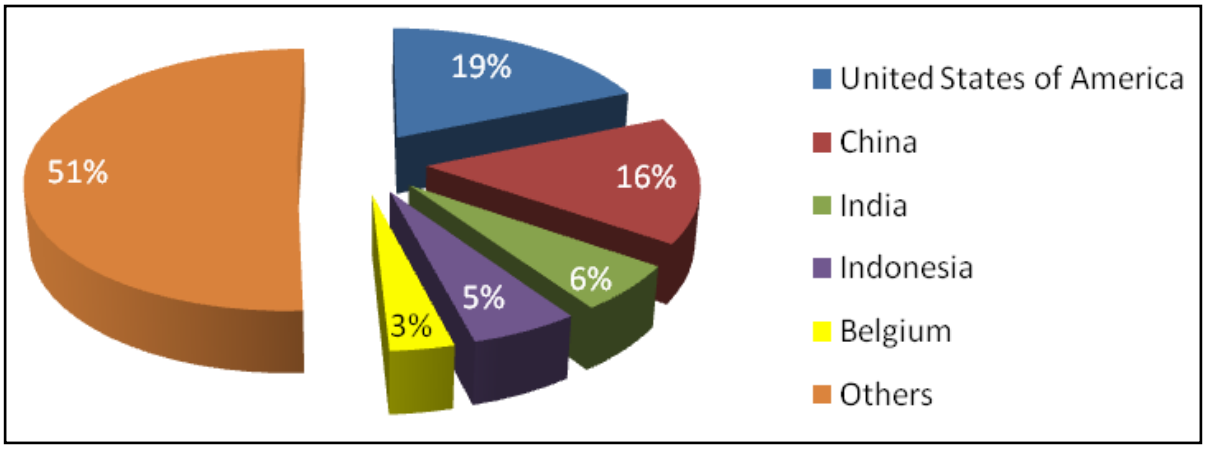


Chart 1I: Share of Different Countries in World K Import, 2012

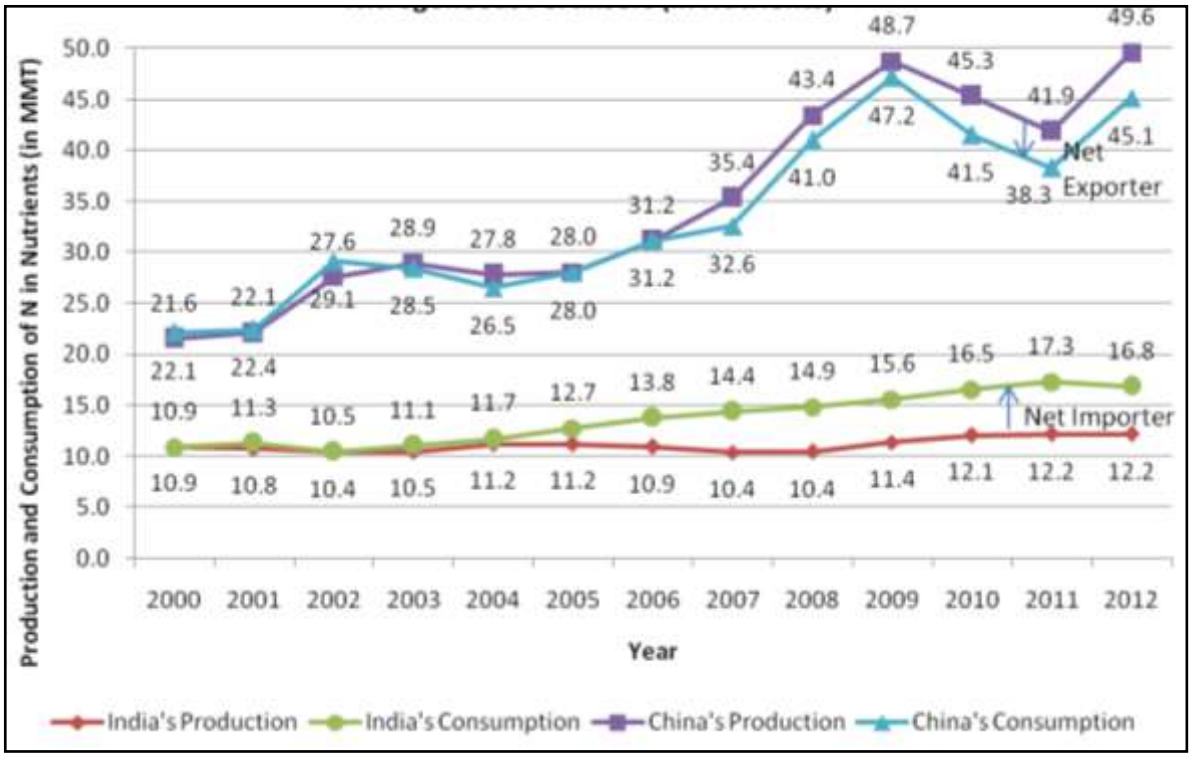


Source: for 1A to 1I: Constructed using data in FAOSTAT

If one compares India to China over the 2000-12 period, especially for nitrogenous fertilisers (N-nutrient), which is the main nutrient consumed in both countries, China increased domestic production of N-nutrient significantly, from 21.6 MMT in 2000 to 49.6 MMT in

2012 and became a net exporter, while India's production of nitrogenous fertilisers inched from 10.9 MMT to just 12.2 MMT over the same period, making India as a net importer (Chart-2). No wonder, Chinese consumption of fertilisers on per ha basis is more than double that of India; so is its cereal production.[15] There may be an important lesson for India to learn from China here, especially in terms of fertilizer pricing policies, as China has moved from subsidising fertilisers to direct cash transfers to farmers on a per hectare basis.

Chart 2: India-China Comparison w.r.t. Production and Consumption of Nitrogenous Fertilisers (in Nutrients)



Source: Constructed using FAOSTAT data

3. Rising Subsidies in India

Supporting agricultural producers through multiple channels is a common practice among most developed countries and emerging economies. Although Producer Support Estimates (PSE) figures are not available for India, we might look into Government of India's budget and a number of other sources to have an idea of the support extended by the government in the form of subsidy to various sectors. As is revealed in the expenditure budget figures for various years, subsidies given to different sectors have seen a significant rise over the last fifteen years. There has been an almost 9.7 times increase in subsidies from Rs. 268.38 billion in 2000-01 to Rs. 2606.58 billion according to the 2014-15 budget estimates (at current prices). The expenditure budget data also reveal that subsidies on food, fertiliser and

[15] In 2011, China and India's fertiliser consumption per ha of arable land and land under permanent crops were 399.8kg and 164.8kg respectively. Paddy yield and acreage were 6.7MT/ha and 3.6MT/ha, of wheat, 4.3 MT/ha and 2.9MT/ha and of maize, 2.3 MT/ha and 5.7 MT/ha- Source: Fertiliser Statistics 2012-13.

fuel (petroleum), sometimes referred to as 3 F's, constitute more than 90 per cent of the total subsidy figures of the central government – the highest being 97.87 per cent in 2003-04 and the lowest being 92.84 per cent in 2002-03. These three subsidies, taken together, have increased by large amounts not only in absolute terms but also as a percentage of gross domestic product (GDP), rising from 1.16 per cent of GDP in financial year (FY) 2001 to 2.16 per cent of GDP of FY 2015 (budget estimate). Structurally, there seems to be a break in the trend around FY 2008. The average figure for these three subsidies during FY 2001 to FY 2008 works out to 1.36 per cent of GDP; this increased to 2.28 per cent for the period FY 2009 to FY 2015, an increase of more than 67 per cent.

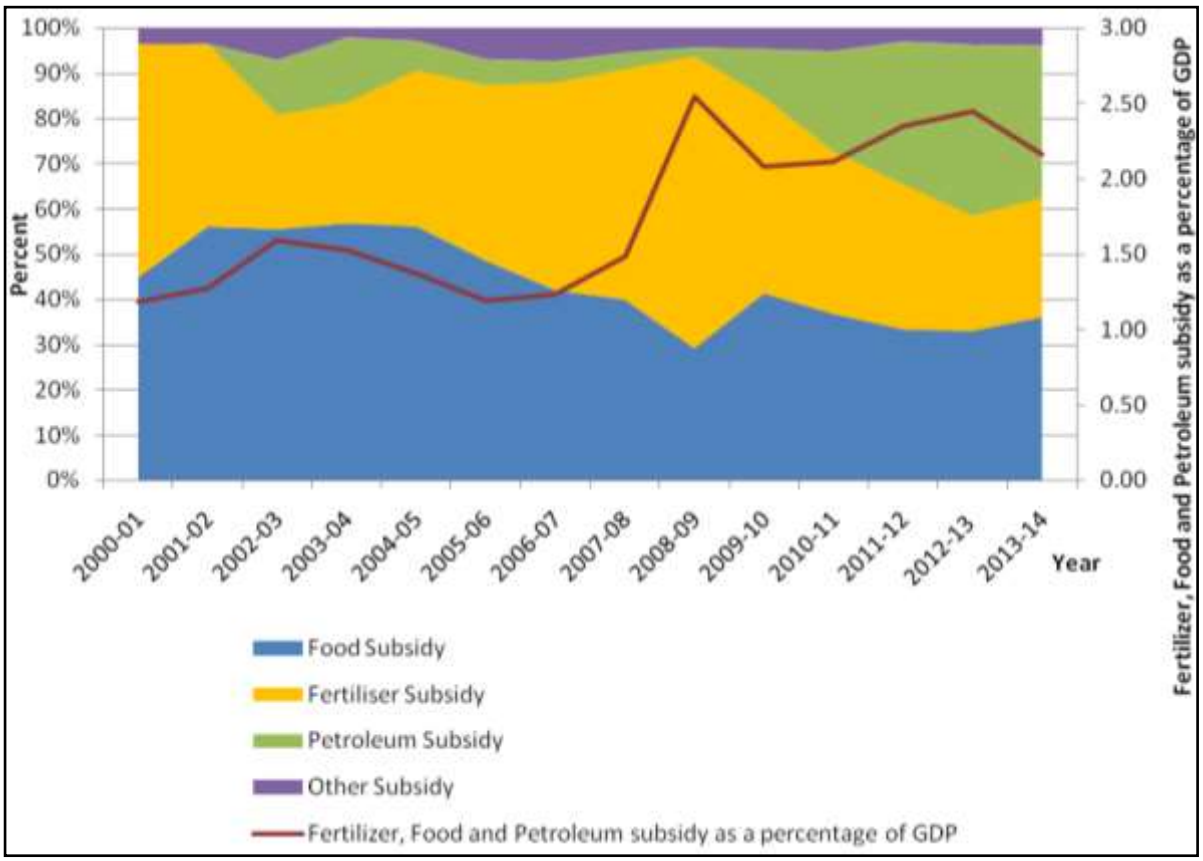
Of these three F's, in most of the years, except for five years (namely 2000-01, 2006-07-2009-10), food subsidy has captured the lion's share of total subsidy disbursements, the highest being almost 56 per cent in 2003-04 and the lowest being 29 per cent in 2008-09.

A noticeable fact, however, is that the share of fuel or petroleum subsidy over this period increased from negligible at the start of the last decade to 24.33 per cent in the budget estimate of 2014-15. It peaked at 37.68 per cent in 2012-13.

As mentioned earlier, almost 28 per cent of total subsidies budgeted by the central government is for fertiliser subsidy in FY2015, although at the start of the last decade, it was around 52 per cent of total subsidies. If we consider the figures from 1991-92 till date, fertiliser subsidy consistently takes up more than 30 per cent of the total subsidy expenditure for all except two years. In the year 2008-09, when global prices of fertilisers erupted to very high levels and domestic prices were not raised, fertiliser subsidies increased substantially, constituting almost 65 per cent of the total subsidy expenditure. The changing composition of total subsidy is represented in Chart 3 (calculations are given in Annex 1).

It may be noted that fuel subsidy contains the subsidy to natural gas, which is an important feedstock in the production of urea. Hence, any change in fuel subsidy arising from a revision in gas prices would have some effect on fertiliser subsidy, unless fertiliser prices are raised to recover the increased prices of gas. If fertiliser prices are raised and other things remain as they are, it may raise the cost of production of major food grains such as rice and wheat, leading to pressure on the government to increase the minimum support prices of these commodities. Given that issue prices of wheat and rice under the public distribution system (PDS) are fixed for three years, as per the National Food Security Act (NFSA, 2013), this will raise the food subsidy bill. In that sense, gas pricing and subsidy are intertwined with fertiliser and food subsidy. In this paper, however, we concentrate mainly on fertiliser subsidy.

Chart 3: Change in the Composition of Total Subsidy



Note:

1. Other subsidy includes subsidy on import/export of sugar, grants to NAFED and interest subsidy among others
2. Petroleum subsidy includes subsidy in diesel, kerosene, domestic LPG, freight subsidy for far-flung areas and supply of natural gas to North-Eastern region

Source: Percentages calculated and constructed using the data in Expenditure Budget, Volume 1, various years and Annual report of the Department of fertilisers GoI, 2010-11 and NAS 2014.

Historically, the subsidy regime for fertilisers started in 1977 with the introduction of the retention price scheme (RPS)[16] for urea in the wake of volatile global prices of gas and urea. The subsidy on urea was calculated as the difference between retention price and the statutorily notified sale price for each urea unit individually. Under the maximum retail price (MRP) scheme of di-ammonium phosphate (DAP) and muriate of potash (MOP), the difference between the delivered price of fertilisers at farm gate level and the MRP fixed by the government was paid out as subsidy. Under the nutrient-based subsidy (NBS)[17] scheme, a fixed rate of subsidy in Rs./kg basis is announced after taking into consideration factors like international prices, exchange rate, inventory level as well as the existing MRP of DAP and

[16] The details of the retention price scheme are given in Section 5.
[17] The details of the nutrient-based subsidy scheme are given in Section 5.

MOP. Subsidy being fixed, any fluctuation in international prices is reflected through the domestic price of DAP and MOP under the NBS policy.

The way fertiliser subsidies are calculated, one can say that it is a function of "consumption of fertilisers, the normative delivered cost of fertilisers and the notified selling prices of fertilisers".[18] The first two have a positive relation with the total subsidy amount while the third has a negative relation. Given that, over a period of time, India's dependence on fertiliser imports has increased, international prices obviously play an important role in influencing the overall levels of fertiliser subsidy.

The amount of fertiliser subsidy has increased almost 144 times at current prices (from Rs. 5.05 billion in 1980-81 to Rs. 729.70 billion in 2014-15 according to the budget estimates of central government) over the last 35 years. Even if one considers fertiliser subsidy only from the start of this millennium, it has increased almost 5 times (from Rs. 138 billion n in FY 2001 to Rs 729.7 billion in FY 2015). The increase in fertiliser subsidy is quite substantial in term of USD too (from $0.64 billion in FY 1981 to $11.13 billion in FY 2015, a 17.5 times increase).

An intriguing feature of the fertiliser subsidy is that the budget figures do not fully reflect the correct amount of fertiliser subsidy, especially from FY 2008 onwards when a part of the subsidy was routed through bonds (Table-1). The fertiliser subsidy peaked at Rs 966 billion in FY 2009 (including Rs 200 billion worth of bonds issued) in the wake of the spike in global prices of fertilisers, In later years, it fell and in FY 2015, it is budgeted at Rs. 729.70 billion (Table-1).

Among the components of fertilisers, the subsidy on urea has always captured the lion's share in total fertiliser subsidy. In the last decade though, there were exceptions for years – from 2008-09 to 2011-12 when the percentage share of subsidy given to farmers due to sale of decontrolled fertilisers at concessional rates was very high and comprised more than 50 per cent of the total fertiliser subsidy. However, the share of that is again showing a decreasing trend in the latest expenditure budgets (especially after introduction of the NBS scheme in 2010). Table 1 gives the components of total fertiliser subsidy during the last decade and a half:

[18] Report of the Working Group on Fertiliser Industry for the Twelfth plan 2012-13 to 2016-17, Department of Fertilisers, GoI

Table 1: Components of Fertiliser Subsidy since 2000-01:

Year	Subsidy on Urea		Sale of decontrolled fertiliser with concession to farmers	Subsidy provided through bond	Total	Total
	Indigenous	Imported				
	in Rupees Billion					USD Billion
2000-01	94.80	0.01	43.19		138.00	3.02
2001-02	80.44	0.47	45.04		125.95	2.64
2002-03	77.90	0.00	32.25		110.15	2.28
2003-04	85.21	0.00	33.26		118.47	2.58
2004-05	102.43	4.94	51.42		158.79	3.53
2005-06	106.53	12.11	65.96		184.60	4.17
2006-07	126.50	32.74	102.98		262.22	5.79
2007-08	129.50	66.06	129.34	75.00	399.90	9.93
2008-09	179.69	100.79	485.55	200.00	966.03	21.00
2009-10	175.80	46.03	390.81		612.64	12.92
2010-11	150.81	64.54	407.66		623.01	13.67
2011-12	202.08	137.16	360.89		700.13	14.61
2012-13	200.00	151.33	304.80		656.13	12.06
2013-14	265.00	115.38	293.01		673.39	11.13
2014-15RE	382.00	121.00	206.67		709.67	11.60
2015-16 BE	382.00	123.00	224.69		729.69	

Source: Expenditure Budget, Volume 1, various years and annual report of the Department of fertilisers GoI, 2010-11; Economic Survey for rupee-dollar exchange rates

Various reports suggest that even in FY 2015, there are pending dues of Rs.38000 crore to be paid to fertilisers companies.[19] If one adds this amount to the budgeted subsidy in the expenditure budget of FY 2015, the total fertiliser subsidy figure crosses Rs.1.1 trillion, which is almost 1 per cent of GDP at current market prices for 2013-14.

Any meaningful temporal analysis of fertiliser subsidy must go beyond absolute figures (in Rs billion or US dollars), and should be seen in relation to some other macro economic variables such as overall GDP, agricultural GDP, or overall tax revenues of the central government. These are given in Chart 4 for the period stretching from FY 2001 to FY 2014.

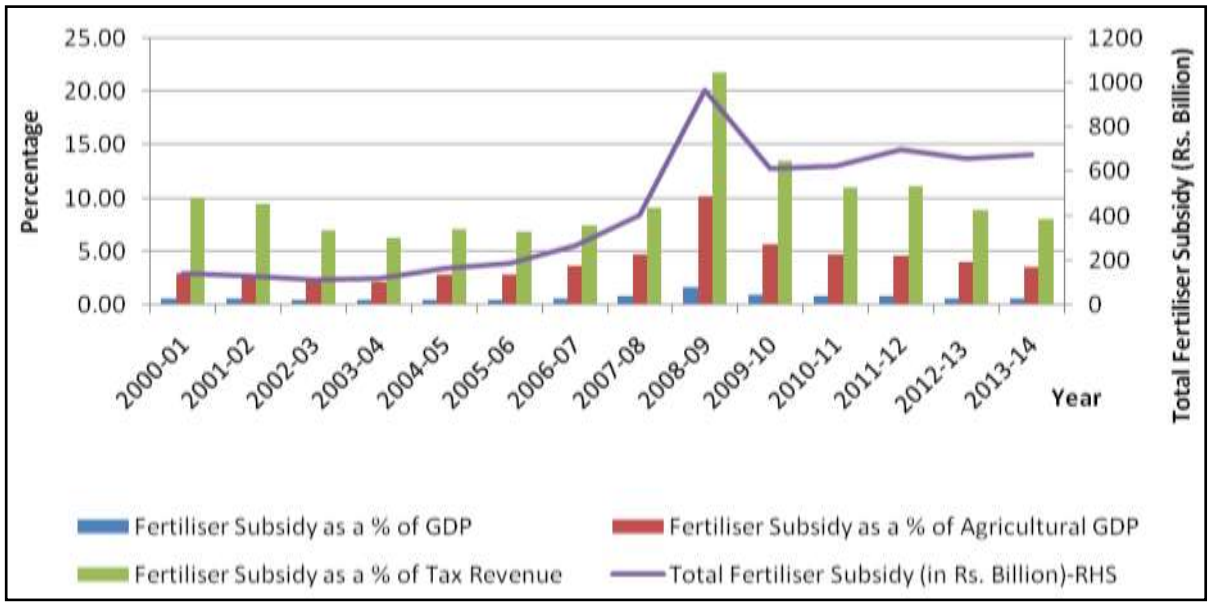
It is interesting to observe that over this period from FY 2001 to FY 2014, fertiliser subsidy in relation to other selected macro variables was at its lowest in FY 2004 and highest in FY 2009: e.g., it was 0.42 per cent of GDP in FY 2004 and 1.72 per cent in FY 2009; as a

[19] Data taken from http://timesofindia.indiatimes.com/business/india-business/New-finance-minister-to-inherit-Rs-1-lakh-cr-of-unpaid-bills/articleshow/35613185.cms accessed on 22.09.2014.

percentage of agricultural GDP, it stood at 2.18 per cent in FY 2004 and 10.24 per cent in FY 2009; and finally as a percentage of central government tax revenue, which in a way measures the real capacity to pay for these subsidies, fertiliser subsidy was 6.34 per cent in FY 2004 and 21.79 per cent in FY 2009.

However, the average fertiliser subsidy during the three-year period FY 2012 to FY 2014,was only 0.68 per cent of overall GDP; 4.08 per cent of agricultural GDP and 9.4 per cent of central government tax revenue (Chart 4; Annex 2).

Chart 4: Total Fertiliser Subsidy (in Rs. crore) and Subsidy as Percentages of Different variables



Source: Constructed using the data in Economic Survey, Volume 1 of expenditure budget, Annual Report 2010-11 of Department of Fertilisers, GoI and National Accounts Statistics 2014.

4. Price Policy of main fertilisers and the main feedstock (gas) pricing in India:

4.1 Evolution of Price Policy for Fertilisers

To understand the fertiliser subsidy situation in India, it is crucial that one understands the pricing policy of fertilisers because the pricing policy is the main determinant of fertiliser subsidy bills. The fertiliser consumption pattern is also influenced by the price policy. Discussed below is the evolution of the fertiliser price policy in India since independence.

- **1955:** Fertiliser was declared as an essential commodity under the Essential Commodities Act (ECA), 1955.

- **1957:** Fertiliser Control Order (FCO) was passed under ECA. The objective was to regulate the sale, price and quality of fertilisers.

- **Up to 1966:** Pooled pricing of fertilisers on a no-profit no-loss basis continued. A uniform price for fertilisers was fixed based on the pooled cost of both domestic and imported fertilisers.

- **1973:** There was fertiliser shortage in the country in the early 1970s. Against that background, the Fertiliser Movement Control Order (FMCO) was introduced to bring fertiliser distribution and inter-state movement under government control.

- **1976:** High imports of wheat during 1973-75 during a period of high global prices and weak monsoons in India, coupled with an acute shortage of foreign exchange reserves, led to an emphasis on self-sufficiency in staple food grains and fertilisers, particularly urea. With that in mind, a committee under the chairmanship of Mr. S.S. Marathe was set up to recommend a pricing policy for fertilisers to ensure a fair return on investment.

- **1977:** Following the recommendations of Marathe Committee, the retention price scheme (RPS) was introduced from November 1, 1977. Retention prices were calculated on a cost plus approach and it was determined separately for each plant producing urea. Retention price was defined as the cost of production of a particular plant producing urea as assessed by government plus a 12 per cent post-tax return on net worth.

Components of cost of production:

1. Variable cost
2. Conversion cost
3. Depreciation
4. Capital related charges
5. Selling expenses

The variable cost consisted of direct input materials (feedstock like gas, naphtha, FO/LSHS and coal; purchased power and water) based on consumption norms. The conversion cost or fixed cost for a pricing period included salaries and wages, catalysts, chemicals and consumables, repairs and maintenance, non-plant power and water, overheads (factory, administration, and social), insurance etc. Actual selling expenses were also in the calculation of retention price subject to a ceiling of Rs. 138/metric tonne (MT).

Achievements of RPS:

RPS achieved its objective of:

1. Increasing investment in the fertiliser industry: The estimated cumulative investment went up from Rs.4.1 billion during the Fourth Plan to Rs.98.40 billion in 1991-92.

2. Increasing investment in turn helped create new capacity. Cumulative capacity created increased from 2528 thousand MT during the Fourth Five-year Plan (FY1970-FY1974) to 10982 thousand MT in 1991-92.

3. Obviously, the above two lead to enhanced fertiliser production, especially in the case of urea.

Shortcomings of RPS:

Although the scheme was successful in achieving some of its goals, it was also criticised for:

1. Being cost-plus in nature

2. Not providing proper incentives for encouraging production efficiency

3. Gold plating – some units reaped undue benefits from RPS by declaring a lower capacity. For lower capacity declaration, their retention prices got inflated artificially and the companies received more subsidy than they should have. This was known as gold plating.

Because of these shortcomings, many committees in subsequent years favoured either the abolition of this scheme or major modifications in this scheme.[20]

- **1979:** From February 1979, RPS was extended to phosphatic and other complex fertilisers.

- **1982:** In May 1982, RPS was extended to single super phosphates.

- **1991:** Increasing subsidies that led to high fiscal deficits, coupled with a foreign exchange crisis, led to a 40 per cent increase in the prices of fertilisers (prices for urea DAP and MOP all were increased by 40 per cent) in July 1991. But subsequently, urea price was rolled back by 10 per cent due to political protest.

- **1992:** In December 1991, a Joint Parliamentary Committee (JPC) on fertiliser policy was set up.

Objectives:

1. To review the existing method of calculation of retention price

2. To suggest measures for decreasing fertiliser prices without putting additional pressure on the exchequer

The committee submitted its report on August 20, 1992.

[20] For e.g. Hanumantha Rao Committee in 1998, and Geethakrishnan Committee in 2000 recommended abolition of unit-wise RPS and introduction of group-wise RPS

Conclusions and Recommendations of the committee:

The JPC concluded that the increase in fertiliser subsidy_was due to three main factors, namely:

1. Increase in the cost of imported fertilisers
2. Devaluation of the rupee in July 1991 and
3. Unchanged farm gate prices, specially for urea, from 1980-1991

On the basis of these conclusions, the committee's main recommendations were as follows:

1. The committee did not recommended total decontrol of fertilisers
2. Recommended decontrolling phosphatic and potassic fertilisers, which were mainly import based
3. Recommended marginal reduction in the consumer price of urea (10 per cent)

Implementation:

Following the JPC's recommendations, all phosphatic and potassic fertilisers under RPS were decontrolled. However, urea continued to be under RPS.

But since the market price of phosphatic and potassic fertilisers were quite high compared to urea, it created the possibility of a severe imbalance in the consumption of nitrogenous (N), phosphatic (P) and potassic (K) fertilisers. To pre-empt imbalanced use of fertiliser and to cushion farmers from the effects of a steep price hike, the government announced ad-hoc concessions for P&K fertilisers.

- **1997:** In 1997-98, the Department of Agriculture and Co-operation started indicating all-India uniform maximum retail prices (MRP) for fertilisers like DAP, MOP, complex NPK, etc. MRPs were revised in February 2, 2002; this continued up to March 31, 2010 in the case of DAP and MOP.

- **1998:** Even after decontrolling the P&K fertilisers, fertiliser subsidy was increasing significantly and much of this was on account of subsidy on urea. This led to the setting up of a High Powered Fertiliser Pricing Policy Review Committee (HPC) under the chairmanship of Prof. C.H. Hanumantha Rao. The committee submitted its report on April 3, 1998. The recommendations of the committee were:

1. Discontinue the unit-wise RPS for urea units
2. Ensure that all future fertiliser production is gas based
3. Introduce a new pricing methodology (normative referral price (NRP)) based on the long-run marginal cost (LRMC) of fertilisers
4. Ensure that relative pricing of fertilisers reflected the desirable NPK ratio

5. Abolish allocations under the ECA
6. Guarantee prices for new units for 15 years
7. Set up a Fertiliser Policy Planning Board

The NRP for urea suggested by the committee was Rs.6500 per MT at the farm gate on January1, 1998. For plants using feedstock other than gas, a feedstock differential cost reimbursement was recommended by the committee. It was Rs.1750 per MT and Rs.1300 per MT of urea produced in naphtha/coal based and FO/LSHS based plants respectively. The farm gate NRP of DAP was recommended at Rs 12800 per MT.

The government did not implement the recommendations of this HPC.

- **1999:** The Purohit Committee was constituted in April 1999 to reassess the capacities of plants operating at high capacities. It submitted its report in November 1999. Based on its recommendations, the Government of India notified a downward revision in the retention prices of 11 urea manufacturing units in May 2000.

- **2000:** The issue of rationalising fertiliser subsidies was also examined by the Expenditure Reforms Commission (ERC) chaired by Mr. K.P. Geethakrishnan. The committee's main recommendations were:

1. Dismantling the control system in a phased manner.

2. Discontinuing RPS with effect from February 1, 2001 and the introduction of a group-wise concession scheme.

i. In the first phase, the following were to be done:

   a. Existing units were to be grouped into five categories: pre-1992 gas-based units, post-1992 gas-based units, naphtha-based units, fuel oil/low sulphur heavy stock (FO/LSHS) based units and mixed feedstock units. Fixed concession rates for each group were to be announced. Plants would be allowed to get feedstock from anywhere including through imports.

   b. The distribution control mechanism should be decontrolled.

   c. The concession of the groups should be re-determined every three months keeping in view the fluctuating import price of feedstock. That is, if the import parity price of the feedstock goes down, the concession payable to the units of that particular group should follow the same direction.

ii. In the second stage, beginning from April 1, 2002, the concession would be reduced so as to "reflect the possibility of reasonable improvement in feedstock usage efficiencies and reduction in capital related charges".

iii. The third stage, beginning on April 1, 2005, would target all non-gas plants to modernise and switch over to LNG.

iv. In the fourth phase, the industry would be decontrolled. The commission recommended a 7 per cent increase in the price of urea in real terms every year from 2001. This way, price would reach Rs.6903 by 2006 to become import competitive.

- **2003:** Following the recommendations of ERC, Government of India introduced a New Pricing Scheme (NPS) for urea units replacing the RPS. The *objectives* of introducing NPS was to:

    1. Make urea units achieve efficiency levels that are internationally competitive and

    2. Bring in greater transparency and simplification in subsidy administration

Stage I of NPS was introduced on April 1, 2003 and continued for one year up to March 31, 2004.

- **2004:** Stage II of NPS was introduced

- **2006:** Stage III of NPS was introduced.

- But the phase IV recommendation of increasing urea prices by 7 percent each year in real terms in between 2001 to 2006, followed by total decontrol, was never implemented. No wonder, therefore, that the problem of rising subsidy and imbalanced use of N, P and K was never resolved.

- **2010:** Under the product-based subsidy regime for P&K fertilisers, the subsidy burden of the government has been increasing during the last few years (especially in 2008-09 and 2009-10). The increase was mainly due to import dependency in the case of phosphatic and potassic fertilisers. Almost 90 per cent of phosphatic fertilisers, both finished and raw material for its production, is imported while India is totally import dependent in the case of potassic fertilisers since there is no known commercially exploitable source of potash in the country. There has also been a huge increase in the world price of the fertilisers and inputs. In fact, 94 per cent of the increase in subsidy was attributable to the increase in prices while only 6 per cent was due to increase in consumption.[21] The fiscal deficit of the country was also on the rise (it reached 6 per cent of GDP in FY 2009[22]) and the target of the government was to bring the deficit down to within 3 per cent of GDP in the following years.[23]

  Against this backdrop, it became absolutely necessary to bring in some reform in the price policy of fertilisers. To address the issues, a nutrient-based subsidy (NBS) policy

[21] Annual Report 2013-14, Department of Fertilisers, Government of India
[22] Economic Survey 2012-13
[23] Since that was the desirable level of fiscal deficit for reasonable fiscal management, according to the Fiscal Responsibility and Budget management Act 2003.

was introduced in India in April 2010. Unlike the earlier product-based subsidy system, the government fixed the subsidy on the nutrient content (per kg) of fertilisers. In calculating the rate of subsidy, all relevant factors like international prices, exchange rate, inventory level and prevailing MRP of P&K fertilisers are taken into account. Along with the primary macronutrient contents, separate subsidy was also announced for micronutrients such as boron and zinc content in fertiliser variants in order to address the issue of deficiency of these micronutrients in the Indian soil. The NBS scheme covers 22 grades of different phosphatic and potassic (P&K) fertilisers including DAP, MOP and other NPK complex fertilisers. Urea, however, has been kept outside the coverage of the NBS scheme.

The MRP of P and K fertilisers (and their complexes) were left open to be fixed at a 'reasonable rate' by fertiliser companies on the basis of the demand-supply, after incorporating the subsidy element, which remains fixed. It is also required that the MRP and the subsidy should be written by the fertiliser companies on the bags clearly. Selling fertilisers at a price above the printed MRP would be considered punishable under the Essential Commodities Act (ECA) of 1955. There is no hard and fast formula for working out what is 'reasonable' MRP for each company. The cost accountants look into the costing of various companies, including the public and cooperative ones, and also look into the import parity prices, with imports totally free, and come up with a reasonably approximate MRP. There is no doubt that there is an element of some fuzziness in this, and like the previous policies, in this policy also, the subsidy is routed through the manufacturers or importers since government does not compensate the farmer directly.

At the start of the policy, farmers used to bear almost 38 per cent (in case of DAP) and 25.6 per cent (in case of MOP) of the total cost of fertilisers under NBS. Within four years (that is, in 2012-13), the percentage of the total cost paid by farmers has become 66.58 per cent and 61.1 per cent for DAP and MOP respectively.

NBS, on the one hand, aimed at decreasing the mounting pressure of fertiliser subsidy and, on the other, was expected to encourage balanced application of nutrients in the soil. So far, we do not have any data that reveal that either of the two goals has been achieved. One cannot deny that subsidies on account of decontrolled fertilisers have declined. But, the total subsidy figure is still rising due to the increasing subsidy for urea. Leaving urea out of the NBS scheme has been a mistake; this has been accepted by the Planning Commission in its twelfth plan document (volume 2, page 14), which says, "NBS roll-out was seriously flawed since urea was kept out of its ambit. Urea prices remain controlled with only a 10 per cent rise at the time of adoption of the NBS in 2010. Meanwhile, prices of decontrolled products doubled." The Economic Survey 2013-14 also expressed the same concern (Chapter 8, page 144). The latest budget speech, surprisingly, does not accorded importance to the issue except for mentioning that "a new urea policy would

also be formulated"[24] and that "there has been growing concerns about the imbalance in the utilisation of different types of fertilisers resulting in deterioration of the soil".[25]

In a recent study carried out by Ernst and Young (E&Y) sponsored by the Department of Fertilisers, Government of India, on the NBS policy, it was recommended that "reasonability" of MRP for P & K fertilisers must be done considering two criteria, namely, "profitability and return for the capital employed for the industry players" and "spend on fertilisers for key crops as a % of farmer's income".[26] The report also suggested bringing urea in the NBS regime and "strategic investments by Indian players in mines abroad by creating a 'sovereign fund'" for P&K fertilisers to ensure their supply in the country.[27]

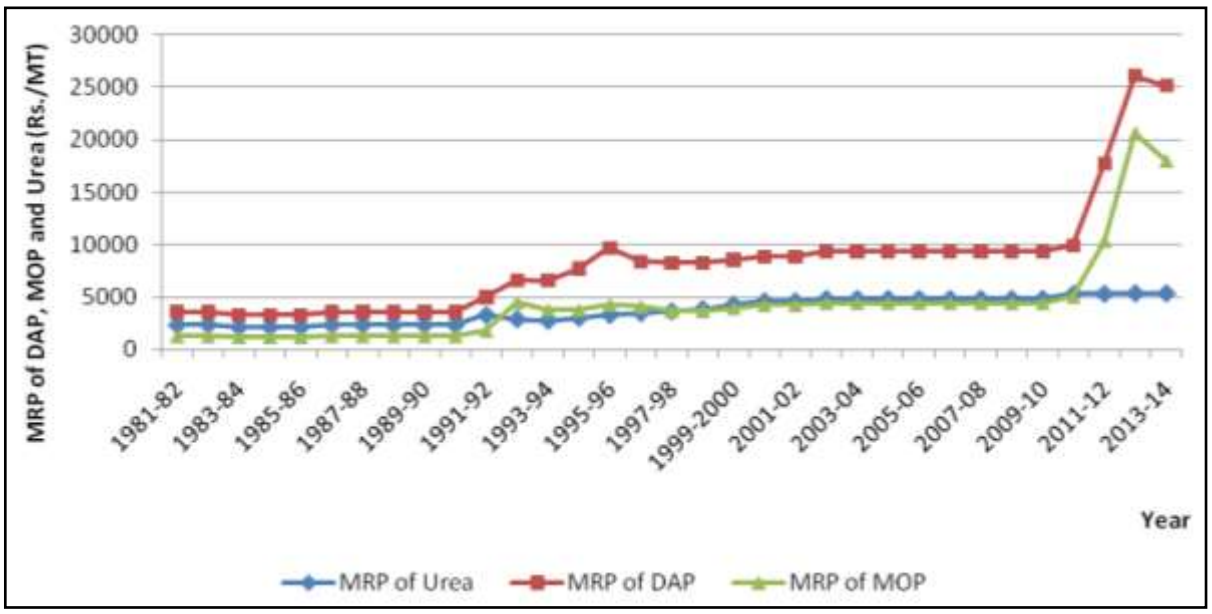
- **2014:** The modified New Pricing Scheme, Stage III (NPS-III) was notified in order to address the issue of under recoveries of existing urea units because of the fixed cost were frozen at the level for the initial year 2002-03. Proposed duration of this stage is one year. The concession rates have been calculated according to the NPS-III is continued with certain amendments.

4.2 Price trends of main fertilisers in India (Urea, DAP and MOP)

The price of DAP has always been higher than that of urea. But before decontrol of P&K fertilisers, the MRP of MOP used to be lower than that of urea. After the decontrol of fertilisers, there was a jump in the price of MOP, which increased to over the price of urea. The situation remained so until 1997-98 and then the price of MOP remained at a slightly lower level than that of urea. The situation, however, altered dramatically after the introduction of NBS in 2010-11. After 2010-11, the prices of DAP and MOP have undergone large changes whereas for 15 years now, the price of urea has remained at almost at the same level (the increase in urea price is marginal – from Rs.4600/MT in 2000-01 to Rs.5360/MT in 2013-14). In comparison, the MRP of DAP and MOP increased manifold. The MRP for DAP increased from Rs.9950/MT in 2009-10 to Rs.25184/MT in 2013-14. Over the same period, MRP for MOP increased from Rs.5055/MT to Rs.17972/MT (Chart 5, calculations for years with varying prices shown in Annex 3). Obviously, this has again resulted in the imbalanced use of fertilisers.

[24] Page 3, Budget Speech, 2014-15
[25] Page 15, Budget Speech, 2014-15
[26] Page 10, E&Y study on NBS Policy
[27] Page 10, E&Y study on NBS Policy

Chart 5: Trend of MRP of Urea, DAP and MOP



Note:

1. MRP of urea, DAP and MOP changed from 2350, 3600, 1300 to 2150, 3350, 1200 respectively from June 29, 1983
2. MRP of urea, DAP and MOP changed from 2150, 3350, 1200 to 2350, 3600, 1300 respectively from January 31, 1986
3. MRP of urea, DAP and MOP changed from 2350, 3600, 1300 to 3300, 5040, 1820 respectively from July 25,1991
4. MRP of DAP and MOP are average MRPs of the MRP ranges that prevailed in the kharif and rabi seasons for the years 1992-93 to 1996-97 and 1999-2000

Source: Constructed using the data in Fertiliser Statistics, 2012-13

4.3 Gas Pricing Policy

In India, gas is the most important feedstock used in the production of fertilisers, especially in the case of urea. Production and consumption of fertilisers are strongly related to the fertiliser price policy but since gas is such an important feedstock in the production of one of the main fertilisers used in India, viz., urea, it is important that the evolution of gas pricing policy is studied to have a fair idea about how those policies affect the fertiliser subsidy regime.

The pricing system in India at present is a bit complex; the existence of a dual pricing system generates two very distinct markets. In one of the markets, gas produced by public sector undertakings (PSUs) is supplied to specific customers under the administrative pricing mechanism (APM) and in the other; gas is produced by joint venture or private sector companies and sold at a price agreed to under production-sharing contracts (PSCs) to other consumers. The gas used in the fertiliser sector is supplied under the APM.

The government has always played an important role in deciding gas price in India. From 1959-1987, the Oil and Natural Gas Corporation Limited (ONGC) and Oil India Limited (OIL) decided on gas prices. The situation changed in 1987 when the government appointed the Empowered Group of Ministers (EGoM) to determine gas prices. Three such committees determined gas prices for three successive five-year plans starting from 1987. The calculation of the price typically included a producer price and a transport tariff. In 1992, the gas price went up from Rs1400/1000m^3 to Rs 1500/1000m^3. In 1997, government decided to raise gas prices to achieve full parity between gas price at landfall and a basket of LSHS fuel oil prices by 2001-02 and introduced a floor and a ceiling price. However, this policy was abandoned due to the increase in oil prices in the early 2000s and gas prices stayed at the ceiling level.

Nevertheless, there were issues in gas pricing arising due to the differences in production costs of different companies. Besides, increasing international oil and gas prices over the period 2000-2005 pointed to the possibility of gas imports becoming more expensive in future. Hence, in 2005, based on the recommendations of the Tariff Commission, it was decided that the administered price of gas would be increased and that the entire gas covered under the APM would go to power generation, fertilisers, specific end-users covered by court orders and small-scale consumers having allocation up to 0.05 million cubic metres per day (Mcm/d). The price increased from Rs.2850/1000m^3 (USD1.59/MMBTU) to Rs.3200/1000m^3(USD1.79/MMBTU). In the north-east, however, gas was sold at 60 per cent of the revised price. In 2007, the Tariff Commission proposed an increase in the price of gas again but the increase did not happen.

From June 2010, the APM price has been revised to USD 4.2/MMBTU including royalty. For the north-east, the APM price of gas continued to be 60 per cent of the price (USD2.52/MMBTU) prevailing elsewhere in India. It was decided to fix the price in USD and convert it into rupees based on the exchange rate of the previous month.

In 2012, the Government of India constituted a committee under the chairmanship of Dr. C. Rangarajan, one of the objectives of which was to determine a formula for the pricing of domestically produced gas. The committee submitted its report on December 2012. According to the committee, "The twin objectives of expediting production and avoiding cartelisation can be achieved by ensuring that producers in India get at least the average price of what producers elsewhere are getting."[28] The committee held that "gas-on-gas competition is the soundest of all mechanisms when free trade prevails in the gas market."[29] But since the gas market in India is far from being competitive, a gas pricing formula was suggested by the committee. It said, "Indian imports of LNG are likely to grow rapidly over the next few years as domestic production is declining and new discoveries are yet to be commercialised. Hence, the netback to producers of LNG from such imports to India (both spot and term) can be used as a basis for deciding domestic gas prices in India."[30]

[28] From Report of the Committee on the PSC Mechanism in Petroleum Industry, Government of India, 2012
[29] From Report of the Committee on the PSC Mechanism in Petroleum Industry, Government of India, 2012
[30] From Report of the Committee on the PSC Mechanism in Petroleum Industry, Government of India, 2012

The gas pricing formula, derived in the report, is the average of two prices. One is the average producer netback[31] for Indian imports for trailing 12 months[32]. The other is the weighted average price (volume-weighted price of US's Henry Hub, UK's NBP and Japan Custom Cleared) to producers in the global markets for the trailing 12 months. Following the formula, the natural gas rate was calculated at USD8.4/MMBTU. The committee also recommended a review of the situation after five years to examine the feasibility of introducing gas-on-gas competition.

In October 2014, the government modified the Rangarajan formula to increase the gas price by 33 per cent – from USD4.2/MMBTU to USD5.61/MMBTU. This price is lower than that recommended by the Rangarajan Committee.

This is a sizeable increase in gas price, which is going to increase the fertiliser subsidy as most of the plants producing urea use natural gas as feedstock (26 plants out of 30 existing urea plants at present). There are reports (Times of India[33]) that each dollar increase in gas price will increase the production cost of urea by Rs 1,370 per tonne. With this increased production cost, government is likely to have to bear a higher subsidy bill unless policies to counter this effect are introduced.

5. Effects of Fertiliser Subsidy Policy

Fertiliser subsidy has had positive effects in that it has increased fertiliser consumption, which in turn has increased yields and production of different crops. However, it could not incentivise an increase in domestic fertiliser production, increasing the import dependency of the sector. It also failed to encourage the balanced use of nutrients by farmers by keeping the price of urea at an abnormally low level for a long time. Thus, it contributed to soil degradation and other environmental damage arising from the imbalanced use of fertilisers. These effects are discussed below.

5.1 Rising Consumption and Import Dependency of Fertiliser Sector:

Fertiliser subsidy seems to have helped in increasing consumption of fertilisers (in total nutrients), from 16.7 MMT in FY2001 to 23.95 MMT in FY2014 (in nutrients).[34] Per hectare consumption has also increased over this period – from 90.1 kg/ha in FY2001 to 122.7 kg/ha in FY 2014.[35] But domestic production has increased only marginally from 14.7 MMT to 16.7 MMT over the same period. This indicates that much of the increased consumption has been met by rising imports, which increased more than three times, from 2.1 MMT in FY 2001 to 6.7 MMT in FY2014 (Chart 6).

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31 Netback is calculated by taking all of the revenues from the gas, less all costs associated with getting the gas to a market.

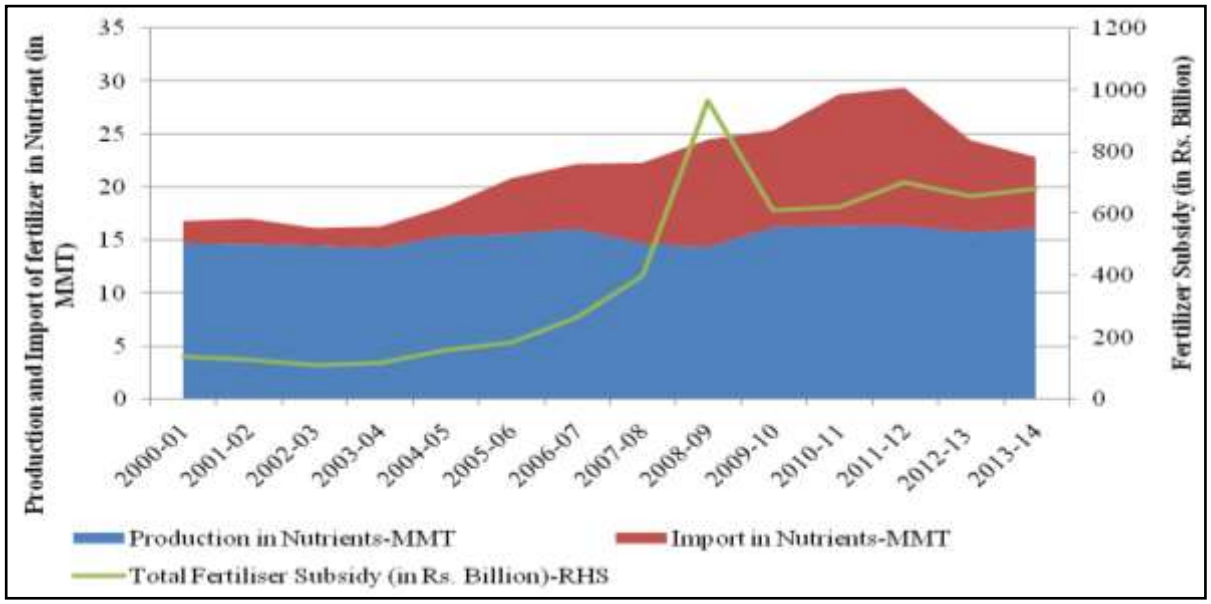
32 "trailing 12 months" means past 12 months.

33 Taken from http://timesofindia.indiatimes.com/business/india-business/Gas-price-hiked-consumers-to-be-cushioned/articleshow/44883137.cms accessed on 20.10.2014

34 All quantities henceforth are in nutrient terms, unless otherwise mentioned

35 Obtained by dividing fertilizer consumption in nutrients (from Annual Report 2014-15 of Department of Fertilizers) by Gross Cropped Area (from Agricultural Statistics at a Glance 2014).

Chart 6: Production and Import of Fertilisers (in nutrients) vis-à-vis Total Fertiliser Subsidy



Source: Constructed using the Expenditure Budget, volume 1, various years; Annual Report 2011-12 and 2013-14, Department of Fertilisers, GoI.

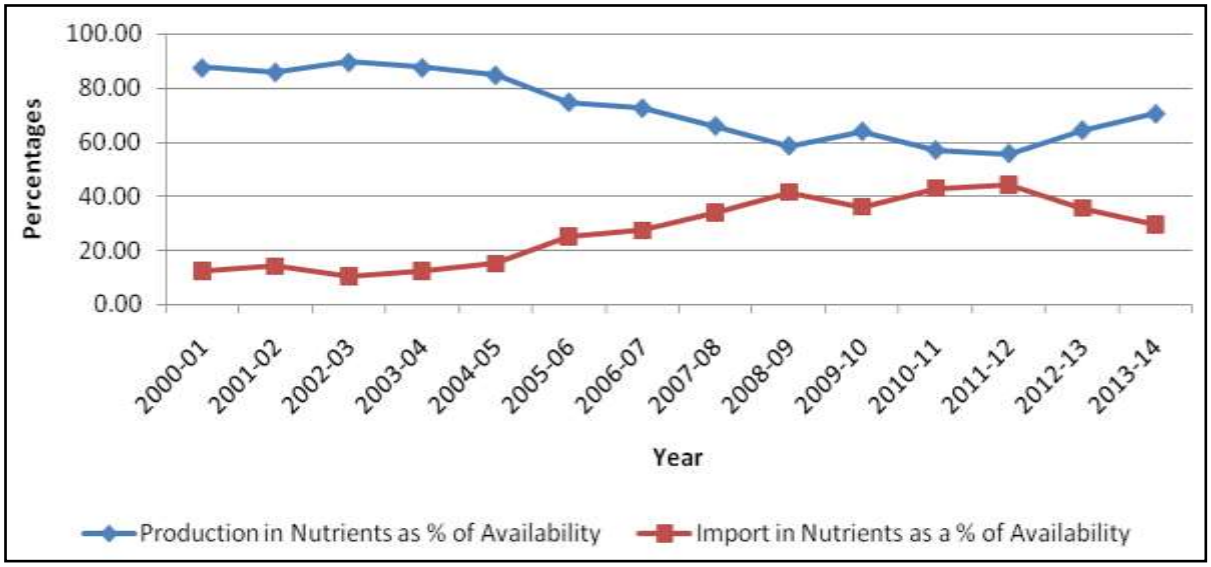
There are two main causes for this stagnation in domestic production:

a. *Lack of raw material for potassic and phosphatic fertilisers:* India is completely lacking in commercially exploitable potash reserves and the entire country's demand for potassic fertilisers (MOP mainly) is met through imports. In the phosphate sector (for e.g., DAP) also, there is limited availability of raw materials like sulphur and rock phosphates and hence, a bulk of raw materials and intermediaries are imported in India. Only in the urea (nitrogenous) sector, most of the requirement is met through indigenous resources. But again, even for production of urea, some inputs like crude oil and now, even gas, are being partly imported. So, this sector is also not entirely self-sufficient.

b. *Low investment in the fertiliser sector in the last decade:* Cumulative estimated investment increased from Rs.252.58 billion in 2000-01 to Rs.281.09 billion in 2010-11. Hence, the capacity creation was also meagre – around 2.3 MMT after the introduction of the new investment policy for urea plants in 2008.[36] (The capacity existing after the revamp of some urea plants is given in Annex 4). In the last two years, however, the cumulative investment in fertiliser sector went up to Rs. 350.90 billion mainly due to the increase in estimated investment in the public sector (Rs. 54.55 billion) in 2012-13.[37] That might be one of the reasons why the share of imports in total fertiliser consumption declined in the last two years (Chart 7).

[36] Page 13, Working Group Report on Fertilizer Industries for the Twelfth Plan Period (2012-13 to 2016-17)
[37] Fertilizer Statistics, 2012-13

Chart 7: Fertiliser Production and Import as a Percentage of Availability (in Nutrients)



Note:

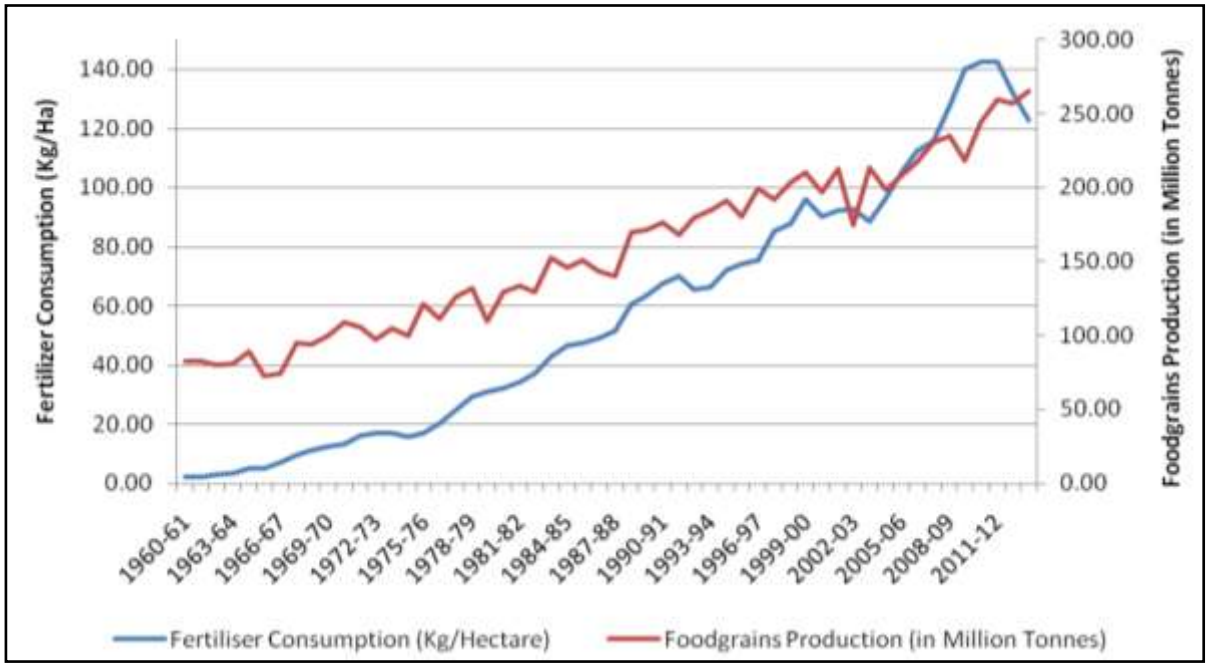
1. Availability here is defined as the sum of domestic production and imports.
2. Calculation is shown in Annex 5

Source: Constructed using the fertiliser production and import data given in Annual Report 2013-14, Department of Fertilisers, GoI

5.2 Increased Food grain Production:

As mentioned earlier, it is very difficult to separate the effects of fertilisers, HYV seeds and irrigation on foodgrain production, as all the three inputs comprise of a composite technology. Nevertheless, the critical role of chemical fertilisers cannot be denied. Food grain production increased more than three times – from 82.02MMT in FY1961 to 265.57MMT in FY2014 and during the same period, per ha consumption of fertilizers (on GCA basis) increased from 1.91 kg/ha in FY 1961 to 122.71 kg/ha in FY2014, showing a strong correlation (0.98) between fertiliser consumption and foodgrain production (Chart 8).

Chart 8: **Fertiliser Consumption per hectare vis-à-vis Food grain Production**



Source: Constructed using data in Annual report 2014-15, Department of Fertiliser, Government of India and Agricultural Statistics at a Glance 2014.

However, in the last decade, the compound annual growth rate (CAGR) of food grain production has become lower than that in earlier decades. The CAGR for the 1960s, 1970s and 1980s were 2.2 per cent, 2.8 per cent, and 3.1 per cent respectively whereas it was 1.9 per cent and 1.1 per cent for 1990s and 2000s respectively. One of the main reasons behind this could be the imbalanced use of nutrients.

5.3 Imbalanced Use of Nutrients

The fertiliser price policy followed in the country did not give right signals to the farmers to use fertilisers in a balanced manner, leading to soil degradation in many parts of the country. The ideal ratio of NPK fertilisers use is considered as 4:2:1. Primarily due to the pricing policy, the ratio has never been close to the ideal except for a few years. At the start of the last decade (2000-01), the ratio was 7.0:2.7:1. The closest it came to the ideal ratio when it was 4.3:2.0:1 was in 2009-10. But after the introduction of the nutrient-based subsidy (NBS) regime for P and K fertilisers in 2010, the prices of these nutrients increased rapidly while urea prices remained controlled and significantly low. The price of the phosphatic fertiliser DAP has gone up by over 153 per cent from Rs. 950 per MT in 2010-11 to Rs.25183.5/MT (average of four quarters) in 2013-14. Similarly, the price of the potassic fertiliser MOP has shot up by 255 per cent from Rs.5055 in 2010-11 to Rs.17972/MT (average of four quarters) in 2013-14. This has lead to the unbalanced use of nutrients again. The ratio of NPK usage has increased to 9.9:3.3:1 in 2012-13 and 8.4:2.8:1 in 2013-14.

Again, this was the all-India picture. The usage ratios in some states like Punjab, Haryana and Rajasthan are really alarming. Even some states like Andhra Pradesh, where the usage ratio

was close to the ideal ratio, has now started to deteriorate from 2011-12 onwards (Table 2, Annex 6 for N-P-K ratios for all states).[38]

Table 2: NPK Consumption Ratios for selected states:

Year	NPK ratio				
	All-India	**Haryana**	**Punjab**	**Rajasthan**	**Andhra Pradesh**
1	2	3	4	5	6
2000-01	7.0:2.7:1	73.9:21.3:1	42.5:11.9:1	92.1:30.5:1	6.5:2.9:1
2007-08	5.5:2.1:1	39.8:10.9:1	34.3:9.0:1	33.7:12.5:1	3.8:1.7:1
2008-09	4.6:2.0:1	32.2:10.7:1	23.6:6.7:1	30.2:13.6:1	3.5:1.7:1
2010-11	4.7:2.3:1	20.5:7.1:1	19.1:5.9:1	24.9:11.8:1	3.9:2.1:1
2011-12	6.7:3.1:1	27.2:9.8:1	26.8:8.5:1	34.9:15.9:1	6.1:3.2:1
2012-13	9.9:3.3:1	61.4:18.7:1	61.7:19.2:1	44.9:16.5:1	7.1:2.8:1

Source: Calculated from State-wise and All-India NPK consumption figures given in Agricultural statistics at a Glance, Various Years

The imbalanced use of fertilisers could cause serious problems. The most pronounced of them are:

- ***Widespread deficiency of secondary and micro nutrients***:

On an all-India basis, the deficiency of sulphur has been found to be 41 per cent, zinc 48 per cent, boron 33 per cent, iron 12 per cent and manganese 5 per cent.[39] Among them, the deficiency of zinc is particularly worth mentioning since the deficiency of zinc in the soil leads to its deficiency in food, which results in the stunted growth and impaired development of infants[40]. Thus, prolonged zinc deficiency might be very harmful for generations to come and hurt India's demographic dividend.

- ***Decreasing response of crops, particularly food grains to fertiliser use:***

According to the Working Group on the Fertiliser Industry for the Twelfth Plan, 2012-13 to 2016-17, Department of Fertilisers, *"The average response to fertiliser application used to be around 10:1 during 1960s and 1970s (sic). The response ratio obtained by research scientists which had been adopted by Department of Agriculture and Co-operation, GOI, for calculating demand projections was 1:7.5 for the 8th Plan, 1:7 for 9th Plan, 1:6.5 for 10th Plan and 1:6 for 11th Plan. However, IASRI, ICAR has made a study in the recent years to work out the response ratio of fertilisers for food grains based on the farmers field data and has concluded the response ratio of*

[38] Needless to say, soil structures differ from plot to plot, across districts and states, and therefore, the optimal ratio of N, P and K will vary accordingly. Some experts make a big issue out of this, but even when one goes by the state specific 'ideal ratios', the reality on ground remains skewed in favour of nitrogenous fertilisers. Ramesh Chand (2015), e.g., gives the normative ratios for Haryana, Punjab, Rajasthan, Andhra Pradesh and All-India as 4.0:1.7:1, 4.1:1.6:1.0, 10.3:5.7:1.0, 2.4:1.4:1.0 and 2.6:1.4:1 respectively, but the reality given in Table-2 differs widely from these.

[39] Page 198, Report of the Working Group of Fertilizer Industry for the Twelfth Plan (2012-13 to 2016-17)

[40] If the soil is Zinc deficient, the produced crop is zinc deficient and people consuming that would not have required zinc. Since zinc is essential for growth, absence of that causes stunted growth in infants.

NPK as 1:7.8, but the response ratio varied for different crops from 1:4.9 for oilseeds to 1:7.1 for pulses and 1:8.6 for cereals (sic).”

Table 3: Grain MSP to N Prices Ratio-2014-15:

MSP of Rice	MSP of Wheat	Price of Urea	Price of N	MSP of Rice: Price of N	MSP of Wheat: Price of N
(Rs./MT)					
20400	14000	5360	11652.17	1.75:1	1.20:1

Source: Agricultural Statistics at a Glance 2014 and Fertiliser Statistics 2012-13

Since the price of N is favourable compared to the MSP for rice and wheat, the price of urea can be increased since the response ratio is high.

- ***Environmental damage:***

Overuse of fertilisers, especially nitrogenous ones, has a degrading effect on the environment. As mentioned in Prasad (2009), “Part of applied fertiliser N is lost as NH_3, N_2, and NO_x gases, which adversely affect the environment. NH_3 after oxidation to NO_3 also contributes to soil acidity, while other NOx are involved in depletion of the stratospheric ozone layer. Part of applied fertiliser N leaches down as NO_3 and contaminates the groundwater resources”. Prasad (2009) has also mentioned that various studies have found that NO_3 contamination in groundwater has become a matter for concern in many states. For example, one of the hazardous side effects of NO_3 contamination in groundwater is methaemoglobinemia or the blue baby syndrome. A study in Rajasthan revealed that there is severe methaemoglobinemia in all age groups of the population, especially in the less than one year age group (Gupta et al., 2000). The WHO safe limit for drinking water is 10 mg NO_3–N·L–1. But it was reported that of the total 822 groundwater samples from Punjab and Haryana, only 3.3 per cent had NO_3–N in the 0–10 mg·L–1 range. Most of the samples, around 58 per cent, contained greater than 22 mg·L–1. Datta et al. (1997) reported < 0.22 to 159 mg NO_3–N·L–1 in Delhi. Other states affected by No_3 pollution in groundwater include Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra.

6. The Way Forward:

The above discussion makes it clear that India’s fertiliser sector is in a mess with rising subsidies, lagging investments, rising imports, highly imbalanced use of NPK, and the diversion of urea to other countries and for uses other than agriculture. This is largely a result of administered-pricing and subsidy policies, particularly of urea. Since land is a scarce resource in a densely populated country like India, increasing agricultural productivity is the only way out to ensure food security. And to increase agricultural productivity, along with the use of HYV seeds and proper irrigation, the importance of balanced use of fertilisers is undeniable. Hence, policies must be directed towards giving proper incentives and price signals to encourage the balanced used of fertilisers. Although the Government of India has already started taking some steps in this direction, they are far from what is needed to bring the sector back on track. Some of steps taken by the government are discussed below:

Gas Price Pooling:

Urea price correction is needed to encourage balanced nutrient application. But there is a problem in totally decontrolling urea prices. Since different urea plants get gas (main feedstock for most of the plants) at different prices, their cost of production differs. Production costs of 30 urea plants ranged from USD163.8 to USD773 in 2014-15, but that does not necessarily indicate that the plants with higher production costs were using less efficient technology. A significant part of the high production cost could be attributable to higher gas prices. And gas pricing is controlled by the government.

Therefore, before even considering the decontrol of urea, it is important that all urea plants get gas at a uniform price. The GoI has recently moved in that direction by pooling gas prices. The pooled price for gas to urea plants is now at USD10.5/MMBTU.[41] This will encourage energy use efficiency amongst urea plants; GoI also expects that it will increase domestic production by around 3.71 MMT of urea in existing fertiliser units over the next four years (i.e., 2015-16 to 2018-19), reduce imports and save subsidy worth Rs. 1550 crore over the period.

Use of neem-coated Urea:

If not applied properly, a sizeable portion of urea applied in the fields is lost.[42] To overcome this problem, GoI has encouraged the production of neem-coated urea in the last decade. Neem-coated urea increases nitrogen use efficiency (NUE)[43] for a crop by retarding the release of nitrogen from urea and reducing the wastage of nitrogen due to leaching, denitrification etc. In the last three years, the sale of neem-coated urea has increased from 3.62 MMT in 2011-12 to 6.34 MMT in 2013-14.[44] Because of the increasing yields associated with higher NUE, the government removed the cap on neem-coated urea production and allowed indigenous producers to neem-coat 100 per cent of their subsidised production of urea. Taking this further, the fertiliser ministry, in a notice to domestic urea manufacturers, made it mandatory to neem-coat at least 75 per cent of their production.[45] This particular decision is expected to reduce fertiliser subsidy by Rs.6500 crore.[46]

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41 Source: Fertiliser Association of India (FAI)

42 The nitrogen use efficiency (NUE) for cereal production worldwide is low and the 67 per cent lost N represents an annual loss of Rs.72000 crore (NAAS 2005). In the case of India, the NUE is very low, especially in the case of rice culture (20-40 per cent: Kumar et al, 2012). The applied nitrogen gets lost due to various reasons including ammonia volatilisation, denitrification, leaching beyond rooting zones of crops and run off (NAAS 2005, 2006).

43 Research done by the Indian Agricultural Research Institute (IARI) indicates an increase in rice grain yield on applying neem-coated urea of 6.3 per cent to 11.9 per cent as compared to the yield from applying normal urea. Obviously, there is a difference between on-station and on-farm yield. But, even in the field, the use of neem-coated urea has led to an increase of 2 per cent to 10 per cent in the yield of rice as compared to uncoated urea. (PIB, March 3, 2015).

44 Press Information Bureau, 9th Dec 2014

45 http://fert.nic.in/sites/default/files/documents/Policy%20for%20encouraging%20production_0.pdf accessed on 03.04.2015

46 http://articles.economictimes.indiatimes.com/2015-03-30/news/60643886_1_domestic-urea-manufacturers-neem-coated-urea-neem-coated-urea accessed on 02.04.2015

These two policy decisions are undoubtedly in the right direction, and have been long overdue. But much bigger policy decisions are needed to rationalise the fertiliser subsidy regime. Some of the required policy initiatives are as follows.

Correcting Price Signals and Decontrolling the Fertiliser Sector:

The world price of urea is hovering around USD300/MT. The country specific prices, however, vary widely. Indian farmers pay a very low price for urea to date – Rs.5360/MT (USD86 at an exchange rate of Rs.62/USD) while in China, urea is priced at $265/MT, in Pakistan at $362/MT, in Bangladesh at $207/MT, in Indonesia at $148/MT, and in the Philippines at $462/MT (Annex 7). Among the large developing economics, perhaps Indian farmers pay the lowest price for urea. This leads to the misuse of urea – its diversion to non-agricultural uses as well as its being smuggled into neighbouring countries. There are no firm estimates, but insider 'guesstimates' of this range between 10-20 per cent of urea distributed in the country. So, raising urea prices, say by 200 per cent, seems an obvious choice. But despite several committees having recommended this, it has not been accepted by the governments of the day. Politically, raising urea prices by about 200 per cent in a single shot, or even in a 3-5 year period, does not seem to be a feasible option, unless this increase is accompanied by a substantial increase in the MSPs of staples like wheat and rice.

The ratio of the MSPs for rice and wheat to their respective urea prices (gives a sense of profitability from applying urea) in different countries show a high ratio for India compared to other countries (Chart 9, Annex 7). But in reality, India's MSP levels are far lower than those in the other countries (Chart 10, Annex 7). Take the case of Pakistan and China; while their urea prices are way higher than in India, they also offer much higher MSPs for certain crops. In Pakistan, the MSP for wheat is $320/MT and in China, $385/MT, against India's $226/MT. Fertiliser cost in Punjab accounts for about 7 per cent of the MSP of wheat. If one adjusts for this, the Indian farmer is in a situation of great disadvantage. If the price of urea is raised by more than 200 per cent, taking it from $86/MT to nearly $265/MT – the price Chinese farmers are paying – while the MSP of wheat is also raised from $226/MT to, say, $385/MT (what the Chinese farmer is getting) or even $320/MT (what the Pakistani farmer is getting), the Indian farmer would be more than happy. So, politically, such a proposal can sail through. But given the National Food Security Act, 2013, which promises wheat and rice at R2-3/kg, this MSP rise will lead to an explosive growth in food subsidy and further distorting the cropping patterns in favour of wheat and rice. India may end up being worse off. Hence, any policy towards increasing fertiliser prices must be well thought out. Deregulation of the sector should be started with first decontrolling the phosphatic and potassic fertiliser sectors since they are already more or less deregulated, and the subsidy on these fertilisers should be directly transferred to farmers' accounts as cash. After that, the urea sector should be decontrolled gradually.

Chart 9: Ratio of MSP of Rice and Wheat to Urea in Selected Countries-2014

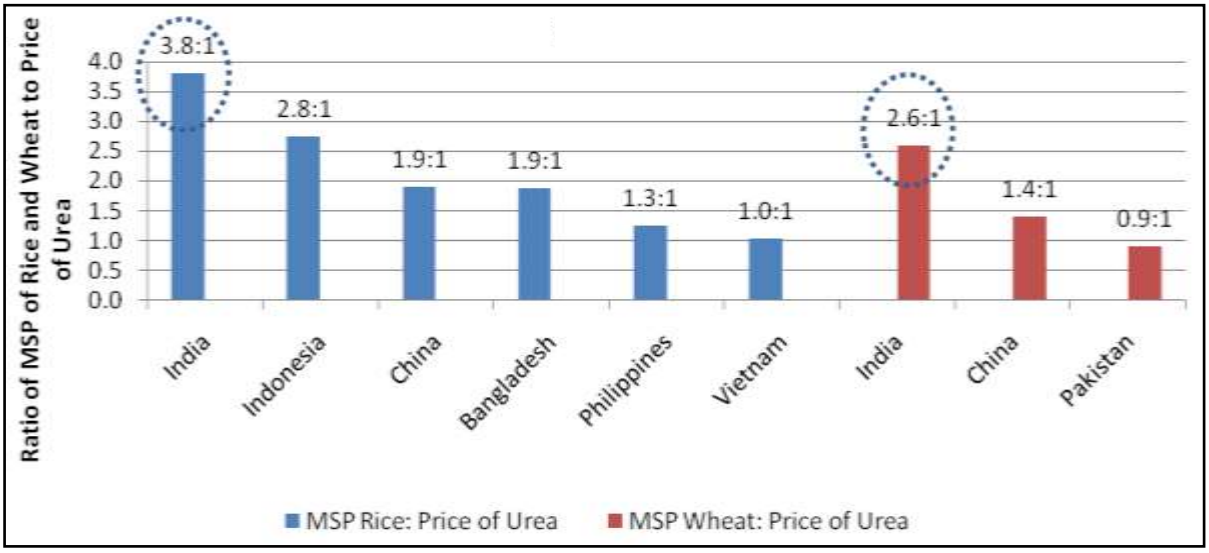
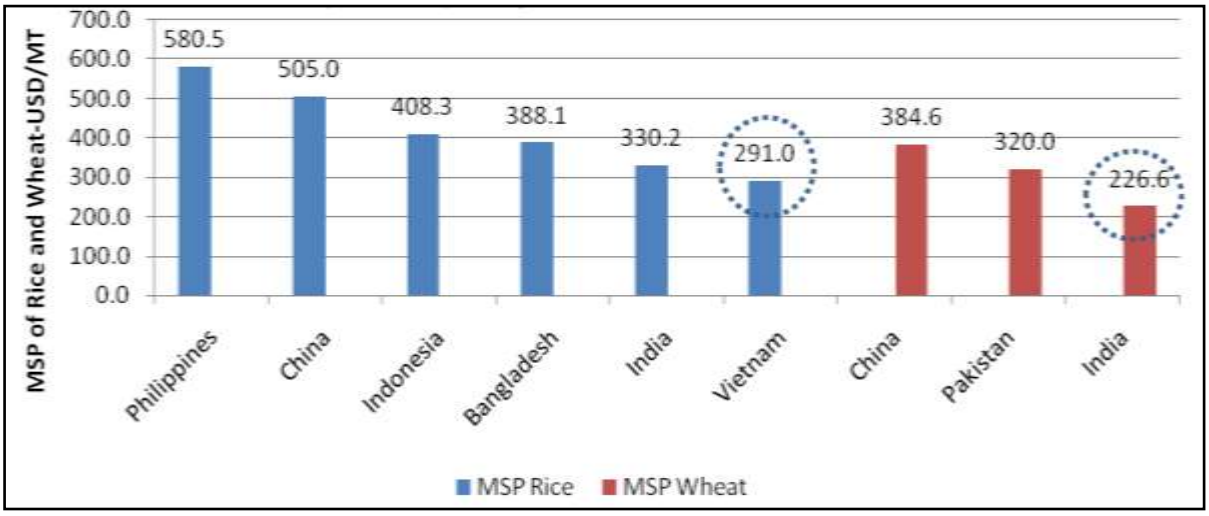


Chart 10: MSP (USD/MT) Comparison between Selected Countries-2014



Source: See Annex 7

Direct cash transfer to the farmers:

Subsidising farmers by reducing the price of inputs could ultimately be regressive, i.e., rich households could benefit more from the subsidisation than their poorer counterparts. This could distort the market in a way that hurts the poor (Economic Survey 2014-15, Volume 1, pp 53-56). Hence, instead of subsidising fertiliser (especially urea) plants and keeping the price of urea abnormally lower than market dictated prices, the government could simply transfer cash to farmers equivalent to the current fertiliser subsidy, say about Rs 6000-7500/ha.[47] If the government wants to make this progressive, farmers with holdings of below 4 ha can be given the subsidy entitlement at a rate higher than those with above 4 ha of holding size. The direct cash transfer can be made through the Jan Dhan Yojana, with

[47] The subsidy amount of Rs 1.1 lakh crore (including arrears), divided by the net sown area of about 140 million ha works out to roughly Rs 7857/ha. But since these arrears belong to last few years, one can take an approximate figure of Rs 6000-7500/ha for the current level of subsidy on yearly basis.

Aadhaar linkage. This is politically feasible, and will lead to huge savings by simply stopping the diversion of urea for non-agricultural uses and to other countries. It will also give the right signal to the farmer for balanced use of NPK, thereby raising the productivity of fertiliser use. The only condition that should be imposed on the beneficiaries is that they have to get their soils tested, say every 2-3 years. The subsidy amount should also be revised after certain intervals taking into consideration the present and forecast price levels of fertilisers.

The argument for direct cash transfer in place of fertiliser has attracted the criticism that farmers would use the transferred subsidy for conspicuous consumption rather than the consumption of fertiliser. But we must consider farmers as rational economic agents who will spend the money for a use that will help them increase their earnings. Besides, there are various studies done in African and Latin American developing nations that indicate that conditional cash transfers help reduce inequality and poverty. Another experimental pilot case study by the UNDP in Delhi (SEWA Bharat 2012) indicates that cash transfers to the women's account in lieu of the ration system helped decrease indebtedness, did not hurt food security and provided an opportunity to increase non-cereal consumption. That is to say, it can be expected that the transferred money would serve the purpose it was meant to. Of course, before rolling out cash transfer for fertiliser, such pilot projects can be taken up to see whether the result holds in this case as well.

Tie-up with Gulf Countries to Set up Plants:

Now that the gas price is pooled, the cost structure of 30 urea plants in the country will undergo a change. The range of cost of production with pooled gas price has narrowed down to between USD 252.83/MT for the lowest cost plant to USD 455.52MT for the highest cost plant as against a range of between USD163.70 and USD772.98 earlier. Given that the world price of urea was USD316.21/MT in 2014 and is projected to be at USD290/MT in 2015, the decontrol of urea would render many existing urea plants unviable under the new pooled gas pricing structure (Chart 11). Simple calculation shows that even if we add $30/MT as transportation cost to the projected price of $290/MT, 12 plants will become unviable – these account for almost 26 per cent of total urea production (Annex 8). The reason is simple: pooled gas price for urea plants in India in 2015 ($10.5/MMBTU) is more than three times higher than in Gulf countries, where gas price has been around $3/MMBTU in recent times. So, the future way to produce urea more efficiently might lie in setting up joint ventures in countries where gas price is relatively low. Since the major cost of producing urea is the gas price, it makes sense to get into a long-term urea off take agreement with countries where gas supplies are abundant and gas price is considerably lower than in India once the capital cost is recovered. India already has such an agreement in place in Oman. The Oman India Fertiliser Company (OMIFCO) has been established as the result of an initiative by the Governments of Oman and India and is owned 50 per cent by Oman Oil Company SAOC (OOC), 25 per cent by the Indian Farmers Fertiliser Co-operative Limited (IFFCO) and 25 per cent by Krishak Bharati Co-operative Limited (KRIBHCO). The Sultanate of Oman has agreed to supply gas for the entire life of the project and GoI will purchase the entire urea production for 15 years. It has been operational since 2006. Another proposal is in progress with Iran,

where the Iran government has agreed to supply gas at USD 2.9/MMBTU. More such ventures are needed to meet the increasing fertiliser demand of India. To incentivise such ventures, GoI could formulate appropriate policies such as allowing open access to the domestic fertiliser market for overseas firms. .

Increase in soil testing facility and issuing soil health cards:

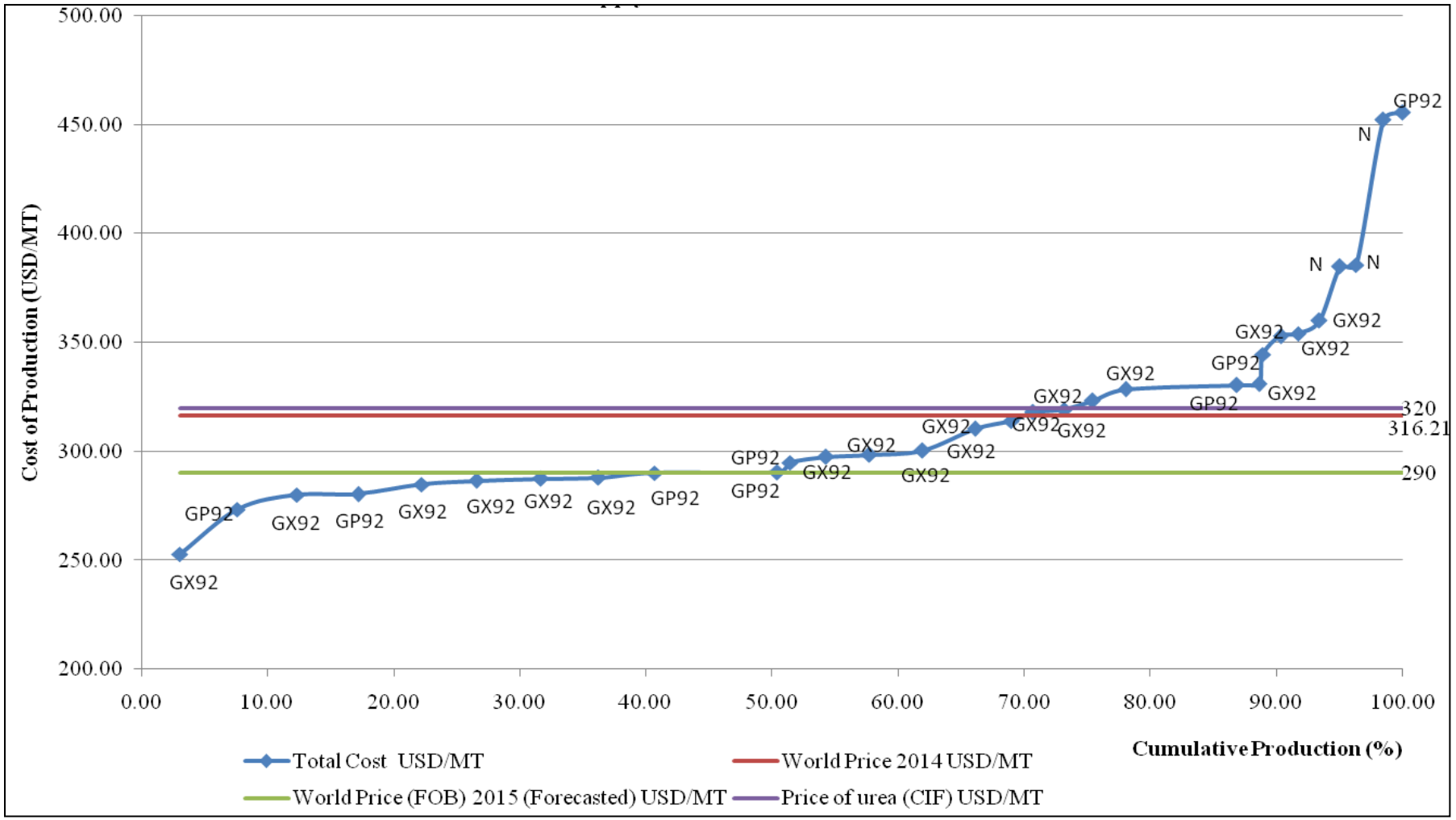
To keep soil fertility intact, we need to know the optimum amount of fertilisers to be used in each plot of land for different agro-climatic zones as well as for different crops, for which soil testing laboratories are needed all over the country.

The issue of setting up soil testing laboratories has been given importance in the 11th plan. Up to March 2012, 1049 soil testing laboratories have been set up in the country (Press Release September 7, 2012). After the new government assumed power in 2014, the Prime Minister launched the "Soil Health Card Scheme" on February 19, 2015, under which it is expected that 14 crore farmers will be issued these cards in the coming 3 years. The cards will not only indicate the nutrient status of the soil but also contain recommendations for fertiliser use. They are to be updated every three years. But, there is a deficiency of soil testing facilities in India. Providing for ample infrastructure in this regard will help farmers understand the soil better and ensure that they apply fertilisers to replenish the nutrient needs of the soil in an efficient manner. That, in turn, will ensure sustainable growth in the agricultural sector.

Digitisation of land records:

The process of digitisation of land records was launched in August 2008 but has not gathered momentum. According to the website of the National Land Records Modernisation Programme, the digitisation has not even been begun properly in most states. Obviously, at this pace, it would take a long time to digitise land records. Without setting right the land records, it will be impossible to transfer the subsidy to beneficiaries or to issue soil health cards. The government should take this up as a challenge and call for states' to take up the issue immediately.

Chart 11: Supply Curve of Urea and World price



Note: GP92 → Gas-based plants, pre-1992; GX92 → Gas-based plants, post-1992; N → Naphtha-based plants

Source: World price for 2014 is from World Bank Pink Sheet, 2015 from World Bank's price forecast

Ensuring timely reach of subsidy to farmers:

Last but not the least, in the drive for increased efficiency and productivity, we should not forget the question of equity and inclusiveness, for 85 per cent of our operational holdings belong to small and marginal farmers[48] and smaller farms tend to use fertiliser more intensively.[49].

Thanks to advances in Information Technology (IT), reaching farmers has become easier than ever before. The subsidy payments that were going to manufacturers and importers can now go to farmers directly. While there have been attempts to compensate farmers directly earlier too, these did not yield any result because the technology was not there. But now, with the advances in IT, we have the mobile-based fertiliser monitoring system (m-FMS) in place. Again, with over 17.29 crore accounts being opened under Pradhan Mantri Jan Dhan Yojana (PMJDY),[50] our policymakers have an advantage that their predecessors did not. Hence, our policies should be reformulated in the light of recent technological advances to achieve not only efficiency but also equity and sustainability.

48 Agricultural Census 2010-11
49 Input Survey 2006-07
50 From http://www.pmjdy.gov.in/account-statistics-country.aspx accessed on August 4, 2015

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Annexure

Annex 1: Calculation for Change in the Composition of Total Subsidy

Year	Food Subsidy	Fertiliser Subsidy	Petroleum Subsidy	Other Subsidy	Total Subsidy	GDP at Current market Prices	Food Subsidy	Fertiliser Subsidy	Petroleum Subsidy	Other Subsidy	Fertiliser, Food and Petroleum subsidy as a percentage of GDP
	Rs. Billion						As percentages of total subsidy				
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8] ={[2]/[6]}*100	[9] ={[3]/[6]}*100	[10] ={[4]/[6]}*100	[11] ={[5]/[6]}*100	[12] = {([2]+[3]+[4])/[7]}*100
2000-01	120.60	138.00	0.00	9.78	268.38	21774.13	44.94	51.42	0.00	3.64	1.19
2001-02	174.99	125.95	0.00	11.16	312.10	23558.45	56.07	40.36	0.00	3.58	1.28
2002-03	241.76	110.15	52.25	31.17	435.33	25363.27	55.53	25.30	12.00	7.16	1.59
2003-04	251.81	118.47	63.51	9.44	443.23	28415.03	56.81	26.73	14.33	2.13	1.53
2004-05	257.98	158.79	29.56	13.24	459.57	32422.09	56.14	34.55	6.43	2.88	1.38
2005-06	230.77	184.60	26.83	33.02	475.22	36933.69	48.56	38.85	5.65	6.95	1.20
2006-07	240.14	262.22	26.99	41.90	571.25	42947.06	42.04	45.90	4.72	7.33	1.23
2007-08	313.28	399.90	28.20	42.88	784.26	49870.90	39.95	50.99	3.60	5.47	1.49
2008-09	437.51	966.03	28.52	65.02	1497.08	56300.63	29.22	64.53	1.91	4.34	2.54
2009-10	584.43	612.64	149.51	66.93	1413.51	64778.27	41.35	43.34	10.58	4.74	2.08
2010-11	638.44	623.01	383.71	89.04	1734.20	77841.15	36.81	35.92	22.13	5.13	2.11
2011-12	728.22	700.13	684.84	66.22	2179.41	90097.22	33.41	32.12	31.42	3.04	2.35
2012-13	850.00	656.13	968.80	95.86	2570.79	101132.81	33.06	25.52	37.68	3.73	2.45
2013-14	920.00	673.39	853.78	99.15	2546.32	113550.73	36.13	26.45	33.53	3.89	2.16

Note:

1. Other subsidy includes subsidy on import/export of sugar, grants to NAFED and interest subsidy among others
2. Petroleum subsidy includes subsidy on diesel, kerosene, domestic LPG, freight subsidy for far-flung areas and supply of natural gas to the north-east region

Source:

1. Expenditure Budget, Volume 1, various years and Annual Report 2010-11 of Department of Fertilisers-for Columns 2-5
2. NAS 2014-for Column

Annex 2: Calculation of Fertiliser Subsidy as a percentage of Different Macroeconomic Variables

Year	GDP at current Prices	Agricultural GDP at Current Prices	Centre's Tax Revenue (Net of States' Share)	Fertiliser Subsidy	Fertiliser Subsidy	Fertiliser Subsidy as a % of GDP	Fertiliser Subsidy as a % of Agricultural GDP	Fertiliser Subsidy as a % of Tax Revenue
	Rs. Billion	Rs. Billion	Rs. Billion	Rs. Billion	USD Billion			
[1]	[2]	[3]	[4]	[5]	[6]	[7]={[5]/[2]}*100	[7]={[5]/[3]}*100	[8]={[5]/[4]}*100
2000-01	21774.13	4606.08	1366.58	138.00	3.02	0.63	3.00	10.10
2001-02	23558.45	4986.20	1335.32	125.95	2.64	0.53	2.53	9.43
2002-03	25363.27	4850.80	1585.44	110.15	2.28	0.43	2.27	6.95
2003-04	28415.03	5446.67	1869.82	118.47	2.58	0.42	2.18	6.34
2004-05	32422.09	5654.26	2247.98	158.79	3.53	0.49	2.81	7.06
2005-06	36933.69	6377.72	2702.64	184.60	4.17	0.50	2.89	6.83
2006-07	42947.06	7229.84	3511.82	262.22	5.79	0.61	3.63	7.47
2007-08	49870.90	8365.18	4395.47	399.90	9.93	0.80	4.78	9.10
2008-09	56300.63	9432.04	4433.19	966.03	21.00	1.72	10.24	21.79
2009-10	64778.27	10835.14	4565.36	612.64	12.92	0.95	5.65	13.42
2010-11	77841.15	13196.86	5698.69	623.01	13.67	0.80	4.72	10.93
2011-12	90097.22	14990.98	6297.65	700.13	14.61	0.78	4.67	11.12
2012-13	101132.81	16449.26	7418.77	656.13	12.06	0.65	3.99	8.84
2013-14	113550.73	19063.48	8360.26	673.39	11.13	0.59	3.53	8.05

Source:

1. NAS 2014 for columns 2 and 3
2. Economic Survey, Various Years and Receipt Budget 2014-15 -for Column 4
3. Expenditure Budget, Volume 1, various years and Annual Report 2010-11 of Department of Fertilisers – for Column 5

Annex 3: Calculation for the Prices of DAP and MOP for the Years in which their Prices Varied

Calculation for 1992-93-1996-97 and 1999-2000 *(In Rs. /MT)*

Year	DAP							MOP						
	Kharif			RABI			Average	Kharif			RABI			Average
	Min	Max	Average	Min	Max	Average		Min	Max	Average	Min	Max	Average	
1992-93				6500	6800	6650	6650							4500
1993-94	6200	7000	6600	6200	7000	6600	6600	3600	4000	3800	3600	4000	3800	3800
1994-95	6900	7770	7335	7544	8799	8171.5	7753.25	3562	3900	3731	3676	3940	3808	3769.5
1995-96	9099	9800	9449.5	9629	10247	9938	9693.75	3619	4543	4081	4200	4800	4500	4290.5
1996-97	7575	8740	8157.5	8161	9100	8630.5	8394	3714	4300	4007	3974	4500	4237	4122
1999-2000			8300			8900	8600			3700			4255	3977.5

Note:

1. Averages for kharif and rabi periods are simple averages of the minimum and maximum price of that period.
2. Average price for a year considered is the simple average of the average prices prevailing in the kharif and rabi periods

Source: Maximum and minimum prices are from Fertiliser Statistics 2012-13

Calculation for 2010-11-2013-14: *(In Rs. /MT)*

Year	Quarter	Price of DAP	Price of MOP
2010-11	**I**	9950	5055
	II	9950	5055
	III	9950	5055
	IV	10750	5055
	Average	10150	5055
2011-12	**I**	12500	6064
	II	18200	11300
	III	20297	12040
	IV	20000	12040
	Average	17749	10361
2012-13	**I**	24800	16695
	II	26500	23100
	III	26500	24000
	IV	26500	18750
	Average	26075	20636
2013-14	**I**	26520	18638
	II	25000	17750
	III	24607	17750
	IV	24607	17750
	Average	25184	17972

Note: Averages for a year is the simple average of prices prevailing in each quarter

Source: Fertiliser Statistics 2012-13

Annex 4: Installed Capacities and Actual Production of Urea Plants in India

Year of Commencement	Year of Revamp	Unit	Sector	Feed- stock	Installed Capacity (Lakh MT)	Actual Production (2012-13)
1967		GSFC-Baroda	Private	Gas	3.706	3.472
1969		SFC-Kota	Private	Gas	3.794	3.854
1969	2013	KFC-Kanpur	Private	Gas	7.220	
1971	1997	MFL-Madras	Public	Naphtha	4.868	4.358
1973		ZIL-Goa	Private	Gas	3.993	3.867
1975		SPIC – Tuticorin	Private	Naphtha	6.200	4.818
1976	2005	BVFCL:Namrup-II	Public	Gas	2.400	1.094
1976		MCFL-Mangalore	Private	Naphtha	3.795	3.795
1978		NFL-Nangal	Public	Gas	4.785	4.714
1978		IFFCO-Kalol	Coop.	Gas	5.445	6.003
1979		NFL-Bhatinda	Public	Gas	5.115	3.945
1979		NFL-Panipat	Public	Gas	5.115	4.138
1981	2008	IFFCO-Phulpur	Coop.	Gas	6.979	6.731
1982		RCF-Trombay-V	Public	Gas	3.300	3.841
1982		GNFC-Bharuch	Private	Gas	6.369	7.088
1985	2012	RCF-Thal	Public	Gas	21.568	19.512
1986	2012	KRIBHCO-Hazira	Coop.	Gas	21.950	21.356
1987	2002	BVFCL-Namrup-III	Public	Gas	3.150	2.813
1988	2012	NFL-Vijaipur	Public	Gas	9.991	9.661
1988	2008	IFFCO-Aonla	Coop.	Gas	9.991	10.92
1988		Indogulf-Jagdishpur	Private	Gas	10.725	10.854
1992	2009	NFCL-Kakinada	Private	Gas	7.673	7.881
1993	2009	CFCL-Gadepan-Unit I	Private	Gas	10.230	10.358
1994	2008	TCL-Babrala	Private	Gas	11.550	11.274
1995		KRIBHCO SHYAMShahjahanpur	Private	Gas	8.646	10.083
1996	2008	IFFCO-Aonla Expansion	Coop.	Gas	9.991	11.528
1997	2012	NFL-Vijaipur Expansion	Public	Gas	10.662	9.652
1997	2008	IFFCO-Phulpur Expansion	Coop.	Gas	9.991	9.92
1998	2009	NFCL-Kakinada Expansion	Private	Naphtha	7.527	7.777
1999	2009	CFCL-Gadepan-Unit II	Private	Gas	9.900	10.56

Source: Fertiliser Statistics 2012-13

Annex 5: Calculation for Fertiliser Production and Import as a Percentage of Availability (in Nutrients)

Year	Production	Import	Availability	Production	Import
	MMT			as a % of availability	
[1]	[2]	[3]	[4]=[2]+[3]	[5] ={[2]/[4]}*100	[6] ={[3]/[4]}*100
2000-01	14.70	2.09	16.80	87.55	12.45
2001-02	14.63	2.40	17.03	85.91	14.09
2002-03	14.47	1.67	16.15	89.63	10.37
2003-04	14.27	2.02	16.28	87.61	12.39
2004-05	15.41	2.75	18.16	84.85	15.15
2005-06	15.58	5.25	20.83	74.78	25.22
2006-07	16.10	6.08	22.18	72.58	27.42
2007-08	14.71	7.58	22.29	65.98	34.02
2008-09	14.33	10.15	24.49	58.54	41.46
2009-10	16.22	9.15	25.37	63.94	36.06
2010-11	16.38	12.36	28.74	56.98	43.02
2011-12	16.36	13.00	29.36	55.72	44.28
2012-13	15.74	8.70	24.43	64.40	35.60
2013-14	16.09	6.73	22.82	70.51	29.49

Source: Annual Report 2013-14, Department of Fertilisers, GoI

Annex 6: State-wise N-P-K Ratio

States	2004-05	2005-06	2006-07	2007-08	2008-09	2010-11	2011-12	2012-13
Andhra Pradesh	4.0:1.8:1	4.5:2.0:1	4.4:2.1:1	3.8:1.7:1	3.5:1.7:1	3.9:2.1:1	6.1:3.2:1	7.1:2.8:1
Karnataka	2.4:1.4:1	2.2:1.3:1	2.6:1.5:1	2.4:1.2:1	2.1:1.4:1	2.6:1.7:1	3.7:2.4:1	3.6:1.6:1
Kerala	1.2:0.6:1	1.1:0.6:1	1.2:0.6:1	1.3:0.6:1	1.2:0.6:1	1.2:0.7:1	1.4:0.7:1	1.4:0.7:1
Tamil Nadu	1.9:0.8:1	2.0:0.9:1	2.2:1.0:1	1.8:0.7:1	1.8:1.7:1	2.1:0.9:1	2.6:1.2:1	3.9:1.5:1
Pondicherry	2.5:1.1:1	2.4:1.2:1	3.3:1.5:1	2.3:1.0:1	2.6:0.9:1	3.5:0.9:1	4.8:1.3:1	7.0:1.7:1
A&N Islands	3.9:1.4:1	4.0:1.6:1	7.3:7.0:1	3.3:3.0:1	2.0:1.3:1	2.1:1.7:1	2.2:2.2:1	1.7:1.3:1
Lakshadweep								
Gujarat	7.8:3.1:1	7.2:2.8:1	7.7:3.0:1	7.2:2.9:1	0.9:.04:1	6.9:2.9:1	8.9:3.1:1	13.2:3.4:1
Madhya Pradesh	11.2:7.1:1	9.5:5.5:1	11.2:6.3:1	10.5:5.7:1	8.9:5.9:1	7.8:5.8:1	13.4:9.4:1	15.3:10.1:1
Chhattisgarh	6.6:2.8:1	6.1:2.8:1	5.7:2.4:1	5.2:2.2:1	4.4:2.2:1	4.7:2.5:1	5.8:2.9:1	8.1:3.9:1
Maharashtra	3.7:2.0:1	3.2:1.8:1	3.3:1.8:1	3.0:1.5:1	2.8:1.6:1	2.5:1.7:1	4.0:2.5:1	3.5:1.8:1
Rajasthan	33.2:12.4:1	31.2:12.2:1	51.2:19.9:1	33.7:12.5:1	30.2:13.6:1	24.9:11.8:1	34.9:15.9:1	44.9:16.5:1
Goa	1.5:0.9:1	1.5:0.9:1	1.7:0.9:1	1.9:1.0:1	1.4:1.3:1	1.9:1.3:1	1.6:1.4:1	2.9:1.7:1
Daman & Diu			42.0:6.0:1	12.7:2.0:1	14.5:4.0:1	14.0:5.3:1		
D&N Haveli	16.8:8.8:1	11.5:6.3:1	12.0:7.8:1	11.4:8.0:1	12.2:8.8:1	24.0:17.7:1		
Haryana	40.3:12.3:1	29.6:8.8:1	47.3:13.4:1	39.8:10.9:1	32.2:10.7:1	20.5:7.1:1	27.2:9.8:1	61.4:18.7:1
Punjab	27.8:7.3:1	19.9:5.9:1	33.7:9.2:1	34.3:9.0:1	23.6:6.7:1	19.1:5.9:1	26.8:8.5:1	61.7:19.2:1
Uttar Pradesh	13.2:4.1:1	12.1:4.1:1	16.8:5.2:1	15.1:4.5:1	11.5:3.6:1	11.0:4.1:1	18.4:6.2:1	25.2:8.8:1
Uttaranchal	11.1:2.8:1	10.2:2.7:1	12.0:2.8:1	11.2:2.4:1	8.8:2.4:1	8.0:2.2:1	12.0:3.1:1	16.3:3.2:1
Himachal Pradesh	4.4:1.2:1	3.9:1.2:1	3.9:1.3:1	3.7:1.0:1	3.2:1.0:1	2.8:0.9:1	3.7:1.1:1	4.7:1.0:1
Jammu & Kashmir	15.9:6.8:1	13.3:5.6:1	8.1:3.5:1	11.9:3.6:1	8.1:3.3:1	6.5:3.3:1	12.5:5.4:1	7.8:2.5:1
Delhi			82.0:21.0:1	30.0:8.0:1			35.0:22.0:1	
Chandigarh								
Bihar	14.7:1.7:1	7.0:1.3:1	9.7:2.2:1	11.0:2.3:1	5.7:1.5:1	5.8:1.9:1	8.4:2.6:1	12.3:3.6:1
Jharkhand	17.4:9.8:1	12.0:5.7:1	21.4:9.7:1	9.2:4.7:1	7.0:3.6:1	8.8:4.2:1	10.4:3.7:1	11.5:7.8:1
Orissa	4.2:1.5:1	4.0:1.5:1	4.8:1.7:1	4.3:1.9:1	3.3:1.7:1	3.3:1.7:1	5.8:2.4:1	6.2:2.4:1
West Bengal	2.2:1.2:1	2.3:1.3:1	2.3:1.3:1	2.2:1.3:1	1.7:1.0:1	2.0:1.4:1	2.7:1.5:1	2.9:1.6:1
Assam	2.1:1.4:1	1.9:1.2:1	2.1:1.0:1	1.8:1.0:1	2.0:0.8:1	1.9:0.8:1	2.0:0.6:1	2.0:0.6:1
Tripura	6.1:1.7:1	4.2:1.2:1	4.1:1.5:1	3.4:1.2:1	2.7:1.3:1	2.3:1.3:1	3.8:2.0:1	3.0:1.6:1
Manipur	17.9:2.5:1	16.6:1.9:1	10.9:2.8:1	11.0:2.6:1	6.4:1.3:1	17.0:3.7:1	15.0:2.2:1	18.9:2.7:1
Meghalaya	15.8:10.6:1	13.6:7.7:1	12.3:8.1:1	7.7:3.7:1	6.5:1.7:1	6.3:3.2:1	13.1:5.0:1	9.9:3.4:1
Nagaland	4.4:3.1:1	4.7:3.1:1	4.0:3.0:1	3.9:2.1:1	3.9:2.7:1	4.5:2.8:1	3.8:2.5:1	2.9:1.8:1
Arunachal Pradesh	4.1:1.8:1	4.0:1.8:1	5.0:2.1:1	5.0:2.1:1	5.7:2.3:1	5.8:2.4:1	18.3:3.3:1	5.0:0.3:1
Mizoram	2.0:1.7:1	2.0:1.7:1	2.2:1.9:1	2.1:1.2:1	2.0:1.1:1	1.8:2.2:1	15.3:3.5:1	54.7:3.0:1
Sikkim		7.0:3.7:1	7.0:3.7:1					

Source: Calculated from the state-wise N-P-K usage data given in Agricultural Statistics at a Glance, various years

Annex 7: Comparison of Minimum Support Price (MSP) of Rice and Wheat, Urea Price and Ratio of MSP to Urea in Selected Countries:

Country	Urea Price	MSP Rice	MSP Wheat	MSP Rice: Price of Urea	MSP Wheat: Price of Urea
	USD/Tonne				
India	86.76	330.2	226.59	3.8:1	2.6:1
China	264.82	504.95	384.59	1.9:1	1.4:1
Pakistan	362.19		319.98		0.9:1
Bangladesh	206.74	388.06		1.88:1	
Indonesia	148.45	408.25		2.75:1	
Philippines	461.77	580.52		1.26:1	
Vietnam	281.04	291.02		1.04:1	

Note:

1. Rice-Paddy conversion rate: 0.66
2. For India, MSP for paddy (common) and wheat in 2014-15 are considered
3. For Bangladesh, MSP for Aman rice in 2013-14 is considered.
4. For China: MSP of Japonica rice is considered
5. Current exchange rates (as on 24.11.2014) were used:
    a. 1USD= 61.78 INR
    b. 1USD= 6.14 CNY
    c. 1 USD= 101.57 PKR
    d. 1 USD= 77.31 BDT
    e. 1 USD= 12124.99 RP
    f. 1 USD= 44.96 PHP
    g. 1 USD= 21349.27 VND
    h. 1 USD= 32.83 BAHT

Source:

MSPs:

1. For India: Agricultural Statistics at a Glance 2013: http://eands.dacnet.nic.in/latest_2013.htm accessed on November 18, 2014
2. For China rice MSP: http://www.ndrc.gov.cn/xwzx/xwfb/201402/t20140211_578631.html accessed on 21.11.2014
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7. For Philippines: Website of National Food Authority, Republic of Philippines: Home> Buying/ Selling Price: http://www.nfa.gov.ph/index.php?id1=22 accessed on November 24, 2014
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9. For Vietnam: Ministry of Agriculture and Rural Development: http://www.mard.gov.vn/en/Pages/news_detail.aspx?NewsId=993 accessed on November 24, 2014

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1. For India: Fertiliser Statistics 2012-13
2. For China: http://marketrealist.com/2014/04/china-urea-prices-drops-to-1626-rmbtonne-fertilisers-feels-pressure/ accessed on September 11, 2014
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Annex 8: Calculation for Urea Supply Curve

Serial Number	Feedstock	Production	Cumulative production	Cumulative production	Total Cost	Total Cost
		MMT	MMT	%	Rs/MT	USD/MT
1	Gas Based, Post 1992	0.70	0.70	3.08	15928	252.83
2	Gas Based, Pre 1992	1.03	1.73	7.63	17226	273.43
3	Gas Based, Post 1992	1.07	2.81	12.36	17644	280.06
4	Gas Based, Pre 1992	1.10	3.91	17.21	17667	280.43
5	Gas Based, Post 1992	1.14	5.05	22.22	17949	284.90
6	Gas Based, Post 1992	0.99	6.04	26.58	18045	286.43
7	Gas Based, Post 1992	1.16	7.20	31.69	18103	287.35
8	Gas Based, Post 1992	1.04	8.24	36.25	18142	287.97
9	Gas Based, Pre 1992	1.01	9.24	40.68	18279	290.14
10	Gas Based, Pre 1992	2.21	11.45	50.41	18296	290.41
11	Gas Based, Pre 1992	0.24	11.69	51.45	18577	294.87
12	Gas Based, Post 1992	0.65	12.34	54.30	18742	297.49
13	Gas Based, Post 1992	0.78	13.12	57.73	18800	298.41
14	Gas Based, Post 1992	0.95	14.07	61.91	18922	300.35
15	Gas Based, Post 1992	0.95	15.02	66.10	19550	310.32
16	Gas Based, Post 1992	0.65	15.67	68.97	19781	313.98
17	Gas Based, Post 1992	0.39	16.07	70.70	20028	317.90
18	Gas Based, Post 1992	0.56	16.63	73.17	20115	319.29
19	Gas Based, Post 1992	0.51	17.14	75.42	20371	323.35
20	Gas Based, Post 1992	0.60	17.74	78.07	20701	328.59
21	Gas Based, Pre 1992	1.99	19.73	86.84	20822	330.51
22	Gas Based, Post 1992	0.40	20.14	88.62	20850	330.95
23	Gas Based, Pre 1992	0.07	20.21	88.93	21706	344.54
24	Gas Based, Post 1992	0.32	20.53	90.35	22239	353.00
25	Gas Based, Post 1992	0.31	20.84	91.72	22310	354.13
26	Gas Based, Post 1992	0.38	21.22	93.38	22676	359.94
27	Naphtha Based	0.38	21.60	95.05	24252	384.95
28	Naphtha Based	0.29	21.88	96.30	24296	385.65
29	Naphtha Based	0.49	22.37	98.45	28482	452.10
30	Gas Based, Pre 1992	0.35	22.72	100.00	28698	455.52

Note: Exchange Rate Used: 1 USD= Rs. 63

Source: FAI

Annex 9: Rupee-Dollar Exchange Rates Used

Year	Rs./USD
1980-81	7.908
1981-82	8.968
1982-83	9.666
1983-84	10.34
1984-85	11.889
1985-86	12.235
1986-87	12.778
1987-88	12.966
1988-89	14.482
1989-90	16.649
1990-91	17.943
1991-92	24.474
1992-93	30.649
1993-94	31.366
1994-95	31.399
1995-96	33.45
1996-97	35.5
1997-98	37.165
1998-99	42.071
1999-00	43.333
2000-01	45.684
2001-02	47.692
2002-03	48.395
2003-04	45.952
2004-05	44.932
2005-06	44.273
2006-07	45.285
2007-08	40.261
2008-09	45.993
2009-10	47.417
2010-11	45.577
2011-12	47.92
2012-13	54.41
2013-14	60.5
2014-15	61.14

Source: Economic Survey, Various Years

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