Fertiliser Subsidy in India: Who Are the Beneficiaries?

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There is a general view in academic and policy circles that fertiliser subsidies are concentrated geographically on a relatively small number of crops and producers. In many cases they do not reach the targeted group(s). This paper examines the trends in fertiliser subsidy and issues of equity in its distribution between farmers and the industry, across regions/states, crops and different farm sizes. The study shows that fertiliser subsidy is more concentrated in a few states and interstate disparity in its distribution is still high though it has declined over the years. A fair degree of equity exists in the distribution of fertiliser subsidy among farm sizes. Based on the results, this paper justifies fertiliser subsidies and questions the rationale for a direct transfer of subsidy to farmers.

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Governments in both developed and developing countries intervene in agriculture with a view to achieving a wide range of economic and social objectives. The reasons for government intervention are diverse and varied. Some of the oft-cited reasons for intervention are self-sufficiency, employment creation, support to small-scale producers for adopting modern technologies and inputs, reduction of price instability and improvement of the income of farm households. This intervention can take a number of forms such as import-export policies and domestic policies like price support programmes, direct payments, and input subsidies to influence the cost and availability of farm inputs like credit, fertilisers, seeds, irrigation water, etc.

Of all the domestic support instruments in agriculture, input subsidies and product price support are the most common. Various benefits are cited in justifying input subsidies: economic, environmental and social (World Bank 2008). Input subsidies can bring economic benefits to society but can also be a major cause of negative environmental externalities when they promote excessive use of fertilisers, agrochemicals and irrigation water. Inputs like fertilisers, irrigation water and electricity have a significant share in agricultural subsidies in India and fertiliser subsidy has attracted much attention of policymakers, researchers, and politicians in the recent past. One of the most contentious issues surrounding fertiliser subsidies in India is how much of what is paid out actually finds its way into the pocket of the farmer, and how much is siphoned away by the fertiliser companies. There has also been a debate about the issue of real beneficiaries of these subsidies (small vs large farmers, well-developed vs less developed regions, etc).

This paper focuses primarily on two issues. One, whether fertiliser subsidy is going to the farmers or to the industry and two, is there equity in the distribution of fertiliser subsidy across regions, crops, and different farm sizes. Section 1 of this paper describes the trends in fertiliser subsidies in India while Section 2 deals with the issue of beneficiaries of fertiliser subsidy and interstate, inter-crop and inter-farm size disparity in fertiliser subsidy. The final section sums up the findings of the paper and raises some policy issues.

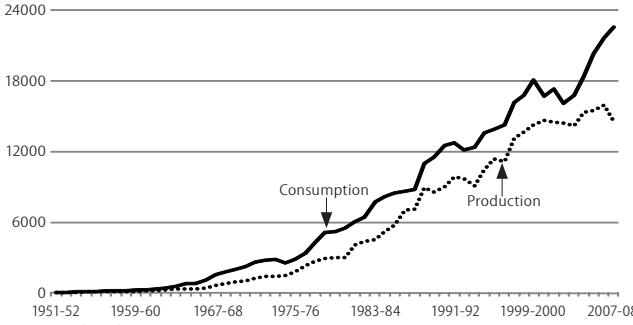
1 Trends in Fertiliser Subsidies

Both the intensity of fertiliser usage in terms of nutrients per hectare area and the extent of fertilisation as measured by the ratio of fertilised area to total cropped area in many developing countries including India are lower than that in developed countries. However, fertiliser use has been and will continue to be a major

factor in the increasing agricultural production and productivity. Typically, very few countries, even advanced ones, have relied entirely on the free market system to set fertiliser prices. It is, therefore, not surprising that governments in developing countries are promoting use of fertilisers through various policy instruments including subsidies. The fertiliser prices at both producer and farmer levels are determined directly or indirectly by the government in most of the countries and such government interventions generally have two basic objectives: (i) to provide fertilisers to the farmers at stable and affordable prices in order to increase agricultural production through higher fertiliser use, and (ii) to encourage domestic production by allowing fertiliser producers a reasonable return on their investments.

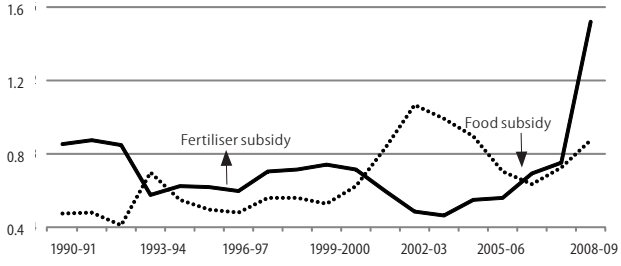
The Indian fertiliser industry has come a long way since its early days of post-independence era. India today is one of the largest producers and consumers of fertilisers in the world. India's production in terms of nitrogen and phosphorus nutrients reached a level of 15,960 thousand tonnes in 2006-07 from 38.7 thousand tonnes in 1951-52. Similarly, consumption of fertilisers in terms of nutrients (nitrogen, phosphorus, potassium (NPK)) has also grown from 65.6 thousand tonnes in 1951-52 to nearly 22,570 thousand tonnes in 2007-08 (Figure 1).

Figure 1: Trends in Fertiliser Production and Consumption in India (1951-52 to 2007-08)
('000 tonnes)



Source: FAI (2008).

Figure 2: Trends in Food and Fertiliser Subsidies in India
(as % of GDP at current prices, 1990-91 to 2008-09)



Source: Government of India (2009 and 2009a).

The Indian fertiliser industry, given its strategic importance in achieving self-sufficiency of foodgrains production in the country, has for decades, been under government control. With the objective of providing fertilisers to farmers at an affordable price and ensuring adequate returns on investments to entrepreneurs, a fertiliser policy of providing fertilisers to farmers at subsidised prices was envisaged to induce farmers to use fertilisers. In order to achieve this objective, government introduced the Retention Price cum Subsidy (RPS) scheme, a cost-plus approach, for nitrogenous fertilisers in November 1977 and extended this to complex fertilisers in February 1979. Under the RPS the retail price of fertilisers was fixed and was uniform throughout the country. The difference between the retention price (adjusted for freight and dealer's margin) and the price at which the fertilisers were sold to the farmer was paid back to the manufacturer as subsidy. The RPS did achieve its objective of developing a large domestic industry, achieving near self-sufficiency in fertiliser production and increasing consumption of chemical fertilisers but it was not free from criticism of fostering inefficiency leading to a huge burden of subsidies.

Table 1: Major Subsidies in India: 1990-91 to 2008-09 (Rs crore)

Year	Food	Fertilisers				Total Subsidies
		Indigenous Urea	Imported Urea	Decontrolled Fertilisers	Total	
1990-91	2,450	3,730	659	–	4,389	12,158
1991-92	2,850	3,500	1,300	–	5,185*	12,253
1992-93	2,800	4,800	996	–	5,796	11,995
1993-94	5,537	3,800	762	–	4,562	11,605
1994-95	5,100	4,075	1,166	528	5,769	11,854
1995-96	5,377	4,300	1,935	500	6,735	12,666
1996-97	6,066	4,743	1,163	1,672	7,578	15,499
1997-98	7,900	6,600	722	2,596	9,918	18,540
1998-99	9,100	7,473	333	3,790	11,596	23,593
1999-00	9,434	8,670	74	4,500	13,244	24,487
2000-01	12,060	9,480	1	4,319	13,800	26,838
2001-02	17,499	8,044	47	4,504	12,595	31,210
2002-03	24,176	7,790	–	3,225	11,015	43,533
2003-04	25,181	8,521	–	3,326	11,847	44,323
2004-05	25,798	10,243	494	5,142	15,879	45,957
2005-06	23,077	10,653	1,211	6,596	18,460	47,522
2006-07	24,014	12,650	3,274	10,298	26,222	57,125
2007-08	31,328	12,950	6,606	12,934	32,490	70,926
2008-09 (RE)	43,627	16,517	10,981	48,351	75,849	1,29,243

*Includes Rs 385 crore fertiliser subsidy given to small and marginal farmers.
Source: Government of India (2009).

Towards Reform of the Price Policy

The mounting burden of subsidies compelled the policy planners to make a serious attempt to reform the fertiliser price policy to rationalise the fertiliser subsidy. As part of economic reforms initiated in early 1990s, the government decontrolled the import of complex fertilisers such as di-ammonium phosphate (DAP) and muriate of potash (MOP) in 1992, and extended a flat-rate concession on these fertilisers. But, urea imports continue to be restricted and canalised.

Based on the recommendations of various committees including the High Powered Fertiliser Pricing Policy Review Committee (HPC) and the Expenditure Reforms Commission (ERC), a New Pricing Scheme (NPS) for urea units was implemented in a phased manner from April 2003 with an objective to bring transparency, uniformity, and efficiency, and reduce the cost of production. Similarly, based on the recommendations of the Expert Group on P and K fertilisers, a policy for phosphatic and potassic fertilisers has been implemented.

The main objective of all policy interventions has been to contain and target fertiliser subsidies. However, estimates of fertiliser subsidy as per the central government budgets over the years in the post-reforms era show that fertiliser subsidy has increased

significantly. Table 1 (p 69) presents the estimates of major subsidies including food and fertiliser subsidies in the post-reforms period (1991-92 to 2008-09). It is evident from the table that total subsidies have increased from Rs 12,158 crore in 1990-91 to Rs 1,29,243 crore in 2008-09, an increase by 10.6 times. The fertiliser subsidy has increased from Rs 4,389 crore in 1990-91 to Rs 75,849 crore in 2008-09 representing an increase of over 17 times. As a percentage of the gross domestic product (GDP), this represents an increase from 0.85% in 1990-91 to 1.52% in 2008-09 (Figure 2, p 69). The fertiliser subsidy in India as a percentage of the GDP varied from 0.47 in 2002-03 to 1.52 in 2008-09. The total food subsidy has jumped to Rs 43,627 crore in 2008-09 from 2,450 crore in 1990-91, about an 18-fold increase in less than two decades in absolute terms. But measured in terms of percentage of GDP, the burden of food subsidies in India is much less than that of many other developing countries. The food subsidy in India as percentage of the GDP has varied from 0.41 in 1992-93 to 1.02 in 2002-03, and on an average has remained at 0.66 over the last 19 years.

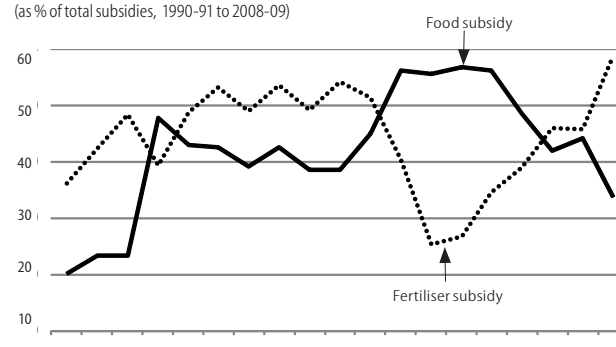
During the 1990s (1990-91 to 2000-01), fertiliser subsidy accounted for about 47% of the total subsidies and share of food subsidy was 35.1% (Figure 3). In the 2000s (2001-02 to 2008-09), food subsidy became dominant, accounting for 49.1% of the total subsidy while fertiliser subsidy accounted for 39.5%. However, during the last three years, fertiliser subsidy has taken the largest share and accounted for 58.7% of total subsidies in 2008-09.

Table 2: Concentration of World Fertiliser Production, Consumption and Trade
(2007-08)

Product/ Nutrients	Countries	% Share of Top 10 in World
Consumption		
N	China (34.8%), India (15.5%), US (12.4%), Pakistan (2.8%), Indonesia (2.8%)	78.9
P	China (31.5%), India (15.8%), US (11.3%), Brazil (9.7%) Pakistan (2.7%)	80.3
K	China (24.0%), US (17.3%), Brazil (15.2%) India (9.8%), Malaysia (3.9%)	81.3
N+P+K	China (32.2%), India (14.6%), US (13.0%), Brazil (6.5%), Indonesia (2.5%)	78.1
Capacity		
N	China (26.9%), India (8.8%), Russia (7.7%), US (6.0%), Indonesia(3.6%)	66.6
P	US (21.0%), China (18.5%), Morocco (8.4%), Russia (7.4%), India(5.5%)	73.8
K	Canada (39.6%), Russia (12.7%), Belarus (11.1%), Germany (8.7%), US (5.6%)	95.0
N+P+K	China (24.3%), Canada (10.4%), Russia (9.7%), US (9.5%), India (7.6%)	75.9
Exports		
Urea	China (16.1%), Russia (12.7%), Saudi Arabia (9.4%), Ukraine (9.3%), Qatar (7.7%)	77.0
Ammonia	Trinidad (25.2%), Russia (18.7%), Ukraine (7.6%), Indonesia (7.3%), Canada (5.1%)	81.1
MAP and DAP	US (33.8%), China (21.1%), Russia (19.2%), Morocco (9.0%), Tunisia (5.3%)	98.8
Potash	Canada (38.6%), Belarus & Russia (36.3%), Germany (11.2%), Israel (7.6%), Jordan (3.7%)	100.0
Imports		
Urea	India (18.0%), US (17.5%), Brazil (6.1%), Thailand (4.9%), Turkey (4.4%)	64.8
Ammonia	US (40.5%), India (9.2%), Korea Republic (5.7%), France (4.3%), China (3.9%)	77.4
MAP and DAP	India (15.5%), Brazil (15.1%), Pakistan (7.6%), Argentina (6.6%), Canada (4.5%)	66.4
Potash	China (15.1%), US (12.7%), Brazil (11.5%), India (6.4%), Malaysia (2.9%)	57.7

Source: Agrium (2009).

Figure 3: Trends in Food and Fertiliser Subsidies in India
(as % of total subsidies, 1990-91 to 2008-09)



Sources: Government of India (2009).

The above analysis shows that the volume of subsidies increased substantially during the post-reforms period (1991-92 to 2008-09). The rate of increase, however, was higher for food subsidy (compound annual growth rate of 16.9% per year) than for fertiliser (12.9%). The rate of change in the amount of subsidies was uneven over time. Total subsidies and fertiliser subsidy increased at a much faster rate during the 2000s while growth rate in food subsidies was higher (16.9%) during the 1990s compared with the 2000s (9.3%). During the 2000s, fertiliser subsidy growth has increased significantly (27.7%) as against 12.9% during the 1990s, because international prices of fertilisers, raw materials, feedstock and intermediates increased substantially (and yet fertiliser farm gate prices remained constant in the country) since 2002 in general but more so during the last two to three years.

Who Benefits from the Fertiliser Subsidy?

There is a debate about whether the fertiliser subsidy benefits the farmers or the fertiliser industry (Gulati 1990; Gulati and Narayanan 2003). Furthermore, the benefits of fertiliser subsidy are heavily tilted towards the large farmers growing water-intensive crops like rice, sugar cane, wheat and cotton in a handful of states.

As per the estimates by Gulati and Narayanan (2003), the share of farmers in the fertiliser subsidy increased from 24.54% in the triennium average ending (TE) 1983-84 to 75.62% in TE 1995-96 with an average share of 67.5% for the period 1981-82 to 2000-01 and the rest went to the fertiliser industry. These estimates have been computed by comparing subsidy estimates through import parity price (IPP) and farm gate prices of fertilisers with the amount of subsidy given in the central government budget. Some of the recent policy announcements like the intention of the government to move to a system of direct transfer of subsidy to the farmer are based on such findings which are based on unrealistic assumptions. For example, the study assumes that India's entry into the world fertiliser market as an importer would not affect world prices and that world fertiliser markets are perfectly competitive. However, both the assumptions are not valid and we discuss these assumptions in greater detail with empirical data in the following section.

World Fertiliser Market

First, when studying prices and price determination in any industry, one usually looks to a body of economic theory called

Table 3: Market Power of Top Five Global Fertiliser Companies

Company	Market Power		
	Nitrogen (N)	Phosphate (P)	Potash (K)
Yara	++++	++	+
Mosaic	++	++++	+++
Agrium	+++	++	++
PotashCorp	++	++	++++
Kali and Salz group	++	+	++

++++ very strong presence; +++ strong; ++ low; + no market presence.
Source: Arovuori and Karokallio (2009).

industrial organisation and relevant empirical studies to help provide answers. In perfect markets, prices will be determined by the forces of supply and demand, but the international fertiliser market is not a perfect market. Table 2 (p 70) indicates the level of concentration in the industry in 2007-08. The top five fertiliser consumers, namely, China, India, the United States (US), Brazil and Indonesia, accounted for nearly 70% of fertiliser consumption while the top five producers (China, Canada, Russia, the US and India) controlled about 60% of world fertiliser production.

Exports of potash and DAP and mono-ammonium phosphate (MAP) are highly concentrated in a few countries and the top six exporters (Canada, Belarus, Russia, Germany, Israel and Jordan) control 97.4% of world exports in case of potash and 88.4% in MAP and DAP. The share of top five urea exporters is 55% and in case of ammonia they control about 64% of the world exports. Imports of fertiliser products are relatively diversified as the top five importers of urea account for about 51% of the world imports while in the case of MAP, DAP and potash it is nearly 50%. The results clearly show that the world fertiliser market is concentrated.

The world fertiliser markets have always been dominated by a small number of buyers and sellers. The five largest fertiliser companies in the world are Yara (Norway), Mosaic (US), Agrium (Canada), PotashCorp (Canada) and The Kali and Salz Group (Germany), which accounted for about 27% of the total production in 2002 and increased their share to about 33% in 2007 (Table 3). Yara is global leader in nitrogen fertilisers with an annual production capacity of 8 million tonnes of ammonia, 6 million tonnes of nitrates and 6 million tonnes of NPK, controlling more than one quarter of global ammonia trade (Yara 2009).

The Mosaic Company, which was formed in 2004 through a business combination of IMC Global Inc. and the crop nutrition business of Cargill, is the world's top producer of phosphates, with an annual capacity of about 9.4 million tonnes, larger than the next three largest producers combined. Mosaic's potash production capabilities are the second largest in the world, with an annual capacity of approximately 10.4 million tonnes. PotashCorp is the largest potash company holding about 22% of global capacity and 75% of the world's excess capacity.

There have been some changes in the shares of different players but still a few players control the market. The question arises as to the degree of competitive pricing in the industry, or if there is some monopoly profit in the system. In other words, to what extent are prices (and profits) above what they would be in a competitive market characterised by many buyers and sellers, where prices are determined by forces of supply and demand, and industry profits are "normal"? Apart from the level of prices in the industry, there is also the question of spatial prices, which is important in the fertiliser industry because farmers constitute a geographically dispersed market. Fertiliser prices can be extremely variable, and this raises the question of what price dynamics are at work that results in such price variability. Fertiliser demand is a derived demand, which in the developed countries is price inelastic while in developing country markets, demand is price elastic, such as in major markets like China and India.

World Fertiliser Prices

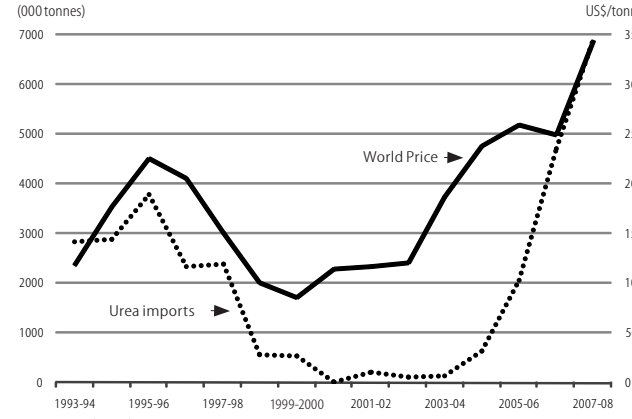
The prices of urea, the main nitrogen product traded and consumed, have varied widely both in absolute and in relative terms over the last two decades. The price of urea varied from about $70 per tonne in July-December 1998 to $865 in July-September 2008 (Table 4). The coefficient of variation was quite high (63.5%) between 1990 and 2008. The average free on board (fob) price during the decade of 1990s was $135 and it increased significantly ($260/tonne) during the 2000s.

Table 4: Trends in International Prices of Urea, DAP and MOP ($/Tonne Product Bulk, January 1990 -September 2008)

Product	Minimum	Maximum	Average	Coefficient of Variation (%)	CAGR (%/Annum)
Urea (fob Middle East)	70 (July-Dec 1998)	865 (July-Sep 2008)	200	63.5	2.64
DAP (fob US Gulf)	110) (Jan-June 1993)	1,230 (April-June 2008)	270	83.6	2.77
MOP (fob Vancouver)	80 (Jan-June 1993)	945 (July-Sep 2008)	160	70.7	2.46

Source: FAI (2008).

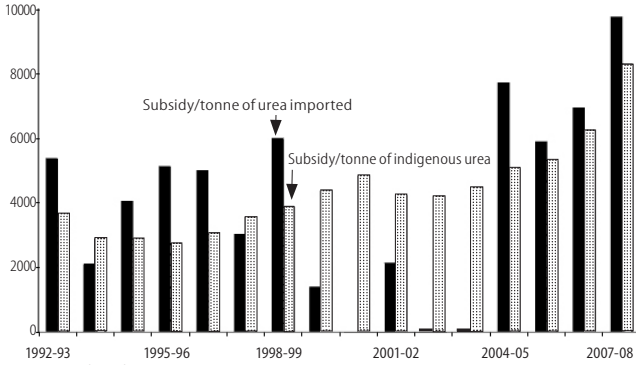
Figure 4: Trends in Urea Imports by India and International Prices of Urea



Source: FAI (2008).

The price of DAP varied from about $110 in January-June 1993 to $1,230 per tonne in April-June 2008. The prices of DAP are the most volatile among three major products, namely, urea, DAP and MOP. The average fob price during the decade of the 1990s was $177 and increased significantly ($422/tonne) during the 2000s, an increase of 238%. The average price of MOP, the most common source of potassium, rose from about $175 per tonne in 2006 to $280 per tonne in 2007 and by December 2008, MOP was being sold for $870 per tonne, an increase of about 400%. The prices of MOP varied from a low of $80 per tonne in 1993 to a peak of $945 per tonne in July-September 2008. The average fob price of MOP during the decade of the 1990s was $111, which increased significantly ($282/tonne) during the 2000s, an increase of about 258%. The above discussion clearly shows that fertiliser markets are highly concentrated and prices of fertiliser products show a wide variability.

Figure 5: Imputed Subsidiy Per Tonne of Urea Imported and Indigenously Produced
(1992-93 to 2007-08, Rs per tonne)



Sources: FAI (2008).

India's Position in World Markets

India is one of the largest producers and consumers of fertilisers in the world and the entry of India in world markets as an importer influences world prices significantly (Figure 4, p 71). A strong positive association exists between the world price of urea and imports of urea by India.

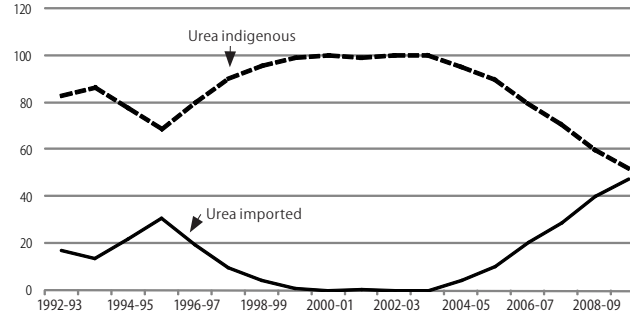
It has also been argued several times that the domestic urea industry is a high-cost producing industry, and therefore, import substitution strategy could be thought about. However, we need to keep in mind the nature, structure and conduct of the urea industry. In order to look at the cost structure of imported urea vs domestically produced urea, we computed per unit subsidy on imported and indigenously produced product (by dividing the total subsidy on indigenous urea by total production and total subsidy on imported urea by total imports) and the results are presented in Figure 5.

As is evident from the figure, out of 13 years between 1992-93 and 2007-08 when urea was imported, the average imputed subsidy per tonne on imported urea was higher than the subsidy on indigenously produced urea in nine years. Likewise, the share of subsidy on imported urea has also increased significantly during the past few years (Figure 6). For example, the share of subsidy on imported urea was 4.6% in 2003-04 and it increased to about 40% in 2008-09 and is estimated to further increase to 47.6% during 2009-10. These trends show that international prices of urea were not always lower than the domestic cost of production. However, this argument does not justify the existence of high-cost producing units.

The total weighted average group concession on urea was Rs 9,738 per tonne, the weighted average concession for gas-based units was Rs 6,823 per tonne, Rs 15,724 per tonne for naphtha-based plants, Rs 11,430 per tonne for furnace oil/low sulphur heavy stock (FO/LSHS)-based units and Rs 9,272 per tonne for mixed feedstock units in July 2005 (Government of India 2007a). The IPP of urea has ranged from about Rs 11,096 per tonne in July-September 2005 to Rs 35,789 per tonne during July-September 2008 and has shown an increasing trend during the past few years (Government of India 2009b). Since the average cost of production of urea in general and gas-based units in particular has been low compared with the IPP, it is therefore advisable to strengthen domestic production capacity. It would help in attaining self-sufficiency in urea production and provide a cushion against the highly volatile world urea market.

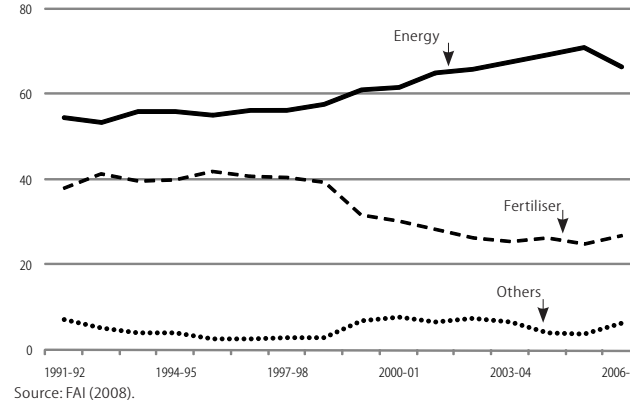
The government has encouraged production of urea based on gas as feedstock because of its efficiency over other feedstocks but there is need to ensure availability of gas for fertiliser sector due to competing uses of gas (Figure 7). From the mid-1990s, share of gas supplied to the fertiliser sector has reduced significantly (42% in 1995-96 to about 27% in 2006-07) despite initial allocation to meet the full requirements. Consequently, gas-based units have started facing a supply shortage and had to meet the shortfall using naphtha. Against the total requirement of 36.33 million metric standard cubic metres per day (MMSCMD) of gas for the existing gas-based fertiliser units, the actual average supply was 27.29 MMSCMD, a shortfall of about 24.8%.

Figure 6: Share of Subsidy on Imported and Indigenous Urea in Total Subsidy on Urea
(1992-93 to 2009-10 (BE), % share)



Sources: FAI (2008).

Figure 7: Natural Gas Allocation for Fertiliser and Energy Sectors (1991-92 to 2007-08, %)



Source: FAI (2008).

Direct Transfer of Subsidy to Farmers

With a shift from the earlier cost-plus based approach to IPP, the Indian fertiliser industry has been exposed to the world competition and only efficient units would survive in the brave world of trade liberalisation and globalisation. Since the basic notion of about one-third of subsidy going to the fertiliser industry does not hold true, the policy of direct transfer of subsidy to farmers is neither desirable nor practically implementable. It would be difficult to ensure that direct transfer of subsidy to millions of farmers is actually used by farmers for only buying fertiliser and there are no leakages in the transfer of subsidy. If the subsidy is not used for fertiliser, it might adversely affect agricultural production in the country. Under the changed scenario, it is advisable to route the subsidies through the existing mechanism which is easy to monitor as well as ensure usage

of fertilisers by all categories of farmers. Therefore, direct transfer of subsidy to farmers is not a right policy decision. However, a new nutrient-based pricing policy instead of product pricing regime for fertilisers is a welcome step as it would ensure balanced application of nutrients and growth of fertiliser industry.

2 Equity Issues in the Distribution of Fertilisers

Understanding who benefits from fertiliser subsidies is important not only to determine the fairness of policy, but also to find out how policy changes farmers' behaviour. There is a general view in policy and academic circles that the benefits of fertiliser subsidy are cornered by powerful interest groups, that subsidies are concentrated geographically, and they are concentrated on relatively few crops and on relatively few producers. Therefore, there is a need to examine the fertiliser subsidy distribution patterns to assess whether the policy benefits all regions and categories of farmers. In this section we examine the pattern of fertiliser consumption by farm size groups and the issue of equity in distribution of fertiliser subsidy across different states, crops as well as farm sizes.

Table 5: Pattern of Fertiliser Consumption by Farm Size in India (1991-92 to 2001-02)

	Marginal (<1 ha)	Small (1.0-2.0 ha)	Semi-medium (2.0-4.0 ha)	Medium (4.0-10.0 ha)	Large (>10 ha)	All Households
Distribution of holdings (%)						
1991-92	57.1	20.3	13.7	7.3	1.6	100.0
1996-97	60.7	18.9	12.5	6.5	1.4	100.0
2001-02	64.0	18.2	11.0	5.6	1.2	100.0
Share in gross cropped area (%)						
1991-92	17.3	19.6	23.8	25.8	13.5	100.0
1996-97	19.0	19.1	23.5	25.1	13.3	100.0
2001-02	22.3	20.3	22.8	22.9	11.7	100.0
Proportion of fertilised area to gross cropped area (%)						
1991-92	63.6	62.6	60.9	58.0	46.9	59.1
1996-97	64.1	62.7	60.8	57.4	45.0	58.8
2001-02	77.1	74.2	71.3	65.1	49.7	69.2
Share in total fertiliser consumption (%)						
1991-92	20.6	21.1	24.2	23.9	10.2	100.0
1996-97	25.6	20.4	23.0	22.2	8.8	100.0
2001-02	29.9	22.1	22.1	18.9	7.0	100.0

Source: Government of India (2007 and 2008).

Pattern of Fertiliser Consumption by Farm Size

Table 5 shows farm size wise consumption of fertilisers in India in 1991-92, 1996-97 and 2001-02. As is evident from the table, the share of small and marginal farmers in total operational holdings increased from 77.4% in 1991-92 to 82.2% in 2001-02 while the share of large holdings declined marginally from 1.6% to 1.2%. Medium and large holdings (with holding size of more than 4 hectares) with a share of 6.8% used just over one-fourth of the total fertiliser consumed in the country in 2001-02. In contrast, the small and marginal farmers, which constituted about 82% of total holdings, consumed 52% of total fertilisers. The share of small and marginal farmers in total operational holdings increased by 4.8% between 1991-92 and 2001-02 but their share in total fertiliser use increased by over 10%. However, if we compared the relative shares of different farm size groups in total operational area and fertiliser use, the scenario is completely changed. In 2001-02, small and marginal farmers accounted for 42.6% of area operated but showed grounds for 52% of total fertiliser consumption in the country. On the other hand, medium and large farmers, which accounted for over one-third of operational area, consumed 25.9% of total fertiliser used in the country in 2001-02.

Table 6: Pattern of Fertiliser Use Intensity by Farm Size in India

	Marginal	Small	Semi-medium	Medium	Large	All Households
Fertiliser consumption per hectare of gross cropped area (kg)						
1991-92	72.2	65.5	61.7	56.3	46.0	60.7
1996-97	103.8	82.6	75.3	68.1	51.1	77.1
2001-02	126.2	100.6	88.8	75.8	55.9	92.6
Fertiliser consumption per hectare of fertiliser area (kg)						
1991-92	113.4	104.6	101.3	97.0	98.1	102.8
1996-97	162.1	131.8	123.9	118.6	113.6	131.1
2001-02	164.7	134.7	122.8	113.3	108.4	131.7

Source: Government of India (2007 and 2008).

Table 7: State-wise Fertiliser Use Per Hectare of Gross Cropped Area by Size of Holding: 2001-02 (kg/ha)

States	Marginal	Small	Semi-medium	Medium	Large	All Households
Andhra Pradesh	171.1	149.0	139.0	128.1	109.6	146.7
Assam	50.4	29.9	24.4	16.1	3.8	30.7
Gujarat	104.1	83.0	72.8	59.0	40.4	70.0
Haryana	145.1	126.0	132.6	132.1	118.5	130.7
Himachal Pradesh	61.6	55.9	52.3	47.3	38.9	55.4
Jammu and Kashmir	159.4	71.6	62.4	39.2	30.4	107.9
Karnataka	172.0	122.5	98.5	79.9	62.2	105.1
Kerala	180.8	104.6	108.3	121.2	131.5	152.0
Madhya Pradesh	44.1	33.5	29.3	27.0	24.4	30.0
Maharashtra	143.2	109.8	92.6	82.8	63.8	101.1
Orissa	65.0	56.4	55.8	60.2	63.8	59.1
Punjab	163.3	164.3	166.7	169.5	169.9	168.6
Rajasthan	69.3	46.9	41.9	33.4	16.3	32.6
Tamil Nadu	173.8	140.6	137.4	128.6	90.2	148.6
Uttar Pradesh	120.4	109.3	104.5	95.0	83.5	109.9
West Bengal	130.2	137.5	139.2	107.5	112.3	133.0
All India	126.2	100.6	88.8	75.8	55.9	92.6

Source: Government of India (2008).

In 2001-02, over 77% of the gross cropped area was fertilised on marginal holdings while nearly 50% of the area was fertilised on large farms. An inverse relationship between farm size and proportion of fertilised area to gross cropped area was witnessed during all the years.

The intensity of fertiliser use was significantly higher on small and marginal farms compared to large farms (Table 6). The average fertiliser consumption per hectare of gross cropped area was the highest (126.2 kg) on marginal holdings and the lowest on large farms (55.9 kg) in 2001-02. A similar trend was observed between 1991-92 and 1995-96. Moreover there has been a significant increase in fertiliser intensity on all farm size holdings during the period 1991-92 to 2001-02. However, the increase was the largest (74.8%) on marginal farms (from 72.2 kg/ha in 1991-92 to 126.2 kg/ha in 2001-02), followed by small holdings (53.7%) and the lowest (21.4%) on large farms.

At the state level, almost a similar trend of inverse relationship between farm size and intensity of fertiliser use was observed (Table 7). The only exception was the state of Punjab, where large farms showed marginally higher fertiliser use intensity (169.9 kg/ha) compared with small (164.3 kg/ha) and marginal farms (163.3 kg/ha) in 2001-02. The average fertiliser consumption was the highest in Punjab, followed by Kerala (152 kg/ha), Tamil Nadu (148.6 kg/ha) and Haryana (130.7 kg/ha) and the lowest was in Madhya Pradesh (30 kg/ha).

State-wise Distribution of Fertiliser Subsidies

Since data on state-wise fertiliser subsidies is not available, an indirect method was used to compute state level subsidies. In order to calculate subsidy on nitrogenous fertilisers in major states, we multiplied the actual use of urea in the state with the national subsidy rate by taking weighted average of domestically produced and imported urea usage and subsidies (Rs/tonne). While in case of P and K fertilisers we could not compute state-wise subsidies using the same methodology as concession rates of P and K fertilisers varied quite frequently and the amount of subsidy calculated by this method was significantly different from the total concession on P and K fertilisers reported in the budget. Hence, we first computed per unit fertiliser subsidy on decontrolled P and K fertilisers by dividing total concession paid on these fertilisers by total consumption of P and K fertilisers in the concerned year and multiplying it with total P and K consumption in the concerned state. In this case our assumption is that fertiliser subsidy is distributed in proportion to fertiliser used. The results are presented in Table 8.

As the table shows, more than half of the total fertiliser subsidy is cornered by the top five states, namely, Uttar Pradesh, Andhra Pradesh, Maharashtra, Madhya Pradesh and Punjab. Most of these states grow fertiliser-intensive crops such as rice, wheat, cotton and sugar cane. The share of these five states in 1992-93 was about 60%, which declined to 55.8% in 1999-2000 and further to 54.5% in 2007-08. Other major beneficiary states were Gujarat, Karnataka, West Bengal, Bihar, Haryana and Tamil Nadu. Their share in the total subsidy has increased from 31.7% in 1992-93 to 36.4% in 2007-08. The share of less developed states like Rajasthan, Orissa, Assam, Jammu and Kashmir and Himachal Pradesh was low and they accounted for only 6.7% of the total subsidy in 1992-93, which increased to about 7.9% in 1999-2000 and was the same in 2007-08. The share of major fertiliser consuming states like Uttar Pradesh, Punjab, Haryana and Tamil Nadu has declined during the last one and a half decade, while the share of agriculturally less developed states like Madhya Pradesh, Gujarat, Bihar, Rajasthan and Orissa has increased.

Table 8: Share of Major States in Total Fertiliser Subsidy in India, 1992-93 to 2007-08 (in %)

State	1992-93	1999-2000	2007-08
Uttar Pradesh	23.2	19.5	17.5
Andhra Pradesh	10.6	10.8	11.3
Maharashtra	8.5	10.3	10.2
Madhya Pradesh	6.2	6.6	7.8
Punjab	11.6	8.6	7.7
Gujarat	5.5	5.2	7.0
Karnataka	4.2	6.2	6.5
West Bengal	5.2	6.7	6.4
Bihar	6.0	5.8	6.2
Haryana	5.8	5.3	5.5
Tamil Nadu	5.0	5.4	4.8
Rajasthan	4.2	4.7	4.4
Orissa	1.6	2.0	1.9
Assam	0.2	0.6	1.0
Kerala	0.7	1.0	0.9
Others	0.9	0.5	0.4
Jammu and Kashmir	0.4	0.4	0.4
Himachal Pradesh	0.3	0.2	0.2
Coefficient of variation (%)	96.5	82.1	76.7

Source: Computed from FAI (2008).

Looking at the absolute shares of states in total fertiliser subsidy is not a good indicator because there are large variations in total cropped area among various states. Therefore, it would be appropriate to examine interstate equity in terms of average subsidy per hectare of cropped area. Punjab, Andhra Pradesh, Haryana, Tamil Nadu, West Bengal and Uttar Pradesh are the main beneficiaries of fertiliser subsidy on per hectare basis (Table 9). In these states, fertiliser consumption per hectare is significantly higher than the national average. Out of 17 states included in the present analysis, 10 states had less fertiliser consumption per hectare than the national average during 1992-93 and 1999-2000 and this number fell to eight in 2007-08. States like Maharashtra, Jammu and Kashmir, Kerala, Madhya Pradesh, Assam, Himachal Pradesh, Orissa and Rajasthan had less than national average subsidy (Rs 2,083/ha) in 2007-08. The per hectare subsidy in Punjab (Rs 3,924) was more than four times compared with states like Orissa (Rs 824) and Rajasthan (Rs 894). The average subsidy on per hectare basis more than doubled between 1992-93 and 1999-2000 (from Rs 331/ha to Rs 703/ha) and almost tripled between 1999-2000 and 2007-08 primarily due to an increase in world prices of fertilisers, feedstock and intermediates.

Table 9: State-wise Trends in Intensity of Fertiliser Subsidy (Rs/ha of gross cropped area)

States	1992-93	1999-2000	2007-08
Punjab	946	1,454	3,924
Andhra Pradesh	512	1,096	3,561
Haryana	607	1,164	3,476
Tamil Nadu	430	1,104	3,307
West Bengal	373	931	2,660
Uttar Pradesh	553	981	2,617
Bihar	394	774	2,432
Gujarat	304	651	2,301
Karnataka	207	682	2,107
Maharashtra	247	637	1,829
Jammu and Kashmir	242	457	1,264
Kerala	150	455	1,235
Madhya Pradesh	159	334	1,213
Assam	35	206	1,143
Himachal Pradesh	170	277	958
Orissa	102	314	894
Rajasthan	129	322	824
India	331	703	2,083
Coefficient of variation (%)	79.3	57.1	51.9

Source: Computed from FAI (2008).

The above discussion reveals that there is a high degree of concentration of fertiliser subsidy in a few states but over time the inequalities in the distribution of subsidy among states have declined sharply. The coefficient of variation in the share of states in total fertiliser subsidy has declined from 96.5% in 1992-93 to 82.1% in 1999-2000 and further to 76.7% in 2007-08. The coefficient of variation in per hectare fertiliser subsidy at the state level is substantially lower and has declined even more sharply from 79.3% in 1992-93 to 51.9% in 2007-08. This has happened due to improvement in rural infrastructure, irrigation facilities, increase in coverage of area under high yielding variety seeds, easy access to fertilisers, affordable prices, and shift in crop patterns towards fertiliser intensive crops in some of these less developed states during the last decade. The benefits of fertiliser subsidy are not restricted to only resource-rich states but have spread to other states also.

It is worth mentioning that the benefits of fertiliser subsidy have spread to unirrigated areas as the share of area treated with fertilisers has increased from 41% in 1996-97 to 53.5% in 2001-02 on unirrigated lands (Figure 8, p 75), while this share is substantially higher in irrigated areas (91.6% in 2001-02). Likewise, the share of unirrigated areas in total fertiliser use has also increased from 26% in 1996-97 to 30.7% in 2001-02 (Figure 9, p 75).

The per hectare fertiliser use on unirrigated lands has increased by about 42% between 1996-97 and 2001-02 (35.8 kg/ha to 50.9 kg/ha). In the case of irrigated areas, the intensity of fertiliser use is significantly higher compared with unirrigated areas

but has increased at a lower rate (13.1%) between 1996-97 and 2001-02 (Figure 10).

It is quite evident from the above discussion that the benefits of fertiliser subsidy are not restricted to only resource-rich areas but have spread to other areas as well. The inequity in the distribution of fertiliser subsidy among states is still large but has declined over time.

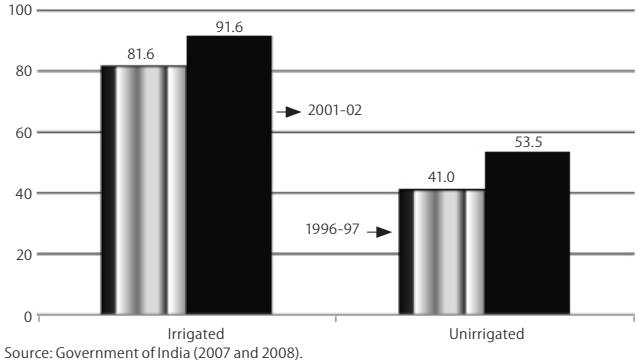
Distribution of Subsidy across Crops

Table 10 shows the concentration of subsidies in 2001-02 across agricultural crops in the country. It is evident from the table that rice and wheat are the major users of fertiliser subsidy accounting for over half of the total subsidy. Rice is the biggest beneficiary receiving 32.2% of the fertiliser subsidy in 2001-02. Wheat has a 20.3% share, followed by sugar cane (6.3%). Cotton is another fertiliser intensive crop which accounted for 5.9% of the total fertiliser subsidy. Coarse cereals receive a small share of the subsidy. The farmers growing fertiliser-intensive crops like paddy, wheat, sugar cane and cotton are the major beneficiaries. So there is a high degree of concentration of fertiliser subsidies in terms of crops as four crops consume nearly two-thirds of the total fertiliser subsidy.

Distribution across Farm Sizes

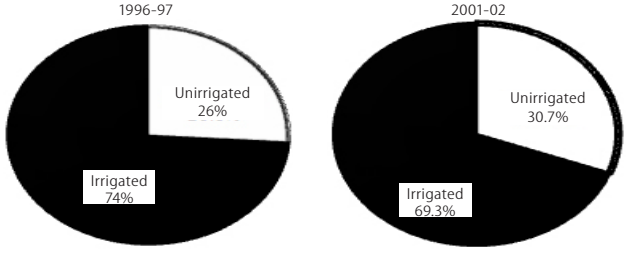
Fertiliser subsidies are generally criticised because they are perceived to be far from universally distributed and concentrated on relatively few producers, mainly large farmers. In order to assess whether the subsidy policy benefits only large farmers or all categories of farmers, subsidy distribution patterns across different farm size groups were analysed. We computed fertiliser subsidy on a per hectare basis as well as share of different farm size groups in total subsidy and the results are presented in Table 11.

Figure 8: Percentage Area Treated with Fertilisers on Irrigated and Unirrigated Land (1996-97 and 2001-02, in %)



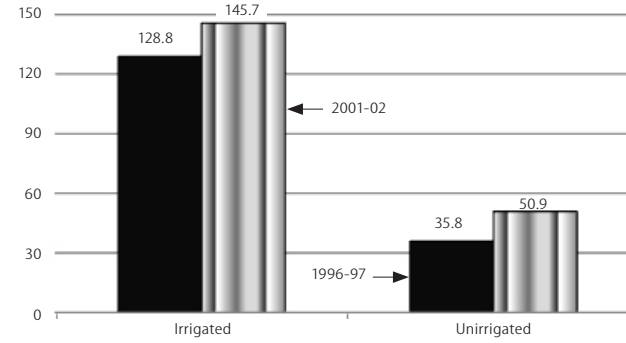
Source: Government of India (2007 and 2008).

Figure 9: Changes (%) in Share of Irrigated and Unirrigated Areas in Consumption of Fertilisers between 1996-97 and 2001-02



Source: Government of India (2007 and 2008).

Figure 10: Trends in Consumption of Fertilisers (N+P+K) on Irrigated and Unirrigated Land (Kg/ha)



Source: Government of India (2007 and 2008).

Table 10: Concentration of Fertiliser Subsidy on Major Crops in India: 2001-02

Crop	Total Fertiliser Used ('000 Tonnes)	Total Subsidy (Rs Lakh)	% Share in Total Subsidy	Per Ha Fertiliser Use (Kg)
Paddy	5,061.7	367.5	32.2	119.4
Wheat	3,189.7	231.6	20.3	130.8
Sugar cane	989.6	71.8	6.3	240.6
Cotton	921.0	66.9	5.9	110.8
Groundnut	465.9	33.8	3.0	74.6
Jowar	443.8	32.2	2.8	60.0
Bajra	304.3	22.1	1.9	29.0
Maize	258.4	18.8	1.6	55.8
Others	4,073.4	295.7	25.9	66.1
All crops	15,707.8	1140.4	100.0	92.6

Computed from FAI (2008) and Government of India (2008).

Table 11: Fertiliser Subsidy on Different Farm Size Holdings in India (1996-97 and 2001-02)

Farm Size (Ha)	Subsidy Per Unit Area (Rs/Ha)		Ratio of Subsidy to All Households		Share (%) in Total Fertiliser Subsidy	
	1996-97	2001-02	1996-97	2001-02	1996-97	2001-02
Marginal (<1.00)	550.7	916.2	134.8	224.2	25.6	28.3
Small (1.00-1.99)	437.8	730.4	107.1	178.7	20.4	23.0
Semi-medium (2.00-3.99)	399.1	644.7	97.7	157.8	23.0	23.3
Medium (4.00-9.99)	360.9	550.3	88.3	134.7	22.2	19.1
Large (≥10.00)	271.4	405.8	66.4	99.3	8.8	6.3
All households	408.6	672.3	100.0	164.5	100	100

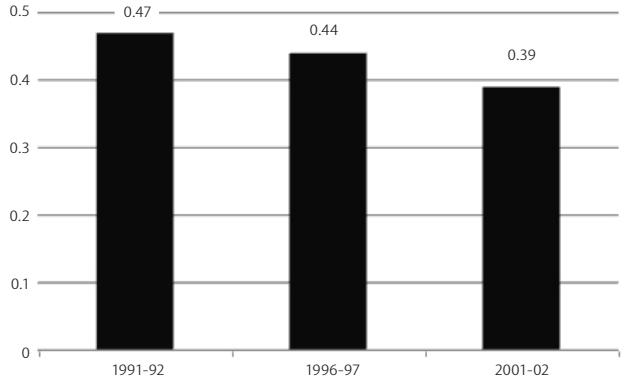
Government of India (2007 and 2008).

It can be seen from the table that there is an inverse relationship between farm size and average subsidy per hectare. Per hectare subsidy on marginal farms was more than double compared with large farms. The average subsidy was the highest (Rs 916.2/ha) on marginal farms and the lowest on large farms (Rs 405.8/ha). The share of marginal farmers in total fertiliser subsidy in 2001-02 was the highest (28.3%), followed by small farms (23%) and the lowest was on large farms (6.3%). The share of small, marginal and semi-medium farms has increased between 1996-97 and 2001-02 while the share of medium and large farms has declined. The results clearly show that the fertiliser subsidy is distributed more equitably among different farm sizes compared with its crop-wise and state-wise distribution.

It may be concluded from the above discussion that there is a fair degree of inter-farm equity in the distribution of fertiliser consumption. However, it would be useful to examine changes in equity in fertiliser consumption over time. In order to investigate this issue, Gini coefficients were computed for the years 1991-92,

1996-97 and 2001-02 and are given in Figure 11. The Gini coefficient is a measure of statistical dispersion most prominently used as a measure of inequality of income distribution. It is defined as a ratio with values between 0 and 1. A low Gini coefficient indicates more equal distribution, while a high Gini coefficient indicates more unequal distribution. As the figure makes clear, between 1991-92 and 2001-02, inequality in fertiliser consumption across different farm size groups went down from 0.47 to 0.39, which is a positive development.

Figure 11: Gini Coefficient in 1991-92 and 2001-02 (Input Survey)



Calculations are based on distribution of holdings ranked by their fertiliser consumption shares.

3 Concluding Observations and Policy Implications

The importance of fertilisers in agricultural production has made the promotion of fertiliser use an important aspect of national policy in India. Almost all developing countries including India have, at various times and to different degrees, subsidised fertilisers. Fertiliser subsidies were considered particularly important in inducing farmers to adopt high yielding varieties, which often depended heavily on fertilisers, and they have been successful in this regard. Therefore, with increase in fertiliser use over time, the subsidy has also increased. In India, fertiliser subsidies increased rapidly during the post-reforms period and peaked in the second-half of 2000s.

The general perception that about one-third of fertiliser subsidy goes to the fertiliser industry is misleading because the underlying assumptions do not hold true. The world fertiliser markets and trade-flows are highly concentrated and volatile, and Indian imports have a significant impact on the world prices. Moreover, with a shift from the earlier cost-plus based approach to IPP, the Indian fertiliser industry would be exposed to the world competition, which would drive the inefficient units out. The proposed policy of direct transfer of fertiliser subsidy to farmers that is based on unrealistic assumptions is misconceived and inappropriate and its adverse effects outweigh the perceived benefits.

On the issues of whether fertiliser subsidy is distributed equitably across crops, states, and farm classes, our results indicate that fertiliser subsidy is concentrated in a few states, namely, Uttar Pradesh, Andhra Pradesh, Maharashtra, Madhya Pradesh, and Punjab. Interstate disparity in fertiliser subsidy distribution is still high though it has declined over the years. Rice, wheat, sugar cane and cotton account for about two-thirds of the total fertiliser subsidy. However, we found that the fertiliser subsidy is more equitably distributed among farm sizes. The small and marginal farmers have a larger share in fertiliser subsidy in comparison to their share in cultivated area. The benefits of fertiliser subsidy have spread to unirrigated areas as the share of area treated with fertilisers has increased from 41% in 1996-97 to 53.5% in 2001-02 on unirrigated lands and the share of unirrigated areas in total fertiliser use has also increased during the corresponding period. A reduction in fertiliser subsidy is, therefore, likely to have adverse impact on farm production and income of small and marginal farmers and unirrigated areas (about 60%) as they do not benefit from higher output prices but do benefit from lower input prices. Thus, the results justify the fertiliser subsidies and question the rationale for direct transfer of subsidy to farmers.

Postscript

The government's move in early 2010 to shift to a nutrient-based subsidy (NBS) on decontrolled phosphatic and potassic fertilisers and to provide additional subsidy for subsidised fertilisers carrying other secondary and micro nutrients is a welcome step. Under the NBS regime, the subsidy on subsidised fertilisers will remain fixed while their retail prices at the farmgate level will be decided by market forces. If prices of decontrolled P and K fertilisers remain affordable, it would lead to balanced use of fertilisers and provide a wider choice of fertiliser products to farmers. However, international prices of P and K fertilisers and feedstock/raw materials are highly volatile which might lead to more volatility and perhaps to an increase in farmgate prices of these fertilisers. In addition, urea will continue to be under government control with a 10% increase in its price. Therefore, these policy interventions might lead to higher increase in P and K prices compared with urea, which would lead to imbalanced use of fertilisers (N: P: K) as was the case post-1991 when P and K fertilisers were decontrolled but urea remained under control. In order to make this policy intervention effective, there is a need to specify a price band for P and K fertilisers so that prices do not go beyond the reach of Indian farmers.

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