

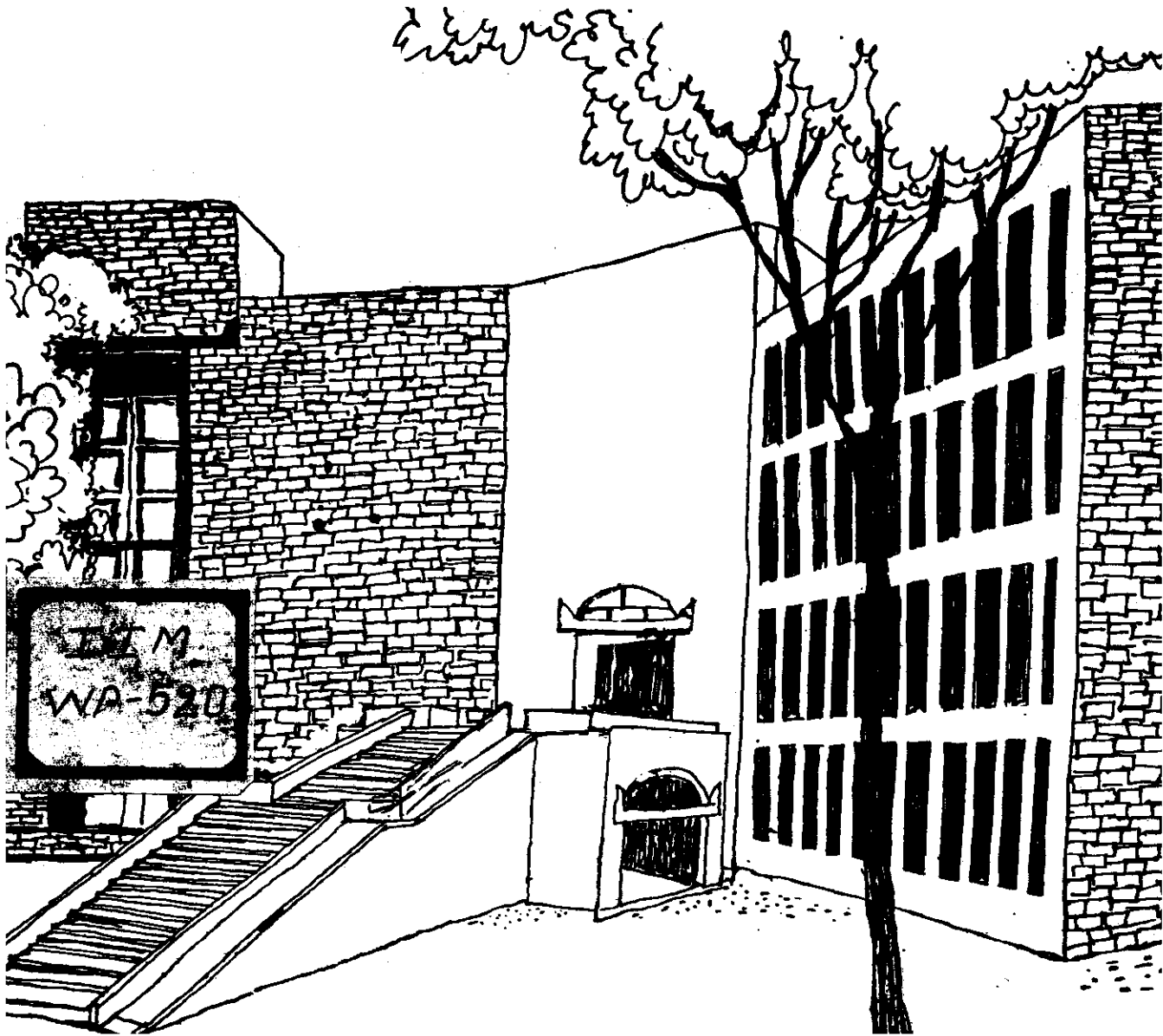


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GROWTH IN FERTILIZER CONSUMPTION:
PRICE AND NON-PRICE POLICIES

By

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GROWTH IN FERTILIZER CONSUMPTION: PRICE AND NON-PRICE POLICIES

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This paper discusses fertilizer pricing policy in the context of the need to generate sustained rapid growth in India's fertilizer consumption. Section I provides a brief overview of past growth and future needs for consumption. Section II, which traces the evolution of fertilizer pricing policy, shows how and why this policy has been inseparable from, perhaps even deeply embedded in, fertilizer supply and distribution policies. It is necessary to understand this relationship in order to appreciate how the fertilizer subsidies of recent years have led to complexities in pricing policy. Section III highlights major non-price policies. These appear to be even more crucial than price policy in continuously raising India's fertilizer consumption rapidly.

I. FERTILIZER CONSUMPTION: PAST GROWTH AND FUTURE NEEDS

Fertilizer began to be used in appreciable quantities in the 1920s on the tea plantations. However, although the low fertility of Indian soils had been recognized since the 1890s, application of fertilizers did not expand much beyond these plantations, and the government did nothing to push it. This situation changed in 1943, when the Grow More Food Campaign was launched in the wake of the Japanese occupation of Burma, from which India imported rice, and the Bengal Famine. The measures

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taken then marked the beginning of efforts to promote fertilizer use in the non-plantation sector in order to raise food production rapidly. These efforts gathered momentum after India became independent in 1947. ^{1/}

In the late 1940s, India was using less than 50,000 metric tons of nutrients in the form of chemical fertilizers (i.e., less than 0.5 kg. per hectare). By 1965/66, consumption had grown to about 800,000 metric tons; by 1973/74, 2.8 million; and by 1983/84, more than 7 million (Table 1). India now ranks fourth in total fertilizer consumption after the United States, the USSR and China. ^{2/}

The need for substantial further growth in consumption is indicated by India's relatively low level of consumption per hectare as compared to the levels in countries with high

^{1/} For a historical perspective, see Gunvant M. Desai, Growth of Fertilizer Use in Indian Agriculture, Past Trends and Future Demands, International Agricultural Development Bulletin No. 18 (Ithaca, N.Y.: Cornell University Press, 1969), Chapter 2; and Gunvant M. Desai, "Fertiliser in India's Agricultural Development," in Agricultural Development of India - Policy and Problems, ed. C.H. Shah (Bombay: Orient Longman Ltd., 1979), pp. 377-426.

^{2/} While India's rank is attributable to its large size, the same is true of the United States, the USSR and China, all of which, however, rank much lower on a per hectare basis. Of importance is that neither China nor India were in the top 15 countries until the 1960s. India's record in raising its consumption from less than 1 kg. per hectare in the early 1950s to 41 kg. by 1983/84 is quite impressive when compared with the time taken by many developing and developed countries to raise their per hectare fertilizer consumption in this range. On the other hand, India's growth performance is considerably poorer than China's.

Table 1: CONSUMPTION OF FERTILIZERS IN INDIA, 1951/52 to 1983/84

Year	Consumption (000 m tons)				Per ha consumption ^{a/} (kgs.)	Annual change in total consumption	
	N	P ₂ O ₅	K ₂ O	Total		000 mt.	Percent
1951/52	59	7	8	74	0.6		
1952/53	58	5	3	66	0.5	-8	-10.8
1953/54	89	8	8	105	0.7	39	59.1
1954/55	95	15	11	121	0.8	16	15.2
1955/56	108	13	10	131	0.9	10	8.2
1956/57	123	16	15	154	1.0	23	17.6
1957/58	149	22	13	184	1.3	30	19.5
1958/59	172	30	22	224	1.5	40	21.7
1959/60	229	54	21	304	2.0	80	35.7
1960/61	212	53	29	294	1.9	-10	-3.3
1961/62	250	61	28	339	2.2	45	15.3
1962/63	333	83	36	452	2.9	113	33.3
1963/64	377	117	51	545	3.5	93	20.6
1964/65	555	149	69	773	4.9	228	41.8
1965/66	575	133	77	785	5.1	12	1.6
1966/67	738	249	114	1,101	7.0	316	40.3
1967/68	1,035	335	170	1,540	9.4	439	39.9
1968/69	1,209	382	170	1,761	11.1	221	14.4
1969/70	1,356	416	210	1,982	12.2	221	12.5
1970/71	1,479	541	236	2,256	13.6	274	13.8
1971/72	1,798	558	300	2,656	16.1	400	17.7
1972/73	1,839	581	348	2,768	17.1	112	4.2
1973/74	1,830	650	360	2,840	16.7	72	2.6
1974/75	1,766	472	336	2,574	15.7	-266	-9.4
1975/76	2,149	467	278	2,894	16.9	320	12.4
1976/77	2,457	635	319	3,411	20.4	517	17.9
1977/78	2,913	867	506	4,286	24.9	875	25.7
1978/79	3,420	1,106	592	5,118	29.2	832	19.4
1979/80	3,499	1,150	607	5,256	30.0	138	2.7
1980/81	3,678	1,214	624	5,516	31.5	260	4.0
1981/82	4,069	1,322	676	6,067	34.6	551	10.0
1982/83 ^{b/}	4,263	1,420	735	6,418	36.6	351	5.8
1983/84 ^{c/}	4,750	1,619	811	7,180	40.9	762	11.9

^{a/} Based on "gross cropped area." Estimates for the last five years are based on the gross cropped area in 1978/79.

^{b/} Provisional.

^{c/} Estimated.

Source: Fertiliser Statistics, 1982/83 and Fertiliser News, December 1983.

crop yields. ^{3/} More important, it is revealed by the future requirements for agricultural production, most of which will have to come from continuous increases in yields per hectare. Those increases in turn will depend in part on fertilizer use. For instance, according to the National Commission on Agriculture, about 80 percent of the additional food grain production required by the year 2000 will depend on increased use of fertilizers.^{4/} This dependence on fertilizers is stressed because it highlights a simple axiom: soil fertility ultimately determines the limits of growth in yields, whether on irrigated or unirrigated areas and with or without improvements in crop varieties. The widespread deficiency of nitrogen in Indian soils is well-known, but the availability of phosphorus and potash is also low, and there is growing evidence of a defici-

^{3/} This disparity is clear from the data on yields of different crops and fertilizer consumption per hectare of arable land in the FAO's Production Yearbook and Fertilizer Yearbook, respectively. It may be noted, however, that comparisons of fertilizer consumption per hectare of arable land based on FAO's data exaggerate the differences between India and many other countries. This exaggeration is most notable in countries such as some in Europe and in Australia and New Zealand, where a substantial proportion of total fertilizer consumption is on pasture land, and in those with a high degree of multiple cropping, as in some Asian countries, including China. In India, there is hardly any fertilizer use on hay and pastures. The data for India in the FAO statistics relate to gross cropped areas (which include multiple cropped areas), whereas those for many other countries, including China, relate to arable land, which excludes multiple cropped areas.

^{4/} The estimates made by the National Commission on Agriculture show that 102 million out of 126 million tons of additional food grain production will depend on greater fertilizer consumption. Against this, the contribution of increased irrigation, the development of command areas and the program of dry farming together is estimated at 24 million tons. For details, see India, Ministry of Agriculture and Irrigation, Report of the National Commission on Agriculture, New Delhi, 1976, Part III, pp.75-80.

ency in sulphur as well as in micro-nutrients at a number of locations.^{5/} Obviously, growth in agricultural production based on yield, cannot be sustained without removing these constraints. Hence, there is a general agreement on the importance of continuously raising fertilizer use.^{6/}

The estimates of required fertilizer use in India by the year 2000 vary between 15 and 20 million tons.^{7/} To achieve those levels, total consumption must go up by 450 to 750 thousand tons every year during the 1980s and 1990s.^{8/} So far, the annual increment in fertilizer consumption has exceeded 500 thousand tons only 5 times. It is, therefore, pertinent to ask

- ^{5/} N.W.Randhawa, and H.L.S.Tandon, "Advances in Soil Fertility and Fertilizer Use Research in India," Fertiliser News 27(2) (February 1982):11-26. See also other articles in this special issue, brought out on the occasion of the 12th International Congress of Soil Science, held in New Delhi on February 8-16, 1982.
- ^{6/} While chemical fertilizers are only one source of plant nutrients, they have become increasingly important, as revealed by experience in India and elsewhere. Even China, with its exemplary performance in mobilizing other sources of nutrients, has found this. See Anthony M.Tang and Bruce Stone, Food Production in the People's Republic of China, International Food Policy Research Institute, Washington D.C., May 1980, especially p.47.
- ^{7/} For example, see the estimates made by the National Commission on Agriculture and UNIDO. For the commission's estimates, see the source cited in footnote 4. For UNIDO's estimates, see UNIDO, Draft Worldwide Study of the Fertilizer Industry: 1975-2000, 1976, Chapter 2.
- ^{8/} The dimension of this is clearer when looked at in absolute rather than percentage terms because of the vast changes in the base level. For instance, a 5 to 7 percent rate of growth in fertilizer consumption is needed to raise the present level to 15 to 20 million tons by the year 2000. In 23 of the last 32 years, fertilizer use grew by a rate considerably higher than 7 percent. Viewed thus, the task does not appear formidable. However, now a 5 to 7 percent growth rate implies increments of consumption greater than 500,000 tons a year. In only 5 of 32 years was that level of increments in consumption reached. The task no longer seems all that easy.

what must be done to generate the desired growth in fertilizer use.

To discuss that question meaningfully, it is necessary to understand the forces behind past growth and the constraints on raising fertilizer consumption at the desired speed. Fertilizer prices are obviously important, but they are only one factor. Also important are such considerations as crop prices, responses of crops to fertilizer use, the untapped potential for fertilizer use and how it is changing in light of the upward shifts in fertilizer response functions, and the workings of the fertilizer supply and distribution, as well as the agricultural research, extension and credit, systems.

These considerations are stressed because fertilizer prices and price policy are becoming increasingly important in policy discussions on sustained rapid growth in consumption. More often than not, such discussion is headed by the rising burden of fertilizer subsidies and an apprehension that raising fertilizer prices to lower the subsidies will adversely affect the growth of consumption.

The burden of fertilizer subsidies on the budget has in fact grown rapidly (Table 2). In 1983-84, it reached Rs.10,480 million, or 2.7 percent of the total disbursements of the central government. A recent article in The Economic Times contends that the fertilizer subsidy is considerably larger (Rs.14,000 million) than stated in the budget statistics, since the domestic fertilizer industry is charged lower prices for naphtha and fuel oil than other industries.^{9/} It further contends that fertilizer subsidies will rise to Rs.70,000 million by 1990 unless the retail prices of fertilizers are

^{9/} "Subsidising Fertilizer," by a correspondent, The Economic Times, January 3-4, 1984.

Table 2: FERTILIZER SUBSIDIES IN THE BUDGETS OF THE CENTRAL MINISTERS

Year	Imported fertilizers a/	Domestic fertilizers b/	Total
1971/72	-20	--	-20
1972/73	-18	--	-18
1973/74	33	--	33
1974/75	371	--	371
1975/76	242	--	242
1976/77	52	60	112
1977/78	159	107	266
1978/79	169	173	342
1979/80	282	321	603
1980/81	335	170	505
1981/82	100	275	375
1982/83 RE	98	550	648
1983/84 RE	148	900	1,048
1984/85 BE	150	930	1,080

RE = Revised, BE = Budget estimates.

a/ These data appear in the capital account of the budget. Details regarding subsidies, losses and changes in inventory are not available separately. These figures, however, are referred to as subsidies on imported fertilizers even in official documents. (For example, see Reserve Bank of India, Report on Currency and Finance, 1982-83, Vol.I, pp.35-36).

b/ These data include (1) payments under the Fertilizer Retention Price Scheme to manufacturers of nitrogenous and phosphatic fertilizers; (2) payment of subsidy to indigenous manufacturers of single super phosphate; and (3) payments under the Fertilizer Freight Subsidy Scheme. In 1983/84, Rs.690 crores were paid under (1), Rs.25 crores under (2), and Rs.185 crores under (3).

Sources: Compiled from Report of the Committee on Controls and Subsidies, May 1979, and budget documents.

raised. While not everyone accepts all the arguments and estimates in the article, there is a general agreement that the burden of the fertilizer subsidy will grow over time as fertilizer consumption increases. However, there is no such consensus on whether the retail prices of fertilizers should be raised.

As shown in Table 2, most of the present burden of fertilizer subsidies is from domestic fertilizers under the Fertilizer Retention Price Scheme. In this scheme, the government pays manufacturers the difference between the retail prices and delivery costs of fertilizers to them. Thus, the fertilizer subsidies could be reduced either by raising the retail prices of fertilizers or lowering the prices paid to the fertilizer manufacturers. It is argued that raising the retail prices will adversely affect fertilizer consumption, on which the targets for agricultural production depend. Given the upward pressure on the cost of fertilizer production, and the industry's claim that even present prices are not enough to ensure a fair return on investment, there is virtually no apparent scope for lowering the retention prices. Moreover, the government's policy is to meet increasing proportions of the fertilizer requirements through domestic production. Thus, any simple-minded policy of lowering the retention prices will be self-defeating, especially if it constrains further development of domestic fertilizer industry.

Clearly, there are valid reasons for concern about fertilizer prices and price policy. It would be unfortunate, however, if they dominate the policy discussions on sustained rapid growth in fertilizer consumption. Fertilizer prices (in either nominal or real terms) are only one set of variables governing growth in fertilizer consumption. In fact, evidence shows clearly that they have been much less important than many other non-price variables and policy instruments. Further, fertilizer pricing policy involves many more issues than either subsidies or

oversimplified relationships between fertilizer prices and growth in usage. A lot more systematic research is needed on the real burden of fertilizer subsidies and its rationale before it is possible to take a prudent position on the extent to which the present magnitude of fertilizer subsidies should govern fertilizer pricing policy. In fact, a few points emerging from a historical perspective in the next section indicate the complexity of the issues and suggest that India's record on fertilizer pricing policy may not be as dismal as it seems from the present burden of the subsidies.

II. FERTILIZER PRICES AND PRICE POLICY

Whereas substantial fertilizer subsidies are relatively recent, the government has always controlled the prices of fertilizers one way or another since 1943. What led to these controls? How did they change over time and why? What was the resulting environment with respect to fertilizer prices? How did it affect the growth in consumption? Which factors have led to the growing burden of fertilizer subsidies?

Questions like these are addressed below. It is important to note that these questions are especially difficult to answer in the Indian context for two reasons. First, historically, fertilizer price policy has been inseparable from fertilizer supply and distribution policy. Perhaps, it has even been deeply embedded in it. Second, supply and distribution policies have been governed on the one hand by the objective of raising food production rapidly, and on the other by the drives and constraints inherent in the strategy adopted to pursue economic development and industrialization in a large country. These points cannot be overemphasized since they help in understanding

not only the evolution but also the present dilemma in fertilizer price policy.

When in 1943 the government launched the Grow More Food Campaign to raise food production rapidly, the most severe constraint was the limited availability of fertilizers. In the late 1930s, imports constituted over 80 percent of the nutrients used, and this was mainly in the plantation sector. As World War II gathered momentum, the export surplus on the world market dwindled sharply, and so did India's imports. The International Emergency Food Council allocated those exports to various governments. To import the fertilisers assigned to India and to ensure their availability to the non-plantation sector, in 1944 the government established a Central Fertiliser Pool in the Ministry of Food and Agriculture. The Pool also procured all the domestic production of nitrogenous fertilizers. The total supply was then distributed to the provincial governments for distribution to cultivators in the non-plantation sector, to boards representing tea, coffee and rubber plantations, and to industrial users. Prices were fixed on a non-profit, no-loss basis.^{10/} This program was the beginning of price controls on fertilizers. It originated from supply constraints and a desire to ensure that some supplies went to the non-plantation sector to promote a rapid increase in food production.

This system continued after independence in 1947 even though with public investments in the fertilizer industry had started enlarging domestic capacity. The main reasons were the need to control supplies in light of the foreign exchange

^{10/} For the origin, objectives and operations of the Central Fertilizer Pool, see Report of the Fertiliser Distribution Enquiry Committee, Government of India, New Delhi, 1960, Chapter II, and Report of the Committee on Fertilizers, Government of India, Annexure IX.

constraints on liberal imports of fertilizers,^{11/} concern for equitable distribution among the states to achieve food production targets (fertilizers were assigned increasing importance over time in achieving these targets), and a preference for co-operative institutions in the fertilizer distribution system (because of their widespread network and the policy of channeling agricultural production credits through them).

Until 1953, the prices the Central Fertiliser Pool set for fertilizers did not include railway freight, which was borne by the consignees. This exclusion resulted into unequal prices at different locations and was considered uncondusive to growth in fertilizer consumption at distant locations. The government decided to charge uniform prices, to be accomplished by including equated railway freight in the prices.^{12/} After 1953, the prices took into account the landed cost of imported fertilizers, the cost of procuring domestic fertilizers, handling charges at ports for imported fertilizers, interest for six months on capital invested in imports, incidental and overhead charges, equated railway freight, excise duties and the prescribed margins for wholesalers and retailers. The retention prices of domestic fertilizers procured by the Central Fertilizer Pool were fixed by the Cost Accountancy Division of the Ministry of Finance based on the costs of production and a fair return on investment by manufacturers.

^{11/} The foreign exchange constraints on liberal imports of fertilizers were not unique to India among developing countries. What was perhaps unique was India's strategy for economic development and industrialization, which made the constraints more severe and persistent.

^{12/} This policy has persisted. The Fertiliser Freight Subsidy Scheme introduced in 1979 is the latest concrete expression of the policy of uniform prices.

For a brief period between 1948 and 1952, this policy of pooling supplies was also applied to phosphatic fertilisers. This step was taken because domestic manufacturers were calling for protection against imports. The price paid to the domestic factories was based on a formula evolved by the Tariff Board, which reflected changes in the prices of rock phosphate and sulphur.

Although the pooling arrangements were discontinued for phosphatic nutrients after 1952, the government continued to fix ex-factory prices until 1966, when it assigned this task to the Fertiliser Association of India. Supplies of phosphatic fertilizers were obtained either by the state governments or by the apex cooperative societies directly from the factories and were distributed through government depots or cooperative societies. In a few states, distribution was handled by the manufacturers through their own agents (either private traders or cooperative societies). The delivered cost of phosphatic fertilizers differed according to the distance from the supplying factories. In some states, retail prices were fixed at a uniform level by pooling the transportation cost and adding a uniform distribution margin to the railhead prices.^{13/} To promote the use of phosphatic fertilizers, the central government introduced a subsidy, initially of 50 percent and later of 25 percent. The cost of the subsidy was to be shared equally by the central and state governments. However, only some state governments participated in this scheme to promote the use of phosphatic fertilizers through subsidizing them.

^{13/} For details, see Report of the Fertiliser Distribution Enquiry Committee, Government of India, New Delhi, 1960; and Report of the Committee on Fertilisers, Government of India, New Delhi, 1965.

Potassic fertilizers were imported by the State Trading Corporation through the Indian Potash Supply Agency. Uniform ex-port prices were fixed by pooling the cost of imports, the handling and administration charges and the profit margin for the Supply Agency. There was, however, no control over the retail selling prices.

This price and distribution policy continued until the mid-1960s. There was very little use of the fertilizer subsidy, which made India somewhat unique among developing countries in the 1950s and 1960s. In the case of nitrogenous fertilizers (which constituted more than 75 percent of total consumption), the subsidy was confined mainly to off-season rebates, transportation to hilly and inaccessible areas, and, in a few states, to the introduction of new fertilizers. Not only was the subsidy bill small, but the Central Fertilizer Pool made a profit in 18 out of the 20 years between 1944/45 and 1963/64 (Table 3), which amounted to Rs.434 million. In 1963/64, the Public Accounts Committee criticized this because a sizable recurring profit was not consistent with the no-profit no-loss concept underlying the pool prices of fertilizers. The Committee on Fertilisers also did similarly criticized this in 1965. The criticism assumed added importance in light of the fact that the prices of fertilizers were quite high not only in nominal terms, but also in real terms (Table 4), and there was no major price support program for crops.^{14/}

^{14/} For the relative importance and influence of price variables vis-a-vis non-price variables such as irrigation and cropping patterns in the growth and use of fertilizers until 1965, see Gunvant M. Desai, Growth of Fertilizer Use in Indian Agriculture, Past Trends and Future Demand, Ph.D. thesis, Cornell University, Ithaca, N.Y., 1969. An abridged version of the thesis was brought out under the same title as International Agricultural Development Bulletin No.18, Cornell University Press, Ithaca, N.Y., 1969.

Table 3: PROFITS AND LOSSES UNDER THE SCHEME FOR THE "PURCHASE OF CHEMICAL FERTILIZERS," 1944/45 - 1963/64

Year	Net Profit or Loss ^{a/} (Rs.)	Distribution (000 metric tons) ^{b/}				Profit or loss per metric ton (Rs.)
		N	P ₂ O ₅	K ₂ O	Total	
1944/45	671,583					
1945/46	2,564,061					
1946/47	-440,316					
1947/48	1,429,857					
1948/49	142,639					
1949/50	1,963,799					
1950/51	1,143,466					
1951/52	444,627	58.7	6.9	-	65.6	6.78
1952/53	340,158	57.8	4.6	3.3	65.7	5.18
1953/54	6,870,760	89.3	8.3	7.5	105.1	65.37
1954/55	-4,547,472	94.8	15.0	11.1	120.9	-37.61
1955/56	875,985	107.5	13.0	10.3	130.8	6.70
1956/57	2,258,216	123.1	15.9	14.8	153.8	14.69
1957/58	15,478,413	149.0	21.9	12.8	183.7	84.26
1958/59	35,050,140	172.6	29.5	22.4	224.5	156.12
1959/60	63,707,000	229.3	53.9	21.3	304.5	209.22
1960/61	74,481,063	211.7	53.1	29.0	293.8	253.51
1961/62	94,719,930	291.5	63.9	28.0	383.4	247.05
1962/63	85,006,580	360.0	81.4	36.4	477.8	177.91
1963/64	51,433,663	407.0	116.7	50.6	574.3	89.56
<hr/>						
Total (1951/52- 1963/64)	426,119,053	2,352.3	484.1	247.5	3,083.9	138.18

Sources: a/ Report of the Committee on Fertilisers, Government of India, New Delhi, 1965, p.184.

b/ Fertiliser Statistics, 1982/83, Fertiliser Association of India, New Delhi, pp.178-79.

Table 4: RATIOS OF NITROGEN TO PADDY AND WHEAT PRICES IN DIFFERENT STATES, 1956/57 - 1964/65

States	Ratio of N to Paddy Prices ^a			Ratio of N to Wheat Prices ^a		
	High	Low	Average ^b	High	Low	Average ^b
Bihar	5.7	4.3	5.2	4.2	2.8	3.6
West Bengal	5.3	3.5	4.6	4.5	3.0	4.0
Uttar Pradesh	6.8	5.9	6.3	4.5	3.0	4.2
Punjab	6.2	4.2	5.3	4.8	3.1	4.1
Rajasthan	5.0	3.4	4.2	4.2	2.8	3.8
Gujarat	4.2	3.3	4.0	3.6	2.4	3.2
Madhya Pradesh	7.2	5.2	6.0	5.0	3.6	4.3
Maharashtra	4.9	3.0	4.3	3.5	2.3	3.1
Karnataka	5.3	3.5	4.5			
Anadhra Pradesh	5.1	3.6	4.5			
Tamil Nadu	5.8	3.5	4.8			
Kerala	5.3	3.5	4.4			

a The average price of nitrogen in different states calculated from the price of different fertilizers weighted according to their relative importance. Prices of paddy and wheat are based on farm harvest prices.

b Average of 9 years from 1956/57 to 1964/65

The policy of pooling supplies and regulating their distribution initiated a trend of growth in fertilizer consumption in the non-plantation sector on a fairly wide geographic range. ^{15/} For a country of India's size and diversity, this achievement was significant, especially given the persistent constraints on increasing total fertilizer supply and the absence of subsidies. Credit goes to the following features of the policy: earmarking a substantial proportions of total supplies for the non-plantation sector; the involvement of state governments in procuring fertilizer supplies and linking the supplies with the agricultural production program; creation of

^{15/} This trend is evident in the following figures, which show per hectare consumption of fertilizers in India in the early 1960s and early 1980s. It also covers 1967/68-1968/69, when high-yield varieties were introduced.

Kg. of nutrients per hectare	1961/62- 1962/63	1967/68- 1968/69	1980/81- 1981/82
	<u>Percent of districts</u>		
Up to 1	56.6	16.3	0.7
1.1 to 2	24.3	12.7	3.5
2.1 to 5	11.4	17.3	8.5
5.1 to 10	5.8	18.4	12.4
10.1 to 30	1.9	30.7	28.0
30.1 to 50	-	3.2	19.9
50.1 to 100	-	1.4	21.0
Above 100	-	-	6.0
Total	100.0	100.0	100.0

a fertilizer delivery system which, with all its deficiencies, was still quite widespread and was linked to the agricultural credit system; and uniform prices of fertilizers all over the country.

The experience of policy-makers and administrators with this policy made them aware that overcoming supply constraints and deficiencies in the distribution system was more important in raising fertilizer use than were high fertilizer prices. This conclusion was evident in the Report of the Fertiliser Distribution Enquiry Committee (1960).

That awareness was also decisive in the government's decision to set up a Committee on Fertilisers in the final years of the Third Five Year Plan (1960/61 -- 1965/66) and in the formulation of proposals for the Fourth Five Year Plan. When these proposals were being developed, the government realized that any breakthrough in agricultural production would have to be based on a massive increase in fertilizer consumption, since 44 percent of the additional food grain production in the Fourth Plan was dependent on increased use of fertilizers.^{16/} Against this background, the committee was to examine the short and long-term problems in rapidly raising fertilizer consumption.

Most of the committee's major recommendations were incorporated in the comprehensive fertilizer policy the government announced in December 1965 as a part of the New Agricultural Strategy. Hence the committee's diagnosis of the problems and policy prescriptions are important in understanding the evolution of fertilizer policy in India. While it is beyond the scope of this paper to cover all points, the following deserve attention.

^{16/} See Report of the Committee on Fertilisers, Government of India, New Delhi, 1965.

The Committee on Fertilisers underscored the urgent need to accelerate growth in fertilizer consumption -- from less than 1 million tons in 1965/66 to 4.1 million tons in 1970/71 and to 7.2 million tons in 1975/76. (As Table 1 shows, fertilizer consumption exceeded 4 million tons in 1977/78 and 7 million tons in 1983/84.) The committee believed that growth in fertilizer consumption of that magnitude was feasible not only because fertilizer-responsive high-yield varieties had been introduced after the mid-1960s, but also because of the potential profitability of fertilizer use on non-high-yield varieties with and without irrigation. For these reasons, the committee saw no need to subsidize fertilizers to achieve the desired rate of growth in consumption. However, it did see a need for price supports for agricultural commodities, and it also recommended that fertilizer prices to farmers not exceed Rs.1,850, Rs.1,750 and Rs.625 per ton of N, P₂O₅ and K₂O respectively during the Fourth Plan period.

The committee identified important constraints on achieving the desired growth in consumption in five major spheres: (1) aggregate availability of fertilizers; (2) arrangements for procuring and delivering fertilizers; (3) the fertilizer distribution system; (4) availability of adequate credits for distributors as well as for farmers; and (5) fertilizer promotion. It made a number of recommendations, of which key ones relating with respect to enlarging supplies and developing the distribution system are especially relevant.

To increase the availability of fertilizers, the committee

opted for domestic production over imports. 17/ It recommended a substantial expansion in the domestic production capacity for nitrogen -- from less than 0.5 million tons in 1965/66 to 3.4 million tons in 1970/71 and 5.0 million tons in 1975/76. To meet the shortfall in availability until 1970/71, it recommended imports of 6.5 million tons of nutrients during the period of the Fourth Plan and an allocation of foreign exchange of Rs.7,765 million for imports of fertilizers, rock phosphate and sulphur.18/

17/ The report does not say why. It appears that the committee was influenced by the foreign exchange constraints of importing growing quantities of fertilizers, by economies of scale in the fertilizer industry and by the potential size of the domestic market. It could also have been influenced by considerations of self-sufficiency in the supply of so critical an input and by the interest multinationals were showing in investing in India's fertilizer industry. Further, growth of the fertilizer industry was consistent with the orientation in India's growth strategy toward basic and heavy industries and a growing realization that a breakthrough in food production was critical.

18/ The following quotation reveals the importance attached to the allocation of foreign exchange for fertilizer imports: "The Committee recommends that the required foreign exchange should be assured for fertilizer imports as fertilizer input are practically the sheet-anchor of the entire plan for agriculture. In the context of general scarcity of fertilizer availability in the world markets, long term contracts with suppliers can assure adequate and timely supplies over a period of time ... The assurance of the foreign exchange requirements for fertiliser imports for the period of the Fourth Plan on the basis of high priority for fertilizer use is also necessary for such long-term arrangements to be conducted." (Emphasis added) Report of the Committee on Fertilisers, pp.21-22.

To fix the prices of nitrogenous fertilizers, the committee recommended the continuation of the practice of pooled prices because of the disparities between indigenous and import prices and because of the variation in the cost of production among domestic factories.^{19/} For the same reasons and because of zonal imbalances in production and consumption, it recommended that the distribution arrangements be continued through the Central Fertiliser Pool in the short run. However, the proportion of domestic fertilizers acquired by the Pool was to be gradually decreased, and the pooling arrangements were to be terminated when domestic production of nitrogen reached 1.2 million tons, so as to give domestic manufacturers freedom in marketing their products. The committee also recommended eliminating the monopoly of the cooperatives in the fertilizer distribution system, increasing the number of retail outlets and raising the distribution margins. Similarly, it called for concessional freight rates from ports to inland factories on imported rock phosphate and sulphur, and the elimination of customs and excise duties on imported fertilizers, fertilizer raw materials and fertilizer machinery to bring down the prices of fertilizers.^{20/}

^{19/} The same considerations led the Fertiliser Prices Committee to the Fertiliser Retention Prices Scheme in 1977.

^{20/} These recommendations, made in 1965, are similar to the arguments of the fertilizer industry in recent years on lowering the cost of production of fertilizers in India. See the speeches of the chairman of Fertiliser Association of India, reported in various issues of Fertiliser News in the last five years or so. For a very forceful and persuasive plea on this score, see S.Venkitraman, "Government Policy Issues and Implications on Fertiliser Plant Costs," Fertiliser News, May 1983, pp.21-26.

The government implemented some of the major recommendations of the committee soon after 1965. For instance, the amount of domestic nitrogenous fertilizers acquired by the Central Fertiliser Pool was gradually decreased beginning in 1967/68, and in 1969/70 the pooling was terminated, leaving the manufacturers free to market their own products. Producers of complex fertilizers were also allowed to fix their prices. (However, the prices of ammonium sulphate, calcium ammonium nitrate and urea remained statutorily fixed under the Fertilizer Control Order.) The monopoly of the cooperatives in fertilizer distribution was abolished, while the distribution margins were revised upwards. As for increasing the supplies, the government imported 5.1 million tons of nutrients between 1966/67 and 1970/71. While this was nearly 80 percent of the committee's recommendation, it must be seen against the dismal growth in domestic production. By 1970, domestic capacity for nitrogen production had risen to only 1.3 million tons, as compared with the committee's recommendation of 3.4 million tons, a level reached only in 1979/80. And the actual production of nitrogen plus P_2O_5 from 1966/67 to 1970/71 was only half what the committee had assumed when working out the import requirements. The near stagnation in the growth of fertilizer consumption in the early 1970s (Table 1) was caused mainly by the tight availability of fertilizers. In turn, the shortage was the result of the impact that a continuous decline in fertilizer imports from 1967/68 to 1970/71 had on carryover stocks, combined with the poor growth in domestic production.^{21/}

^{21/} For evidence on how inadequate supplies restricted growth in fertilizer consumption during the early 1970s, see Gunvant M. Desai, "A Critical Review of Fertiliser Consumption after 1974/75 and Prospects of Future Growth," Fertiliser News (July 1978):7-18; and Gunvant M. Desai, Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use, International Food Policy Research Institute, Washington D.C., 1982. For micro-level evidence, see various papers on "Agricultural Input Supply Systems Including Marketing," Indian Journal of Agricultural Economics (October-December 1973), and on "Impact of Increase in Input Prices on Profitability and Production," Indian Journal of Agricultural Economics (July-September 1976).

With respect to fertilizer prices and price policy, the post-1965 period can be divided into two sub-periods, consisting of the years up to and after 1973/74.

Between 1966/67 and 1973/74, the farmgate prices of all fertilizers taken together increased by about 60 percent. Most of this increase came in 1967/68 and 1973/74 (Table 5). In 1967/68, fertilizer prices rose because of a 57 percent devaluation of the rupee in June 1966. In 1973/74, the rise was attributable to the increased costs of fertilizer imports. Given the magnitudes of the devaluation and the importance of imports to the availability of fertilizers, the 1967/68 increase in retail prices was kept relatively small. Details about the loss incurred by the Central Fertiliser Pool because of this policy are not readily available. It is unlikely to have been substantial, however, once the initial impact of the devaluation had passed. This conclusion is suggested by the trends in the unit cost of imported fertilizers shown in Table 6. It is also suggested by the information in Report of the Committee on Controls and subsidies (1979). This report shows, under "Imports of nitrogenous fertilizers," a surplus of Rs.200 million in 1971/72 and Rs.180 million in 1972/73, and a deficit of Rs.330 million in 1973/74. (No data are available for the years before 1971/72). The relevant tables in the report do not show any subsidy for domestic fertilizers during the above three years.

After 1973/74, with respect to both changes in fertilizer prices and fertilizer price policy, there is a different story. As shown in Table 5, the retail prices for all fertilizers went **up substantially** in 1974/75, irrespective of whether they were statutorily controlled by the government. The price rise was greater than the increased cost of domestic production, but considerably less than the increased cost of imported fertilizers

Table 5: INDEX NUMBERS OF RETAIL PRICES ^{a/} OF MAJOR FERTILIZERS
IN INDIA, 1966/67 - 1983/84

Year	Urea	AS	SSP	DAP	MOP
1966/67	100	100	100	100	100
1967/68	124	121	126	132	128
1968/69	126	123	126	132	141
1969/70	139	131	120	147	151
1970/71	139	130	123	147	151
1971/72	136	134	122	163	151
1972/73	141	134	123	169	157
1973/74	154	147	178	169	194
Jun. 1974	294	228	255	362	353
Jul. 1975	272	228	305	338	338
Dec. 1975	272	228	282	313	313
Mar. 1976	257	228	199	266	260
Feb. 1977	243	228	137	266	230
Oct. 1977	228	228	137	266	230
Mar. 1979	213	220	153	266	230
Jun. 1980	294	333 to 408	249	369	315
Jul. 1981	346	383 to 408	270	436	373
Jun. 1983	316	333 to 408	350	404	347

^{a/} Exclusive of sales tax and local duties but inclusive of the excise duty.

Source: Calculated from data on fertilizer prices in Fertiliser Statistics, various issues.

Table 6: UNIT COST OF MAJOR IMPORTED FERTILIZERS, 1967/68 to 1981/82

Year (April to March)	Urea	CAN	AS	DAP	MOP	Value of total imports Es. mil.
	-----Es. per metric ton-----					
1967/68	652	398	445	622	391	1,933
1968/69	684	421	351	778	387	1,630
1969/70	662	428	332	521	345	1,168
1970/71	588	389	330	592	387	768
1971/72	454	358	167	567	305	900
1972/73	504	384	215	787	318	1,213
1973/74	713	792	514	1,058	453	1,768
1974/75	2,180	1,556	1,112	2,253	730	5,991
1975/76	2,375	1,557	1,497	2,757	839	7,228
1976/77	1,110	1,089	a	1,442	693	2,202
1977/78	1,231	867	737	1,495	707	3,064
1978/79	1,284	887	763	1,355	707	4,600
1979/80	1,497	1,060	733	1,729	860	5,545
1980/81	1,896	1,246	760	2,185	1,192	9,252
1981/82	2,085	a	767	2,206	1,246	7,166

a Not imported.

Source: Calculated from data in Fertiliser Statistics, 1982-83 (pp.I-56 and 57).

(Tables 4 and 5). To prevent any adventitious gain to domestic producers and to reduce the burden of the subsidy on imported fertilizers, the government introduced a Fertilizer Prices Equalisation Charge. It ran as high as Rs.610 per ton of urea.

The sudden large increases in fertilizer prices in 1974/75 coincided with a nearly 10 percent decline in total fertilizer off-take. Although the disaggregated and micro-level evidence is mixed,^{22/} it can reasonably be said that the rise in fertilizer prices had an adverse impact on total consumption. This is, however, the only instance in more than three decades in which the magnitude of the year-to-year change in aggregate fertilizer consumption can be attributed with no hesitation to a change in fertilizer prices (in either nominal or real terms).

Concerned over the sizable decline in consumption, the government reduced the prices for fertilizers in 1975, 1976, 1977 and 1979 (Table 5). Even though an upward trend in fertilizer consumption resumed at an impressive pace in 1975/76 (Table 1). The reductions in prices were facilitated by a decline in the unit cost of imported fertilizers (Table 6) and by a lowering of the Fertiliser Prices Equalisation Charge

^{22/} For disaggregated evidence, see the time series on fertilizer consumption at the state and district levels. See also Gunvant M.Desai, "A Critical Review of Fertiliser Consumption after 1974/75 and Prospects of Future Growth," Fertiliser News (July 1978): 7-18. D.C.Sah's Ph.D. thesis, "Fertilizer Use in Indian Agriculture, an Economic Evaluation," submitted to Gujarat University, also reveals mixed evidence. For micro-level evidence, see various papers on the "Impact of Increase in Input Prices on Profitability and Production" and the Rapporteur's Report on the subject in Indian Journal of Agricultural Economics (July-September 1976).

levied on the domestic fertilizer industry from 1974 on. On the other hand, the reductions led, for the first, to a substantial and rising burden of fertilizer subsidies.

As shown in Table 2, both imported and domestic fertilizers were subsidized after 1975/76. The relative burden of the subsidies on domestic fertilizers has been higher than on imported fertilizers in every year after 1977/78 except 1980/81, when the retail prices of fertilizers were raised substantially, as shown in Table 5. Despite the increases in the retail prices, the total amount of the subsidy paid on domestic fertilizers did not go down in 1981/82 (Table 2). Even more significant, the share of domestic fertilizers in the total subsidy grew rapidly after 1980/81, reaching as high as 86 percent in 1983/84. Part of the explanation lies in the rising relative importance of domestic fertilizers in total consumption. However, the increased domestic supply was possible because of new fertilizer plants, which in general had higher unit costs of production. Thus, the question of the relative importance of domestic and imported fertilizers in the total fertilizer subsidy is tied up with the fertilizer pricing policy. This is stressed because the relative importance of domestic production and imports in total fertilizer supply is decided not by competitive market forces but by macro policy of the government about sources of fertilizer supply.

The total subsidy for domestic fertilizers has three components: (1) payments to manufacturers of nitrogenous and phosphatic fertilizers under the Fertiliser Retention Prices Scheme; (2) payments of subsidies to manufacturers of single super phosphate; and (3) payment under the Fertiliser Freight Subsidy Scheme for delivery up to block headquarters. In 1983/84, the

shares of these components in the total subsidy of Rs.9,000 million on domestic fertilizers were 77.6, 2.8 and 20.6 percent respectively. Thus, the payments under the Fertiliser Retention Prices Scheme were the dominant component. The subsidy under this scheme grew from Rs.250 million in 1977/78 to Rs.6,900 million in 1983/84. (The budget estimate for 1984/85 is Rs.7,150 million.)

The Fertiliser Retention Prices Scheme was introduced in November 1977 on the recommendation of the Fertiliser Prices Committee set up by the Ministry of Chemicals and Fertilisers in 1976. The committee, under the chairmanship of S.S.Marathe, chairman of the Bureau of Industrial Costs and Prices, was to examine the existing basis of fertilizer pricing and recommend a pricing policy which would ensure a fair, sustained return on investment.

The need to set up the above committee arose for several reasons. On the recommendation of the Committee on Fertilisers, the government had stopped procuring fertilizers at a "fair retention price" from domestic factories beginning in 1969/70, leaving them "free" to market their own products. However, the government continued to control the retail prices of fertilizers either statutorily or informally. This policy adversely affected the return on investment in the domestic fertilizer industry, especially in new plants. The impact of the oil crisis on the cost of fertilizer raw materials worsened the situation. By the mid-1970s, the average costs of production exceeded the average ex-factory realization price for a majority of the domestic producers, although the impact differed by plant based on such factors as age, location, size, technology, feedstock, capital investment and pattern of financing. The price policy was critical to the fertilizer plants under construction and to new investment in additional capacity, given the steep escalation in capital costs and feedstock prices after 1973.

On the basis of many studies on technical, economic and cost aspects and much deliberation and weighing of different alternatives, the Fertiliser Prices Committee recommended that ex-factory retention prices be fixed for each plant. The individual ex-factory retention prices was to be calculated so as to assure a 12 percent post-tax return on net worth if the factory utilized 80 percent of its installed capacity and achieved certain norms with respect to the consumption of raw materials, utilities and other inputs. This policy was an astute way of combining incentives to and efficiency in the fertilizer industry.

The committee submitted its report on a pricing policy for urea, ammonium sulphate and calcium ammonium nitrate in July 1977. The government accepted the committee's recommendations and introduced the Fertiliser Retention Prices Scheme for the above fertilizers in November 1977. It was extended to complex fertilizers in February 1979 and to single super phosphates in May 1982.

Under the scheme, retention prices are fixed for each plant for three years, after which they are revised. The scheme is administered by the Fertiliser Industry Coordination Committee (FICC), an office attached to the Ministry of Chemicals and Fertilisers. The FICC also administers the Fertilizer Price Fund Account to which the differences between the maximum ex-factory price and the individual ex-factory retention prices are credited/debited.

The Fertiliser Retention Prices Scheme was an important landmark in India's fertilizer pricing policy. Until then, statutory prices controls were levied on fertilizers only at the retail (i.e., consumers') level. The retention price scheme extended it to producers. However, most important is that the scheme aimed at assuring a 12 percent post-tax return on net

worth provided norms with respect to capacity utilization, etc., are achieved. Thus, for the first time, the fertilizer price policy showed a concern for farmers, fertilizer manufacturers and efficiency in the industry.

It is difficult to fault the principles of this policy, especially because administered price regimes for fertilizers became the rule rather than the exception following the oil crisis of the 1970s, at least in the developing world. Payments made to the domestic fertilizer industry under the scheme, which were the dominant component of the fertilizer subsidies, should thus be seen as the cost of adopting a fertilizer price policy which is concerned about the interests of both fertilizer consumers and producers, as well as about healthy growth in the industry.

Nevertheless, the fertilizer subsidy has been a burden on budgetary resources. This cost is an inevitable part of a policy that meets growing proportions of fertilizer requirements through greater domestic production and yet keeps the fertilizer prices to farmers at levels that do not reflect the cost of production. Whether the policy of supplying fertilizers by greater domestic production is right cannot be answered here. The issue is complex, involving India's large and growing requirements,^{23/} the technological capability and experience gained in fertilizer production technology,^{24/} the vast potential to use this experience, and the place of the fertilizer industry in the overall strategy of economic development.

^{23/} Even at present India ranks either first or second (after China) in net imports of fertilizers among countries, both developing and developed.

^{24/} See various papers in Development of Fertilisers in India, Fertiliser Association of India, New Delhi, 1980.

Given that the Government has chosen to meet the growing requirements for fertilizers through further expansion of the domestic industry, it has two options. One is to live with the growing burden of fertilizer subsidies. The second is to reduce that burden by lowering the costs of fertilizer production and raising the retail prices of fertilizers.

There is ample scope to reduce costs in the fertilizer industry, but the task may not be easy. Three aspects should be distinguished. The first relates to the prices of raw materials and of services charged to the fertilizer industry, and the taxes and duties on raw materials and equipment. These pricing and fiscal policies need to be examined, not only in terms of lowering prices and the tax burden on the fertilizer industry, but also to understand the magnitude of the "real" burden of fertilizer subsidies.^{25/} The second aspect relates to improving the performance and efficiency of fertilizer plants. While some units are performing as well as the best plants anywhere, overall the performance of the industry has considerable scope for improvement. What is required is to identify the critical bottlenecks plant by plant, and to remedy the chronic deficiencies in the infrastructure such as power and water supplies and transport.^{26/} The third aspect relates to better planning, speedier implementation and sound economic analysis in taking up new fertilizer projects. Even if concerted efforts are made in all three directions, the

^{25/} See various articles in Fertiliser News (May 1983), especially S.Venkitramanan, "Government Policy Issues and Implications on Fertiliser Plant Costs," pp.21-26.

^{26/} See B.K.Jain and Satya Nand, "Productivity in the Indian Fertiliser Industry," Fertiliser News (December 1980): 7-18. See also various issues of Fertiliser News in the last three years, when this topic has been discussed and analyzed again and again.

average real cost of all the fertilizers supplied by the domestic industry may rise over time because of the higher investment costs of new plants, from which growing proportions of the domestic supply will be coming.

Viewed thus, there is a clear need for a judicious policy of fixing the fertilizer prices to be paid by farmers. Two things are necessary. First, proper coordination between pricing policies for fertilizers and crops needs to be established. Second, correct appreciation of the role of the fertilizer price environment in the growth of fertilizer use must be developed.

The need for a coordinated approach in pricing policies for fertilizers and crops is obvious, since the profitability of a farmer's use of fertilizers depends on both.^{27/} In this context, it is important to note that while the nominal prices of fertilizers in the early 1980s were substantially higher than in the late 1960s, in real terms they were about the same. Table 7 shows the maximum retail prices of three fertilizers and the procurement (or minimum support) prices of important crops from 1967/68 to 1983/84. In drawing conclusions about the real prices of fertilizers from the table, note that the farm harvest prices of crops have often been higher than the procurement or minimum support prices. Even more important, the real prices of fertilizers have consistently improved over time as far as crops like pulses, groundnut and other oilseeds are concerned. Yet all the evidence indicates that despite the potential profitability of fertilizer use on these

^{27/} The need is especially important at this stage because of the substantial burden of food and fertilizer subsidies on the budget. In 1983/84, even though the procurement prices of crops were raised, fertilizer prices were lowered by about 7 percent, adding nearly Rs.2,000 million to an already heavy burden of fertilizer subsidies.

Table 7: MAXIMUM RETAIL PRICES OF FERTILIZERS (EXCLUSIVE OF SALES AND LOCAL TAXES) AND PROCUREMENT (OR MINIMUM SUPPORT) PRICES OF IMPORTANT AGRICULTURAL CROPS, 1967/68-1983/84
(Rs.per 100 kilograms)

Year	N ^a	P ₂ O ₅ ^b	K ₂ O ^c	Paddy	Wheat	Coarse Grains	Gram	Groundnut in shell	Sugarcane ^d	Seed Cotton ^e	Jute
1967/68	183	184-195	73	45-56	65-95	43-55	43	f	7.37	f	f
1968/69	187	187-195	81	45-56	76-81	47-56	46	f	7.37	285	107.17
1969/70	205	172-187	87	45-58	76	52	f	f	7.37	285	107.17
1970/71	205	175-199	87	46-58	76	55	f	f	7.37	299	107.17
1971/72	201	289-353	89	47-58	76	55	f	f	7.37	f	113.87
1972/73	209	291-343	92	49-58	76	57-60	f	f	8.00	142	115
1973/74	228	299-355	113	70	76-82	70	f	f	8.00	f	125
1974/75	435	533-593	205	74	105	74	f	f	8.50	f	125
1975/76	402	546-713	183-197	74	105	74	90	f	8.50	210	135
1976/77	380	308-490	152	74	105	74	90	140	8.50	f	136
1977/78	337	310-409	134	77	110	74	95	160	8.50	255	141
1978/79	337	307-414	134	85	112.50	85	125	175	10.00	255	150
1979/80	315	354-460	134	95	115	95	140	190	12.50	275	155
1980/81	435	472-582	183	105	117	105	145	206	13.00	304	160
1981/82	511	488-644	217	115	130	116	f	270	13.00	f	175
1982/83	511	587	217	122	142	118	f	295	13.00	380	175
1983/84	467	531	200	132 ^g	151	124	235	315	13.50	400	185

a Based on urea

b Based on single super phosphate

c Based on muriate of potash

d Statutory minimum price

e MP Virner variety up to 1970/71, 320F/D-34F variety up to 1982/83, F-414/11 777 variety in 1983/84.

For Hybrid 5 variety in 1983/84, Rs.527

f Not announced

g Common variety; Rs.136 for fine end Rs.140 for superfine varieties

Source: Fertiliser Statistics, 1982/83; Indian Agriculture in Brief (18th edition); and Economic Survey 1983/84.

crops, most of the area under these crops is not fertilized.^{28/} This and other evidence for many crops and regional locations show that the fertilizer price environment (in either nominal or real terms) is only one of the factors affecting the growth of fertilizer use. This point is well worth remembering while discussing fertilizer price policy for further sustained growth in consumption. This is especially so because of the complexities of and compulsions in fertilizer pricing policy discussed above, and the importance of certain non-price factors and policy instruments, as shown in the next section.

III. NON-PRICE POLICIES AND FUTURE GROWTH IN CONSUMPTION ^{29/}

Three simple propositions form a good starting point for discussing the policies required to sustain rapid growth in fertilizer consumption. First, the economic potential of fertilizer use is determined by fertilizer response functions, the cost of fertilizers and the prices of crops. Second, actual fertilizer use is an outcome of the conversion of economic potential into farmers' demand for fertilizers, a demand being met through fertilizer supply and distribution systems at numerous micro-locations. Third, the evidence clearly suggests that the present level of fertilizer consumption is well below potential, as determined by the fertilizer response function-cum-price environment.

^{28/} For evidence on the growth in fertilizer consumption by crop, see Guntant M. Desai, Sustaining Rapid Growth in India's Fertilizer Consumption: A Perspective Based on Composition of Use, International Food Policy Research Institute, Washington, D.C., 1982.

^{29/} For elaboration of the arguments presented in this section, see Guntant M. Desai, "Economics of Sustained Rapid Growth in India's Fertiliser Consumption," a paper presented at the FAI-FAO Annual Seminar on Systems Approach to Fertiliser Industry, Fertiliser Association of India, December 9 and 10, 1983.

It follows from these propositions that the rate of growth in consumption will depend on converting untapped potential into actual fertilizer consumption and on continuously raising the potential of fertilizer use. Accordingly, there are two central questions. First, what efforts are required to convert the untapped potential into fertilizer use? Second, what changes must be made in the agro-economic variables to increase continuously the potential of fertilizer use?

Generating growth in fertilizer consumption through tapping unexploited potential depends on (1) extension of the use of fertilizers to land which is not being fertilized, even though it is potentially profitable from the farmers' point of view, and (2) raising the rates of application from suboptimal to optimum on already fertilized land.

Most of the scope for a further extension of fertilizer use involves unirrigated areas all over the country in different agro-climatic environments.^{30/} To speed up the spread of ferti-

^{30/} The problem of raising fertilizer consumption when irrigation is limited or non-existent does not occur only with low rainfall. A study on the fertilizer growth performance of districts in the 1960s clearly showed that areas with low irrigation located in high rainfall regions, particularly in eastern India (including parts of Madhya Pradesh), performed the worst among all districts with little irrigation. See Gunvant M. Desai and Gurdev Singh, Growth of Fertilizer Use in Districts of India, Performance and Policy Implications, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, 1973, Chapter 4. The trends in the 1970s show a similar pattern. See also Gunvant M. Desai, "Fertilizer Use on India's Unirrigated Areas: A Perspective Based on Past Record and Future Needs," a paper presented at the Seminar on Technology Options for Dry-Land Agriculture: Potential and Challenge," jointly organized by ICRISAT and the Indian Society of Agricultural Economics, Hyderabad, August 22-24, 1983.

lizers to these areas, knowledge on fertilizer response functions specific to the area, and details on fertilizer practices and other agronomic matters, need to be generated and disseminated to farmers.^{31/} These efforts should be supplemented simultaneously by an adequate and timely flow of credit to farmers and by development of an efficient fertilizer distribution system. In other words, the processes that convert potential into effective demand for fertilizers and that make fertilizers available must be strengthened. Price incentives alone are not adequate. For sustained growth in fertilizer demand, there must be a widespread conviction among farmers that significant additional production will result from fertilizer use. In addition, they must know how to use fertilizers most advantageously under rainfed conditions. Similarly, if vigorous efforts to promote fertilizer use are absent and fertilizer turnover remains low, small increases in the distribution margins will not accelerate the geographic expansion of the distribution system to rainfed areas. Hence, strengthening agricultural research and extension activities must be emphasized.

Efforts to generate growth in fertilizer use in unirrigated areas will not be sustainable unless growth in the total supply of fertilizers stays ahead of growth in the market for fertilizers in irrigated areas (i.e., present and newly irri-

^{31/} The need for this knowledge cannot be overemphasized. The amount of additional production resulting from fertilizers depends on such things as the timing and method of fertilizer application, balance among nutrients, sowing time, choice of variety and plant population. What makes these considerations critical in rainfed areas is that without appropriate agronomic practices, returns on fertilizer use **are considerably** lower than in irrigated areas. On the other hand, the research indicates that returns on fertilizer use in rainfed areas can be considerably enhanced by proper practices.

gated areas). For some time to come, this condition will depend on fertilizer imports. The policy for imports should be based on an understanding of the role the supply side plays in converting untapped potential into actual fertilizer use under rainfed conditions. To accomplish this conversion, improvements in the fertilizer promotion and distribution systems in rainfed areas are required. Experience shows that these improvements cannot be brought about without generating pressure from the fertilizer supply side on promotion and distribution systems serving rainfed regions. It is this understanding rather than short-term considerations of clearing inventories and saving foreign exchange, or a long-term policy of self-sufficiency in domestic production which should govern policies with respect to fertilizer imports.

Raising rates of application on already fertilized land from sub-optimal to optimum is another way of generating growth in fertilizer consumption by tapping unexploited potential. Efforts here should focus on educating farmers about fertilizer practices such as balance among nutrients, correct timing and placement of fertilizers, and use of micro-nutrients and soil amendments. The research indicates that changes in fertilizer practices resulting from these efforts will increase fertilizer use efficiency in crop production, an outcome that will benefit both farmers and society as a whole. Conversely, raising the rates of application through injudicious use of a price policy will only increase either the fertilizer subsidies or inflation or both.

To strengthen efforts in the above direction, location-specific research on optimal fertilizer practices and application of this knowledge by the agricultural extension system (especially T and V system) are musts. Similarly, the soil

testing service needs to be strengthened.^{32/}

For sustained rapid growth in fertilizer consumption, tapping the unexploited potential through these efforts will not be enough. It is also important to raise the potential of fertilizer use. The urgency of this is indicated by the need to increase fertilizer consumption by more than 500,000 tons every year and virtual exhaustion of the two main forces behind the past growth in fertilizer consumption. These two forces were diffusion of fertilizer on irrigated land and replacement of local varieties by fertilizer-responsive high-yield varieties on this land.

Theoretically, the potential for fertilizer use goes up as a result of upward shifts in response functions and/or a fall in the ratios of fertilizer to crop prices. Thus, two alternatives may raise potential fertilizer use. Shifting the response functions upwards is superior to either raising the prices of crops through unrealistic price support programs or lowering fertilizer prices by increasing the subsidies. This approach is especially true for developing countries, because injudicious use of price policy instruments generates inflationary pressures and distracts attention from the tasks required to raise the productivity of fertilizer use, as experience in many countries shows.

^{32/} For information on the deficiencies in the soil-testing service and how their removal will increase the efficiency of fertilizer use, see C.H. Babaria, "Economics of Soil Testing Service in Gujarat," unpublished Ph.D. thesis, Department of Economics, Sardar Patel University, Vallabh Vidyanagar, 1977. See also Trailokya Nath Saikia, Use of Soil Testing Services in Assam, Agro-Economic Research Centre for North-East India, Jorhat, 1982; R.D. Sevak, Soil Testing Service in Rajasthan, Agro-Economic Research Centre, Vallabh Vidyanagar, 1982; and T.S. Sehgal and others, "Adoption of Soil Testing in Ludhiana," Fertiliser News XVII (6).

To increase the potential for fertilizer use through continuous upward shifts in fertilizer response functions, it is necessary to accelerate the spread of irrigation and to strengthen the agricultural research and extension systems. There is considerable scope for enhanced efforts in both directions, and both farmers and society would benefit. As for a better price environment, that requires improving the fertilizer supply and distribution systems to lower the "real" cost of fertilizers to farmers by making available at the right time and place. An objective evaluation of the Fertiliser Freight Subsidy Scheme on which Rs.1,850 million were spent in 1983/84 seems necessary.

Concerted efforts in the above directions would continuously raise the potential for fertilizer use. Converting that potential into sustained rapid growth in consumption in turn depends on simultaneous development and coordinated functioning of the fertilizer promotion, distribution and supply systems. This condition cannot be overemphasized, especially given the experience of the time lags in extending fertilizers even to irrigated areas and promoting optimal fertilizer practices.

Thus efforts to convert untapped potential into actual fertilizer use and to increase that potential continuously must be addressed simultaneously. There should be no hesitancy about investing in massive efforts to spread fertilizer use in unirrigated areas and to raise the rates of application on fertilized lands through research on and extension of optimal fertilizer practices. Without such efforts, India's fertilizer consumption cannot grow by more than 500,000 tons every year, a claim that is easy to show. Assume that irrigated areas are increased every year by 2.5 to 3 million hectares, that is, by 50 to 75 percent more than the average annual

increment in the 1970s. Assume, further, that areas remain unfertilized until they receive irrigation, at which point they are fertilized with 100 kg. per hectare without any time lag. Even under these heroic assumptions, fertilizer consumption goes up by only 250,000 to 300,000 tons a year. Thus, to raise fertilizer consumption by more than 500,000 tons year after year requires that untapped potential be converted into actual fertilizer use, as well as raising the potential continuously.

The case for rapidly spreading fertilizer use in unirrigated areas and for raising the rates of application on fertilized land can be made on other grounds. More than 70 percent of India's cultivated land is unirrigated; about half will remain so even after developing the entire irrigation potential. Over 80 percent of the production of jowar, bajra, small millets, pulses and oilseeds, plus two-thirds of cotton, come from unirrigated areas. Even in the case of wheat and rice, unirrigated areas account for 30 to 40 percent of total production. Therefore, raising the productivity of unirrigated areas is crucial to generating sustained yield-based growth in total agricultural production. Soil fertility in these areas is as important a constraint as any other on raising their productivity. In fact, it can be argued that unless concerted efforts are made to raise soil fertility through rapid and judicious use of fertilizers, there will be little incentive for farmers to invest in dryland technologies.

There is little disagreement over the need to raise the rates of application on irrigated and unirrigated fertilized land. Here the emphasis is on accomplishing this through research on and extension of optimal fertilizer practices, rather than through manipulation of prices. Clearly, high rates of fertilizer use cannot be an end in itself. They

must contribute the maximum possible to additional agricultural production. Only then can they be viable in the long run. Optimal fertilizer practices such as balance among nutrients, correct timing and placement, and the use of soil amendments and micro-nutrients increase the response of crops to fertilizer use and thus raise the rates of application.

Tapping the potential for fertilizer use and raising it continuously calls for public investment in different areas. Equally important, effective mechanisms are needed to resolve the conflicts between different segments of the fertilizer system, and between short-term expediencies and long-term goals. These measures are neither costless nor easy. However, what other less costly and equally effective alternatives are there to raise India's fertilizer consumption by more than 500,000 tons, year after year?