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FERTILISER CONSUMPTION AFTER 1974-75
A CRITICAL REVIEW

by

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FERTILISER CONSUMPTION AFTER 1974-75
A CRITICAL REVIEW

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1 Introduction

This paper focuses on the fertiliser consumption scene after 1974-75. After a sharp decline in 1974-75, fertiliser consumption in India increased substantially in the subsequent years. There is a general feeling that all is well with the trends of demand for fertilisers.

The main aim of the paper is to assess critically the prospects of continuous rapid growth in demand for fertiliser during the next few years. This is done by identifying the forces responsible for growth after 1974 in the background of growth in fertiliser consumption up to 1974. The most important conclusion of the paper is that the growth rates in fertiliser consumption after 1974-75 cannot be taken as indicative of the rates at which it is likely to grow in the next few years, and that concerted efforts are required in the right directions if post-1974 growth rates in demand for fertilisers are to be sustained.

2 Fertiliser Consumption Scene after 1974-75

In 1974-75 when fertiliser prices shot up by nearly 100 per cent due to the Oil Crisis, consumption of fertilisers fell by about 0.27 million tonne (9 per cent) from the level attained in 1973-74. In the subsequent two years, however, it increased substantially (Table 1).

Table 1 : Fertiliser Consumption, 1974-75 to 1976-77

Year	Consumption (Million tonnes of NPK)	Increase in consumption	
		Absolute terms	Percentage
1974-75	2.57	-0.27	-9
1975-76	2.89	0.32	12
1976-77	3.41	0.52	18

Source : Fertiliser Statistics, 1976-77, Fertiliser Association of India, New Delhi, December 1977, Pp. I. 182-183.

Available information indicates that growth in fertiliser consumption has also continued in 1977-78. The Fertiliser Association of India has estimated the consumption during 1977-78 at 4.31 million tonnes after taking into account the actual off-take of fertilisers during the Khharif season¹. This is 0.9 million tonne (26 per cent) more than the level attained in 1976-77.

Thus for three successive years after 1974-75 fertiliser consumption increased, and that too at an accelerated rate. Two reasons make this very impressive. First, there was very little growth in fertiliser consumption after 1971-72. In fact, with the decline in consumption in 1974-75, the level in that year was below the one attained by 1971-72. Against this, not only was there continuous growth after 1974-75 but the growth in absolute terms registered in 1976-77 (and likely to register in 1977-78) is larger than during any year before 1976-77. Second, such an impressive growth in consumption has occurred

1 " Fertiliser Situation in India ", Fertiliser News, December, 1977, Pp. 3 to 15.

under price environment which is much less favourable to cultivators than the one which prevailed in the years before the Oil Crisis².

Given the high need-based estimates of fertiliser requirements³, and repeated past experiences in not achieving the need-based targets⁴, the obvious question is: Will fertiliser consumption continue to increase rapidly as indicated by the recent experience? A similar question is also suggested by projections of fertiliser consumption just published by the Fertiliser Association of India (Table 2). These projections imply increase in fertiliser consumption by more than 600,000 tonnes each year for the next 10 years.

To answer the above question, it is necessary to examine the recent growth in fertiliser consumption in the context of the forces which have governed the past growth in fertiliser consumption.

3 Major Factors behind the Past Growth, An Overview⁵

Fertiliser use in appreciable quantities began in 1920s on tea plantations. In 1930s it spread to sugarcane and rice in some areas.

2 See Appendix Table 1

3 See Appendix Table 2

4 See Appendix Table 3

5 For supporting research, see Gunvant M. Desai, "Fertilisers in India's Agricultural Development, Problems and Policies" in Agricultural Development Policies (Editors: C.N. Vakil and C.H. Shah) under publication by Orient Longman Limited; Gunvant M. Desai and Gurdev Singh, Growth of Fertiliser Use in Districts of India, Performance and Policy Implications, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, 1973; Gunvant M. Desai, P.N. Char, and S.C. Bandyopadhyay, Dynamics of Growth in Fertiliser Use at Micro Level, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, 1972; and Gunvant M. Desai, Growth of Fertiliser Use in Indian Agriculture, Past Trends and Future Demand, Occasional Paper No.24, Department of Agricultural Economics, Cornell

Table 2 : Projections of Fertiliser Consumption made by the Fertiliser Association of India, 1978-79 to 1987-88.

Year (1)	Annual Consumption				Increase in Total Consumption	
	N (2)	P205 (3)	K20 (4)	Total (5)	Absolute Terms (6)	Percentage (7)
	<u>Million Tonnes</u>					
1978-79	3.30	0.88	0.49	4.67	-	-
1979-80	3.74	0.96	0.55	5.25	0.58	12.4
1980-81	4.71	1.04	0.60	5.85	0.60	11.4
1981-82	4.71	1.13	0.66	6.50	0.65	11.1
1982-83	5.24	1.22	0.72	7.18	0.68	10.5
1983-84	5.80	1.31	0.79	7.90	0.72	10.0
1984-85	6.39	1.41	0.85	8.65	0.75	9.5
1985-86	7.01	1.51	0.92	9.44	0.79	9.1
1986-87	7.66	1.62	0.99	10.27	0.83	8.8
1987-88	8.34	1.73	1.07	11.13	0.86	8.4

Source : " Fertiliser Situation in India " Fertiliser News, December 1977, Pp 3 to 15.

What, however, got it going in the non-plantation agriculture was the importance given to it by the Government in the efforts to raise the production of foodgrains rapidly. This began with the Grow More Food Campaign (1943), and continued after the Independence in the successive Five Year Plans.

The official strategy to increase fertiliser use aimed at (i) increasing availability of fertilisers through imports and development of domestic fertiliser industry, (ii) controlling the distribution of available supplies among different regions, (iii) establishing and regulating distribution outlets to make fertilisers available to cultivators, and (iv) making cultivators adopt fertiliser use mainly through the operations of the extension machinery.

In the above strategy, availability and distribution related issues received greater attention than cultivators' effective demand for fertilisers. It would be, however, incorrect to say that the growth in fertiliser consumption was governed by the policies related to availability of and distribution arrangements for fertilisers, and cultivators' demand played a passive role. Empirical evidence shows just the opposite.

When fertiliser use in non-plantation agriculture began, as one would expect, the actual level of use was substantially below the viable potential. This potential began to be tapped with increasing number of cultivators taking to fertiliser use. This process was unambiguously governed by cultivators' effective demand for fertiliser. The policies with respect to aggregate availability of fertilisers, its

distribution among different regions, and expansion in the distribution networks only facilitated the growth in fertiliser use resulting from cultivators' demand for this input rather than govern its pace and pattern.

Till mid-1960s, the main force behind growth in effective demand for fertilisers was the adoption-diffusion process. Increasing familiarity of cultivators with fertilisers, improvement in the prices of agricultural commodities, growth in irrigated areas and, to a limited extent, implementation of intensive agricultural programmes (IADP and IAAP) accelerated the process. But, by and large, it remained confined to irrigated regions and rainfed areas which were growing commercial crops like cotton, tobacco and chillies. In other words, it remained confined to situations where the size and certainty of cultivators' returns from fertiliser use were relatively high. There was no pressure through availability and distribution policies to initiate and sustain the adoption-diffusion process under rainfed conditions through promotional efforts. Consequently, the base supporting growth in effective demand for fertiliser remained rather narrow.

The introduction of high yielding varieties (HYVs) after mid-1960s brought another factor into play. Fertiliser use on these varieties, at substantially higher rates than on the local varieties, was very profitable to the cultivators under the prevailing price conditions. With the spread of HYVs in good irrigated areas, the trends in fertiliser consumption accelerated despite the adoption diffusion process on the narrow base approaching its upper limit at many locations.

The problem of inadequate effective demand, however, did manifest itself in the late 1960s in less than anticipated growth in consumption, and

huge carryover stocks for four consecutive years from 1967-68 to 1970-71. But these manifestations were not understood as inadequate growth in demand due to the relatively narrow base which was generating it. Instead, they were attributed to " excess " supply and various imperfections in the distribution system. This, in turn, resulted in substantially reducing imports and liberalising the distribution system which was till then governed by the Pool arrangements and distribution through the co-operative institutions.

The liberalisation of the distribution system meant freedom to domestic fertiliser manufacturers to market their products through agencies of their choice, in place of their choice, and at prices to be determined by them. If excess supply of fertiliser would have continued for some years after the liberal policy came into full operation in 1969, the competitive pressures would have pushed the fertiliser manufacturers to open up new markets by undertaking promotional efforts in the rainfed areas. But this did not happen.

As shown in Table 5 in the next section, the continuous reductions in imports during the late 1960s and changed conditions in the world fertiliser market created tighter overall availability of fertilisers in 1972-73 and 1973-74. This led to promulgation of an order in July 1972 under the Essential Commodities Act to ensure equitable distribution of fertiliser among states. It was only in 1974-75, when fertiliser consumption declined substantially in the wake of a sudden and dramatic increase in fertiliser prices, that a widespread concern, about demand for fertiliser emerged. In this concern, of all factors governing demand, fertiliser price was singled out as the problem issue.

This led to successive reductions in fertiliser prices. Another outcome of the 1974-75 crisis was emphasised on the promotional efforts by both the government and the fertiliser manufacturers.

With the impressive recovery in fertiliser consumption after 1974-75, an impression seems to be gaining ground that all is well with the trends of cultivators' demand for fertilisers, and also with the efforts to sustain these trends.

To check if this impression is justified, we have examined below the major features of the growth pattern in fertiliser consumption. Two objectives of this analysis are to ascertain (i) if the growth in fertiliser consumption after 1974-75 indicates a decisive acceleration in the trends, and (ii) if the base supporting growth in fertiliser consumption has widened.

4 Major Features of the Growth Pattern in Consumption

4.1. All India Consumption Trends, 1961-62 to 1976-77

The latest issue of Fertiliser Statistics, 1976-77 contains a time series of total fertiliser consumption from 1961-62 to 1976-77 (Table 3)⁶.

During the 15-year period, total fertiliser consumption increased by 10 times, from about 0.34 million tonnes to 3.41 million tonnes. Though this is impressive, it must be recognised that the annual growth rates (either in absolute or in percentage terms) have been very unsteady. As shown in Table 4, they fluctuated between very wide

6 Until recently, estimates of fertiliser consumption (as against distribution) were available only from 1967-68.

Table 3: Fertiliser Consumption in India, 1961-62 to 1976-77

Year	Consumption (000 Tonnes)				Annual Change (000 Tonnes)				Annual Change (per cent)			
	N	P	K	Total	N	P	K	Total	N	P	K	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1961-62	250	60	28	338	-	-	-	-	-	-	-	-
1962-63	333	83	36	452	83	23	8	114	33	33	38	34
1963-64	377	116	51	544	44	33	15	92	13	40	42	20
1964-65	555	149	69	773	178	33	18	269	47	28	35	49
1965-66	575	133	77	785	20	-16	8	12	4	-11	12	2
1966-67	738	249	114	1101	163	116	37	316	28	87	48	40
1967-68	1035	335	170	1540	297	86	56	439	40	35	49	40
1968-69	1209	382	170	1761	174	47	0	221	13	14	0	14
1969-70	1356	416	210	1982	147	34	40	221	12	9	24	13
1970-71	1479	541	236	2256	123	125	26	274	9	30	12	14
1971-72	1798	558	300	2656	319	17	64	400	22	3	27	18
1972-73	1839	581	348	2768	41	23	48	112	2	4	16	4
1973-74	1829	650	360	2839	-10	69	12	71	-1	12	3	3
1974-75	1766	471	336	2573	-63	-179	-24	-266	-3	-28	-7	-9
1975-76	2149	467	278	2894	383	-4	-58	321	22	-1	-17	12
1976-77	2457	635	319	3411	308	168	1	517	14	36	15	18

Source: Fertiliser Statistics, 1976-77, Fertiliser Association of India, New Delhi, December 1977, PP. I. 182-183. (The Fertiliser Association of India has developed this table from Indian Agriculture in Brief, Ministry of Agriculture and Irrigation, Government of India.

Table 4 : Analysis of the Annual Rates of Change in Fertiliser Consumption, 1961-62 to 1976-77.

	N	P	K	Total
<u>Annual Change in Absolute Terms</u>				
i) Average (000 Tonnes)	147	40	20	207
ii) Coefficient of variation (Percent)	91	193	150	91
iii) Maximum (000 Tonnes)	383	168	64	517
iv) Minimum (000 Tonnes)	-63	-179	-58	-266
<u>Annual Change in Percentage Terms</u>				
i) Average (Per cent)	17	19	20	18
ii) Coefficient of variation (Percent)	85	134	104	86
iii) Maximum (Per cent)	47	87	49	40
iv) Minimum (Per cent)	-3	-28	-17	-9

Based on Table 3

limits, and had very high coefficients of variation. Nor were the years with growth rates below the mean level confined to the pre-1967 period when there were no high yielding varieties. Quite the contrary. As far as the growth rate in percentage terms is concerned, there was not a single year after 1967-68 in which it exceeded the average rate for the entire period, and it was below in seven out of nine cases. Even with respect to annual increments in absolute terms, half of the years with annual increments below the mean level are after 1967-68.

Another point which emerges from Table 3 is that the substantial growth in fertiliser consumption (in absolute terms) during 1975-76 and 1976-77 follows not only a substantial decline in 1974-75 but also poor growth in 1972-73 and 1973-74. If one takes the period from 1971-72 to 1976-77, the average annual increment in total fertiliser consumption was only 1,51,000 tonnes. This is considerably less than the increment in any year between 1966-67 and 1971-72. Thus, it would be incorrect to take substantial growth in fertiliser consumption after 1974-75 as indicative of decisive acceleration in the trends. It seems very much like an outcome of the poor growth in 1972-73, 1973-74 and substantial decline in 1974-75.

At this stage we would like to comment on the three factors which are often referred to while "explaining" the setback to consumption trends during 1972-73, 1973-74 and 1974-75. These factors are (i) "bad" weather conditions, (ii) changes in the price environment, and (iii) "tight" availability of fertilisers.

More often than not poor growth in fertiliser consumption during 1972-73 and 1973-74 has been attributed, among other things, to

" bad " weather conditions. The weather conditions during 1972-73 and 1973-74 were unsatisfactory. But could this explanation be taken at the face value?

In neither of the two years, the weather conditions were as bad as in 1966-67 when the increment in fertiliser consumption (in absolute terms) was three to four times more than in 1972-73 or in 1973-74. Similarly, in spite of generally good weather conditions in 1968-69, 1969-70 and 1970-71, the annual increments in fertiliser consumption were consistently and substantially below the increments in either 1967-68 or even 1966-67. Thus, it seems virtually impossible to explain variations in annual changes in aggregate consumption by overall weather conditions unless one picks only that evidence which suits one's argument.

As for the price environment, much has been made of it after the sharp decline in fertiliser consumption in 1974-75 when fertiliser prices shot up by nearly 100 per cent due to the Oil Crisis. The effect of price environment on fertiliser consumption has been further reiterated by relating the growth in consumption after 1974-75 to successive reductions in fertiliser prices. What is not recognised in these arguments, however, is that a close scrutiny of the past trends do not reveal systematic association between changes in the price environment and changes in fertiliser consumption. To illustrate, in spite of no major changes in the price environment, the growth rates of fertiliser consumption in 1968-69, 1969-70 and 1970-71 were substantially below the rate in 1967-68. Similarly again in 1972-73 and 1973-74 they were

below the rate in 1971-72. Most significantly, the unprecedented absolute magnitude of growth in fertiliser consumption in 1976-77 has occurred under price environment which was much less favourable to the cultivators than the one which prevailed in the years before 1974-75. Thus, it would be incorrect to attribute an overwhelming influence to changes the price environment while discussing the trends in fertiliser consumption, or to argue that continuous rapid growth in fertiliser consumption could be sustained by manipulating the prices⁷.

This brings us to the third macro variable, namely availability of fertilisers, which has been sometimes referred to while explaining the aggregate consumption trends.

The overall availability of fertilisers during a particular year is determined by domestic production and imports of fertilisers during the year plus carry-over stocks of fertilisers from the previous year. If time-series data on the three components of availability were available, it would be easy to check if the pattern in fertiliser consumption trends was governed by availability of fertilisers. While

7 For further discussion of this issue see various paper submitted to the 1976 annual conference of the Indian Society of Agricultural Economics on " Impact of Increase in Input Prices on Profitability and Production, as well as the present author's Rapporteur's Report on the subject in Indian Journal of Agricultural Economics, Vol. XXXI, No. 3, July-September, 1976, Pp. 63-156.

time-series on production and imports for all fertilisers are readily available, time-series on stocks could be developed only for nitrogen. Therefore, the following analysis is restricted to nitrogen.

Using the estimate of opening stock for 1962-63 available from the Report of the Committee on Fertilisers (Government of India, 1965), and the time-series on production, imports and consumption of nitrogen available from Fertiliser Statistics, 1976-77, we have compiled Table 5. The most striking point in Table 5 is that in many years between 1962-63 and 1976-77, a fairly high percentage of available nitrogen remained unutilised. Obviously, one could not expect a complete utilisation of all available fertilisers during any year. But the table clearly shows that in 11 out of 15 years as much as over one-fourth of the available nitrogen remained unutilised. In fact, following the norm used by the fertiliser industry, if we assume that only 10 per cent of the aggregate consumption is required in the pipeline, then there was only one year (1973-74) when the growth in aggregate consumption could have suffered adversely due to tight overall availability. Taken together with Column 6 (or 10) of Table 3, a scrutiny of Table 5 suggests that while decline in the growth rate of nitrogen consumption during 1973-74 (and may be 1972-73) could be attributed to tight availability, the same cannot be maintained for the lower growth rates during 1968-69, 1969-70 and 1970-71 than the impressive growth rate in 1967-68.

Table 5 also reveals that tight availability of nitrogen in 1972-73 and 1973-74 was mainly due to a sharp fall in opening stocks from over 600 to 800 thousand tonnes between 1968-69 and 1971-72 to

Table 5 : Availability and Consumption of Nitrogen, 1962-63 to 1976-77

Year	Opening Stocks	Domestic produce	Net Import	Total availability	Consumption	Closing stock	Closing stock as percentage of	
							Consumption	Availability
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>'000 Tonnes</u>								
1962-63	105	194	244	543	333	210	63	39
1963-64	210	219	228	657	377	280	74	43
1964-65	280	243	232	755	555	200	36	26
1965-66	200	238	326	764	575	189	33	25
1966-67	189	309	632	1,130	738	392	53	35
1967-68	392	403	867	1,662	1,035	627	61	38
1968-69	627	563	844	2,034	1,209	825	68	41
1969-70	825	731	667	2,223	1,356	867	64	39
1970-71	867	833	477	2,177	1,479	698	47	32
1971-72	698	949	481	2,128	1,798	330	18	16
1972-73	330	1,055	665	2,050	1,839	211	11	10
1973-74	211	1,050	659	1,920	1,829	91	5	5
1974-75	91	1,187	884	2,162	1,766	396	22	18
1975-76	396	1,508	996	2,900	2,149	751	35	26
1976-77	751	1,857	750	3,358	2,457	901	37	27

Source : Derived from Fertiliser Statistics, 1976-77, P.I.182. India Report of the Committee on Fertilisers, Ministry of Food and Agriculture, Government of India, New Delhi, 1965, P. 154.

330, 211 and 91 thousand tonnes in 1972-73, 1973-74 and 1974-75 respectively. This, in turn, was mainly due to sharp and continuous reduction in imports from 1967-68 to 1971-72. Inasmuch as this was in response to huge carryover stocks for consecutive years, it could be argued that the import component of availability was influenced by trends in consumption and not the other way round. Thus, again, it would be naive to assume a one way cause and effect relationship between availability and consumption of fertilisers while explaining the trends in the latter.

To recapitulate the discussion in this section, substantial growth in fertiliser consumption after 1974-75 was mainly by way of recovery in the trends of fertiliser consumption after poor growth in 1972-73 and 1973-74 and the sharp decline in 1974-75. The poor growth in 1972-73 and 1973-74 was due to tighter overall availability of fertilisers during those years resulting from over-cautious fertiliser import policy during the earlier years. The decline in fertiliser consumption during 1974-75 seems to be due to the first reactions of the fertiliser distribution system and cultivators to sudden and drastic increase in fertiliser prices by as much as about 100 per cent. Available evidence clearly indicates that the decline in consumption was as much due to the psychological reactions of fertiliser distributing agencies and their problems of enhanced working capital requirements as due to the reactions of the cultivators.

Could the growth in fertiliser demand after 1974-75 be sustained in the coming year? To answer this question it is necessary

to examine if the base supporting growth in fertiliser consumption has widened in the recent years.

4.2 Statewise Consumption Trends, 1967-68 to 1976-77

Table 6 presents trends of fertiliser consumption in different states from 1967-68 to 1976-77⁸. Table 7 shows some characteristic features of the trends, and levels of fertiliser use in 1967-68 and 1976-77 in different states. Table 8 shows percentage contribution of different states to the annual change in total fertiliser consumption. These tables reveal the following major points.

In all states except Assam, the level of fertiliser consumption in 1976-77 was substantially higher than in 1967-68. Though the growth pattern in fertiliser consumption in each state has some unique features, roughly there are two broad categories: (i) states where there was substantial growth in consumption by the early 1970s, then stagnation or decline in consumption for two to three years, and finally rise in consumption in 1975-76 and/or 1976-77, and (ii) states where the upward movement in consumption was generally spread over the entire period. Rajasthan, Maharashtra, Bihar, West Bengal and Kerala come in the second category while the rest fall in the first category. The list of states in the second category is of interest because it includes states with relatively moderate levels of irrigation, and in three of them rice (rather than wheat) dominate the cropping pattern.

⁸ All-India estimates of consumption made by adding statewise estimates do not always tally with the estimates shown in Table 3. No explanation is available for the discrepancies between the two series. Despite the inconsistencies in the two series, they represent similar trends.

Table 6 : Consumption of Fertilisers in Different States, 1967-68 to 1976-77.

State/ Zone (1)	Consumption of Fertilisers									
	1967-68 (2)	68-69 (3)	69-70 (4)	70-71 (5)	71-72 (6)	72-73 (7)	73-74 (8)	74-75 (9)	75-76 (10)	76-77 (11)
<u>'000 Tonnes of NPK</u>										
<u>Central</u>										
Madhya Pradesh	22	32	52	81	118	140	141	99	108	137
Rajasthan	25	30	42	54	71	58	74	59	78	99
Uttar Pradesh	196	339	458	410	478	519	465	411	485	729
<u>East</u>										
Assam	6	9	7	9	8	10	8	6	6	4
Bihar	43	67	110	99	108	119	97	117	135	155
Orissa	20	24	26	28	50	56	63	49	47	62
West Bengal	44	53	52	79	95	92	99	127	130	153
<u>North</u>										
Haryana	42	47	51	70	82	94	115	75	96	138
Himachal Pradesh	NA	4	4	6	6	8	7	11	9	8
Jammu & Kashmir	NA	9	4	5	5	10	14	8	11	13
Punjab	102	178	174	213	290	323	330	271	311	372
<u>South</u>										
Andhra Pradesh	133	303	313	284	297	275	281	307	413	402
Kerala	52	68	72	57	65	75	81	67	64	85
Karnataka	57	106	132	156	167	202	196	233	218	206
Tamil Nadu	155	180	222	259	346	324	341	257	300	277
<u>West</u>										
Gujarat	91	96	108	165	182	178	212	136	150	202
Maharashtra	175	127	150	199	241	200	261	303	265	290

Source : Compiled from various issues of Fertiliser Statistics, The Fertiliser Association of India, New Delhi.

Table 7 : Levels of NPK consumption, and Characteristic Features of Fertiliser Consumption Trends in Different States during 1967-68 to 1976-77.

Zone/State (1)	Level of Use		Average Annual Change (4)	C.V. of (4) (5)	Annual Change		No. of Years with Negative Annual Change (8)
	1967-68 (2)	1976-77 (3)			Maximum (6)	Minimum (7)	
	<u>Kgs/Hect.</u>		<u>000 Tonnes</u>	<u>Per cent</u>	<u>000 Tonnes</u>		<u>No.</u>
<u>Central</u>							
Madhya Pradesh	1.1	6.4	13.0	173	37	-42	1
Rajasthan	1.5	5.5	8.2	154	21	-15	2
Uttar Pradesh	8.6	31.7	59.2	162	244	-54	3
<u>East</u>							
Assam	2.2	1.3	-0.2	-869	3	-2	5
Bihar	3.9	14.5	12.4	146	43	-22	2
Orissa	2.8	8.5	4.7	205	22	-14	2
West Bengal	6.7	20.4	12.0	93	28	-3	2
<u>North</u>							
Haryana	8	26.6	11.2	174	42	-35	1
Himachal Pradesh	5.9 ^a	9.9	0.5 ^b	374	4	-2	3
Jammu & Kashmir	10.4 ^a	13.6	0.5 ^b	755	5	-6	2
Punjab	18.7	61.6	30.0	136	77	-59	2
<u>South</u>							
Andhra Pradesh	10.4	30.3	29.9	207	170	-30	3
Karnataka	5.5	19.0	16.6	132	49	-15	3
Kerala	18.9	23.1	3.7	318	21	-15	3
Tamil Nadu	21.3	36.6	13.6	347	87	-84	3
<u>West</u>							
Gujarat	8.7	20.0	12.3	300	57	-76	2
Maharashtra	9.1	14.9	12.8	317	61	-48	3

a. For the year 1968-69.

b. Growth between 1968-69 and 1976-77.

Table 8: Relative Contributions of Different States to Absolute Annual Changes in Total Fertiliser Consumption, 1967-68 to 1976-77.

State/Zone	1968-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76	76-77
	<u>Per cent</u>								
<u>Central</u>									
Madhya Pradesh	2	7	15	8	30	1	-17	3	6
Rajasthan	1	4	6	4	-18	16	-6	7	4
Uttar Pradesh	29	39	-24	16	55	-53	-22	26	48
<u>East</u>									
Assam	1	-1	1	-a	3	-2	-1	0	-a
Bihar	5	14	-6	2	15	-22	+8	6	4
Orissa	1	1	1	5	8	7	-6	-1	3
West Bengal	2	-a	14	3	-4	7	+11	1	4
<u>North</u>									
Haryana	1	1	10	3	16	21	-14	7	8
Himachal Pradesh	-	0	1	0	3	-1	+2	-1	-a
Jammu & Kashmir	-	-2	1	0	7	4	-2	1	a
Punjab	15	-1	20	18	45	7	-24	14	12
<u>South</u>									
Andhra Pradesh	34	3	-15	3	-30	6	+11	37	-2
Kerala	3	1	-8	2	14	6	-6	-1	4
Karnataka	10	8	12	2	7	-6	+15	-5	-2
Tamil Nadu	5	14	19	20	-30	17	-34	15	-4
<u>West</u>									
Gujarat	1	4	29	4	-5	33	-31	5	10
Maharashtra	-10	7	25	10	-55	60	+17	-13	5
Total =	100	100	100	100	100	100	-100	100	100

a. less than 0.5 per cent

While the above finding indicates some changes in the forces governing growth in fertiliser consumption, it should not be overemphasised. As shown in Table 8, over 70 per cent of the growth in fertiliser consumption during 1975-76 was accounted for by only four states, namely Andhra Pradesh, Uttar Pradesh, Tamil Nadu and Punjab. Similarly, Uttar Pradesh, Punjab and Gujarat accounted for about 70 per cent of the growth in 1976-77. Thus, it is clear that the impressive magnitude of growth in total fertiliser consumption after 1974-75 was not mainly due to the broadening of the statewide base of growth in fertiliser consumption.

Whether the pace of increase in total fertiliser consumption after 1974-75 would continue for a number of years is difficult to say from the statewide growth patterns of fertiliser use. Bulk of this growth is accounted for by some of the states which were primarily behind the growth up to 1971-72. Impressive growth in fertiliser consumption in these states could be due to poor growth between 1971-72 and 1974-75, and the impact of increase in irrigated areas and spread of HYVs over the entire period after 1971-72. In fact, given the unsteady nature of trends in fertiliser consumption in all states, one can reasonably argue that fertiliser consumption is not likely to increase year after year at the pace indicated by the post-1974 experience. However, before reaching such a conclusion it would be useful to see the growth pattern at the district level. This is because a state is too large a unit to judge if the base supporting growth in fertiliser use has widened in the recent years, particularly in view of the emphasis on promotional efforts.

4.3 Growth Patterns in Districts

In a study carried out for the National Commission on

Agriculture, we had analysed the growth of fertiliser use in various districts for the period from 1960-61 to 1970-71⁹. The major findings of this study are briefly summarised below before discussing the growth patterns of fertiliser consumption in districts during the recent years.

Between 1960-61 and 1968-69, fertiliser use increased at widely different rates in different districts. In 31 out of the 286 districts covered by the study, nitrogen consumption increased by over 1,000 tonnes per year while at the other extreme in as many as 102 districts, it increased by less than 100 tonnes per year. The growth rates of phosphorus consumption varied even more widely. As a result of such growth patterns, 70 to 80 per cent of the total fertiliser consumption was concentrated in less than one-third of the same districts in any year between 1960-61 and 1968-69. The variation in growth rates of fertiliser consumption was mainly due to the differences among districts with respect to (i) levels of irrigation, (ii) cropping patterns, and (iii) diffusion of HYVs.

The study also revealed that despite good weather conditions, adequate availability of fertilisers, and favourable price environment, the actual levels of fertiliser use were below the trend lines in 46 per cent of the districts for two consecutive years in 1969-70 and 1970-71. In other 26 per cent they were below the projections in one of the two years. Only in 28 per cent of the districts the actual levels were above the projections in the two years. The phenomenon of lower than the trend

9 Gurvant M. Desai and Gurdev Singh, Growth of Fertiliser Use in Districts of India, Performance and Policy Implications, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, 1973.

line growth in fertiliser consumption was much more common in districts which had high growth rates in fertiliser consumption between 1960-61 and 1968-69 than among those with moderate to low growth rates.

The above phenomenon was mainly due to (i) slowing down of further diffusion of HYVs of wheat, (ii) low rate at which HYVs of rice were spreading even in districts with high levels of irrigation, (iii) HYVs not making much headway under rainfed conditions, (iv) limited scope for further diffusion of fertiliser use on the existing irrigated areas, and (v) absence of rapid diffusion of fertiliser use on rainfed areas under crops which occupied bulk of the cultivated land.

From the above conclusions of the previous study it seems that slowing down in the growth of fertiliser consumption in 1970s was inevitable unless a combination of three factors were to operate vigorously - - these factors being dramatic breakthroughs in HYVs (particularly rice) and their rapid spread, accelerated growth in irrigation, and most importantly, rapid and sustained diffusion of fertiliser use in rainfed districts. With hindsight it appears that, poor growth in fertiliser use till 1974-75 confirms this apprehension to some extent because the available data indicate no vigorous play of the forces mentioned above.

Does the impressive growth in fertiliser consumption after 1974-75 mean that the situation has changed during this period? Due to non-availability of recent data on irrigation and spread of HYVs, it is difficult to say anything conclusively but no optimistic assumptions about growth in irrigated areas and spread of HYVs can

explain the magnitude of increase in fertiliser consumption after 1974-75. One is, therefore, inclined to conclude that the districtwise base supporting growth in fertiliser consumption must have widened, particularly in the light of intensified promotional efforts. Such a conclusion is only partially supported by a study under progress. Some preliminary results of this study, which focuses on the growth in fertiliser consumption after 1968-69 in the 262 districts covered in the earlier study reported above, reveal the following.

Between 1974-75 and 1976-77, nitrogen consumption increased in 208 districts while in 54 districts it declined¹⁰. This is in sharp contrast to the findings for the 1960-61 to 1968-69 period during which not a single of the 262 districts had a negative growth rate. While a two-year period is too short to infer anything conclusively, it is worth noting that 19 of the 54 districts with decline in consumption are districts with relatively high growth rates between 1960-61 and 1968-69.

For the two-year period between 1974-75 and 1976-77, 81 out of the 262 districts had over 1500 tonnes average annual increment in

10 These 54 districts are distributed among states as follows: Andhra Pradesh 3 (including West Godavari), Assam 5, Gujarat 2, Karnataka 11 (including Bangalore and Bellary), Kerala 4 (including Kottayam, Kozhikode and Alleppy), Maharashtra 9 (including Ahmednagar, Buldhana, Aurangabad, Akola and Yeotmal), Madhya Pradesh 8, Orissa 3, Punjab 1 (Sangrur), Rajasthan 1, Tamil Nadu 3 (including Thanjavur), Uttar Pradesh 1, and West Bengal 3 (including Murshidabad).

nitrogen consumption¹¹. Together these 81 districts account for 87 per cent of the growth in total nitrogen consumption. As many as 58 out of these 81 districts were from the same set of 101 districts which had accounted for between 70 to 80 per cent of nitrogen consumption in any year between 1960-61 and 1968-69. In other words, a large majority of the 81 districts were the same which generated bulk of the growth in fertiliser consumption during the 1960s.

Not all 81 districts had very high growth rates in nitrogen consumption between 1960-61 and 1968-69. In fact, only 10 of them had average annual increments over 1500 tonnes, and as many as 51 of them had annual increments below 750 tonnes. It would be, however, incorrect to conclude from this that after 1968-69 there was decisive acceleration in the trends of fertiliser consumption in these 81 districts. As can be seen from Table 9, such a conclusion would be valid mainly for the 18 districts with very low growth rates (below 300 tonnes per year) between 1960-61 and 1968-69. As for the other districts, the impressive growth rates of 1500 tonnes or more per year after 1974-75 follow stagnation or decline in growth rates between 1968-69 and 1973-74, and a substantial fall in consumption during 1974-75.

From the above findings it is clear that while there was some broadening in the districtwise base generating growth in fertiliser consumption after late 1960s, it is still quite narrow. Also, bulk

¹¹ These 81 districts are distributed among states as follows: Uttar Pradesh 34, Andhra Pradesh 12, Punjab 8, Maharashtra 8, Haryana 5, Gujarat 5, Karnataka 3, Tamil Nadu 2, and 1 each in West Bengal, Orissa, Madhya Pradesh and Rajasthan.

Table 9 : Average Annual Changes in Nitrogen Consumption in the 81 Districts during Different Periods

Categories according to growth rates between 1960-61 and 1968-69	No. of districts	Average growth rate of a district between				Per cent contribution by the category to total growth between 1974-75 & 1976-77
		1960-61 and 1968-69	1968-69 and 1973-74	1973-74 and 1974-75	1974-75 and 1976-77	
<u>Tonnes of N per year</u>						
Above 1500	10	1982	824	-3156	6239	18.1
751 to 1500	22	1059	406	-1622	4563	29.0
301 to 750	31	530	538	-728	3036	27.2
101 to 300	16	216	666	-486	2380	11.0
Below 100	2	97	565	-1419	2851	1.6
	81	780	563	-1240	3712	87.0

of the post-1974 growth in fertiliser consumption is accounted for by many of the traditional growth generating districts. Nor can the magnitudes of growth in fertiliser consumption in many districts after 1974-75 can be taken as decisive acceleration in their trends because (i) in almost all of them there was substantial fall in consumption during 1974-75, and (ii) in many of them (which accounted for bulk of the total growth between 1974-75 and 1976-77) growth rates after 1968-69 had either stagnated or declined.

5 Summing Up

Two major conclusions emerge from the discussion in this paper. First, the growth rates in fertiliser consumption after 1974-75¹² cannot be taken as indicative of the rates at which fertiliser consumption is likely to grow in the next few years because, as shown by the statewide as well as districtwise analysis of the trends, bulk of the recent growth seems to be due to recovery in trends after the sharp decline in consumption in 1974-75 and poor growth in 1972-73 and 1973-74. As stated earlier, the average annual increment in fertiliser consumption between 1971-72 and 1976-77 works out at only 155,000. This is considerably below the growth rate in any year from 1966-67 to 1971-72. Even if one takes into account nearly 900,000 tonnes growth in fertiliser consumption during the current year (1977-78) as estimated by FAI, the average annual increment in fertiliser consumption after 1974-75 works out at 277,000 tonnes. This is also less than the average annual

12 These growth rates have been 321,000 in 1975-76, 517,000 tonnes in 1976-77, and is estimated to be 896,000 tonnes in 1977-78.

increment of 312,000 tonnes during the period from 1966-67 to 1971-72.

Second, though there has been some broadening in the districtwise base supporting the growth in fertiliser consumption after late 1960s, it is still not wide enough to sustain growth in effective demand for fertiliser at 600 to 800 thousand tonnes a year for 10 consecutive years as implied by the recent projections made by the Fertiliser Association of India. This is because as much as 87 per cent of the growth in consumption after 1974-75 is still accounted for by only 81 districts many of which are the traditional growth generating districts.

The above conclusions are not intended to convey that growth in fertiliser consumption at rates implied by the FAI projections cannot be generated. The intent of our arguments is that if continuous rapid growth in fertiliser consumption at such rates is desired, as indeed it is, given the need-based requirements of fertiliser consumption, there is no room for complacency because of the impressive performance after 1974-75 and vigorous efforts are required in the right directions.

Obviously, these efforts will have to be in all the three spheres, namely increasing the aggregate availability of fertilisers, improving the efficiency of the distribution arrangements to make fertilisers available to millions of cultivators, and generating continuous growth in cultivators' effective demand for fertilisers. The rationale and details of efforts in each of these directions are spelled out elsewhere¹³. Here we would like to stress only a few points which

13 Gunvant M. Desai, Growth of Fertiliser Use in Districts of India, Performance and Policy Implication, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad. 1973, Chapter VI. Pp.181-212.

emerge from the past experience.

So far the supply system of fertilisers has operated only to facilitate the growth in fertiliser consumption resulting from growth in cultivators' demand for this input. In other words, the supply system has not been deliberately utilised to generate rapid growth in demand for fertilisers. This must change. The most crucial thing to do to bring about this change is to manipulate aggregate availability to create constant pressures on the distribution system to develop markets (and not just open retail outlets) in a large number of districts which have so far remained outside the mainstream of growth in fertiliser use. Such pressures cannot be created without rapidly increasing domestic production and following a bold import policy. The importance of bold import policy at this stage cannot be overemphasised. From the substantial growth in fertiliser consumption during 1976-77 and 1977-78, and estimates of likely domestic production of fertilisers made by FAI, it is clear that by 1978-79 carryover stocks are likely to reach fairly low levels. Unless pressures from the supply side are continued through sizeable imports in the short run, efforts to develop new markets, which have recently begun, will not sustain. This will be most unfortunate particularly because there is an imperative need and substantial scope to broaden the base for generating continuous and rapid growth in demand for fertilisers.

As for the direct efforts to generate sizeable growth in cultivators' demand for fertilisers year after year, we would stress accelerated growth of irrigation facilities, development and diffusion

of HYVs suited to varied agro-climatic conditions particularly in rainfed areas, and improvement in the quality of agricultural extension services to train cultivators in various details of fertiliser practices such as balance among macro and micro nutrients, and correct timing and placement of fertilisers. While these measures are relevant at any time, they assume urgency in India at this stage of growth in fertiliser use because of the following reasons.

Till mid-1960s bulk of the growth in fertiliser consumption resulted from the spread of its use on areas which were already irrigated. After mid-1960s this source of growth was reinforced by the impact of the diffusion of high yielding varieties (mainly under irrigated conditions) on rates of fertiliser application. Available evidence clearly shows that by now most of the scope for further spread of either fertiliser use or of diffusion of HYVs on already irrigated areas is exhausted. Consequently, in years to come, the rate of growth in irrigated areas, the pace at which HYVs will spread on rainfed areas, and diffusion of fertiliser use under unirrigated conditions will play far more important role in determining the rate of growth in fertiliser consumption than they did in the past. This is not to argue that there is no scope for increasing the rates of fertiliser application on areas which are already fertilised. In fact the case for meaningful extension support to train cultivators in details of fertiliser practices emerges both from the discrepancy between optimal and actual fertiliser practices on areas already fertilised as well as its importance in promoting fertiliser use

under rainfed conditions. The rapid recovery in trends of fertiliser consumption after 1974-75 under less favourable price environment than what it was before 1974-75 clearly shows that the price environment is unlikely to obstruct rapid growth in cultivators' demand for this input. However, the demand will continue to grow rapidly only if the other variables affecting cultivators' returns from fertiliser use are strengthened. Thus, to sustain the recent trends, concerted efforts are required in the above directions because it is these efforts, more than marginal manipulations of prices, which will determine the limits and pace of further growth in cultivators' demand for fertilisers.

APPENDIX TABLES

Table 1 : Index Numbers of Fertiliser Prices and Wholesale Prices of Agricultural Commodities, 1961-62 to 1976-77.

Year	Urea	Ammonium Sulphate	Super Phosphate	Diammonium Phosphate	Muriate of Potash	Agricultural Commodities
1961-62	100	100	100		100	100
1962-63	99	98	104		100	104
1963-64	92	98	106		97	110
1964-65	85	98	109		97	122
1965-66	88	102	115		101	132
1966-67	94	111	133	100	106	150
1967-68	117	134	168	132	136	167
1968-69	119	136	168	132	149	165
1969-70	131	145	160	147	162	172
1970-71	131	144	164	147	180	181
1971-72	128	149	162	154	180	188
1972-73	133	149	164	160	207	207
1973-74	146	163	234	162	227	254
June 1974	277	254	339	362	414	342
July 1975	257	254	404	338	397	330
Dec 1975	257	254	375	313	368	297
Mar 1976	243	254	265	266	308	276
Feb 1977	229	254	182	266	273	337
Oct 1977	215	254	182	260	273	NA

- Note : 1. Index Numbers of fertiliser prices are prepared on the basis of information on fertiliser prices available from various issues of Fertiliser Statistics.
2. Index Numbers of wholesale prices of agricultural commodities from 1961-62 to 1974-75 represent the official series published in Bulletin of food statistics, Directorate of Economics and Statistics, Government of India, New Delhi, 1976, P 148. For February 1977 the Index Number is derived from the series with base 1970-71.

Table 2 : Need-based Estimates of Fertiliser use

	Nitro- genous	Phos- phatic	Potassic	Total
<u>In Million Tonnes of Nutrients</u>				
<u>Estimate for 1970-71</u>				
Committee on Fertilisers	2.40	1.00	0.77	4.17
USAID (Standstill) ^a	1.96	0.98	0.49	3.43
USAID (Minimum Acceptable) ^b	2.69	1.34	0.67	4.70
Donahue	2.67	1.80	0.93	5.40
Hoist (Food Self-sufficiency, 1976)	1.96	0.88	0.43	3.27
Hoist (Food Self-sufficiency, 1971)	2.50	1.10	0.60	4.25
<u>Estimates for 1973-74</u>				
Draft Fourth Five Year Plan	3.70	1.80	1.10	6.60
Fertiliser Association of India:				
(a) Population-nutrition basis	3.07	1.53	0.77	5.37
(b) Area-crop Approach	3.68	2.20	1.67	7.55
(c) To get 5 per cent annual growth in foodgrain production	3.54	1.77	0.88	6.19
<u>Estimates for 1975-76</u>				
Committee on Fertilisers	4.00	2.00	1.20	7.20
USAID (Standstill) ^a	3.08	1.54	0.77	5.39
USAID (Minimum Acceptable) ^b	4.37	2.18	1.09	7.64
Hoist (Food Self-sufficiency, 1976)	3.88	1.96	0.97	6.81
<u>Estimate for 1978-79</u>				
Draft Fifth Five Year Plan	5.20	1.80	1.00	8.00
<u>Estimate for 1980-81</u>				
National Commission on Agriculture ^c	3.41	1.27	0.99	5.67

contd ...

- a These estimates were derived from the requirements of foodgrains which imply no change in dietary levels, and self-sufficiency by mid-1970s.
- b These estimates were derived from the requirements of foodgrains which imply some improvement in dietary levels and self-sufficiency by 1970-71.
- c The National Commission on Agriculture made these estimates using three different methods. These methods took into account (i) replenishment of nutrients removed by crops, (ii) area under crops and recommended doses, and (iii) agricultural production demand and response rate of crops to addition of fertilisers. Considerable amount of judgement went into reconciling the estimates arrived at by different methods and presenting one set of estimate. For details see reference 8 cited below.

Sources:

- 1 Report of the Committee on Fertilisers, Government of India, Ministry of Food and Agriculture, Department of Agriculture, (New Delhi, 1965).
- 2 Fertiliser Proposal for Increased Agricultural Production, United States Agency for International Development Mission to India, American Embassy, (New Delhi, 1964) (Mimeographed).
- 3 Roy L. Donahue, Estimates of Fertiliser Consumption in India in 1970-71, The Fertiliser Association of India, (New Delhi, 1966).
- 4 The World Food Problem. A Report of the President's Science Advisory Committee, (The White House, Washington, D.C., 1967), Vol. II, Pp. 673-711.
- 5 Fourth Five Year Plan, 1969-74, Draft, Government of India, Planning Commission, (New Delhi, 1969) p. 121.
- 6 Report on the Development of the Fertiliser Industry during the Fourth Plan Period. The Fertiliser Association of India, New Delhi, p.5, also Appendix III-A, III-B, III-C, and III-D, pp. 32-46.
- 7 Draft Fifth Five Year Plan, 1974-79, Vol. II, Government of India, Planning Commission, (New Delhi, 1973) p.8.
- 8 Report of the National Commission on Agriculture, 1976, Government of India, Ministry of Agriculture and Irrigation, New Delhi, 1976, Part X, Chapter 48, Pp 61-74.

Table 3 : Targets and Achievements of Fertiliser Consumption in Different Five Year Plans.

	Nitro- genous	Phos- phatic	Potassic	Total
<u>'000 Tonnes of Nutrients</u>				
<u>First Five Year Plan (1951-52 to 1955-56)</u>				
Target of consumption in 1955-56	122	NA	NA	NA
Level of consumption in 1955-56	107	19	11	137
Percentage of target achieved	88	NA	NA	NA
<u>Second Five Year Plan (1956-57 to 1960-61)</u>				
Target of consumption in 1960-61	510	150	NA	NA
Level of consumption in 1960-61	210	70	28	308
Percentage of target achieved	41	47	NA	NA
<u>Third Five Year Plan (1961-62 to 1965-66)</u>				
Target of consumption in 1965-66	1,020	406	203	1,629
Level of consumption in 1965-66	580	132	77	789
Percentage of target achieved	57	33	38	48
<u>Draft Fourth Five Year Plan (1966-67 to 1970-71)</u>				
Target of consumption in 1970-71	2,000	1,000	350	3,350
Level of consumption in 1970-71	1,479	541	236	2,256
Percentage of target achieved	74	46	65	66
<u>Draft Fourth Five Year Plan (1969-70 to 1973-74)</u>				
Target of consumption in 1973-74	3,700	1,800	1,100	6,600
Level of consumption in 1973-74	1,829	650	360	2,839
Percentage of target achieved	49	36	33	48
<u>Fifth Five Year Plan (1974-75 to 1978-79)</u>				
Target of consumption in 1978-79				
Draft Fifth Plan	5,200	1,800	1,000	8,000
Final version of Fifth Plan	NA	NA	NA	4,800
Level of consumption in 1976-77	2,457	635	319	3,411

contd ...

Table (Contd)

Note : The First Draft of the Fourth Five Year Plan (1966-67 to 1970-71) laid down the target of fertiliser consumption for 1970-71 as shown in the table. This was subsequently revised as nitrogen 2.4 million tonnes, phosphorus 1.0 million tonnes, and potash 0.7 million tonnes. Similarly, the Fourth Five Year Plan (1969-70 to 1973-74) laid down the targets of fertiliser consumption in 1973-74, as shown in the table. However, these were subsequently revised as nitrogen 3.2 million tonnes, phosphorus 1.4 million tonnes, and potash 0.9 million tonnes.

Sources:

- 1 For the First, Second and Third Five Year Plan, Government of India, Directorate of Economics and Statistics, Indian Agriculture in Brief, 11th Edition, (New Delhi, 1977) pp. 154-155.
- 2 The targets of the Fourth and the Fifth Five Year Plan are taken from: Government of India, Planning Commission, Fourth Five Year Plan, A Draft Outline (New Delhi, 1966), p. 185 ; Government of India, Planning Commission, Fourth Five Year Plan, 1969-74, Draft (New Delhi, 1969), p. 121; Government of India, Planning Commission, Draft Fifth Five Year Plan, 1974-79, Vol. II, (New Delhi, 1974) p.8 ; Government of India, Planning Commission, Fifth Five Year Plan, 1974-79, (New Delhi, 1976) n.10.
- 3 Consumption figures for 1970-71, 1973-74, and 1976-77 are from Fertiliser Association of India, Fertiliser Statistics, 1976-77, (New Delhi, 1977) Pp. 182-183.