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FERTILIZER PRICE DEREGULATION AND
PUBLIC POLICY: THE CASE OF BANGLADESH

by

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Preface

This study was initiated at the request of the United States Agency for International Development (USAID), Dhaka, Bangladesh. The need for such a study was felt by the Bangladesh Agricultural Development Corporation (BADC), Ministry of Agriculture, and USAID while the author was on assignment in Bangladesh assisting the Design Team entrusted with developing a project proposal for USAID's Fertilizer Distribution and Improvement Project, Phase II, for Bangladesh. The primary purpose of the study is to analyze the economic impact of fertilizer price deregulation on retail prices in Bangladesh and draw implications for fertilizer price policy. In this context the study is an important component of the fertilizer policy research program of the International Fertilizer Development Center (IFDC).

This study is unique in two respects. First, it deals with actual prices paid by farmers at the retail level. Second, it compares the economic implications of three distinct phases of fertilizer price policy: (1) fertilizer price regulation all over the country, (2) segmented market with price deregulations in one part of the country and price regulation in the other, and (3) price deregulation all over the country. In this context, the results of this study are relevant in formulating fertilizer price policy not only for Bangladesh but also for other developing countries of the world.

The author is grateful to BADC, USAID, and IFDC personnel in Bangladesh for making available the primary data collected through monthly farmer fertilizer price surveys conducted under the BADC/IFDC contract. The author also benefitted from discussions with BADC, USAID, and IFDC personnel and policymakers in Bangladesh. The author gratefully acknowledges the valuable comments received from Mr. Charles H. Antholt and Dr. Raymond W. Hooker of USAID/Washington, D.C. The superb research assistance provided by Mrs. Susan Highfield during different stages of this study is gratefully acknowledged.

Symbols, Abbreviations, and ConversionsOrganizations

BADC	Bangladesh Agricultural Development Corporation
BCIC	Bangladesh Chemical Industries Corporation
EPADC	East Pakistan Agricultural Development Corporation
IFDC	International Fertilizer Development Center
USAID	United States Agency for International Development
ZFCL	Zia Fertilizer Company, Ltd.

Fertilizers

DAP	Diammonium phosphate
HP	Hyper phosphate
K ₂ O	Potash (potassium oxide)
MOP	Muriate of potash
N	Nitrogen
P ₂ O ₅	Phosphate (phosphorus pentoxide)
TSP	Triple superphosphate
TSPG	Triple superphosphate--granular
TSPP	Triple superphosphate--powder

Others

c.i.f.	Cost, insurance, freight
c.&f.	Cost and freight
f.o.b.	Free on board
f.o.r.	Free on rail
HYV	High-yielding variety
KSS	Krishi Samabaya Samity
LCV	Local variety
mtpy	Metric tons per year
NMS	New Marketing System
OMS	Old Marketing System
PDP	Primary distribution point
TCCA	Thana Central Cooperative Association
TSC	Thana sales center

Conversions

1 seer	= 0.9331 kilogram
	= 2.0572 pounds
1 pound	= 0.4536 kilogram
	= 0.4862 seer
1 kilogram	= 2.205 pounds
	= 1.07 seers
1 maund (md)	= 40 seers
	= 37.32 kilograms
	= 82.29 pounds
1 short ton	= 2,000 pounds
	= 907 kilograms
	= 0.907 metric ton
	= 0.8929 long ton
1 long ton	= 27.22 maunds
	= 2,240 pounds
	= 1.016 metric ton
	= 1.12 short ton
1 metric ton (mt)	= 2,205 pounds
	= 26.80 maunds
	= 1,000 kilograms
	= 1.102 short ton
	= 0.9844 long ton
1 kilometer	= 0.62 miles
1 mile	= 1.61 kilometers
1 square mile	= 2.59 square km
	= 640 acres
	= 259 hectares
1 acre	= 0.4047 hectares
1 hectare	= 2.471 acres
1 bigha	= 0.33 acre
	= 0.1336 hectare
1 crore	= 10 million
	= 100 lakh
1 Taka (TK)	= US \$0.04 (December 1983)
	= US \$0.0417 (1982/83)

CHAPTER 1

INTRODUCTION

Food self-sufficiency is one of the stated national goals of the Bangladesh Government. Demand for food is increasing rapidly in response to population growth, an increase in per capita income, and government policies designed to reduce starvation and malnutrition. In order to achieve food self-sufficiency and reduce dependence on food imports and food aid, growth in food production must be accelerated. An expansion in land, however, offers a limited scope as a source of needed growth in food production. Consequently, additional food production must come from an increase in cropping intensity, shift in cropping pattern in favor of food crops, and an expansion in crop yields. Fertilizer use, along with complementary inputs such as modern crop varieties, plant protection, and irrigation, is expected to play a vital role in achieving needed and potential growth in food production.

The Government of Bangladesh has recognized the crucial role of fertilizer in expanding agricultural production. The domestic production of fertilizer, especially nitrogen, has increased. The fertilizer marketing and distribution system is in the process of being streamlined in order to improve operational efficiency of the fertilizer marketing system. Fertilizer storage capacity has been and is being expanded, and fertilizer is being made available to farmers in the remote areas of the country. The role of the private sector in fertilizer marketing, especially at the retail level, has been expanded through gradual privatization of the fertilizer sector. However, one of the major changes in fertilizer policy has been fertilizer price deregulation at the retail level.

From 1971 to 1982, retail fertilizer prices were regulated (fixed and administered) by the government and kept uniform all over the country. These fertilizer prices were deregulated in Chittagong Division on April 1, 1982, and the price deregulation policy was later extended to the whole country on April 1, 1983. However, it was not clear how fertilizer price deregulation would influence retail fertilizer prices. One group of policymakers felt that fertilizer prices would skyrocket, fertilizer consumption would decline, and farmers and the nation would suffer an economic loss. On the other hand, the second group of policymakers felt that fertilizer prices would not increase

significantly, fertilizer consumption might increase, and farmers might benefit. In any case, there were serious reservations with respect to the potential economic impact of fertilizer price deregulation, especially on retail fertilizer prices.

Broadly, the purpose of this research is to analyze the economic impact of fertilizer price deregulation in the context of fertilizer price and subsidy policy in Bangladesh. More specifically, the purpose of this study is fivefold: (1) to discuss the status and performance of the fertilizer sector, (2) to analyze the fertilizer marketing system and marketing policy, (3) to evaluate fertilizer price and subsidy policy, (4) to analyze the impact of fertilizer price deregulation on retail fertilizer prices, and (5) to discuss implications of price deregulation for fertilizer price policy in Bangladesh and other developing countries of the world.

CHAPTER 2STATUS AND PERFORMANCE OF FERTILIZER SECTOR

In order to realistically analyze the economic impact of fertilizer price deregulation on retail prices, it is necessary to evaluate the status and performance of the fertilizer sector in Bangladesh.¹ More specifically, the purpose of this chapter is three-fold: (1) to discuss national fertilizer consumption and nutrient supply sources; (2) to discuss fertilizer procurement, including production and imports; and (3) to analyze spatial and seasonal patterns in fertilizer consumption.

Fertilizer Consumption

The total nutrient ($N + P_2O_5 + K_2O$) consumption in Bangladesh during 1982/83 was 466,000 metric tons (mt), which represents a 17% growth over the previous year (Table 2.1 and Figure 2.1). After the initial economic adjustments during 1970-72, fertilizer consumption has been steadily rising over time, with the exception of two time periods. First, fertilizer consumption declined in 1974-75, primarily in response to the international fertilizer crisis and disruption in fertilizer supply. Second, fertilizer consumption declined during 1981/82 primarily because of poor weather, fertilizer price increases, and problems with fertilizer availability.

During 1972/73, the share of individual nutrients in total consumption was $N = 71\%$, $P_2O_5 = 23\%$, and $K_2O = 6\%$. However, during 1982/83, the relative share of N declined to 65% and the percentage share of P_2O_5 and K_2O increased to 28% and 7%, respectively. In any case, nitrogen is still the most important nutrient, and will remain so in the near future. Percentage growth in nutrient consumption over the previous year (Table 2.1) indicates wide fluctuations in nutrient consumption over time, which in turn adds to instability in food production. The wide fluctuations in consumption are primarily due to disruptions in fertilizer supply, with respect to both production and imports.

1. The analysis in this chapter can be supplemented by the detailed assessment of the agricultural sector in Bangladesh by Wennergren, Antholt, and Whitaker (1983).

As reported in Table 2.2, fertilizer distribution/sale (a proxy for consumption) during 1982/83 was 950,000 long tons, which is approximately twice that of the post-fertilizer crisis period (1975/76). The primary source of nitrogen is urea, which during 1982/83 accounted for about 99% of nitrogen consumption. Despite the introduction of diammonium phosphate (DAP) in 1978/79, triple superphosphate (TSP) is still the dominant source of P_2O_5 , accounting for about 73% of P_2O_5 consumption in 1982/83. Finally, muriate of potash (MOP) accounted for about 95% of K_2O consumption during 1982/83. It is rather clear that the fertilizer scene in Bangladesh is dominated by three fertilizers: urea, TSP, and MOP.

Despite relatively high existing fertilizer consumption, both per hectare and total, there is still substantial scope to expand fertilizer consumption. However, even though the agronomic potential is determined by the physical and biological considerations, the speed with which the potential will be realized will depend upon fertilizer supply and economic incentives, including fertilizer prices and profitability of fertilizer use.

Fertilizer Production

All the existing fertilizer production facilities are in the public sector. Bangladesh Chemical Industries Corporation (BCIC) is responsible for fertilizer production and the operation of fertilizer plants with the exception of one urea plant. Bangladesh has facilities to produce urea and TSP. The historical trends in urea and TSP production are reported in Table 2.3.

Up to 1978/79, urea production had been fluctuating widely; thus, there was considerable uncertainty with respect to fertilizer supply and planning for imports. However, since 1978/79, urea production has been steadily increasing. The pattern of TSP production has not differed much from that of urea production. The direct result of uncertain local production has been unstable fertilizer supply and fertilizer prices. Since fertilizer production is in the public sector, the Government of Bangladesh has been able to maintain fertilizer price stability through (1) fertilizer price regulation, both at retail and factory levels, and (2) fertilizer subsidies to both the Bangladesh Agricultural Development Corporation (BADDC) and BCIC.

Currently, three urea plants are in operation with a combined installed capacity of about 900,000 mtpy; one urea plant also has facilities to produce ammonium sulfate with a total installed capacity of about 12,000 mtpy; and a TSP complex has two production units with a combined installed capacity of about 150,000 mtpy. Bangladesh has no facilities to produce potash fertilizers. Based on local natural gas as feedstock, several new ammonia/urea plants are at different stages of planning and development.

The major problem with fertilizer production is the poor performance of existing fertilizer plants. On the average, the annual capacity utilization rate is estimated to be about 60%, with large yearly variations. Since all of these plants are in the public sector, and since feedstock and f.o.b. factory prices of fertilizer are fixed by the government, fertilizer price deregulation at the retail level is not expected to improve plant performance or in any way influence decisions to build new fertilizer plants.

Fertilizer Imports

The gap between fertilizer demand and domestic fertilizer supply is met through fertilizer imports. The historical trends in fertilizer imports are given in Table 2.4. On the basis of fertilizer import statistics, we can make three observations. First, Bangladesh fertilizer imports primarily consist of four types of fertilizers: urea, TSP, MOP, and DAP. Second, DAP was introduced only recently into Bangladesh. Third, there is considerable year-to-year variation in fertilizer imports. This may be due primarily to high variability in domestic production. Fertilizer imports can be broadly classified into three categories: grants, concessionary imports, and commercial imports. Fertilizer grants and concessionary imports account for a large share of fertilizer imports by Bangladesh.

Fertilizer Self-Sufficiency

Bangladesh is striving hard to become self-sufficient in meeting fertilizer requirements, especially nitrogen. However, despite excess capacity

to produce urea, Bangladesh has not been able to become self-sufficient.² Total urea and TSP procurement and the share of procurement from domestic production in total procurement are reported in Table 2.5. The historical trends in domestic fertilizer production and fertilizer imports are shown in Figure 2.2. On the basis of the experience of the last 3 years (1980-83), it is estimated that approximately three-fourths of urea and one-third of TSP requirements are met from domestic production. Bangladesh is wholly dependent on imports for MOP, DAP, and NPK fertilizers. With the planned capacity creation for urea, the country may become self-sufficient in nitrogen fertilizers. However, because of the lack of raw materials, Bangladesh would continue to be dependent on imports for phosphate and potassium fertilizers.

Fertilizer Stocks

Fertilizer stocks serve as a buffer between fertilizer supply and fertilizer demand and can be used to correct unforeseen developments in the fertilizer market in the short-run. In this context, fertilizer stocks are an important component of national fertilizer supply strategies. Growth in estimated stocks for urea, TSP, and MOP, along with procurement and distribution, is reported in Table 2.6. The cumulative or year-end fertilizer stocks, for a particular fertilizer, have been estimated as follows:

$$(2.1) \quad S(t) = P(t) + I(t) + S(t-1) - D(t),$$

where $S(t)$ = year-end or cumulative stocks, $P(t)$ = current production, $I(t)$ = current net imports, $S(t-1)$ = carryover stocks from the previous year, and $D(t)$ = current distribution/sale. The results indicate large year-to-year fluctuations in estimated fertilizer stocks and do not appear to indicate any consistent relationship with annual fertilizer procurement or distribution.

According to BADC buffer-stock formula, the targeted stock should be equal to 3 months of annual targeted sale for urea and 5 months of targeted sale

2. According to Bangladesh Ministry of Agriculture and USAID (1982), Bangladesh exported 39,000 long tons of urea during 1980/81. As reported in BADC (1983), urea exports were estimated to be 71,000 long tons during 1982/83.

for other fertilizers (TSP, DAP, and MOP). Since targeted sales are generally overestimated, this formula results in excess stocks. For example, during 1981/82, actual consumption was only 66% of target consumption. Although too little stock can result in fertilizer scarcities and hence an increase in fertilizer prices, too much stock can result in very high storage costs, and hence either high retail prices or substantial fertilizer subsidy cost.

The real impact of fertilizer stock on prices or availability depends on the type, size, and location of stock. According to BADC (1983), the fertilizer stock position in Bangladesh is divided into several categories. These are:

1. BADC stock
 - a. Stock in district godowns
 - b. Stock in transit godowns
 - c. Stock in transit (in ship or at port)
2. Factory stock
 - a. BCIC stock
 - b. Zia Fertilizer Company, Ltd. (ZFCL) stock

Since BADC is responsible for fertilizer distribution, all the factory stock must be transferred to BADC before it can be distributed. In the short-run, however, the actual stock is equal to stock in district godowns since it is readily available for distribution.

Spatial Consumption Pattern

In Bangladesh, fertilizer consumption varies widely across different districts (Table 2.7 and Figure 2.3). During 1980/81, fertilizer consumption ranged from a low of 5,000 long tons in Chittagong Hill Tracts to a high of 120,000 long tons in Comilla. Furthermore, during 1980/81, three districts alone (Comilla, Dhaka, and Bogra) accounted for 31% of total fertilizer consumption in Bangladesh. As reported in Table 2.8, different districts in Bangladesh are classified according to (1) level of fertilizer use and (2) growth in fertilizer use. Any change in government policy, including price deregulation, is expected to influence each district differently, depending upon the existing level and growth in fertilizer use.

Seasonal Consumption Pattern

Monthly distribution of fertilizer sales, as a proxy for seasonal consumption, is reported in Table 2.9. Depending upon the cropping pattern, each fertilizer has its own seasonal consumption pattern. For urea, February, March, and September are the peak consuming months, whereas for TSP/DAP and MOP, January, October, November, and December appear to be the peak consuming months. As a result, the fertilizer policies with respect to supply, allocation, transportation, and storage need special attention in these months to avoid fertilizer scarcity and the resulting rise in fertilizer prices.

Table 2.1. Historical Dynamics of Fertilizer Consumption in Bangladesh

Year	Consumption ^a				% Change in Consumption Over Previous Year ^b			
	N	P ₂ O ₅	K ₂ O	Total ^c	N	P ₂ O ₅	K ₂ O	Total
	-- ('000 mt)--				-- (%)--			
1970/71	98	35	11	143				
1971/72	78	28	8	114	-20	-20	-27	-20
1972/73	129	42	11	182	+65	+50	+38	+60
1973/74	127	44	11	182	-2	+5	0	0
1974/75	83	36	11	129	-35	-18	0	-29
1975/76	147	54	15	216	+77	+50	+36	+67
1976/77	166	61	15	241	+13	+13	0	+12
1977/78	225	91	25	341	+36	+49	+67	+41
1978/79	228	101	27	356	+1	+11	+8	+4
1979/80	260	118	29	407	+14	+17	+7	+14
1980/81	268	120	29	417	+3	+2	0	+2
1981/82	251	119	28	398	-6	-1	-3	-5
1982/83	304	130	32	466	+21	+9	+14	+17

a. Obtained from FAO (1983a). Data for 1982/83 is obtained from BAJC (1983).

b. Estimated as follows: $\{[C(t)/C(t-1)]-1\} 100$.

c. Totals are approximate due to rounding of data.

FIGURE 2.1: HISTORICAL DYNAMICS OF FERTILIZER CONSUMPTION IN BANGLADESH

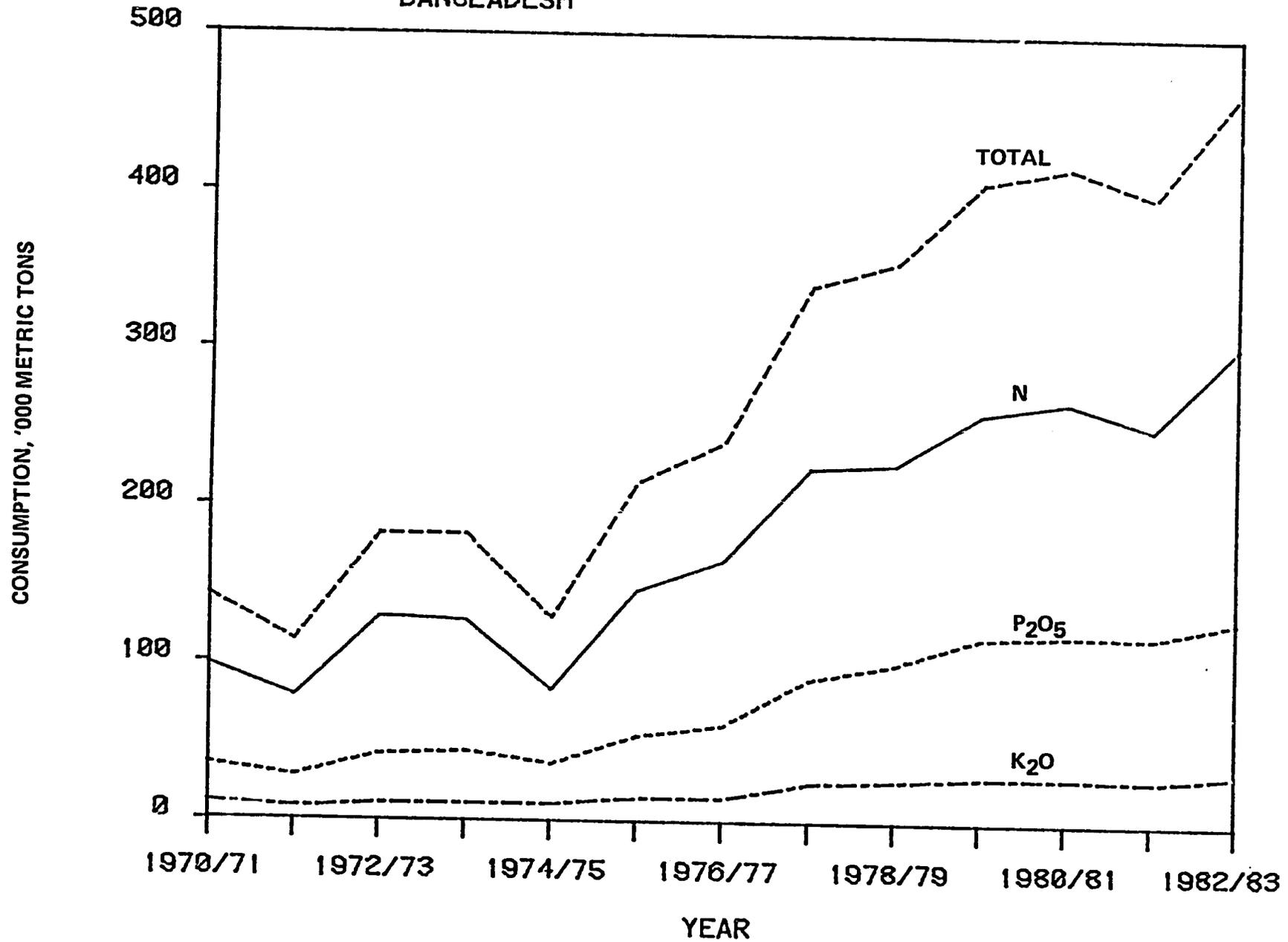


Table 2.2. Distribution/Sales of Fertilizer Materials in Bangladesh^a

<u>Year</u>	<u>Urea</u>	<u>TSP</u>	<u>MOP</u>	<u>HP^b</u> (¹ 000 long tons)	<u>NPK</u>	<u>SSP</u>	<u>DAP</u>	<u>Total^c</u>
1970/71	212	75	17	-	-	-	-	304
1971/72	170	60	14	-	-	-	-	244
1972/73	277	89	18	-	-	-	-	384
1973/74	268	94	18	-	-	-	-	380
1974/75	174	75	18	11	1	-	-	280
1975/76	312	110	22	4	8	2	-	458
1976/77	353	126	22	4	6	1	-	513
1977/78	480	192	41	3	1	1	-	719
1978/79	470	178	44	3	4	-	38	742
1979/80	536	206	46	3	8	-	42	842
1980/81	561	215	45	3	10	-	42	875
1981/82	519	208	45	-	8	-	49	829
1982/83	619	203	50	-	6	-	72	950

a. Data from 1971/72 to 1979/80 are obtained from Bangladesh Bureau of Statistics (1982a). All other are from BADC.

b. Hyper phosphate.

c. Totals may be more than the sum of individual fertilizers listed since some minor fertilizers have been left out. Ammonium sulfate is not included (annual production about 10,000 long tons) since it is sold by BCIC directly to tea growers.

Table 2.3. Domestic Production of Fertilizer Materials in Bangladesh^a

Year	Urea		TSP		Total	
	Production (['] 000 long ton)	% Change ^b	Production (['] 000 long ton)	% Change ^b	Production (['] 000 long ton)	% Change ^b
1970/71	86	-	-	-	86	-
1971/72	56	-35	-	-	56	-35
1972/73	187	+234	-	-	187	+234
1973/74	269	+44	-	-	269	+44
1974/75	82	-70	24	-	106	-61
1975/76	281	+243	39	+63	320	+202
1976/77	270	-4	43	+10	313	-2
1977/78	226	-16	38	-12	264	-16
1978/79	274	+21	59	+55	333	+26
1979/80	304 ^c	+11	58	-2	362	+9
1980/81	352 ^c	+16	73	+26	425	+17
1981/82	420 ^c	+19	66	-10	486	+14
1982/83	500 ^c	+19	68	+3	568	+17

a. Derived from various BADC publications.

b. Percent change over the previous year and is calculated as follows: $\{[P(t)/P(t-1)]-1\} 100$.

c. Out of domestic production, apparent exports of urea were approximately 39,000 long tons in 1980/81, and 71,000 long tons in 1982/83.

Table 2.4. Imports of Fertilizer Materials in Bangladesh^a

<u>Year</u>	<u>Urea</u>	<u>TSP</u>	<u>MOP</u>	<u>HP</u>	<u>NPK</u>	<u>SSP</u>	<u>DAP</u>	<u>Total</u> ^b
				('000	long tons)			
1970/71	105	149	2	-	-	-	-	256
1971/72	108	3	-	-	-	-	-	111
1972/73	124	116	-	-	-	-	-	240
1973/74	-	96	41	11	-	-	-	148
1974/75	140	47	7	13	17	5	-	229
1975/76	71	219	37	-	-	-	-	329
1976/77	11	20	10	-	-	-	-	41
1977/78	256	113	37	-	-	-	-	406
1978/79	343	102	76	6	4	-	82	615
1979/80	282	171	59	3	8	-	42	565
1980/81	63	191	42	-	18	-	36	350
1981/82	254	147	26	-	-	-	37	464
1982/83	42	133	43	-	9	-	71	298

a. Derived from Bangladesh Ministry of Agriculture and USAID (1982) and various BADC publications. The figures are rounded to the nearest whole number.

b. Totals may be more than the sum of individual fertilizers listed since some minor fertilizers have been left out.

Table 2.5. Share of Procurement From Domestic Production in Total Fertilizer Procurement in Bangladesh^a

Year	Total Procurement of ^b			Share of Domestic in Total Procurement of ^b		
	Urea	TSP	Total	Urea	TSP	Total
	-- ('000 long tons)--			-- (%)--		
1970/71	191	149	342	45	- ^c	25
1971/72	164	3	167	34	-	34
1972/73	311	116	427	60	-	44
1973/74	269	96	417	100	-	65
1974/75	222	71	335	37	34	32
1975/76	352	258	649	80	15	49
1976/77	281	63	354	96	68	88
1977/78	482	151	670	47	25	39
1978/79	617	161	948	44	37	35
1979/80	586	229	927	52	25	39
1980/81	376	264	736	83	28	52
1981/82	674	213	950	62	31	51
1982/83	471	201	795	91	34	63

- a. Total procurement = domestic production + imports - exports,
= domestic production + net imports, or
= domestic procurement + imports.
- b. Includes all fertilizers, except ammonium sulfate.
- c. Implies no domestic production.

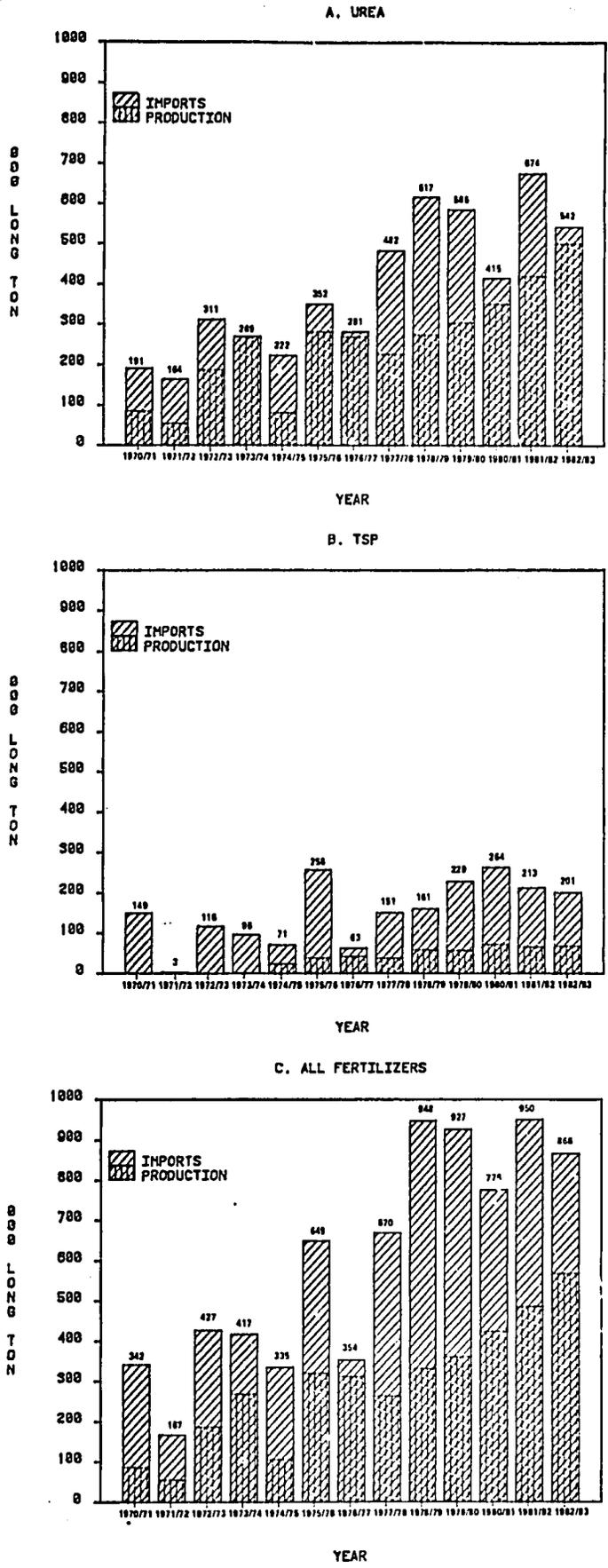


FIGURE 2.2: DYNAMICS OF FERTILIZER PRODUCTION AND IMPORTS IN BANGLADESH

Table 2.6. Growth in Estimated Stocks for Urea, TSP, and MOP In Bangladesh^a

Year	Urea ^b				TSP ^b				MOP ^b			
	P	D	CS	ΣS	P	D	CS	ΣS	P	D	CS	ΣS
					(^{'000}	long	tons)					
1972/73	311	277	+34	+34	116	89	+27	+27	-	18	-18	-18
1973/74	269	268	+1	+35	96	94	+2	+29	41	18	+23	+5
1974/75	222	174	+48	+83	71	75	-4	+25	7	18	-9	-4
1975/76	352	312	+40	+123	258	110	+148	+173	37	22	+15	+11
1976/77	281	353	-72	+51	63	126	-63	+110	10	22	-12	-1
1977/78	482	480	+2	+53	151	192	-41	+69	37	41	-4	-5
1978/79	617	470	+147	+200	161	178	-17	+52	76	44	+32	+27
1979/80	586	536	+50	+250	229	206	+23	+75	59	46	+13	+40
1980/81 ^c	376	561	-185	+65	264	215	+49	+124	42	45	-3	+37
1981/82	674	519	+155	+220	213	208	+5	+129	26	45	-19	+18
1982/83	471	619	-148	+72	201	203	-2	+127	43	50	-7	+11

a. Because of lack of estimates on initial stocks (in 1970/71) and needed economic adjustments (1970/71 and 1971/72), the cumulative stocks during 1971/72 are assumed to be zero.

b. Where P = procurement; D = distribution; CS = current stocks; and ΣS = cumulative stocks. In other words, cumulative stocks are equal to year-end stock or carry-over stocks for next year.

c. The magnitude of ΣS estimates may not match actual BADC stock estimates. Furthermore, the magnitude of ΣS for 1980/81, 1981/82, and 1982/83 would increase if one assumes that urea exports during 1980/81 were only 5,000 rather than 39,000 long tons, as has been assumed in these calculations. If urea exports during 1980/81 were only 5,000 long tons (as has also been indicated by the Bangladesh Ministry of Agriculture and USAID, 1982), the ΣS estimates during 1980/81, 1981/82, and 1982/83 would have been 99,000, 254,000, and 106,000 long tons, respectively.

Table 2.7. District Level Growth in Fertilizer Material Consumption in Bangladesh^a

Division/ District	Actual Consumption ^b			Annual Compound Growth Rate		
	1973/74	1977/78	1980/81	1973/74- 1977/78	1977/78- 1980/81	1973/74- 1980/81
	--- ('000 long tons)---			--- (%) ---		
<u>Rajshahi</u>	79.0	190.4	264.0	24.6	11.5	18.8
Rajshahi	17.4	41.8	58.7	24.5	12.0	19.0
Dinajpur	14.1	35.2	45.1	25.7	8.6	18.1
Rangpur	16.6	38.8	55.6	23.6	12.7	18.8
Bogra	19.3	43.0	70.1	22.2	17.7	20.2
Pabna	11.6	31.6	34.5	28.5	3.0	16.8
<u>Khulna</u>	53.8	108.8	130.2	19.3	6.2	13.5
Khulna	7.4	11.9	16.1	12.6	10.6	11.7
Barisal	21.0	25.1	24.1	4.6	-1.3	2.0
Patuakhali	5.2	7.1	6.2	8.1	-4.4	2.5
Jessore	10.6	33.3	40.6	33.1	6.8	21.1
Kushtia	9.6	31.4	42.7	34.5	10.8	23.8
<u>Dhaka</u>	105.5	193.0	237.5	16.3	7.2	12.3
Dhaka	39.6	65.7	80.8	13.5	7.1	10.7
Kishoreganj	26.5	40.8	53.2	11.4	9.2	10.5
Mymensingh	23.1	51.1	53.9	22.0	1.8	12.9
Tangail	9.8	22.5	35.1	23.1	16.0	20.0
Faridpur	6.5	12.9	14.5	18.7	4.0	12.1
<u>Chittagong</u>	141.6	227.1	243.0	12.5	2.3	8.0
Chittagong	52.0	69.1	59.5	7.4	-4.9	1.9
Chittagong H.T.	2.6	2.7	4.6	0.9	19.4	8.5
Noakhali	21.6	32.8	32.7	11.0	-0.1	6.1
Comilla	52.6	98.8	119.8	17.1	6.6	12.5
Sylhet	12.8	23.7	26.4	16.7	3.7	10.9
Bangladesh	379.9	719.3	874.7	17.3	6.7	12.7

a. The data for 1973/74 are obtained from Bangladesh Ministry of Agriculture and USAID (1982) and for 1977/78 and 1981/82 from Moots (1982).

The data for 1973/74 and 1977/78 are also available in Bangladesh Bureau of Statistics (1982a).

b. Consumption is taken as a proxy for fertilizer distribution/sale.

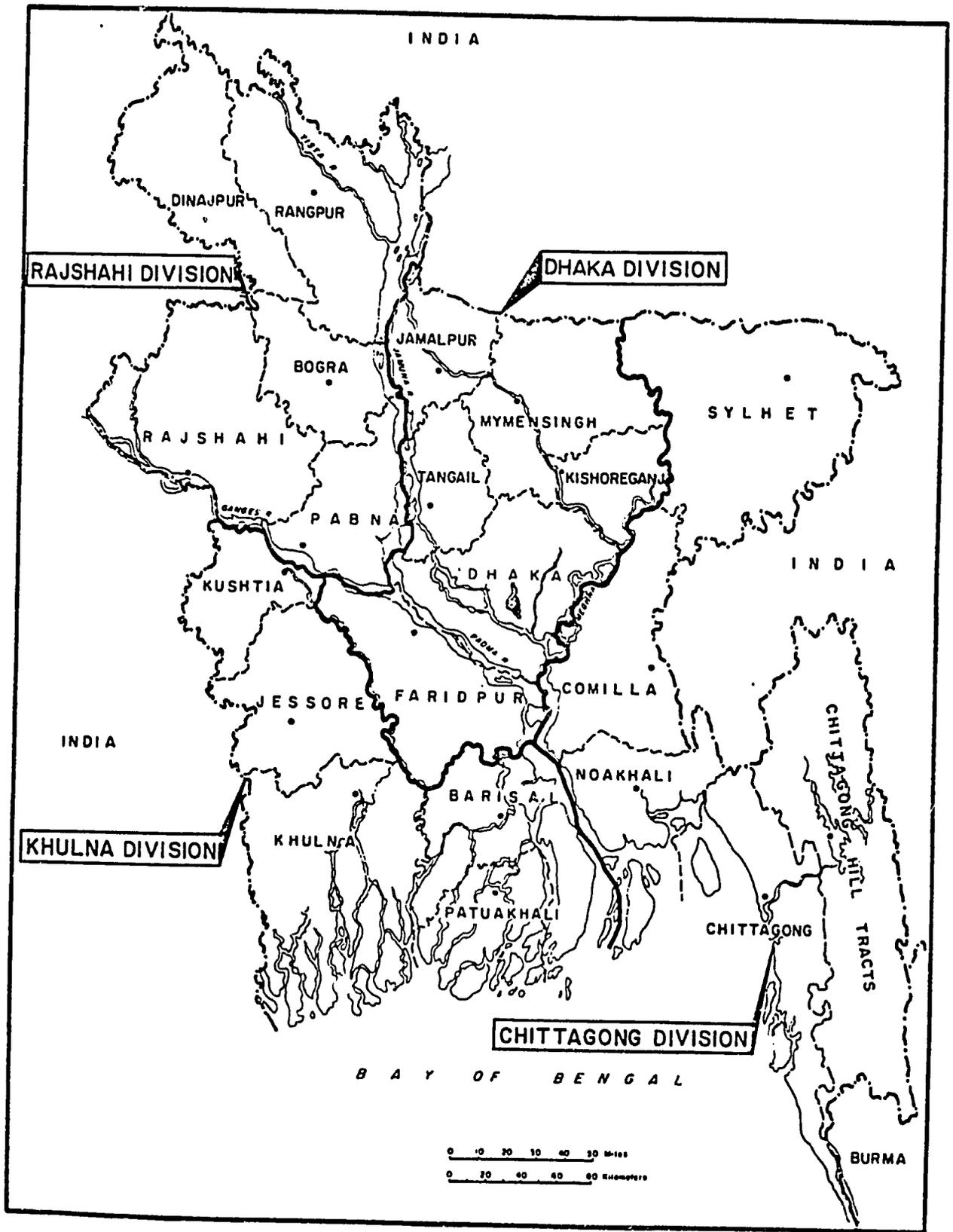


Figure 2.3. Bangladesh BADC Marketing Divisions (Hill and Benton, 1980).

Table 2.8. Classification of Districts Based on Level and Growth in Fertilizer Use

Fertilizer Use Level ^a ('000 long tons)	Percent Annual Compound Growth Rate (g), 1973/74 to 1980/81		
	<u>Low, g ≤ 5.0</u>	<u>Medium, 5 < g ≤ 15</u>	<u>High, g > 15</u>
Low L ≤ 50	Barisal Patuakhali	Khulna Faridpur Chittagong H.T. Noakhali Sylhet	Dinajpur Jessore Kushtia Pabna Tangail
Medium 50 < L ≤ 100	Chittagong	Dhaka Kishoreganj Mymensingh	Rajshahi Rangpur Bogra
High L > 100		Comilla	

a. During 1980/81. L = Fertilizer use level.

Table 2.9. Monthly Distribution of Fertilizer Sales in Bangladesh During 1982^a

Month	Monthly Sale as % of Annual Sale for				Monthly % Share of			
	Urea	TSP/DAP	MOP	Total	Urea	TSP/DAP	MOP	Total
January	8.2	9.1	11.4	8.6	62.4	31.1	6.5	100
February	11.4	8.7	8.6	10.5	71.5	24.5	4.0	100
March	12.5	4.7	5.3	9.8	83.3	14.0	2.7	100
April	5.7	6.3	8.3	6.0	62.3	30.8	6.9	100
May	5.9	3.5	4.0	5.1	75.8	20.3	3.9	100
June	9.1	4.4	4.1	7.4	79.9	17.4	2.7	100
July	3.2	5.5	3.9	3.9	53.7	41.4	4.9	100
August	5.1	5.8	4.6	5.3	63.2	32.5	4.3	100
September	14.7	3.6	3.1	10.8	88.8	9.8	1.4	100
October	7.8	12.9	11.8	9.5	54.0	39.9	6.1	100
November	7.7	20.5	19.4	12.0	41.9	50.2	7.9	100
December	8.8	14.9	15.5	10.9	52.7	40.2	7.0	100
Total (%)	100	100	100	100	65.6	29.4	4.9	100
('000 mt)	(544)	(244)	(41)	(829)	(544)	(244)	(41)	(829)

a. Original data were obtained from BADC (1983).

CHAPTER 3ANALYSIS OF FERTILIZER MARKETING POLICY

Fertilizer price deregulation at the retail level was conceived as one of the important components of privatization of fertilizer marketing initiated through the establishment of the New Marketing System (NMS) in Bangladesh. Furthermore, retail fertilizer prices are influenced by the operational efficiency of the marketing system, fertilizer marketing costs, and government rules which regulate the behavior and performance of the marketing system. Consequently, it is important to understand the fertilizer marketing system in order to evaluate the economic impact of fertilizer price deregulation. Specifically, the purpose of this chapter is fivefold: (1) to discuss the evolution of the fertilizer marketing system, (2) to describe the existing fertilizer marketing organization and channels, (3) to analyze fertilizer marketing costs and margins, (4) to discuss fertilizer market equilibrium, and (5) to evaluate the operational efficiency of the fertilizer marketing system.

Evolution of the Fertilizer Marketing System

Fertilizer was introduced in Bangladesh around 1951. The market for fertilizer has expanded from merely 3,000 long tons of product in 1951/52 to 73,000 long tons of product in 1962/63 to almost 823,000 long tons of product in 1981/82. The fertilizer marketing system in Bangladesh is by no means a "static" system. In the last 10 years, the marketing system has experienced several major changes, and it appears to be adjusting well to these changes.¹

Phase I

The Bangladesh Agricultural Development Corporation (BADC) has been responsible for marketing fertilizer since 1962/63. The predecessor of BADC was the East Pakistan Agricultural Development Corporation (EPADC), which was established in 1961; the name was changed to BADC in 1971. BADC is a corporation

1. Further details on different aspects of the fertilizer marketing system in Bangladesh are available in several IFDC publications, including Chuang, Hill, and Barnett (1978); Hill and Benton (1979); Hill and Benton (1980); Clayton (1981); IFDC (1982); and Moots (1982).

which is wholly owned by the government. The key regulatory features of this so-called Old Marketing System (OMS) were the following:

1. BADC, an "absolute public monopoly" was responsible for procuring and distributing fertilizer up to the level of Thana Sales Center (TSC), beyond which private dealers and cooperatives sold to farmers.
2. The private dealers, 15 in every union, were appointed by BADC, and each dealer was assigned to a fixed marketing territory.
3. The fertilizer retail price at which a dealer could sell to a farmer was fixed and uniform throughout the country.
4. The dealer's commission was fixed by BADC at a level which was low and perceived by dealers as providing limited economic incentive.

Phase II

The New Marketing System (NMS) was first introduced in Chittagong Division on December 1, 1978; it was expanded to Dhaka and Khulna Divisions on January 1, 1980, and later expanded to the whole country (except Chittagong Hill Tracts) on July 1, 1980. The primary features of NMS included the following:

1. BADC was still "absolute public monopoly" for fertilizer procurement but its role in fertilizer distribution was reduced to Primary Distribution Points (PDPs) and viable TSCs only.
2. Any number of private dealers could sell fertilizer by merely registering with BADC without any restrictions on their number or market territory (except within the 5-mile border zone).
3. The retail price at which a dealer could sell fertilizer to a farmer was still fixed and uniform throughout the country.
4. The economic incentives to private dealers were expanded (but were still regulated) through an increase in dealer's commission, price flexibility at wholesaler level, quantity discounts and credit facilities.

Phase III

The NMS was further modified by deregulating retail fertilizer prices. The price deregulation was first introduced in the Chittagong Division on April 1, 1982, and later expanded to the whole country (except Chittagong Hill Tracts) on April 1, 1983. The concept of price deregulation in this context is rather limited. The PDP and TSC prices are still regulated by BADC and are fixed at

the same level across all PDPs or TSCs for a particular fertilizer. However, the dealers are free to sell fertilizer to farmers at any price.

Fertilizer Marketing Channels

Marketing Organization

The fertilizer marketing system in Bangladesh is organized somewhat like a "pyramid." BADC, an absolute public monopoly, is responsible for procuring fertilizer from domestic fertilizer plants (except ammonium sulfate) and through imports (commercial or grants) at the national level. BADC is also responsible for distributing nationally procured fertilizer up to PDPs and TSCs through various transit and intermediate warehouses. As shown in Figure 3.1, a large number of private dealers and cooperatives sell fertilizer to farmers, directly as well as through their subdealers. The private fertilizer dealers at the retail level compete with each other and with cooperatives involved in fertilizer sales.

Spatial Dimensions

According to Bangladesh Bureau of Statistics (1982a) and Bangladesh Times (1983), as of 1983, Bangladesh is divided into 4 administrative divisions, 21 districts, 65 subdivisions, 477 thanas, and 4,420 unions. There are about 65,000 villages in Bangladesh and each union consists of approximately 15 villages. Furthermore, the total number of households in Bangladesh is about 13.47 million, and 6.256 million of these are directly involved in farming--58% as owners, 41% as owner-cum-tenants, and the remaining less than 1% as pure tenants. The large number of small farmers, who are widely and remotely distributed across the countryside, provide a challenge and an opportunity to make the right kind of fertilizer available in adequate quantities to all farmers at the right time and at reasonable prices.

Fertilizer Allocation

The national targets for fertilizer sales are set for the long term (as part of 5-year plans) and short term (as annual targets which are derived from long-term targets). The national annual target is then split into district-level monthly/seasonal targets. BADC then allocates fertilizer to each district

according to these targets. The fertilizer allocation is, however, adjusted from time to time in view of changes in fertilizer demand and supply at the district and national levels. Such a strategy ensures equitable distribution of fertilizer to different districts but also implies a maximum limit on the amount of fertilizer a dealer can purchase and sell. There are also regulations that impose a minimum-limit on the amount of fertilizer a dealer can purchase from a PDP or TSC, especially in periods of scarcity.

Marketing Channels

The fertilizer marketing channels in Bangladesh, as outlined in Figure 3.1, can be broadly divided into three categories: (1) government, (2) private, and (3) cooperatives. The role of government in retailing fertilizer is rather limited to a few selected areas only. In these areas the private dealers and cooperatives are not allowed to sell fertilizer.

The private fertilizer dealers operate at both wholesale and retail levels. The PDP and TSC dealers purchase fertilizer from BADC and sell fertilizer through their own outlets as well as through their subdealers. In the NMS, there are no restrictions on the number or market territory of fertilizer dealers and subdealers.

The cooperatives are also involved in fertilizer marketing at both wholesale and retail levels. Thana Central Cooperative Associations (TCCA) purchase fertilizer from BADC in wholesale and then distribute it through Krishi Samabaya Samity (KSS), and private dealers. In the OMS, the cooperatives were given preferential treatment over the private dealers. However, in the NMS some of these economic incentives have been withdrawn from cooperatives.

In the OMS approximately 75% of fertilizer was distributed through private dealers and the rest through cooperatives. In the NMS the share of private dealers in retail fertilizer distribution appears to have increased.

Dealer Profile

The precise information on the number of dealers (both wholesale and retail) in Bangladesh is rather sketchy. The following information on the number of dealers is based on several sources including Chuang, Hill, and Barnett (1978); Hill and Benton (1980); and Moots (1982).

<u>Year</u>	<u>Registered Dealers</u>	<u>Active Dealers</u>	<u>% Active Dealers</u>
1977/78	35,425	18,800	53
1978/79	42,949	NA	NA
1979/80	44,376	NA	NA
1980/81	48,535	13,780	28

An increase in registered dealers is partly misleading. According to Moots (1982), in NMS the same dealer can be registered at more than one PDP, which results in double or triple counting in registered dealers, and 87% of registered dealers in NMS were also OMS dealers. Furthermore, the size of many retail fertilizer dealerships, as indicated by the amount of retail fertilizer sales, appears to be so small that it is not economically viable for an individual to deal exclusively in fertilizer. According to Hill and Benton (1980), 70% of active dealers are part time, and the average annual sale per dealer has increased from approximately 25 long tons in 1975/76 to 33 long tons in 1977/78.

Fertilizer Marketing Costs

In the absence of any subsidies, the actual fertilizer distribution costs in most developing countries are generally very high. Bangladesh is no exception. Furthermore, because of government regulations in the marketing system, hidden subsidies, and operational inefficiencies, the estimated marketing costs do not always reflect the actual costs of fertilizer marketing.

Magnitude of Incidental Costs

The magnitude of fertilizer incidental costs, as determined by the accounting system used by BADC, is based on cost estimates for moving fertilizer from port or factory to the farmer. The incidental costs are fixed at the same level for all the fertilizer materials, irrespective of the origin or destination of fertilizer, and whether the fertilizer is imported or domestically produced. The estimates of incidental costs in the NMS are as follows:

<u>Year</u>	<u>Incidental Costs^a</u>		
	<u>TK/Long Ton</u>	<u>TK/mt</u>	<u>% Increase</u>
1980/81	730	719	-
1981/82	-	750	4
1982/83	-	900	20

a. Effective July 1, 1982, the incidental costs were fixed in terms of TK/mt rather than TK/long ton.

These average incidental costs are added to average c. & f. or f.o.r. prices in order to obtain average delivered cost for fertilizer at the farmer level. The derived average fertilizer costs indirectly form the basis for establishing retail fertilizer price and determining fertilizer subsidy.

Relative Share of Incidental Costs

The magnitude of incidental costs is fixed at the same level for all the fertilizers, whereas the average fertilizer costs vary by fertilizer and their source of supply. As a result, the relative share of incidental costs in average fertilizer costs varies from one fertilizer to another. The relative share of incidental costs for different fertilizer is reported in Table 3.1 for Bangladesh. The relative share of incidental costs varies from 13% for DAP to 22% for urea during 1982/83.

Components of Incidental Costs

The magnitude of various components of incidental costs, along with their relative share, is reported in Table 3.2. During 1978/79 (transitional year between OMS and NMS), the average incidental costs for fertilizer marketing and distribution in Bangladesh were estimated to be TK 741.1/long ton (or about TK 730/mt). These costs are obtained by dividing total fertilizer marketing and distribution costs, as estimated by BADC, by total tonnage of fertilizer sold during a particular year.

The relative contribution of 15 individual cost components has also been estimated and reported in the table. During 1978/79, four components accounted for approximately 88% of total incidental costs. This includes 43.3% for movement and handling, 21.5% for commission, 18.1% for inventory loss, and 5.4% for staff pay and allowances. At this stage, it is important to point out that the incidental costs and their cost components are based on BADC's book-keeping system and hence do not reflect the actual fertilizer marketing and distribution costs.

As has been estimated by Hill and Benton (1980), the relative share of individual cost components at the district level has changed with the establishment of NMS. During 1978/79 the share of commission paid increased from 39% to 58%; the share of transport and handling cost declined from 15% to 3%; and the share of inventory interest declined from 30% to 26%. These shifts reflect the general philosophy underlying the NMS, i.e., increase economic incentives to

dealers and lower distribution costs through an improvement in operational efficiency in fertilizer marketing.

Dealer's Commission in the OMS

The commission paid to fertilizer dealers in the OMS was fixed by BADC. Broadly, three criteria were used to fix dealers' commissions: (1) the greater the distance of the dealer from BADC sale point, the greater the commission; (2) the commission was higher in the border zone than in the interior; and (3) the cooperatives were granted higher commissions than the private dealers. The evolution of commission for private fertilizer dealers in OMS is reported in Table 3.3. On the average, the commission increased from TK 45/long ton in 1973/74 to TK 141/long ton during 1977/78. From the BADC sale point to his store, the dealer pays all the costs from the commission.

Dealer's Commission in the NMS

As reported in Table 3.4, the process of establishing a commission for fertilizer dealers was simplified in the NMS. The commission at TSC was approximately 60% of that paid at PDP. This was partly because, on the average, the distance of the dealer from TSC was less than the corresponding distance from PDP. However, the commission is the same for all those buying from TSC or PDP, irrespective of their distance or mode of transportation. Quantity discounts are available for purchases from PDP but not from TSC. The dealer pays all the transportation and handling costs after fertilizer purchase from his commission. Since December 7, 1981, there has been no increase in the PDP or TSC commission for the fertilizer dealer.

Relative Share of Dealer's Commission

In Bangladesh, dealer's commission is equivalent to dealer discount from official retail fertilizer prices. The commission is already accounted for in estimating incidental costs. Fertilizer commission is uniform for all the fertilizers, irrespective of their PDP, TSC, or retail prices. As reported in Table 3.5, the fertilizer commission during 1983 at PDP was approximately 7%-9% and at TSC was 4%-5% of the official retail price. Even though the commission was uniform for all the fertilizers, the percentage of commission was high for low-priced fertilizers and vice versa. At the PDP level, dealer commission was even higher for those who were eligible for a quantity discount, which was TK 30/mt to TK 40/mt, depending upon the quantity purchased.

Fertilizer Market Equilibrium

First, fertilizer demand is seasonal, whereas fertilizer production is a continuous process. However, fertilizer imports create discontinuity in fertilizer supply, especially at low levels of fertilizer production.

Second, fertilizer demand is diffused all over the country, whereas fertilizer supply is localized depending upon the number and location of fertilizer plants and ports.

Third, there is a need to make a clear distinction between (1) fertilizer available at the national level with BADC and BCIC; (2) fertilizer available with BADC, including transit godowns, warehouses at the port, and ships at port or in high seas; (3) fertilizer available with BADC for immediate distribution; and (4) fertilizer available with fertilizer dealers.

These factors have important implications for fertilizer market equilibrium, storage needs, size of inventory and fertilizer transportation. Proper planning of fertilizer supply to meet seasonal fertilizer requirements is necessary and large capital investments are required to build storage facilities at strategic points as well as adequate transportation facilities.

Conceptually, fertilizer market is in equilibrium when

$$(3.1) \quad D(t) = S(t),$$

$$(3.2) \quad D(t) = C(t) + T(t), \text{ and}$$

$$(3.3) \quad S(t) = P(t) + I(t) + T(t-1),$$

where $D(t)$ is annual demand for fertilizer, $S(t)$ is annual supply of fertilizer, $C(t)$ is annual consumption of fertilizer, $T(t)$ is annual fertilizer stocks, $P(t)$ is domestic fertilizer production, $I(t)$ is net fertilizer imports (total imports minus total exports), and $T(t-1)$ is stocks carried over from previous year.

According to FAO statistics on fertilizer consumption and production, worldwide fertilizer market is approximately in equilibrium when $S(t)$ exceeds $D(t)$ by 3% to 7%, depending upon the fertilizer and international market conditions. This allows for fertilizer losses and fertilizer in the pipeline. However, at the national level $S(t)$ should generally exceed $D(t)$ by more than 7%. This is especially important for developing countries like Bangladesh in order to account for the following factors:

1. Fertilizer losses.
2. Safety stock.
3. Stock with speculating dealers.

4. Fertilizer in pipeline.
5. Shutdown of fertilizer plants.
6. Late arrival of imported fertilizer.
7. Fertilizer movement across borders.

These factors reduce effective fertilizer supply, i.e., reduce fertilizer availability in local markets for purchase by farmers, especially in the peak fertilizer demand months. However, the relative importance of these factors as well as the optimum size of fertilizer stocks may vary from one country to another. Lack of an effective market communication and infrastructure, which is prevalent in most developing countries, further reinforces the need for efficient supply management, proper planning, and floating stocks.

In the OMS, BADC buffer-stock policy implied sales-to-inventory ratio of 2.4 at the national level (5 month stock or 42% of target sales) and 4.0 at the district level (3 month stock or 25% of target sales). According to Moots (1982), in the NMS efforts are being made to maintain sales-to-inventory ratios of 3.1 at the national level and 3.0, 4.4, 2.9, and 2.3 in Dhaka, Chittagong, Rajshahi, and Khulna divisions, respectively. These buffer stocks, which appear rather large and expensive to maintain, are expected to ensure adequate fertilizer availability in Bangladesh. Seasonal variation in fertilizer consumption does create an additional economic burden on the marketing system in the form of large fertilizer stock requirements.

Operational Efficiency of Marketing System

Government intervention and distortions in the fertilizer market make it difficult to determine the operational efficiency of the marketing system. Despite serious constraints with respect to infrastructure and resources, the marketing system in Bangladesh is performing rather well in providing fertilizer to farmers on time and in adequate quantities. There is, however, substantial scope for reducing fertilizer marketing costs and improving the operational efficiency of the marketing system.

Fertilizer Transportation

According to Moots (1982) and BADC sources, fertilizer transportation modes included the following:

<u>Transport Mode</u>	<u>Up To District</u>	(%)	<u>Within District</u>
Rail	37		<5
Water	21		30-35
Road	42		60-65
Total	100		100

Many different modes of transport, except rail, were used to carry fertilizer from PDP or TSC to dealer stores. Finally, as reported in Table 3.6, 67%-82% of the farmers carried their fertilizer from dealer stores to farms on head.

BADC has limited control of fertilizer movement since it is transported by other government agencies and by the private sector. As a result, sometimes it takes several weeks for fertilizer to arrive at dealer stores. Fertilizer transport is cheapest by water and most expensive by road. Proper planning and adequate allocation of boats and railcars for transporting fertilizer would not only expedite fertilizer movements but would also lower transportation costs.

Fertilizer Storage

According to BADC (1983) the total fertilizer storage capacity available to BADC as of July 1, 1983, was as follows:

<u>Type</u>	<u>Transit</u>	<u>PDP</u>	<u>TSC</u>	<u>Total</u>
		('000 mt)		
Own	36.5	104.9	17.3	158.7
Rented	35.2	151.3	22.4	208.9
Total	71.7	256.2	39.7	367.6

The storage capacity would increase substantially once the construction of proposed warehouses is complete. This is expected to remove one of the primary constraints on timely fertilizer availability to dealers.

Loose Fertilizer Sales

As reported in Table 3.7, approximately 80% of urea, 90% of TSP, and 100% of MOP sales are in loose form, and the rest in bags. As a result, there

is a possibility for adulteration, underweighing, and deterioration of fertilizer. There is, albeit limited, evidence that these problems do exist in Bangladesh. However, not enough is known about violations in fertilizer quality control. One way to reduce such problems is to use small-size bags. This may increase bagging cost, but the standard quality and the convenience of carrying smaller bags as head load will compensate for the added cost.

Source of Information

One of the functions of an efficient marketing system is to provide technical and market information to farmers. As reported in Table 3.8, approximately 80% of the farmers receive no information about fertilizer. About 10% of the farmers receive information from the dealers. Clearly, it is possible to improve the information base and its transfer so that farmers are in a better position to make decisions with respect to purchase and use of fertilizer. Dealers could be one logical source of such information. Since most dealers know little about agriculture, however, there is also a need for an agricultural extension service to develop and disseminate information related to efficient and economical fertilizer use.

New Marketing System

The overall objective of the NMS is to improve the operational efficiency of fertilizer marketing. This is being accomplished through (1) an improvement in economic efficiency in fertilizer marketing from supply source to farmer and (2) an increased availability of quality fertilizers to all classes of farmers in the country at competitive prices.

Some of the reforms under NMS include expanded role of the private sector, fertilizer price deregulation, creation of additional fertilizer storage facilities, streamlining fertilizer procurement through imports, and improving fertilizer marketing and distribution systems. The underlying purpose for these reforms is to reduce marketing constraints, reduce fertilizer delivery costs, increase fertilizer availability in all areas and to all farmers, and increase opportunities for greater competition at all levels.

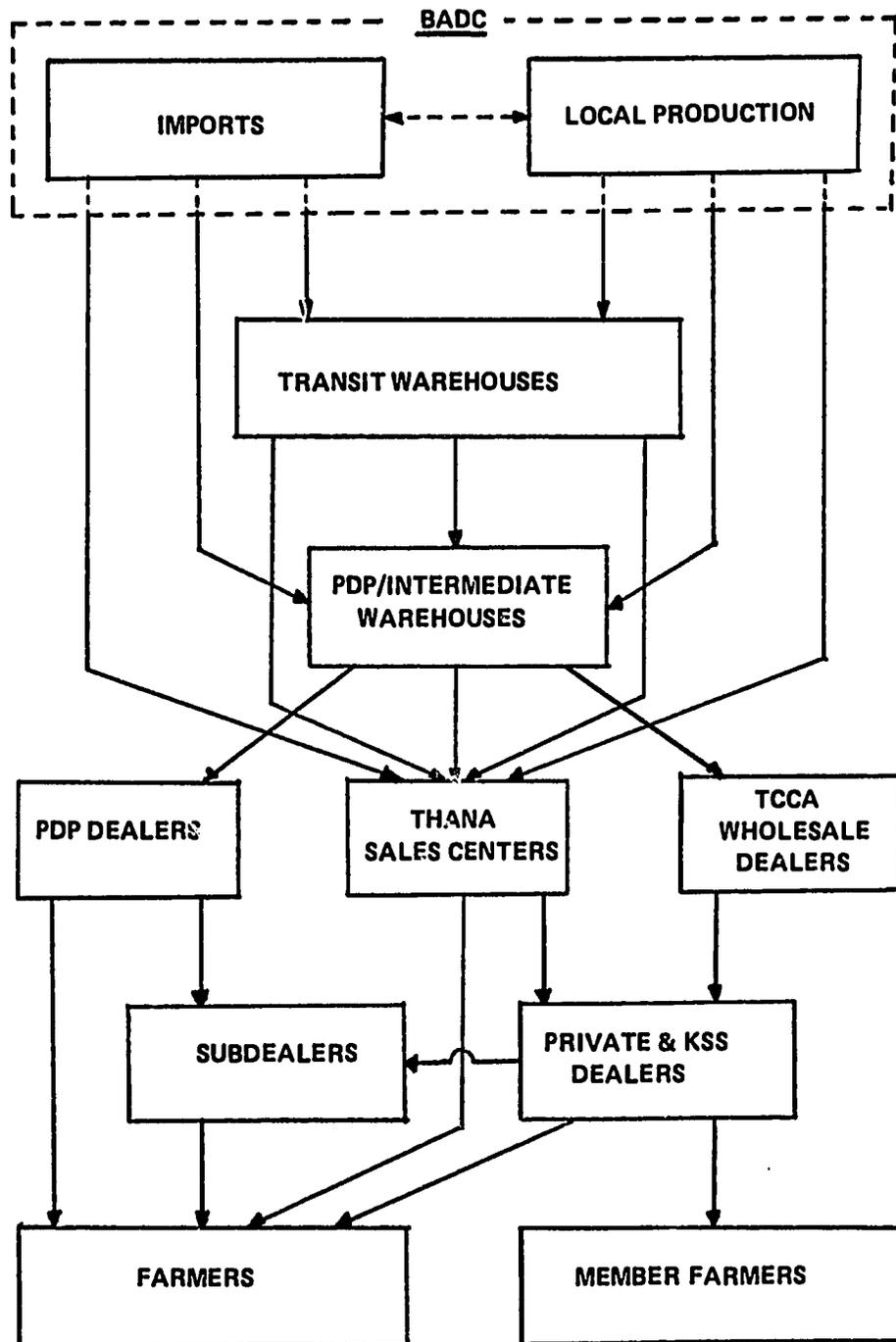


FIGURE 3.1: FERTILIZER MARKETING CHANNELS UNDER NEW MARKETING SYSTEM IN BANGLADESH (MODIFIED FROM HILL AND BENTON, 1980)

Table 3.1. Relative Share of Fertilizer Incidental Costs in Average Fertilizer Costs in Bangladesh^a

Fertilizer	Average Fertilizer Costs ^b		Incidental Costs		Incidental Costs as % of Average Costs	
	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83
	----- (TK/mt) -----		-----		----- (%) -----	
Urea (local) ^c	2,795	4,080	719	900	26	22
TSP (local)	5,069	6,319	719	900	14	14
TSP (imported)	5,779	5,945	719	900	12	15
DAP (imported)	6,503	6,694	719	900	11	13
MOP (imported)	4,014	4,370	719	900	18	21

a. The original fertilizer and incidental cost estimates were obtained from various BADC sources, including BADC (1981).

b. Average fertilizer cost = average c. & f./f.o.r. fertilizer cost + average fertilizer incidental cost.

c. During 1982/83 the average costs refer to the weighted average of the local and imported urea.

Table 3.2. Estimated (Not Actual) Incidental Costs for Marketing and Distributing Fertilizer by BADC in Bangladesh During 1978/79

Cost Component	Incidental Costs	
	TK/Long Ton Sold ^a	Percent of Total ^b
Movement and handling ^c	320.6	43.3
Commission paid ^d	159.6	21.5
Inventory loss ^e	134.1	18.1
Overhead ^f	17.5	2.4
Staff pay and allowances	40.3	5.4
Physical verification and rebagging	1.8	0.2
Godown rent and depreciation	21.7	2.9
Depreciation of vehicles and equipment	6.0	0.8
Repairs and maintenance ^g	2.1	0.3
Establishment costs ^h	8.1	1.1
Cost of dunnage	1.5	0.2
Cost of tarpaulin	1.2	0.2
Publicity and advertising	1.0	0.1
Interest on working capital ⁱ	20.3	2.7
Marine insurance	5.2	2.7
Total^j	741.1	100.0

a. Obtained from Benton (1979). The cost of each component may have changed due to the implementations of the NMS. According to Benton (1979), the average incidental costs from 1973/74 to 1977/78 were 254, 499, 624, 478, and 467 TK/long ton sold.

b. The relative share of each cost component may have changed due to disproportionate changes in costs of each cost component.

c. Includes (1) internal movement cost, (2) railway and steamer freights, (3) c. & f. handling charges, and (4) port dues, bank charges, surveys, etc.

d. Paid to dealers in the form of retail price discounts. Due to the introduction of NMS, about 13% of the sales received higher commission at TK 230/ton at PDPs.

e. Estimated at 4% of sales receipts. In other words, 4% of weighted average cost per ton (TK 3,352/ton).

f. BADC/Dhaka headquarter costs allocated to fertilizer scheme.

g. Repairs and maintenance of godowns, vehicles, furniture, and office equipment.

h. Cost of operating the district, subdivision, and thana offices.

i. Was higher than previous years due to policy change by Ministry of Finance--BADC was required to pay for imports which meant increased borrowings.

j. Includes TK 0.1/ton for training.

Table 3.3. Evolution of Commission for Fertilizer Dealers in the OMS in Bangladesh^a

Year	Effective From	Commission Tier (miles)	Commission		
			TK/md	TK/Long Ton	Average TK/Long Ton ^b
1973/74	June 1, 1973	0-2	1.15	31.30	45.00
		2-4	1.41	38.40	
		4-6	1.65	44.90	
		6-9	2.00	54.40	
		>9	2.52	68.60	
1974/75	March 27, 1974	0-3	1.75	47.60	60.00
		3-6	2.00	54.40	
		6-9	2.25	61.20	
		>9	2.52	68.60	
1975/76 ^c	January 7, 1975	0-3	3.50	95.30	119.00
		3-6	4.00	108.90	
		6-9	4.50	122.50	
		>9	5.00	136.10	
1976/77 ^d		- ^e	-		119.00
1977/78 ^f	January 1, 1978	0-6	4.00	108.90	141.00
		>6	6.00	163.30	

a. This table is based on information obtained from several BADC and non-BADC sources.

b. According to Benton (1979) from 1973.74 to 1977/78 the average reported commission was 44, 60, 116, 119, and 101 TK/long ton sold as compared to average estimated commission of 58, 70, 130, 130, 135 TK/long ton sold for the corresponding years.

c. Excluding Chittagong Hill Tracts where the commission was slightly higher, effective January 6, 1976.

d. Same as for 1975/76.

e. Information not available.

f. The cooperative sector was favored over private sector through higher commission.

Table 3.4. Evolution of Commission for Fertilizer Dealers in the NMS in Bangladesh^a

Year	Effective From	Commission at			
		PDP		TSC	
		TK/Long Ton	TK/mt	TK/Long Ton	TK/mt
1978/79	December 1, 1978	230.00		136.10	
1979/80	December 1, 1979	230.00		136.10	
1980/81	November 2, 1980	230.00	226.45	136.10	134.01
1981/82	December 7, 1981	280.00	275.68	163.33	160.80
1982/83	August 3, 1982 ^b	-	275.00	-	160.00
1983/84	As of April 1983 ^b	-	275.00	-	160.00

a. This table is based on information obtained from several BADC and non-BADC sources. Dealer pays all the freight and handling cost after fertilizer purchase.

b. In addition to commission, quantity discounts were given at PDP at TK 30/mt for lifting ≥ 15 mt, and TK 40/mt for lifting ≥ 25 mt.

Table 3.5. Fertilizer Dealer Discount (Commission) From Official Retail Fertilizer Price in Bangladesh During April 1983

<u>Fertilizer</u>	<u>Official Retail Price^c</u> (TK/mt)	<u>PDP Price Discount^a</u>		<u>TSC Price Discount^b</u>	
		<u>TK/mt^d</u>	<u>% of Retail Price</u>	<u>TK/mt^d</u>	<u>% of Retail Price</u>
Urea	3,970	275	6.9	160	4.0
GTSP	3,750	275	7.3	160	4.3
PTSP	2,950	275	9.3	160	5.4
DAP	3,970	275	6.9	160	4.0
MOP	2,950	275	9.3	160	5.4

a. In addition, quantity discount was allowed at TK 30/mt if the quantity lifted at a time was at least 15 mt; and at TK 40/mt if the quantity lifted was at least 25 mt. Minimum quantity which a dealer must lift was 3.0 mt, except in Barisal, Faridpur, Patuakhali, and Khulna districts where the minimum requirement was 1.0 mt.

b. No such quantity discounts were allowed. Minimum quantity which a dealer must lift was 0.75 mt.

c. Effective July 1, 1982.

d. Effective December 7, 1981.

Table 3.6. Percentage of Farmers Using Different Modes of Fertilizer Transportation in Bangladesh

Mode of Transportation	Month/Year							
	1981 December	January	February	March	1982 April	May	June	July
	---(%)--							
Cart/tomtom	5.1	7.9	8.8	6.3	9.1	9.3	9.9	7.4
Head/kuli/laborer	81.6	75.5	72.7	78.1	73.8	68.5	68.2	66.9
Rickshaw	6.6	11.0	12.0	8.2	9.0	7.8	7.0	8.2
Boat/launch	4.4	2.6	3.2	2.6	2.5	5.8	6.0	12.3
Bus/motore	1.5	0.8	0.1	1.4	3.3	5.2	7.9	4.5
Bicycle	0.8	2.2	3.2	3.4	2.3	3.4	1.0	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of farmers surveyed	473	607	697	697	569	463	302	269

Table 3.7. Distribution of Loose or Bagged Fertilizer Sales in Bangladesh

<u>Month/Year</u>	<u>Urea</u>			<u>TSPG</u>			<u>MOP</u>		
	<u>Bagged</u>	<u>Loose</u>	<u>Total</u>	<u>Bagged</u>	<u>Loose</u>	<u>Total</u>	<u>Bagged</u>	<u>Loose</u>	<u>Total</u>
					(%)				
<u>1981</u>									
December	13.0	87.0	100.0	5.4	94.6	100.0	1.1	98.9	100.0
<u>1982</u>									
January	20.9	79.1	100.0	6.4	93.6	100.0	2.2	97.8	100.0
February	34.4	65.6	100.0	13.0	87.0	100.0	2.7	97.3	100.0
March	25.6	74.4	100.0	6.7	93.3	100.0	2.0	98.0	100.0
April	20.4	79.6	100.0	7.7	92.3	100.0	- ^a	100.0	100.0
May	20.2	79.8	100.0	6.8	93.2	100.0	-	100.0	100.0
June	21.4	78.6	100.0	2.9	97.1	100.0	-	100.0	100.0
July	22.7	77.3	100.0	12.5	87.5	100.0	-	100.0	100.0
August	22.7	77.3	100.0	17.2	82.8	100.0	-	100.0	100.0
September	25.1	74.9	100.0	5.9	94.1	100.0	-	100.0	100.0
October	30.8	69.2	100.0	11.8	88.2	100.0	-	100.0	100.0
November	12.3	87.7	100.0	6.5	93.5	100.0	-	100.0	100.0
December	15.2	84.8	100.0	21.6	78.4	100.0	1.4	98.6	100.0
<u>1983</u>									
January	18.0	82.0	100.0	16.4	83.6	100.0	3.1	96.9	100.0
February	22.2	77.8	100.0	10.5	89.5	100.0	-	100.0	100.0
March	28.7	71.3	100.0	2.3	97.7	100.0	-	100.0	100.0
April	22.7	77.3	100.0	12.4	87.6	100.0	-	100.0	100.0
May	19.5	80.5	100.0	6.6	93.4	100.0	-	100.0	100.0
June	18.7	81.3	100.0	7.2	92.8	100.0	-	100.0	100.0
July	20.8	79.2	100.0	16.8	83.2	100.0	2.1	97.9	100.0

a. None of the quantity was bought in bags.

Table 3.8. Sources of Fertilizer Information to Farmers in Bangladesh

Source of Fertilizer Information	Month/Year																			
	1981				1982								1983							
	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
Information not available	72.3	74.2	81.9	83.2	63.7	62.1	74.8	76.2	77.4	82.1	85.5	82.9	82.9	81.9	86.3	88.8	83.5	85.9	87.1	88.8
TAO ^a	18.8	19.9	16.7	13.1	13.5	15.1	12.0	7.0	3.6	2.8	2.1	2.8	4.3	7.6	5.4	2.9	3.3	3.8	3.1	1.4
Dealer	4.1	5.7	1.4	3.7	22.4	21.3	11.2	14.0	15.4	11.6	11.8	14.0	12.2	10.5	7.9	7.9	10.6	8.0	8.8	7.9
Radio/newspaper	0.2	0.2	- ^b	-	0.2	-	0.9	1.4	1.8	-	0.3	-	-	-	-	-	-	-	-	-
Neighbor	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal farmer	4.0	-	-	-	-	1.5	1.1	1.4	1.8	3.5	0.3	0.3	0.6	-	0.4	-	0.4	0.8	0.6	0.8
School teacher	0.4	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	1.8	1.7	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of farmers surveyed	469	612	697	696	570	465	349	358	279	319	339	392	351	437	467	518	491	477	510	429

a. Or other extension agency in the agricultural department.

b. No information was available.

CHAPTER 4EVALUATION OF FERTILIZER PRICE AND SUBSIDY POLICY

The economics of fertilizer use at the farm level depends upon fertilizer price, crop price, and crop response to fertilizer use, with appropriate adjustments for price and yield variability and cost of credit. In order to improve the consumer welfare, particularly in urban areas, governments in most developing countries tend to keep food prices received by farmers below the market prices. In order to compensate partly for the loss of income to farmers due to cheap food pricing policy and partly for high fertilizer cost due to protection of domestic fertilizer industry, governments tend to subsidize fertilizer. Bangladesh is no exception to this pattern. The purpose of this chapter is to evaluate fertilizer price and subsidy policy in Bangladesh and provide a perspective on policies designed to reduce fertilizer subsidy and to deregulate fertilizer prices at the retail level.

Price Policy Goals and Conflicts

The appropriateness of fertilizer price and crop price policy for a particular sector depends on the goals and preferences of decisionmakers, as conceptualized in Table 4.1. Fertilizer producers and distributors, as opposed to fertilizer users, generally prefer higher fertilizer prices. On the other hand, farmers with a marketable surplus, as opposed to consumers, prefer higher crop prices.

In a free-enterprise system, the market resolves these inherent conflicts where the demand and supply factors determine price. However, the fertilizer and crop markets in developing countries are far from perfect. As a result, governments intervene to resolve some of these conflicts. In the agricultural sector government intervention involves price regulation, fertilizer price subsidies, crop price supports, mandatory allocation of fertilizer to different regions, foreign exchange allocation for fertilizer imports, setting up of fertilizer plants, grain procurement, export and import quotas, and so on. Most of these government intervention policies tend to misallocate resources and

hence lower resource use efficiency. The magnitude and distribution of social benefits and costs of these policies varies not only among different sectors but also across different economic policies.¹

Behavior of Fertilizer Prices

Level of Fertilizer Prices

Fertilizer prices in Bangladesh have been regulated and subsidized by government. The level of official subsidized fertilizer prices from 1972 to 1983 is reported in Table 4.2, Table 4.3, and Figure 4.1. These prices are kept uniform throughout the country, and the uniformity is accomplished through freight equalization and transport subsidies. The fertilizer prices have been subsidized to provide incentives to farmers for increasing fertilizer use. The official regulated or administered fertilizer prices, however, have not always been effectively implemented.

Growth in Fertilizer Prices

Growth in official regulated fertilizer prices is reported in Table 4.4. It appears that every time the government has decided to raise the official fertilizer price, the increase has been substantial. Such large increases, no matter whether they are justified or not, tend to create significant adjustment problems with respect to fertilizer use by farmers and fertilizer distribution by dealers. This also makes planning for imports more difficult. From August 1979 to July 1982 (approximately 3 years) prices for three important fertilizers increased by 64% for urea, 100% for TSPG, and 100% for MOP. These 21%-33% annual increases, on the average, in fertilizer prices have been triggered by inflation and government's desire to reduce fertilizer subsidies. Instead of a large increase in prices once every few years it may be desirable to raise prices gradually every year.

1. Further discussion on price policy in the context of Bangladesh is available in Ahmed (1979, 1981), IFDC (1982), Mudahar (1983a), and World Bank (1979). General discussion on agricultural and fertilizer price policy in developing countries is available in Barker and Hayami (1976), Brown (1978), Mellor (1978), Mudahar (1978, 1979, 1983b), Mudahar and Pinstrup-Andersen (1977), Parthasarathy and Mudahar (1976), Krishna (1968), Schultz (1978), and Timmer and Falcon (1975).

Behavior of Crop Prices

Level of Food Grain Prices

The food grain procurement prices are regulated by government in Bangladesh. These prices are designed to serve as a floor for market prices but do not always hold.² Farmers selling their marketable surplus to government procurement centers are expected to receive, for a standard grade, procurement prices. On the other hand, farmers selling to private traders are expected to receive a price higher than procurement prices. However, in the postharvest season, when most of the produce is sold by farmers, the prevailing market price is not much different from the procurement price. The procurement price policy may not provide the needed production incentives, but it may reduce price uncertainty especially when the farmer is assured a minimum procurement price.

The levels of procurement prices for paddy (Aus, Aman, and Boro seasons), rice and wheat are reported in Table 4.5 and Figure 4.2. These prices are kept uniform throughout the country. On the other hand, the market prices are not uniform throughout the country. It is the market prices that determine the returns to investment in fertilizer use since the market prices are not always equal to procurement prices. According to Sidhu, Baanante, and Ahsan (1982), there was considerable variation in market prices for paddy across locations, seasons, and varieties, but not across different farm-size groups.

Growth in Food Grain Prices

The food grain prices received by farmers have not been increasing as rapidly as fertilizer prices paid by them. For example, from September 1976 to September 1982 (a period of 6 years), the procurement prices increased by 61% for Aman paddy and 65% for wheat. These 10%-11% annual increases, on the average, are generally lower than the price increases in fertilizer.

2. For example, the official prices from November 15, 1979, to November 14, 1980, were TK 105/md for Aus, Aman, and Boro paddy and wheat. On the other hand, according to Sidhu, Baanante, and Ahsan (1982), the average market prices received by farmers based on a sample survey during 1979/80 were, in terms of Taka per maund, 104 for HYV Boro paddy, 111 for LCV Boro paddy, 89 for HYV Aus paddy, 94 for LCV Aus paddy, 100 for HYV Aman paddy, 102 for LCV Aman paddy, and 101 for wheat.

Economic Incentives and Price Policy

According to the profit-maximizing-decision rule, the optimum level of fertilizer (nutrient) use for a particular crop is determined as:

$$(4.1) \quad F = \frac{1}{2c} \left[\left(\frac{P_F}{P_Q} \right) - b \right], \quad b > 0, \quad c < 0,$$

where F is the economically optimum level of fertilizer (nutrient) use, P_F is the fertilizer nutrient price paid by the farmer, P_Q is the crop price received by the farmer, and b and c are coefficients of the quadratic polynomial response function.

The levels of b and c depend upon the magnitude of crop response to fertilizer use, as reflected by the fertilizer response curve. In other words, the levels of b and c are determined by crop, crop variety, level of fertilizer use, type of fertilizer, fertilizer management, irrigation level, water control, and a host of other agroclimatic factors. The provision of these factors requires large investments in the form of agricultural research, fertilizer research, irrigation development, agricultural extension, and related infrastructure. Upward shifting of the fertilizer response function through technological progress is necessary, but it is not a sufficient condition for accelerating fertilizer use.

Along with efforts to shift the fertilizer response function, there is a need to improve the economics of fertilizer use through economic incentives. In this context, a higher level of economic incentives can be accomplished by manipulating fertilizer and crop prices so that the nutrient and crop price ratio $[P_F/P_Q]$ is relatively small.

The paddy price, nutrient prices for N , P_2O_5 , and K_2O , and the implied nutrient/paddy price ratios for Bangladesh are reported in Table 4.6. These ratios refer to an 11-year period from 1972/73 to 1982/83. The evolution of these price and price ratio series is also shown graphically in Figure 4.3 for N , in Figure 4.4 for P_2O_5 , and in Figure 4.5 for K_2O . This analysis clearly indicates that nutrient prices have been increasing much faster than the paddy prices, and the result has been increasing nutrient/paddy price ratios (as shown in the table) or declining paddy/nutrient price ratios (as shown in the figures).

The behavior of these price ratios is indicative of declining price incentives for expanding fertilizer use in Bangladesh. Any further increase in fertilizer prices, without a corresponding increase in crop prices, would further reduce economic incentives. Since a large number of farmers in Bangladesh are still at the lower levels of the learning curve, upward shifts in fertilizer response function through technological change and improvements in fertilizer use efficiency can, to some extent, compensate for declining paddy/nutrient price ratios.

Fertilizer Subsidy Policy

Types of Fertilizer Subsidy

In Bangladesh, fertilizer subsidy takes at least three forms and each is designed to lower retail fertilizer prices.

Fertilizer Production Subsidy--Fertilizer production subsidy is given directly to fertilizer producers. BADC acquires fertilizer from BCIC and fertilizer plants at a price that is determined by the government. Consequently, any direct or indirect subsidy given to fertilizer plants is not included in BADC's calculations of fertilizer subsidy.

Fertilizer Procurement Subsidy--Since BADC is responsible for importing and distributing fertilizer, a component of fertilizer subsidy that is attributed to imported fertilizer can be considered as procurement subsidy. Since BADC has access to foreign exchange and low interest credit, the true cost of procurement subsidy may be underestimated.

Fertilizer Transport Subsidy--The transport subsidy takes the form of payments to reduce transport costs to those areas that are farther away from the fertilizer supply point. Since BADC may get discounts and rebates on internal freight costs, the transport subsidy may result in an underestimate of true subsidy cost.

Level of Fertilizer Subsidy

Fertilizer subsidy estimates can be derived as follows:

$$(4.2) \quad S_j(t) = A_j(t) - R_j(t),$$

$$(4.3) \quad A_j(t) = P_j(t) + M_j(t), \text{ and}$$

$$(4.4) \quad S(t) = \sum_j S_j(t)T_j(t),$$

where $S_j(t)$ is fertilizer subsidy per unit (TK/mt), $A_j(t)$ is the acquisition price which is a sum of f.o.r. or c. & f. price [$P_j(t)$] and incidental costs [$M_j(t)$], $R_j(t)$ is official subsidized sale price, $T_j(t)$ is total sales for jth fertilizer, and $S(t)$ is total subsidy cost for all the fertilizers.

Total cost of fertilizer subsidy [$S(t)$] in Bangladesh is reported in Table 4.7. During 1981/82, fertilizer subsidy was about TK 1.355 billion (which was the highest since 1976/77). However, according to BADC, fertilizer subsidy has declined to TK 0.884 billion (approximately \$37 million) during 1982/83. Efforts are underway to completely remove fertilizer subsidy. During 1982/83, of the total fertilizer subsidy cost, the share of urea, TSP, DAP, and MOP was 8%, 62%, 22%, and 8%, respectively. This was in contrast with 1978/79, when 53% of the subsidy was for urea and 36% for TSP.

Rate of Fertilizer Subsidy

The rate of fertilizer subsidy, $r_j(t)$, can be estimated as follows:

$$(4.5) \quad r_j(t) = \left[\frac{A_j(t) - R_j(t)}{A_j(t)} \right] 100 = \left[\frac{S_j(t)}{A_j(t)} \right] 100.$$

The rate of fertilizer subsidy varies from one year to another and from one fertilizer to another, depending upon the magnitude of $A_j(t)$ and $R_j(t)$.

The estimated rate of subsidy for different fertilizers in Bangladesh is reported in Table 4.8. The rate of fertilizer subsidy has been fluctuating but is generally declining over time. During 1982/83, the estimated subsidy rate was lowest (3%) for urea and highest (50%) for TSP. This decline is due to the fact that the fertilizer sale price is increasing faster than the acquisition price. In other words, it is due to government's desire to reduce and ultimately eliminate fertilizer subsidies.

The absolute level and rate of subsidy, for a given level of sales price, depends on whether one uses acquisition price or border price to estimate fertilizer subsidy. The border price estimates are developed in Table 4.9, the three price concepts (acquisition price, border price, and sale price) are

compared in Table 4.10, and fertilizer subsidy estimates based on both acquisition price (as done by BADC) and border price are developed in Table 4.11.

The rate of subsidy for locally produced urea is 24% to 25% as compared with 0.6% when estimated by using the border price approach. This is simply due to the fact that BCIC transfers urea to BADC at a price which is lower than their own true production costs. Consequently, the actual subsidy on locally produced urea is much higher than BADC estimates indicate. On the other hand, the rate of subsidy based on border price for all other fertilizers, including imported urea, is lower than BADC estimates. As a result, the implicit economic subsidy on different fertilizers, except local urea, is lower than BADC estimates as well as estimates based on the acquisition price approach.

Benefits and Costs of Subsidy

Any form of government intervention, including fertilizer subsidies, has its economic benefits and costs. In order to evaluate returns to investment in fertilizer subsidy, one must compare actual benefits from fertilizer subsidy with potential benefits foregone from an alternative investment portfolio based on the opportunity cost concept. Any misallocation of resources results in a national economic loss due to lower efficiency in resource use. The capital-scarce countries, including Bangladesh, cannot afford inefficient utilization of capital. The estimated cost of fertilizer subsidy in Bangladesh during 1982/83 was approximately \$37 million (not including fertilizer production subsidy). This is the apparent financial cost, not economic cost, of fertilizer subsidy.

It is generally a misconception to believe that farmers are the only beneficiaries of fertilizer subsidy programs. Those farmers who use fertilizer do benefit, in the form of compensation, from fertilizer subsidies. But farmers are not the only beneficiaries of fertilizer subsidy. The indirect beneficiaries of fertilizer subsidies are consumers of those commodities on which subsidized fertilizer was applied. In order to reduce fertilizer subsidies, controls on crop prices must be eliminated or there must be some compensation so that economic incentives for food production are maintained. Most governments are reluctant to increase crop prices for fear of urban revolt and deterioration of nutritional standards of poor consumers. In addition to food consumers, the fertilizer industry also is enjoying government protection which is indirectly financed by taxpayers through fertilizer subsidies.

Alternatives to Fertilizer Subsidy

The long-term economically viable alternative to fertilizer subsidy is not a price support program but rather a reduction of fertilizer cost through improvements in production efficiency and marketing efficiency, and an increase in crop response to applied fertilizer through improvements in use efficiency.

When the local fertilizer plants are operated inefficiently, whatever the reasons, per-unit cost of fertilizer production increases. Under these circumstances there is no economic justification for either (1) having farmers subsidize an inefficient fertilizer industry by charging prices which may be higher than border prices or (2) labeling fertilizer production subsidy as subsidy to farmers. One can extend the same logic to fertilizer procurement and transport subsidies, if these subsidies exist because of inefficient procurement and/or transport systems. In this context, the initiation of NMS in Bangladesh is a step in the right direction.

Fertilizer Price Regulation

Price Regulation in Theory

Fertilizer is considered a strategic commodity in most food-deficit developing countries. In those countries that depend on imports, fluctuations in the international market often create instability in fertilizer prices domestically. Most governments in developing countries are hesitant to accept these fluctuations and to leave the determination of domestic fertilizer prices to forces which are beyond their control. Consequently, they justify price regulation to create price stability at the national level.

When national fertilizer supply is greater than national fertilizer demand, prices tend to drop in the absence of price regulations. For fertilizer producers, this creates a profit squeeze which may disrupt fertilizer supply and hence availability at the farm-level. On the other hand, when national fertilizer supply is lower than fertilizer demand, prices would tend to increase. The small farmers (with limited cash supply) and the farmers in remote areas (with high transport costs) may suffer. Under these circumstances, many governments feel obligated to regulate fertilizer prices.

The regulated price could be equal to, greater than, or lower than the market equilibrium price. If regulated price is lower than equilibrium price,

demand will exceed supply, creating fertilizer scarcity, a black market, and higher prices in the black market. On the other hand, if regulated price is higher than equilibrium price, supply will exceed demand, creating large inventories, dealer competition, and potentially lower prices.

Advantages of Price Regulation

First, all the farmers--rich or poor, large or small, remote or non-remote--pay the same price. As a result, there is no price discrimination. In practice, as will be shown later, this is not always true.

Second, at times when the market price is too high--due to reasons which are beyond the control of national government, such as the 1973/74 fertilizer crisis--dealers cannot take undue advantage of farmers by charging very high prices.

Third, price regulation keeps fertilizer prices low (through fertilizer subsidies); hence regulation is important and necessary in order to provide adequate economic incentives to farmers, especially when government follows a cheap food pricing policy and protects a high-cost domestic fertilizer industry.

Fourth, price regulation does lower price risk by stabilizing fertilizer prices around the regulated price.

Disadvantages of Price Regulation

First, due to distortions, the regulated price does not reflect the true economic value of fertilizer. In this context, regulation can result in misallocation of resources to manufacture, import, and distribute fertilizer, as well as misallocation of fertilizer across different crops and regions.

Second, when price is regulated, the market cannot provide the needed signals to the policymakers with respect to surplus or scarcity of fertilizer. In this context, the government may not be able to undertake a corrective action on time or may even take a wrong action.

Third, price regulation may provide disincentives to the private sector to invest in fertilizer manufacturing, imports, and distribution. Under these circumstances, government has to perform these functions regardless of its ability to do so. Consequently, government may end up paying a very high cost.

Fourth, under price regulation the commission for fertilizer dealers is generally fixed, often at a low level. This provides disincentives to private fertilizer dealers. These disincentives can result in (1) limited number of

full-time dealers, (2) limited number of dealers in remote areas due to high transport costs, and (3) lack of aggressiveness on the part of dealers to expand sales through promotion since the cost of promotion is greater than zero.

Fifth, price regulation does not promote competition. Lack of competition among dealers may result in high price, substandard quality of fertilizer, and poor service to farmers.

Sixth, fertilizer price regulation, along with a fixed commission for dealers, may reduce fertilizer availability in remote areas. In extremely remote areas the distribution costs of the dealer may be higher than the fertilizer commission allowed by the government. Under these circumstances, fertilizer dealers can potentially lose money in the fertilizer retail business.

Seventh, price regulation results in substantial administrative costs to government to enforce such fertilizer price regulation. There may be high economic payoffs, however, if this money is used to promote efficient use of fertilizer or build fertilizer infrastructure.

Price Deregulation in Bangladesh

Fertilizer price regulation was gradually phased out as an integral part of NMS in Bangladesh.

First, prior to April 1982, retail fertilizer prices were regulated and were kept uniform all over the country.

Second, effective April 1, 1982, retail fertilizer prices were deregulated in four districts of Chittagong division. Prices in Chittagong Hill Tracts remained regulated. Even in deregulated districts, PDP and TSC prices were still regulated and uniform.

Third, effective April 1, 1983, retail fertilizer prices were deregulated all over the country, except Chittagong Hill Tract district and the 5-mile border zone. However, PDP and TSC prices still remain regulated and uniform.

The economic impact of fertilizer price deregulation at the retail level depends upon several factors, including fertilizer supply and demand situation, the level of government intervention in the fertilizer sector, and level of fertilizer use. The impact of price deregulation on the level and variability of retail fertilizer prices is analyzed in the following chapter.

Table 4.1. Conceptualization of Price Policy Goals and Preferences for Decisionmakers in Different Sectors of a Developing Country

<u>Component</u>	<u>Decisionmaker</u>	<u>Goals and Preferences^a</u>
Fertilizer price paid by farmer	Producer	High → Higher profits
	Importer	High → Higher profits
	Dealer	High → Higher profit when commission is linked to price
	Farmer	Low → Lower production costs and larger profits
	Consumer	Low → Lower production costs and lower crop prices
	Government	High → Lower subsidy cost if prices are kept low through subsidy
Crop price received by farmer	Farmer	High → Higher profit and income
	Consumer	Low → Lower food prices and higher real income
	Government	Low → Lower procurement outlays and lower food prices for urban consumers

a. These may vary over time and across countries depending upon the level of government intervention through taxes, subsidies, and other compensatory policies in different sectors of the economy.

Table 4.2. Evolution of Official Subsidized Retail Fertilizer Prices in Bangladesh^a

Effective Date	Official Prices for						
	Urea	TSPG	TSPP	SSP (TK/md) ^b	MOP	DAP	NPK
July 1, 1972	20	15	-	-	10	-	-
July 1, 1973	40	30	-	-	20	-	-
July 10, 1973	30	20	-	-	15	-	-
April 1, 1974	50	40	-	-	30	-	-
February 5, 1975	50	40	-	-	30	-	40
June 17, 1975	50	40	-	20	30	-	40
July 1, 1976	60	48	-	20	40	-	40
December 15, 1976	60	48	-	22	40	-	45
July 1, 1978	70	55	-	22	45	-	45
October 3, 1978	70	55	-	22	45	-	55
October 16, 1978	70	55	-	22	45	70	55
August 27, 1979	90	70	60	22	55	90	55
October 25, 1979	90	70	60	22	55	90	70
November 2, 1979	110	90	80	22	70	110	90
January 1, 1981	110	90	80	30	70	110	90
December 7, 1981	132	115	95	30	90	132	115
July 1, 1982 ^c	148	140	110	30	110	148	140
March 31, 1983 ^d	148	140	110	30	110	148	140

a. Prices to be charged by fertilizer retailers were not to exceed these prices. The information was obtained from various BADC publications. Other chemical fertilizers are not included since they were not considered of major importance.

b. The prices can be converted from TK/md to TK/mt by multiplying these prices by 26.80 since 1 mt = 26.80 md.

c. These prices prevailed up to March 31, 1983

d. Effective April 1, 1983, there was no official regulated retail fertilizer price since prices were deregulated across the country.

Table 4.3. Dynamics of Official Subsidized Retail Fertilizer Prices in Bangladesh^a

Year	Month	Official Prices for			
		Urea	TSPG (TK/md)	MOP	DAP
1973	July-December ^b	30	20	15	-
1974	January-March	30	20	15	-
	April-December ^c	50	40	30	-
1975	January-December	50	40	30	-
1976	January-June	50	40	30	-
	July-December ^d	60	48	40	-
1977	January-December	60	48	40	-
1978	January-June	60	48	40	-
	July-December ^e	70	55	45	70
1979	January-July	70	55	45	70
	August-December ^f	90	70	55	90
1980	January-October	90	70	55	90
	November-December ^g	110	90	70	110
1981	January-November	110	90	70	110
	December ^h	132	115	90	132
1982	January-June	132	115	90	132
	July-December	148	140	110	148
1983	January-March ⁱ	148	140	110	148

a. Prices to be charged by fertilizer retailers were not to exceed these prices. The original information was obtained from various BADC publications.

b. Effective July 10, 1973.

c. Effective April 1, 1974.

d. Effective July 1, 1976.

e. Effective July 1, 1978. DAP prices became effective on October 16, 1978.

f. Effective August 27, 1979.

g. Effective November 2, 1980.

h. Effective December 7, 1981.

i. Effective April 1, 1983, there was no official regulated fertilizer price.

FIGURE 4.1: EVOLUTION OF OFFICIAL SUBSIDIZED RETAIL FERTILIZER PRICES IN BANGLADESH

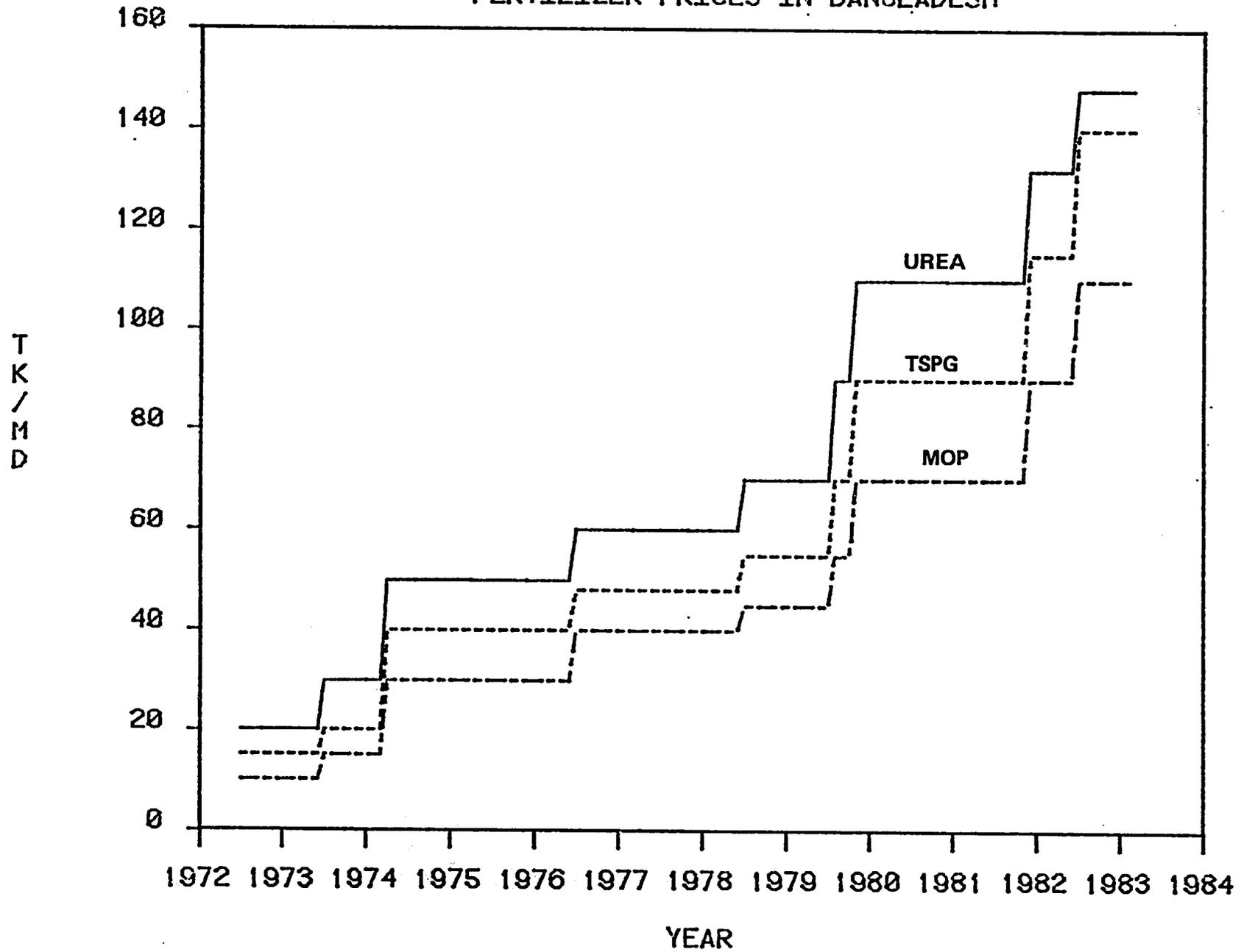


Table 4.4. Growth in Official Subsidized Fertilizer Prices in Bangladesh

Period	Number of Months ^b	Percent Growth in Prices Over Previous Level ^a		
		Urea	TSPG	MOP
July 1973 to March 1974	9	-	-	-
April 1974 to June 1976	27	67	100	100
July 1976 to June 1978	24	20	20	33
July 1978 to July 1979	13	17	15	13
August 1979 to October 1980	15	29	27	22
November 1980 to November 1981	13	22	29	27
December 1981 to June 1982	7	20	28	29
July 1981 to March 1983	9	12	22	22

a. Official price levels during July 1973 to March 1974 were, in terms of TK/md, 30 for urea, 20 for TSPG and 15 for MOP.

b. Number of months during each period when prices remained unchanged.

Table 4.5. Evolution of Food Grain Procurement Prices in Bangladesh^a

Effective Date	Rice						Wheat
	Aus		Aman		Boro		
	Paddy	Rice	Paddy	Rice	Paddy	Rice	
				(TK/md)			
January 15, 1972	- ^b	-	23	37	-	-	-
December 14, 1972	-	-	33	53	-	-	-
November 15, 1973	-	-	45	72	-	-	-
January 2, 1974 ^c	-	-	45	72	-	-	-
November 15, 1974 ^d	-	-	74	118	-	-	-
April 21, 1975	-	-	74	118	74	118	-
August 1, 1975	74	118	74	118	74	118	-
April 1, 1976	74	118	74	118	74	118	72
September 14, 1976	70	112	74	118	74	118	72
February 19, 1977	70	112	74	118	74	118	72
April 1, 1977	70	112	74	118	74	118	74
May 1, 1977	70	112	74	118	70	112	74
November 15, 1977	70	112	80	128	70	112	80
May 1, 1978	70	112	80	128	80	128	80
August 1, 1978	80	128	80	128	80	128	80
April 5, 1979	80	128	80	128	80	128	86
May 2, 1979	80	128	80	128	86	136	86
November 15, 1979	105	165	105	165	105	165	105
November 15, 1980	105	165	110	170	110	170	110
December 7, 1981	110	170	119	185	119	185	119
November 15, 1982 ^e	119	185	130	205			

a. Prices are obtained from Ministry of Food, Government of Bangladesh.

b. No procurement price.

c. Effective January 2, 1974, variable transport bonus was paid to farmers and traders delivering grains to the purchasing centers. This is not included in the procurement price.

d. The variable transport bonus was replaced by single uniform transport bonus effective November 15, 1974. It was TK 3/md up to September 14, 1976; TK 4/md from February 19, 1977 to May 2, 1979; and TK 5/md since November 15, 1979. However, transport bonus is not included in procurement prices.

e. During 1982/83, the average actual market price received by farmers for paddy was approximately TK 155/md or TK 4143/mt. However, there was a large variability in prices across different parts of the country. On milled rice basis, this price is equivalent to TK 6184/mt. On the other hand, the international prices (FAO, 1983b) for milled rice during 1982/83 were TK 6528/mt for 5% broken rice, f.o.b. Bangkok; and TK 9864/mt for Texas long grain No. 2, f.o.b. mills. Finally, the international price for wheat during 1982/83 was approximately TK 3840/mt for hard winter wheat No. 2, f.o.b. U.S. Gulf.

FIGURE 4.2: EVOLUTION OF OFFICIAL PADDY PROCUREMENT PRICE IN BANGLADESH

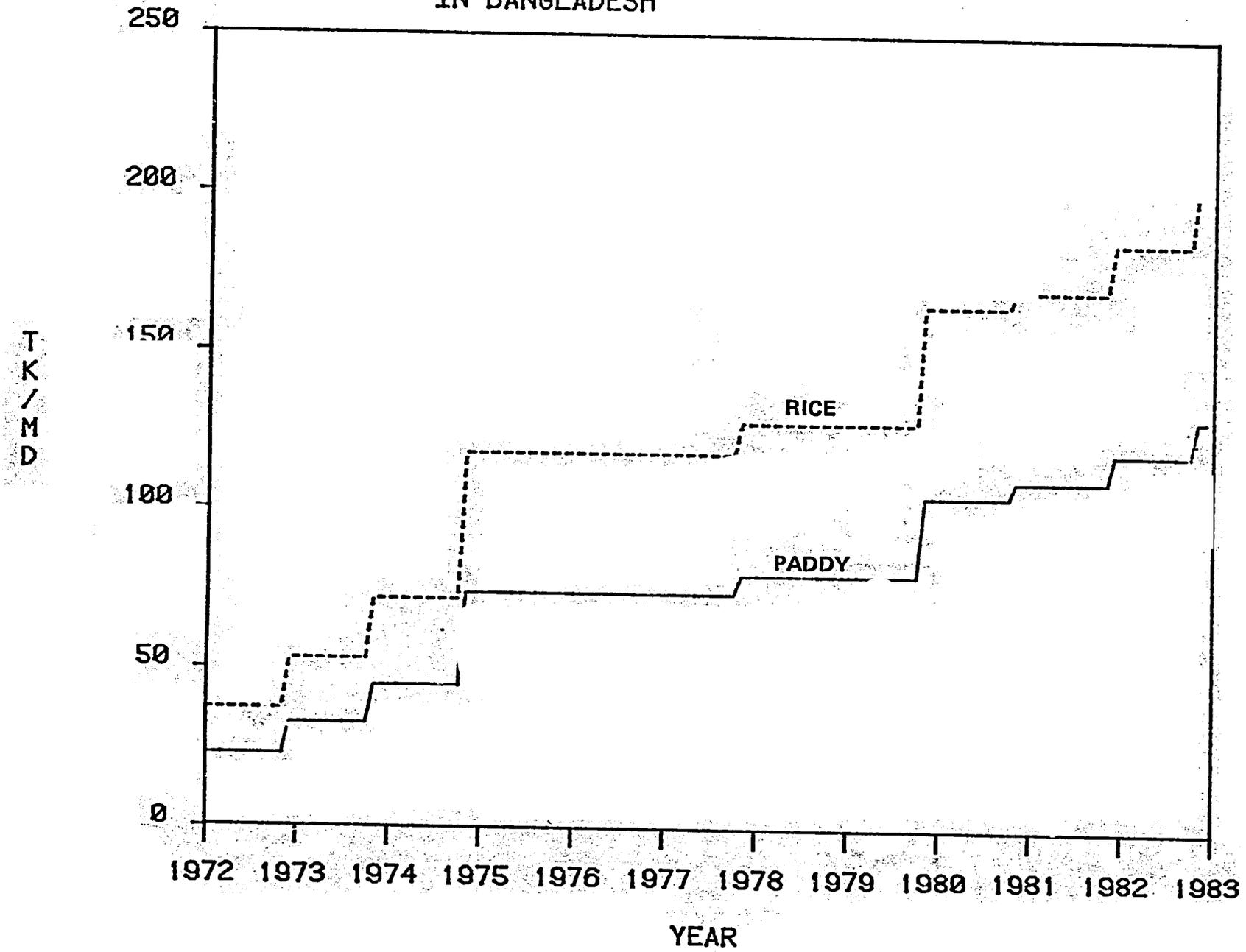


Table 4.6. Evolution in Official Paddy Procurement Price, Fertilizer Retail Prices, and Implied Price Ratios in Bangladesh^a

Fiscal Year ^b	Procurement Paddy Price	Estimated Official Nutrient Prices for ^c			Implied Price Ratios for		
		N From Urea	P ₂ O ₅ From TSPG	K ₂ O From MOP	N/Paddy	P ₂ O ₅ /Paddy	K ₂ O/Paddy
		-(TK/md)-			- (kg paddy/1 kg nutrients) ^d -		
1972/73	33	43	33	17	1.3	1.0	0.5
1973/74	45	65	43	25	1.4	1.0	0.6
1974/75	77	109	87	50	1.4	1.1	0.6
1975/76	77	109	87	50	1.4	1.1	0.6
1976/77	78	130	104	67	1.7	1.3	0.9
1977/78	84	130	104	67	1.5	1.2	0.8
1978/79	84	152	120	75	1.8	1.4	0.9
1979/80	110	196	152	92	1.8	1.4	0.8
1980/81	115	239	196	117	2.1	1.7	1.0
1981/82	124	287	250	150	2.3	2.0	1.2
1982/83	135	322	304	183	2.4	2.3	1.4

- a. Official prices are obtained from previous tables. Paddy prices refer to Aman season.
b. July 1-June 30, although the cutoff points for corresponding prices are to some extent arbitrary.
c. Assuming 46% N in urea, 46% P₂O₅ in TSPG, and 60% K₂O in MOP.
d. These ratios imply kilogram of paddy needed to purchase 1 kg of nutrients.

FIGURE 4.3: DYNAMICS OF OFFICIAL N PRICES, PADDY PRICES AND PRICE RATIOS IN BANGLADESH

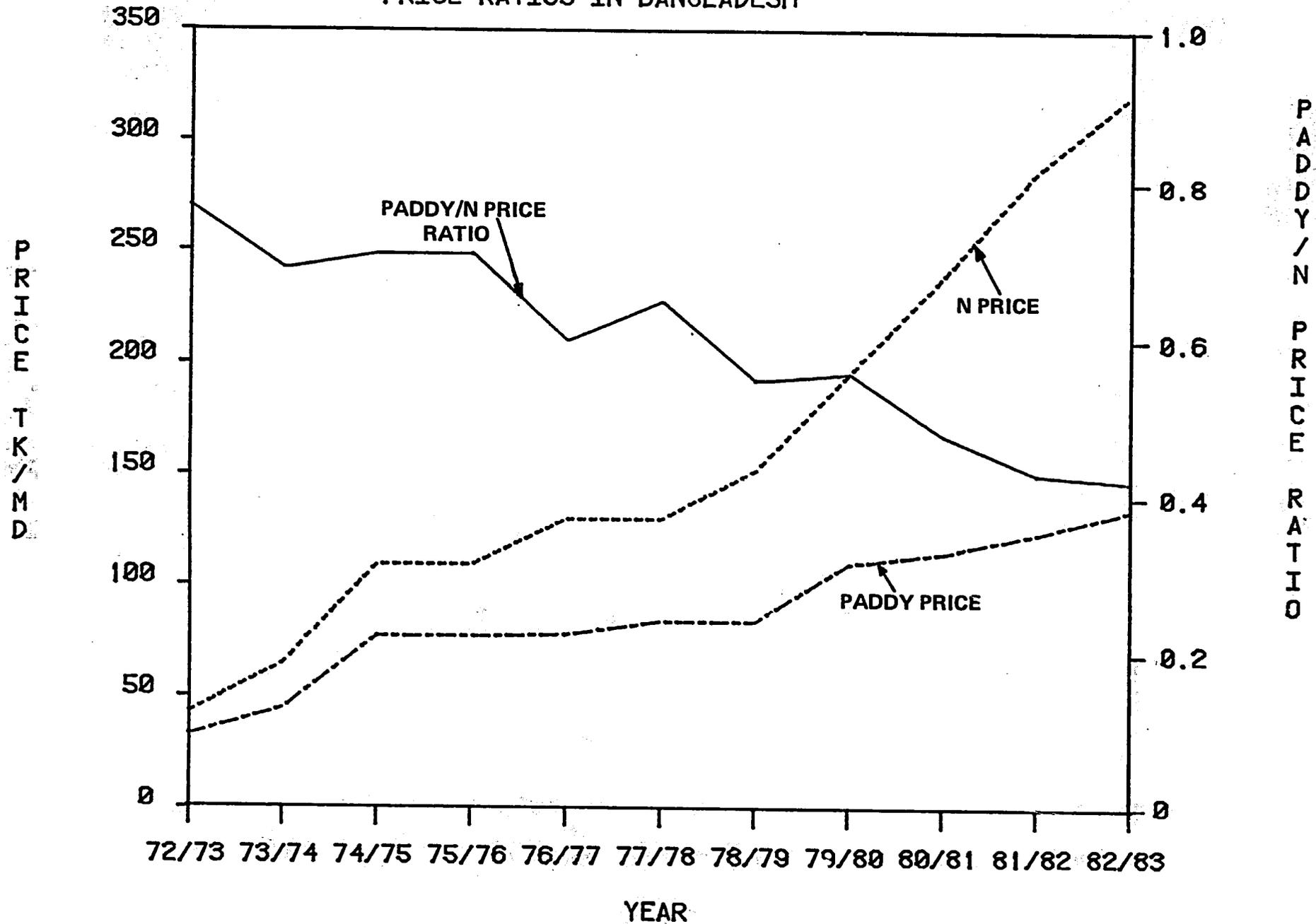


FIGURE 4.4: DYNAMICS OF OFFICIAL P2O5 PRICES, PADDY PRICES AND PRICE RATIOS IN BANGLADESH

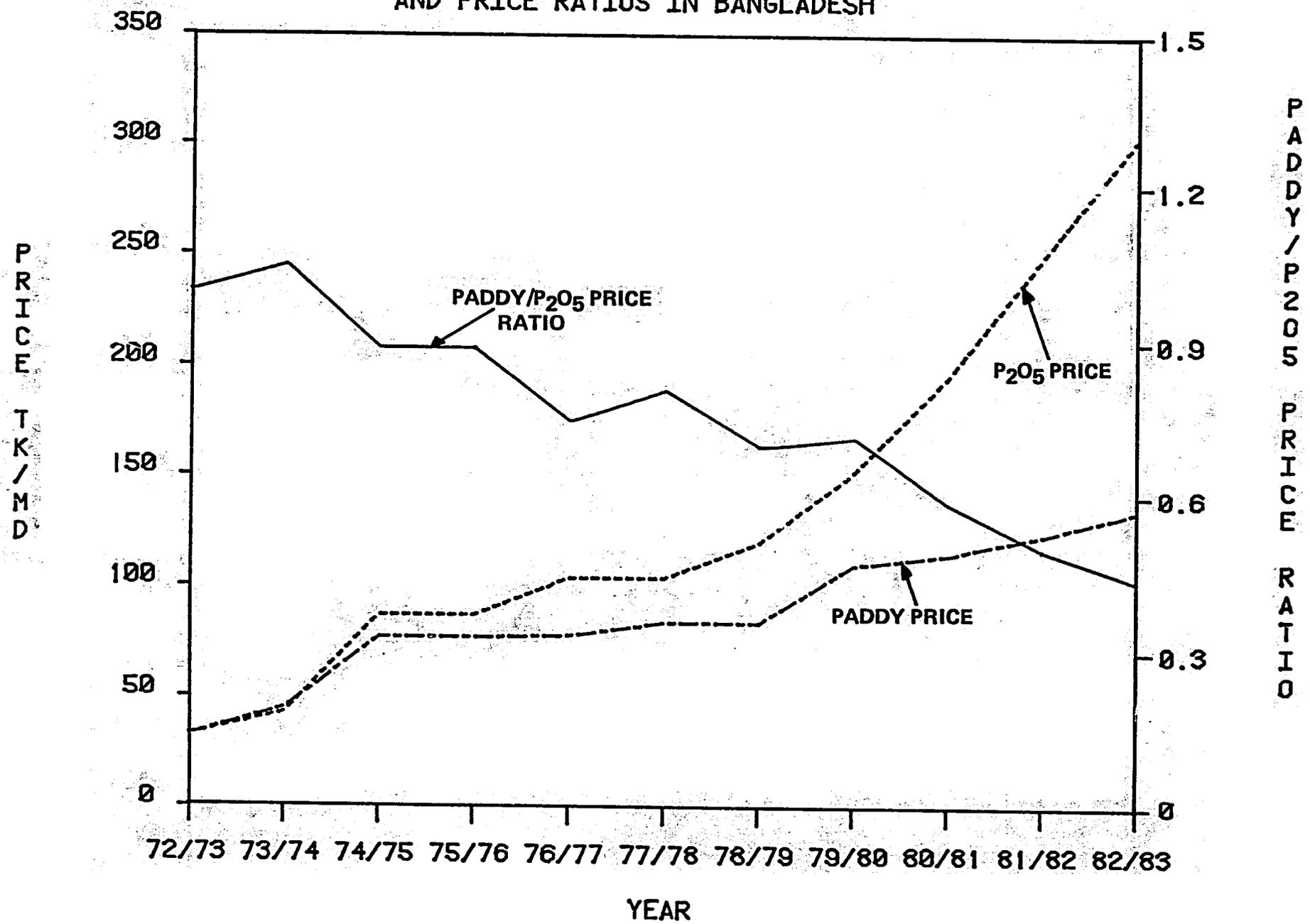


FIGURE 4.5: DYNAMICS OF OFFICIAL K20 PRICES, PADDY PRICES AND PRICE RATIOS IN BANGLADESH

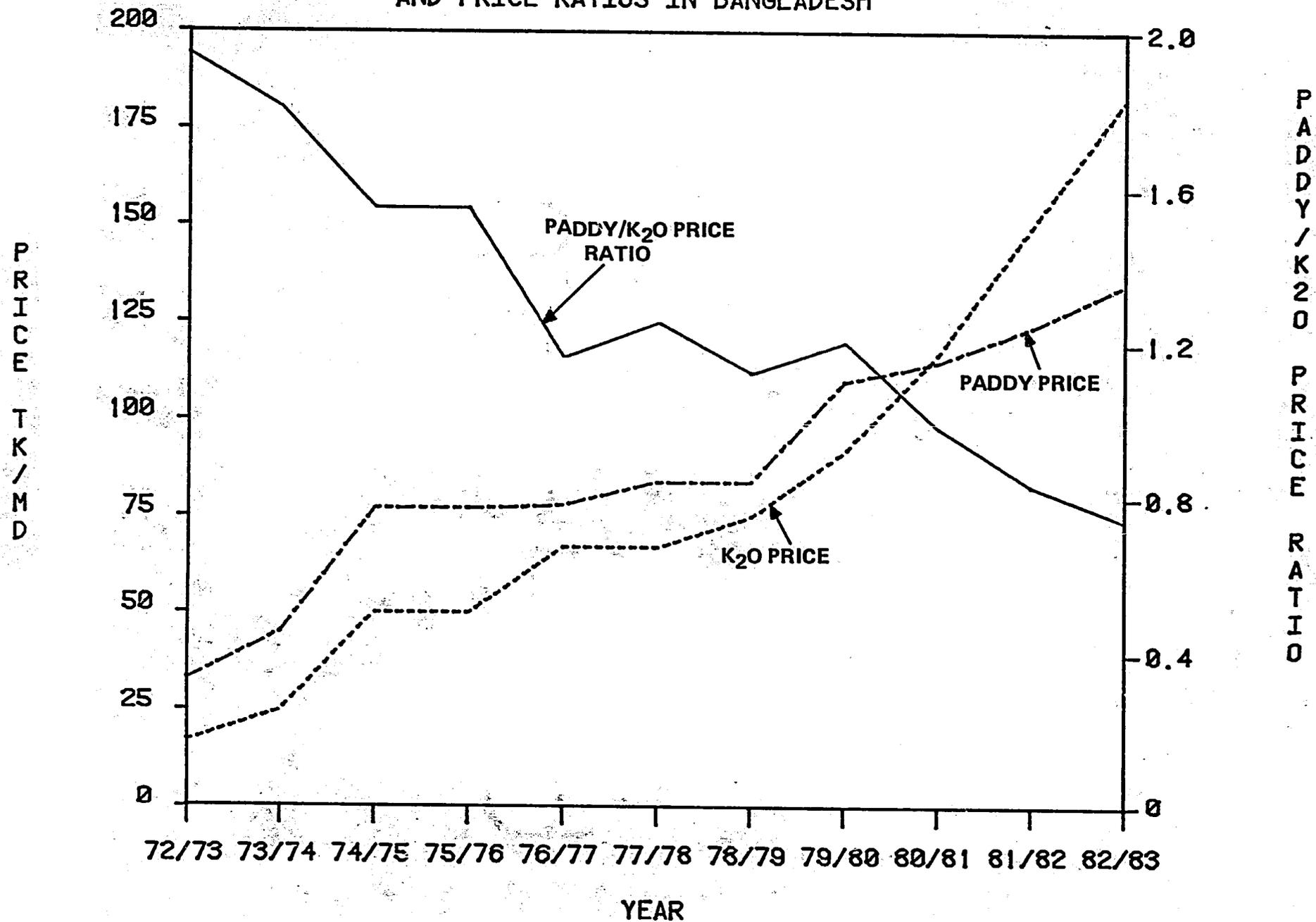


Table 4.7. Fertilizer Subsidy in Bangladesh and Its Allocation to Different Fertilizers^a

<u>Year</u>	<u>Total Fertilizer Subsidy</u> (million TK)	<u>Allocation of Subsidy</u>				<u>Total</u>
		<u>Urea^b</u>	<u>TSP^c</u>	<u>DAP</u> (%)	<u>MOP</u>	
1976/77	701	37	57	-	6	100
1977/78	1,183	59	36	-	5	100
1978/79	1,286	53	36	7	4	100
1979/80	1,342	40	46	8	6	100
1980/81	1,115	19	64	10	7	100
1981/82	1,355	25	55	12	8	100
1982/83 ^d	884	8	62	22	8	100

a. Derived from data obtained from BADC. Does not include subsidy for other chemical fertilizers.

b. For local and imported urea.

c. For local and imported TSP.

d. Revised estimate.

Table 4.8. Estimated Fertilizer Subsidy Rate in Bangladesh^a

Year	Rate of Subsidy for ^b		
	Urea ^c	TSP ^d (%)	MOP
1974/75	48	66	54
1975/76	52	74	71
1976/77	45	67	64
1977/78	36	65	51
1978/79	41	66	44
1979/80	28	61	55
1980/81	-9	58	53
1981/82	11	51	43
1982/83 ^e	3	50	33

a. Derived from data reported in Bangladesh Ministry of Agriculture and USAID (1982).

b. $[(\text{Estimated Cost} - \text{Sales Price}) / \text{Estimated Cost}] \times 100$.

c. Average for local and imported urea.

d. Average for local and imported TSP.

e. Estimate.

Table 4.9. Estimated Border Price for Fertilizer Imports in Bangladesh During 1982/83

Fertilizer	f.o.b. Price ^a	Ocean Freight Cost ^b	c. & f. Price (\$/mt)	Marine Insurance ^c	c.i.f. Price ^d		Bags and Bagging Cost ^e	Incidental Cost ^f	Border Price ^g
					\$/mt	TK/mt		(TK/mt)	
Urea	127.70	35.00	162.70	2.70	165.40	3,970	436	900	5,306
TSP	134.25	35.00	169.25	2.80	172.05	4,129	436	900	5,465
DAP	174.85	35.00	209.85	3.45	213.30	5,119	436	900	6,455
MOP	73.25	35.00	108.25	1.80	110.05	2,641	436	900	3,977

a. U.S. Gulf in bulk. Averages of weekly price quotes for the whole year, July 1, 1982, to June 30, 1983. Original data was obtained from Green Markets, Woodall (1983).

b. U.S. Gulf to East Coast India is used as a basis for freight cost for bulk cargo (British Sulphur Corporation, 1983).

c. Insurance premium rate for all-risk conditions @ 1.5% of insurable cargo value which, in turn, is equal to c. & f. price * 1.1. (Chuang, 1984).

d. Assuming 1 US \$ = 24 TK which was used by BADC in their own calculations.

e. Local costs @ TK 436/mt as per Carroll (1983).

f. BADC estimate of all marketing costs and used in their own calculations. This may also include marine insurance. If so, this will lead to double counting.

g. Estimated border price for fertilizer imports would not be the same as the border price for fertilizer exports.

Table 4.10. Estimated Acquisition and Border Prices in Relation to Official Sale Prices for Fertilizers in Bangladesh During 1982/83

<u>Fertilizer</u>	<u>Estimated Acquisition Price^a</u>	<u>Estimated Border Price</u>	<u>Official Sale Price</u>
		(TK/mt)	
Urea (local)	3,991	5,306	3,966
Urea (import)	5,856	5,306	3,966
TSPP (local)	6,319	5,465	2,948
TSPG (import)	5,945	5,465	3,752
DAP (import)	6,694	6,455	3,966
MOP (import)	4,370	3,977	2,948

a. The weighted average price of urea (local plus import) is estimated to be TK 4,080/mt. The acquisition price includes all the estimated costs (including incidental costs) up to the retail point. The import or ex-factory prices for different fertilizers are weighted averages of different supply sources. These estimates were obtained from BADC.

Table 4.11. Estimated Fertilizer Subsidy in Bangladesh During 1982/83

Fertilizer	Official	Scenario I		Scenario II				
	Subsidized Price	Acquisition Price	Subsidy ^a	% Subsidy ^b	Border Price	Subsidy ^c	% Subsidy ^d	% Subsidy ^e
	-----	-(TK/mt)-	-----		-----	-(TK/mt) - -		
Urea (local)	3,966	3,991	25	0.6	5,306	1,340	25.3	24.3
Urea (import)	3,966	5,856	1,890	32.3	5,306	1,340	25.3	24.3
TSPP (local)	2,948	6,319	3,371	53.3	5,465	2,517	46.1	45.4
TSPG (import)	3,752	5,945	2,193	36.9	5,465	1,713	31.3	30.5
DAP (import)	3,966	6,694	2,728	40.8	6,455	2,489	38.6	37.8
MOP (import)	2,948	4,370	1,422	32.5	3,977	1,029	25.9	25.1

a. Acquisition price - official subsidized price.

b. [(Acquisition price - official subsidized price) ÷ acquisition price] 100.

c. Border price - official subsidized price.

d. [(Border price - official subsidized price) ÷ border price] 100

e. Assuming marine insurance is already included in incidental costs.

CHAPTER 5IMPACT OF PRICE DEREGULATION ON FERTILIZER PRICE

Broadly, the purpose of this chapter is to analyze the economic impact of fertilizer price deregulation on retail fertilizer prices in Bangladesh. More specifically, the objectives are (1) to evaluate the impact of deregulation on price levels, (2) to evaluate the effectiveness of administered price policy at the retail level, and (3) to analyze the impact of deregulation on price variability under different price policy regimes.

Deregulation and Price Policy Analysis

Retail fertilizer prices were deregulated in Chittagong Division on April 1, 1982. The price deregulation was extended to the whole country on April 1, 1983. Consequently, as summarized in Table 5.1, fertilizer price policy in Bangladesh can be divided into three phases. Phase I refers to the time period prior to April 1, 1982, when fertilizer price was regulated by the government all over the country. Phase II refers to the time period between April 1, 1982, and April 1, 1983, when the country was segmented into two markets--one with price deregulation (Chittagong Division) and the other with price regulation (rest of the country). Finally, Phase III refers to the time period effective April 1, 1983, when fertilizer price was deregulated all over the country.

The concept of fertilizer price deregulation in this context is limited to retail fertilizer prices only. The PDP and TSC prices are still regulated by the government. However, the fertilizer dealers buy fertilizer at regulated price from PDPs or TSCs and sell to farmers at any price the market will bear. The analysis of the economic impact of deregulation on fertilizer price is based on farm-level price data--actual prices paid by farmers--for a period of 20 months; Phases I and III deal with 4 months each, and Phase II deals with 12 months.¹ Throughout the analysis, deregulated market area implies

1. The time period for economic analysis was dictated by the availability of farm-level price survey data. Further details on the nature and scope of sample for price survey and data based on price survey are provided in Appendix A.

Chittagong Division only, whereas regulated market area implies the rest of the country, including Dhaka, Rajshahi and Khulna Divisions.

Deregulation and Actual Price Behavior

The official subsidized and actual (overall weighted average) retail fertilizer prices from October 1980 to March 1983 are reported in Table 5.2 and in Figure 5.1 for urea, in Figure 5.2 for TSPG, and in Figure 5.3 for MOP. Up to June 1982 (prices were officially revised in July 1982), the actual retail fertilizer prices paid by farmers were always higher than those that were officially fixed by the government.² Beyond June 1982 the actual prices were either below or fluctuated around the official prices. The official prices appear to serve as reference prices for the dealers. In any case, the average actual retail prices were always different from official subsidized prices. The magnitude of price differences, however, varies from one month to another, depending on the fertilizer supply and demand situation.

In evaluating price differences between actual and official fertilizer prices, there is a need (1) to segment the sample survey data into deregulated and regulated market areas and (2) to calculate simple arithmetic price averages for both regulated and deregulated market areas, as well as for the overall sample (i.e., pooled data from both regulated and deregulated areas). As reported in Figure 5.4 for urea, the differences between simple average and weighted average of actual retail fertilizer prices were positive (i.e., simple average was greater than weighted average) in all the market categories for urea. In other words, simple price averages were higher than the corresponding weighted price averages. However, the difference varied from one market category to another, from one month to another, and from one fertilizer to another. The price difference appears to increase when one uses simple averages in comparing actual retail prices in deregulated and regulated market areas.

2. This is further supported by the empirical evidence from Sidhu, Baanante, and Ahsan (1982), based on a sample survey during 1979/80. They conclude that fertilizer prices paid by farmers were slightly higher than the official prices for all fertilizers, during all seasons and in all locations.

Impact of Deregulation on Price Levels

Absolute Price Levels

The first criterion for evaluating the impact of price deregulation is the comparison of the absolute levels of actual prices in deregulated markets with actual prices in regulated markets, and then comparison of both with the official price levels. Most of the analysis is based on simple arithmetic averages. However, wherever relevant, weighted averages have also been calculated for comparative purposes. For several reasons, the simple price averages are relatively more appropriate for analyzing the impact of price deregulation.

First, the weighted price averages have an inherent downward bias and do not truly reflect the "going market" or modal price. One large purchase at a lower price--due to quantity price discount--can offset the impact of a large number of small purchases at higher prices. Since quantity weights are generally not the same, weighted average price may not be the same as simple average price.

Second, a large number of small farmers generally buy small quantities of fertilizer in loose bags, either because of small requirements or lack of financial resources.³ Consequently, for policy and equity considerations, it is extremely important to monitor, compute, report, and evaluate simple average prices since these prices more accurately reflect the prices paid by small farmers.

The simple and weighted average fertilizer prices are calculated as follows from the farm-level price survey data.

$$(5.1) \quad \bar{P}_{il}^{SF}(t) = \frac{\sum_{j=1}^N \sum_{k=1}^K \sum_{l=1}^F P_{ijkl}(t)}{\sum_{j=1}^N K_j}, \text{ and}$$

3. According to Sidhu, Baanante, and Ahsan (1982), the percentage share of sample farmers using fertilizer was 68%, 62%, and 61% in Boro, Aus, and Aman seasons, respectively, during 1979/80. However, the percentage share of farmers actually using fertilizer increases with an increase in farm size. For example, during Aman 1980 season, the percentage share of sample farmers using fertilizer was 54%, 57%, 67%, and 72%, respectively, for farm size categories of less than 1.0 acre, between 1.0-2.5 acres, between 2.5-5.0 acres, and greater than 5.0 acres. On the other hand, fertilizer use per acre appears to have an inverse relationship with farm size.

$$(5.2) \quad \bar{P}_{il}^{WF}(t) = \frac{\sum_{j=1}^N \sum_{k=1}^K Q_{ijkl}^F(t) \cdot P_{ijkl}^F(t)}{\sum_{j=1}^N \sum_{k=1}^K Q_{ijkl}^F(t)},$$

where $\bar{P}_{il}^{SF}(t)$ and $\bar{P}_{il}^{WF}(t)$ refer to "simple" and "weighted" average prices, respectively, paid for l th fertilizer in i th fertilizer market category; $P_{ijkl}^F(t)$ is price paid by k th ($k = 1, \dots, K$) farmer for l th ($l = 1, \dots, L$) fertilizer in i th ($i = 1, \dots, M$) market category of j th ($j = 1, \dots, N$) district in month t in TK/md; and $Q_{ijkl}^F(t)$ is quantity purchased by k th farmer of l th fertilizer in i th market category of j th district in month t in md. These averages have been calculated for individual districts, regulated districts as a group, deregulated districts as a group, and all the districts combined as a group; for individual market categories and all the market categories combined as a group; and for individual fertilizers.⁴

The absolute levels of actual prices paid by farmers in Bangladesh in regulated and deregulated market areas, both as simple and weighted averages, along with the official prices are reported in tables and figures as follows:

1. For urea in Table 5.3 and Figures 5.5 and 5.6.
2. For TSPG in Table 5.4 and Figures 5.7 and 5.8.
3. For MOP in Table 5.5 and Figures 5.9 and 5.10.

From the results reported in these tables and figures for urea, TSPG, and MOP from December 1981 to July 1983, we can draw the following conclusions:

1. With few exceptions, actual prices paid by farmers in deregulated market areas were always higher than those paid in regulated markets.⁵
2. For urea and TSPG, the differences between prices in deregulated and regulated market areas were larger in Phase I (complete price regulation) than in Phase II or Phase III of price policy. However, for MOP, these price differences appear to be larger in Phase II than in Phase I or Phase III.

4. A detailed discussion on different price indicators, methods to calculate simple and weighted average fertilizer prices for different classifications of price survey data, and appropriate formats for reporting the results are available in Mudahar (1983a).

5. The possible impact of price deregulation on retail prices (according to the analysis by Forrest Walters, a team member) was also discussed in Bangladesh Ministry of Agriculture and USAID (1982), but no conclusions were drawn. Rather, this study recommended a detailed analysis to address this issue.

3. In Phase II, the actual prices in deregulated market areas were generally above the official price, whereas in regulated market areas they were generally below the official prices. However, there were several exceptions. First, in Phase I, actual prices in both regulated and deregulated market areas were above the official price levels. Second, even in Phase II, actual prices for urea, TSPG, and MOP were above their official prices during April-June 1982; actual MOP prices remained above official prices in about 6 or 7 months out of the 12 months of Phase II.
4. These conclusions were generally true, but monthly fluctuations were more predominant with weighted price averages than with simple price averages.
5. The average prices for urea, TSPG, and MOP in regulated and deregulated market areas converged in Phase III when there was no price regulation.
6. Finally, these results indicate that fertilizer price differences in regulated and deregulated market areas do not appear to be the direct result of price deregulation. Rather, fertilizer availability, supply management, and operational efficiency of the marketing system seem to be responsible for these price gyrations and price differences between regulated and deregulated market areas. The policy of price deregulation does not appear to have any adverse impact on retail fertilizer prices.⁶

Price Differences

The second criterion for evaluating the impact of price deregulation on fertilizer prices is the comparison of price differences between regulated and deregulated market areas in three phases of pricing policy in Bangladesh. The price differences, both absolute (in TK/md) and relative (as %), are calculated as follows:

$$(5.3) \quad P_{il}^{Ab}(t) = P_{il}^D(t) - P_{il}^R(t), \text{ and}$$

$$(5.4) \quad P_{il}^{Re}(t) = [(P_{il}^D(t) - P_{il}^R(t)) / P_{il}^R(t)] 100,$$

6. As reported in Tables B-10 through B-15 of Appendix B, average prices in individual districts vary quite a bit from each other in both regulated and deregulated districts. However, there is no consistent pattern. Again, price differences may be due to problems related to fertilizer supply management and marketing efficiency rather than to price deregulation.

where $P_{il}^{Ab}(t)$ and $P_{il}^{Re}(t)$ refer to absolute and relative price differences, respectively, between deregulated and regulated market areas; $P_{il}^D(t)$ is actual average price for l th fertilizer in i th market category of deregulated market area; and $P_{il}^R(t)$ is actual average price for l th fertilizer in i th market category of regulated market area.

The price differences are estimated by using average prices for deregulated and regulated market areas for urea, TSPG, and MOP. The results are reported for three price policy phases in Table 5.6 for simple averages and in Table 5.7 for weighted averages. Both absolute and relative price differences for urea and TSPG were larger in Phase I (complete price regulation) than in Phase II and in Phase III (complete price deregulation). For MOP, the results are mixed with price differences being slightly higher in Phase II than in Phase I or Phase III. These results indicate that price deregulation does not appear to have increased retail prices in price deregulated market areas. Rather, complete price deregulation appears to have narrowed the retail price differences between regulated and deregulated market areas.

Statistical Analysis

The third criterion for evaluating the impact of price deregulation on fertilizer prices is the measurement of the statistical significance in price differences. The statistical significance of the absolute difference between means of actual prices in deregulated and regulated market areas has been tested by computing t statistic. With few exceptions, the absolute price differences reported earlier are positive, but they may or may not be statistically different from zero.

Assuming that (1) there are two populations, (2) both populations are normally and independently distributed, (3) both populations have same mean ($\mu_1 = \mu_2 = \mu$), (4) both populations have equal variance ($\sigma_1^2 = \sigma_2^2 = \sigma^2$), (5) the value of variance (σ^2) is not known, and (6) both samples are drawn independently and randomly, then the statistic

$$(5.5) \quad t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S^2 \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

has t distribution with $N_1 + N_2 - 2$ degrees of freedom, where

- \bar{X}_1 : sample mean, i.e., simple average price in deregulated market,
 \bar{X}_2 : sample mean, i.e., simple average price in regulated market,
 N_1 : sample size, i.e., number of price observations in deregulated market,
 N_2 : sample size, i.e., number of price observations in regulated market, and
 S^2 : pooled sample variance, i.e., variance of pooled price observations from deregulated and regulated markets.

The t statistic is used to test the hypothesis

$$H_0 : \mu_1 = \mu_2 \text{ (or } \mu_1 - \mu_2 = 0), \text{ against}$$

$$H_1 : \mu_1 \neq \mu_2.$$

The computed t statistic is then compared with t values from the critical region at a given level of significance and $N_1 + N_2 - 2$ degrees of freedom in order to accept or reject the null hypothesis (H_0) of equality of means from two independent random samples. Alternatively, as in this case, the level of significance is computed for each t at $N_1 + N_2 - 2$ degrees of freedom which is then compared with a specified level of significance to reject or accept the null hypothesis.

The statistical results for the overall absolute difference between regulated and deregulated market areas are reported in Table 5.8 for urea, TSPG, and MOP for three phases of pricing policy in Bangladesh. The results indicate that in Phase I the price differences were statistically significant for urea and TSPG but not for MOP. In Phase II, urea price differences were statistically significant in all the 12 months, TSPG price differences were statistically significant in 10 out of 12 months, and MOP price difference was statistically significant in 7 out of 11 months. Finally, in Phase III, price differences were statistically significant in 5 out of 12 cases. In other words, price differences between regulated and deregulated market areas became less and less significant as Bangladesh gradually switched from complete price regulation to complete price deregulation for urea, TSPG, and MOP.

The conclusions are further reinforced by results obtained from statistical analysis on price differences for individual fertilizer market categories. These results are summarized in Table 5.9 for urea, in Table 5.10 for TSPG, and in Table 5.11 for MOP, and complete details are reported in Tables B-1 through B-9 of Appendix B. It appears, as one would expect, that price differences were

statistically significant more often in remote than in nonremote market categories. However, there is no consistent pattern, either across market categories or over time. The frequency of cases with statistically significant price differences are summarized below:

<u>Phase</u>	<u>Cases</u>	<u>Urea</u>	<u>TSPG</u>	<u>MOP</u>
I	Significant	22	25	4
	Total	28	28	20
	Proportion ^a	79%	89%	20%
II	Significant	61	28	25
	Total	84	83	62
	Proportion ^a	73%	34%	40%
III	Significant	8	5	3
	Total	28	27	22
	Proportion ^a	29%	19%	14%

a. Percent share of significant cases in total.

These results indicate that as Bangladesh gradually shifted from complete price regulation to complete price deregulation, the percent share of cases with statistically significant price differences between deregulated and regulated market areas declined for urea and TSPG (the two most important fertilizers), whereas for MOP it first increased and then declined to a very small frequency. One could conclude that the implementation of price deregulation policy does not seem to have any unfavorable impact on retail fertilizer prices. Rather, the fertilizer marketing efficiency and supply factors appear to play a more important role in explaining this pattern. In Phase III, prices in deregulated and regulated market areas appear to converge.

Effectiveness of Administered Price Policy

Absolute Price Differences

The first criterion for evaluating the effectiveness of administered fertilizer price policy is the comparison of the absolute differences between actual and official (administered) retail prices. These price differences for urea, TSPG, and MOP--for regulated market, deregulated market, and overall--are reported in Table 5.12 by using simple averages and in Table 5.13 by using weighted averages. The results can be summarized below:

First, as indicated by positive price differences, the actual prices paid by farmers for urea, TSPG, or MOP were rarely equal to the official administered prices.

Second, in Phase I, actual prices were greater than official administered prices in both regulated and deregulated market areas. On the other hand, in Phase II, actual prices were generally lower than official prices in the regulated market, whereas actual prices were generally higher than official prices in the deregulated market.

Third, the absolute differences between actual and official administered prices were much higher in Phase I than in Phase II, in both regulated and deregulated market areas.

Relative Price Differences

The second criterion for evaluating the effectiveness of administered fertilizer price policy is the comparison of the relative price differences between actual and administered retail prices in regulated and deregulated markets, between Phase I and Phase II, and across different fertilizers. In computing the relative price differences, the absolute price differences are reduced to a common denominator, i.e., all the price differences are expressed as percentage.

The relative price differences for urea, TSPG, and MOP--for regulated market, deregulated market, and overall--are reported in Table 5.14 by using simple averages and in Table 5.15 by using weighted averages. Again, the results indicate that the actual prices paid by farmers were rarely equal to the official administered prices. The price differences were much more in Phase I than in Phase II. This was due to at least two factors. First, the fertilizer supply situation, in relation to demand, improved in Phase II over Phase I, making it more difficult for dealers to charge unreasonably high prices. Second, the operational efficiency of the fertilizer marketing system improved in Phase II over Phase I in response to the initiation of NMS, which increased incentives for dealers and competition among dealers and reduced marketing constraints.

Statistical Analysis

The third criterion for evaluating the effectiveness of administered fertilizer price policy is the test of whether the absolute difference between actual and official administered prices was statistically significant or not.

Assuming that (1) population is normally distributed, (2) population variance (σ^2) is not known, and (3) the sample is random, the statistic

$$(5.6) \quad t = \frac{\bar{X} - \bar{P}}{\sqrt{S^2/n}}$$

has t distribution with N-1 degrees of freedom, where

- \bar{X} : sample mean, i.e., simple average price in regulated market, deregulated market, or overall,
- \bar{P} : administered official price,
- N : sample size, i.e., number of price observations, and
- S^2 : sample variance.

In this case, the t distribution is used to test the hypothesis:

H_0 : $\mu = \mu_0$ (or $\mu - \mu_0 = 0$), against

H_1 : $\mu \neq \mu_0$.

The computed t statistic is then compared with t values from the critical region at a given level of significance and N-1 degrees of freedom in order to accept or reject the null (H_0) hypothesis of equality between sample mean of actual prices and official administered price. In this case, however, the level of significance is computed for each t at N-1 degrees of freedom which is then compared with specified levels of significance to reject or accept the null hypothesis.

The results on the statistical significance of the difference between actual and official administered prices for regulated and deregulated areas are reported in Table 5.16 for urea, in Table 5.17 for TSPG, and in Table 5.18 for MOP. The results for Phase I indicate that the differences between actual and official administered prices for urea, TSPG, and MOP were statistically significant in regulated as well as deregulated market areas. This indicates that official administered prices were not effective. On the other hand, in Phase II the results were mixed. The actual prices in most cases, however, were statistically different from the official administered prices, which indicates that official prices were a little more effective in Phase II than in Phase I. This

difference was primarily due to better supply management and fertilizer availability in Phase II than in Phase I.

Impact of Deregulation on Price Variation

The results in the preceding sections indicate that in Bangladesh (1) the policy of price deregulation did not increase retail prices actually paid by farmers and (2) the implementation of official administered prices were not very effective. The purpose of this section is to evaluate whether or not the policy of price deregulation in Bangladesh increased fertilizer price variation, hence, price risk, at the retail level. This is accomplished by estimating the coefficient of variation in prices for regulated and deregulated market areas, for three price policy regimes, and for three fertilizers--urea, TSPG, and MOP.

The coefficient of variation in sample prices is measured as follows:

$$(5.7) \quad V = \left[\frac{S}{\bar{X}} \right] 100,$$

where V is coefficient of variation which measures relative dispersion of retail prices and is expressed as a percentage; $S = \sqrt{S^2}$ or S (sample standard deviation) is positive square root of S^2 (sample variance), and \bar{X} is sample mean of prices.

The results on coefficient of variation in actual prices are reported in Table 5.19, and in Figure 5.11 for urea, in Figure 5.12 for TSPG, and in Figure 5.13 for MOP. On the basis of these results, we can draw the following conclusions:

First, with few exceptions, the coefficient of variation in actual prices was higher in deregulated areas than in regulated areas during all the three price policy phases.

Second, the coefficient of variation gradually declined as Bangladesh shifted from complete price regulation to complete price deregulation. In other words, the coefficient of variation was higher in Phase I than in Phase II, and higher in Phase II than in Phase III.

These results indicate that price variation was always greater in the deregulated than in the regulated market areas. However, higher price

variation does not appear to be due to policy of price deregulation since price variation was higher in deregulated market areas even in Phase I, i.e., prior to price deregulation.

Table 5.1. Phases in Fertilizer Price Policy and Price Survey Data Availability in Bangladesh

<u>Year</u>	<u>Time-Period</u>	<u>Months for Which Data was Available</u>	<u>Phase</u>	<u>Fertilizer Price Policy Type of Price Policy</u>
1981/82 ^a	December 1981 to March 1982	4	I	Prices were regulated all over the country
1982/83	April 1982 to March 1983	12	II	Effective April 1, 1982, prices were deregulated in Chittagong Division
1983/84 ^b	April 1983 to July 1983	4	III	Effective April 1, 1983, price deregulation was extended to the whole country

a. Primary data were not available prior to December 1981.

b. Monthly farm-level fertilizer price survey continues, but the price data were not available beyond July 1983 at the time the analysis for this study was initiated.

Table 5.2. Official Subsidized and Actual (Weighted Average) Retail Fertilizer Prices in Bangladesh

Year	Month	Urea		TSPG		MOP	
		Official Price	Actual ^a Price	Official Price	Actual ^a Price	Official Price	Actual ^a Price
		---(TK/md)---					
1980	October	90.00	90.02	70.00	74.12	55.00	55.73
	November	110.00	112.14	90.00	92.25	70.00	72.93
	December	110.00	112.40	90.00	94.05	70.00	73.63
1981	January	110.00	112.11	90.00	95.06	70.00	72.84
	February	110.00	111.66	90.00	92.64	70.00	73.32
	March	110.00	111.68	90.00	93.66	70.00	72.49
	April	110.00	111.68	90.00	96.78	70.00	72.83
	September ^b	110.00	115.94	90.00	96.09	70.00	73.59
	October	110.00	120.28	90.00	97.65	70.00	72.82
	November	110.00	128.46	90.00	99.65	70.00	74.54
	December	132.00	150.84	115.00	127.88	90.00	92.50
1982	January	132.00	145.01	115.00	126.12	90.00	91.00
	February	132.00	137.73	115.00	126.54	90.00	92.25
	March	132.00	134.49	115.00	121.87	90.00	92.09
	April	132.00	133.81	115.00	119.81	90.00	93.18
	May	132.00	133.48	115.00	120.03	90.00	91.91
	June	132.00	132.39	115.00	119.15	90.00	92.24
	July	148.00	146.90	140.00	138.35	110.00	102.73
	August	148.00	147.53	140.00	140.99	110.00	114.75
	September	148.00	146.52	140.00	142.08	110.00	109.66
	October	148.00	146.78	140.00	140.19	110.00	112.23
	November	148.00	146.19	140.00	140.87	110.00	110.58
	December	148.00	145.58	140.00	139.56	110.00	110.34
1983	January	148.00	145.14	140.00	137.47	110.00	108.68
	February	148.00	146.43	140.00	138.65	110.00	109.67
	March ^c	148.00	146.05	140.00	139.29	110.00	113.84

a. The actual weighted average retail price refers to the whole sample. The actual prices prior to December 1981 were obtained from Moots (1981), IFDC/BADC monthly price survey summary reports.

b. Farm-level fertilizer price survey was not conducted during May, June, July, and August of 1981.

c. Effective April 1, 1983, retail prices were deregulated all over the country. Hence, there were no official prices at the retail level.

FIGURE 5.1: COMPARISON OF OFFICIAL SUBSIDIZED PRICES WITH ACTUAL (WEIGHTED AVERAGE) RETAIL PRICES FOR UREA IN BANGLADESH

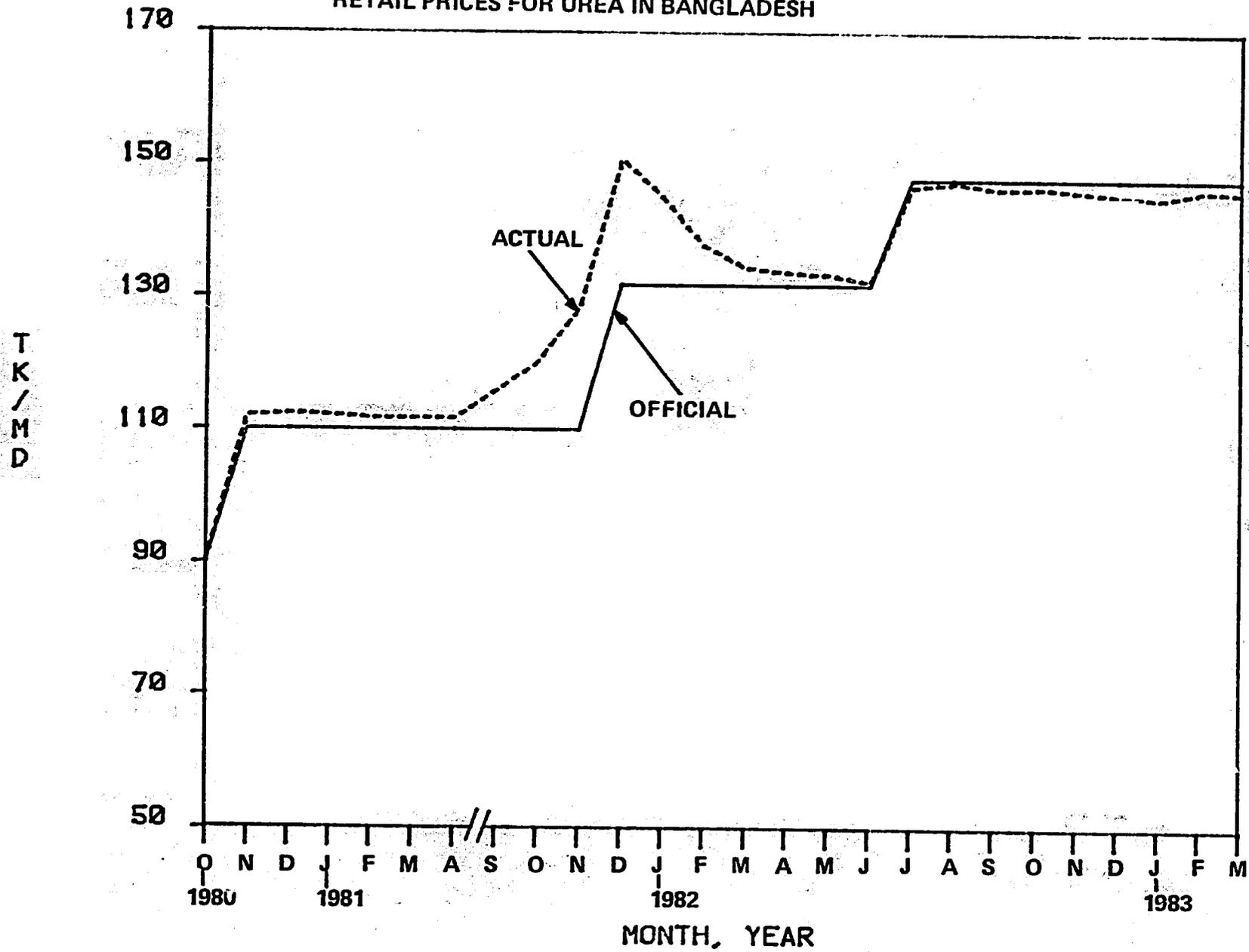


FIGURE 5.2: COMPARISON OF OFFICIAL SUBSIDIZED PRICES WITH ACTUAL (WEIGHTED AVERAGE) RETAIL PRICES FOR TSPG IN BANGLADESH

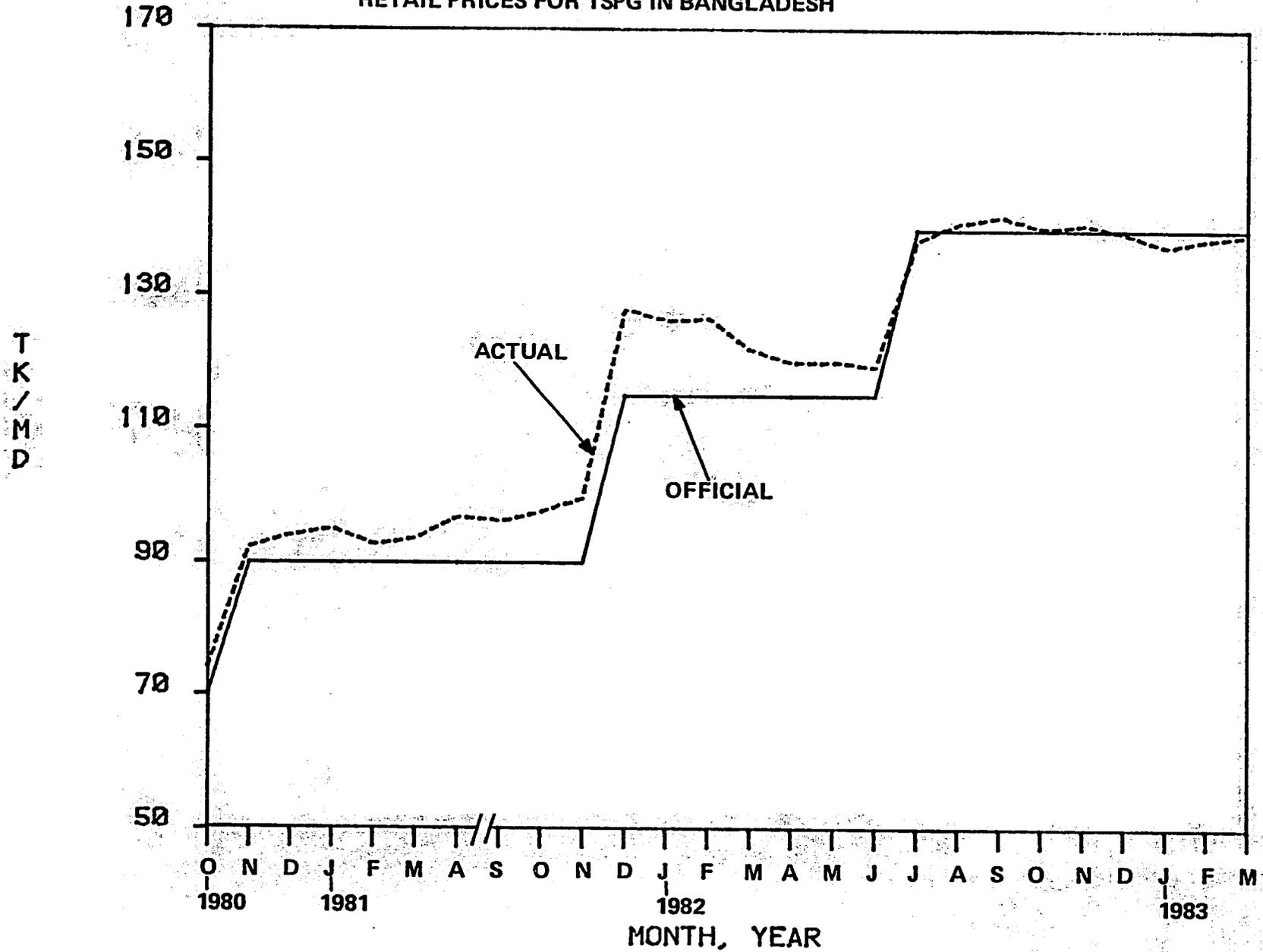


FIGURE 5.3: COMPARISON OF OFFICIAL SUBSIDIZED PRICES WITH ACTUAL (WEIGHTED AVERAGE) RETAIL PRICES FOR MOP IN BANGLADESH

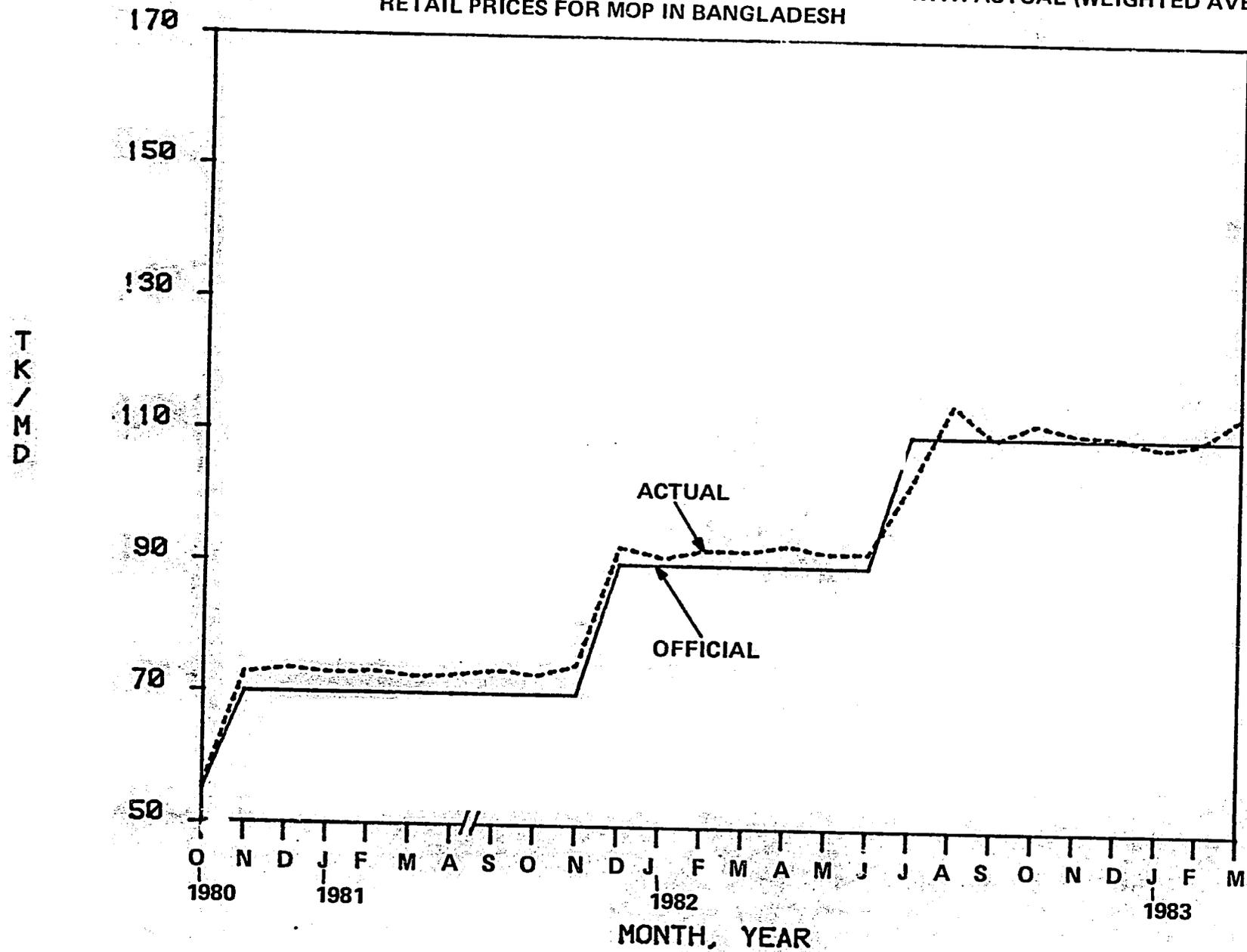
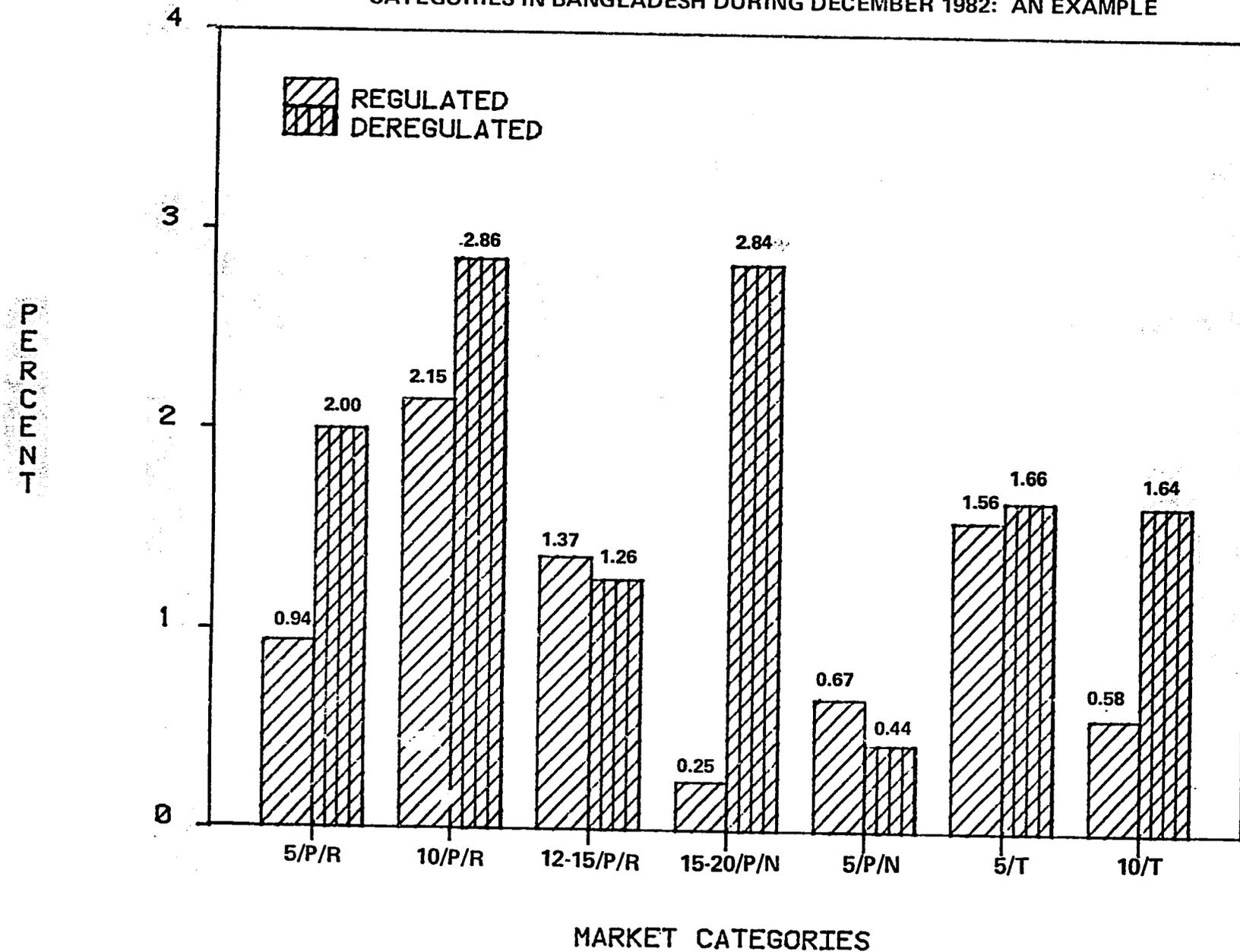


FIGURE 5.4: COMPARISON OF DIFFERENCES BETWEEN SIMPLE AND WEIGHTED AVERAGE UREA RETAIL PRICES FOR REGULATED AND DEREGULATED FERTILIZER MARKET CATEGORIES IN BANGLADESH DURING DECEMBER 1982: AN EXAMPLE



SEE APPENDIX TABLE A-3 FOR DEFINITION OF MARKET CATEGORIES

Table 5.3. Behavior of Farm-Level Urea Prices in Bangladesh

Price Policy Phase ^a	Month/Year		Official Regulated Price	Actual Price as Simple Average		Actual Price as Weighted Average	
				Regulated Area	Deregulated Area	Regulated Area	Deregulated Area
(TK/md)							
I	December	1981	132	147.38	156.84	144.79	158.76
	January	1982	132	139.24	162.43	136.01	162.82
	February		132	133.50	147.50	131.28	146.28
	March		132	133.76	139.30	131.72	134.49
II	April	1982	132	132.45	136.14	131.94	135.26
	May		132	132.64	137.58	131.75	136.34
	June		132	131.13	140.47	128.94	139.10
	July		148	143.64	154.60	140.49	151.36
	August		148	146.48	151.86	145.65	149.85
	September		148	147.55	149.59	146.46	146.55
	October		148	147.88	152.12	145.33	148.12
	November		148	146.27	151.52	144.59	150.53
	December		148	146.66	149.03	144.98	146.11
	January	1983	148	146.14	150.49	143.81	147.01
	February		148	146.36	150.36	145.70	147.06
	March		148	146.82	149.92	146.07	146.01
	III	April	1983	b	148.32	149.83	147.36
May			b	149.01	149.76	146.80	147.78
June			b	149.17	150.01	148.22	148.84
July			b	150.66	150.32	150.14	148.55

a. For definition of price policy phases, see Table 5.1.

b. Effective April 1, 1983, there was no official regulated price at the retail level for urea.

FIGURE 5.5: BEHAVIOR OF FARM-LEVEL UREA PRICES IN BANGLADESH
(ACTUAL PRICES AS SIMPLE AVERAGES)

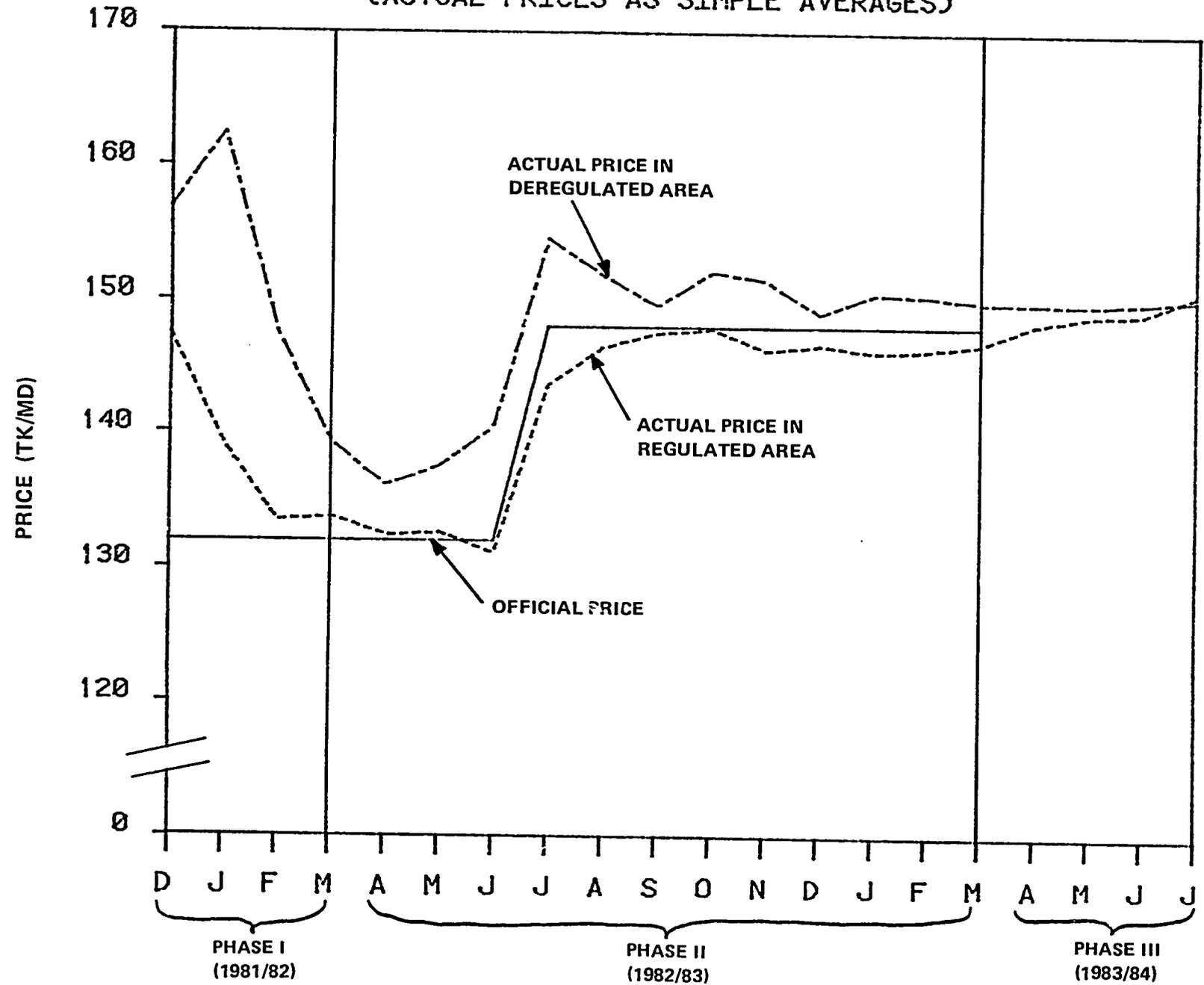


FIGURE 5.6: BEHAVIOR OF FARM-LEVEL UREA PRICES IN BANGLADESH
(ACTUAL PRICES AS WEIGHTED AVERAGES)

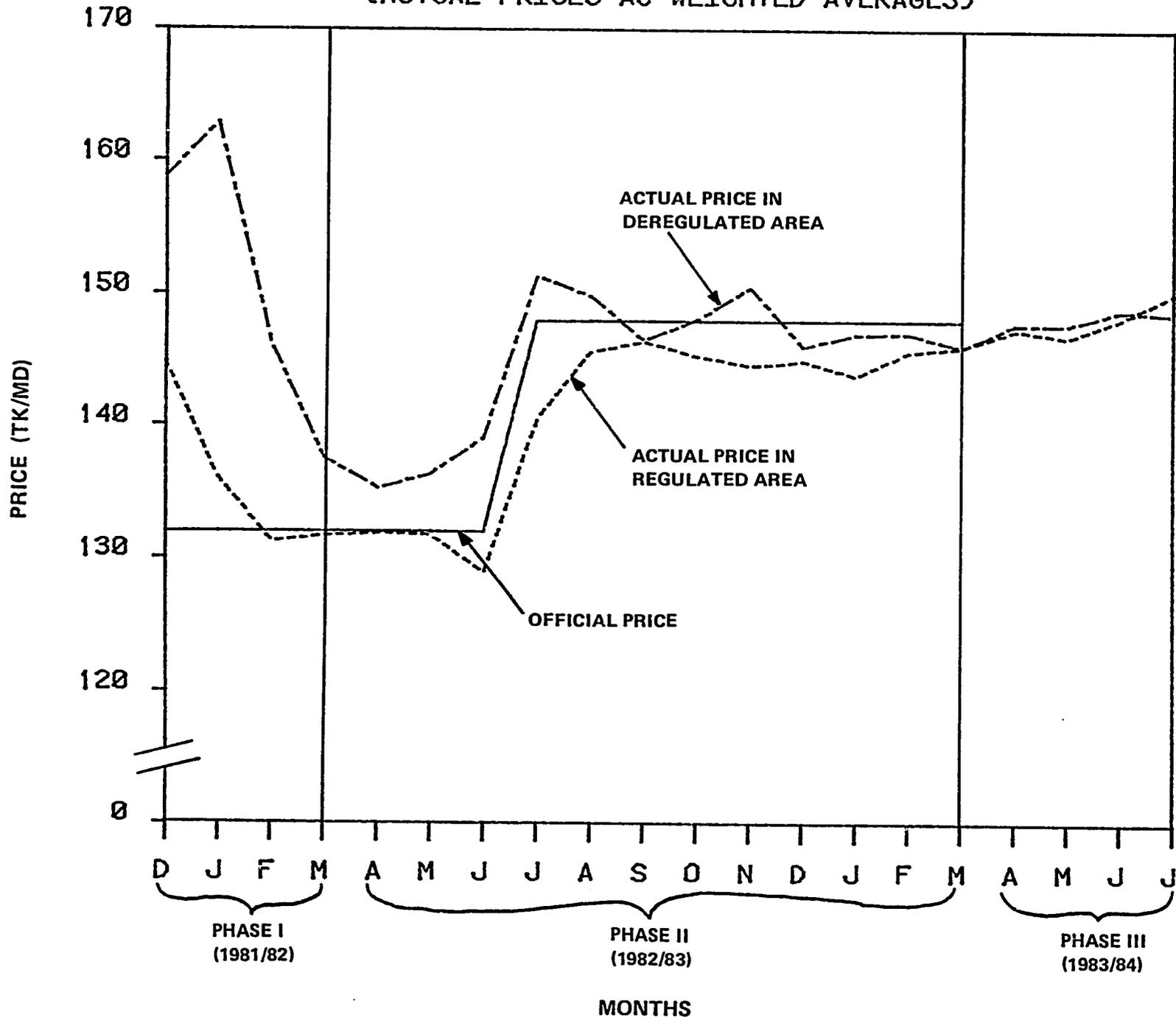


Table 5.4. Behavior of Farm-Level TSPG Prices in Bangladesh

Price Policy Phase ^a	Month/Year		Official Regulated Price	Actual Price as Simple Average		Actual Price as Weighted Average	
				Regulated Area	Deregulated Area	Regulated Area	Deregulated Area
(TK/md)							
I	December	1981	115	123.00	132.97	122.76	136.88
	January	1982	115	121.58	149.09	119.41	149.78
	February		115	120.64	135.53	119.23	132.70
	March		115	118.18	132.54	117.70	130.89
II	April	1982	115	118.96	125.13	117.80	124.81
	May		115	119.16	123.65	118.11	124.53
	June		115	120.40	120.59	119.89	117.99
	July		140	137.97	139.53	137.76	139.47
	August		140	139.00	144.14	138.72	142.65
	September		140	138.19	146.47	136.10	145.54
	October		140	139.71	144.54	137.93	143.35
	November		140	138.96	145.93	137.37	144.48
	December		140	138.79	141.63	138.50	139.89
	January	1983	140	138.13	141.22	136.86	139.41
	February		140	139.17	141.81	138.37	139.73
	March		140	139.46	141.87	139.35	139.17
	III	April	1983	b	139.71	142.76	139.46
May			b	140.30	139.26	138.39	137.00
June			b	140.80	141.21	140.05	141.17
July			b	142.18	139.85	142.05	137.40

a. For definition of price policy phases, see Table 5.1.

b. Effective April 1, 1983, there was no official regulated price at the retail level for TSPG.

FIGURE 5.7: BEHAVIOR OF FARM-LEVEL TSPG PRICES IN BANGLADESH
(ACTUAL PRICES AS SIMPLE AVERAGES)

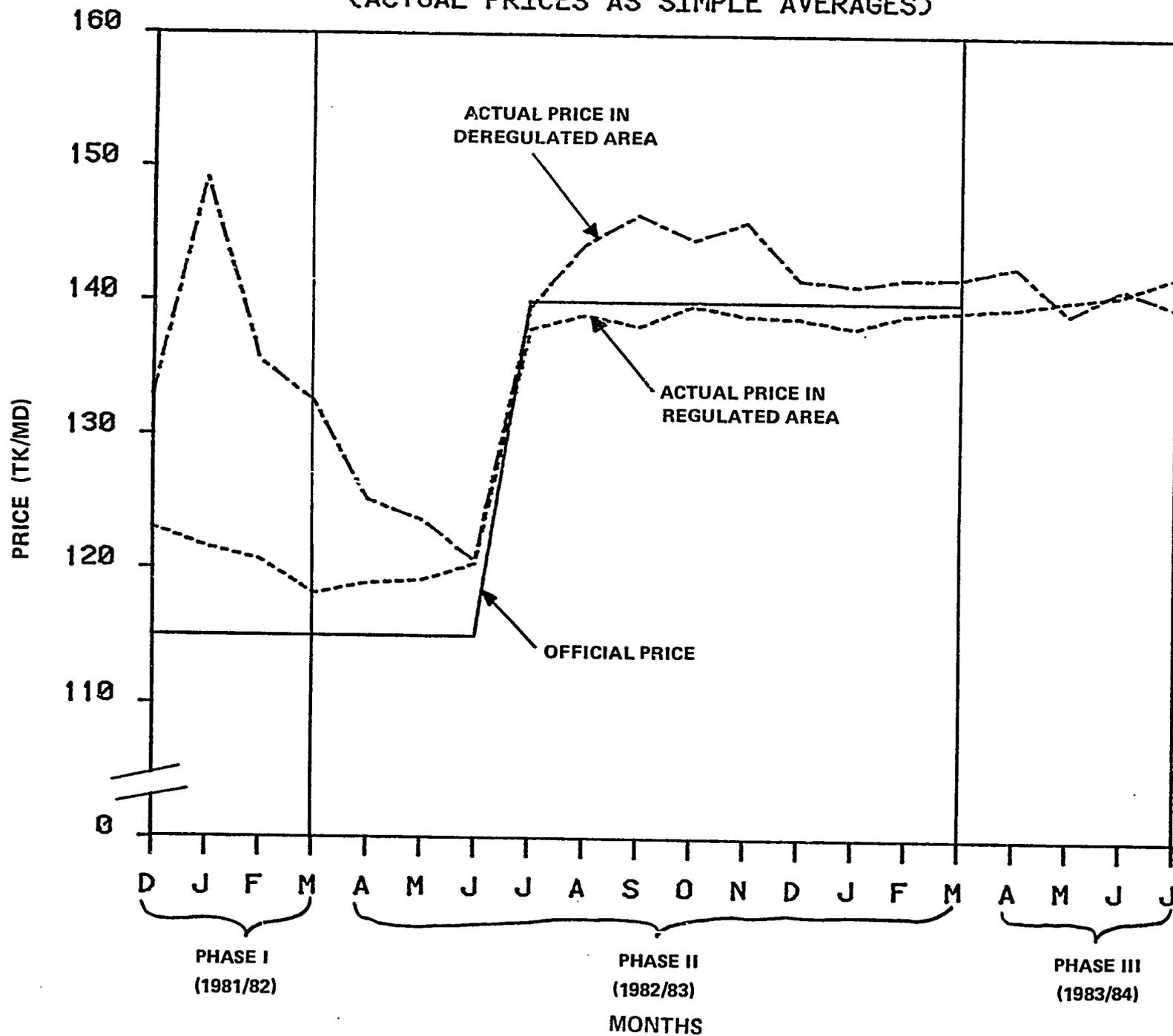


FIGURE 5.8: BEHAVIOR OF FARM-LEVEL TSPG PRICES IN BANGLADESH (ACTUAL PRICES AS WEIGHTED AVERAGES)

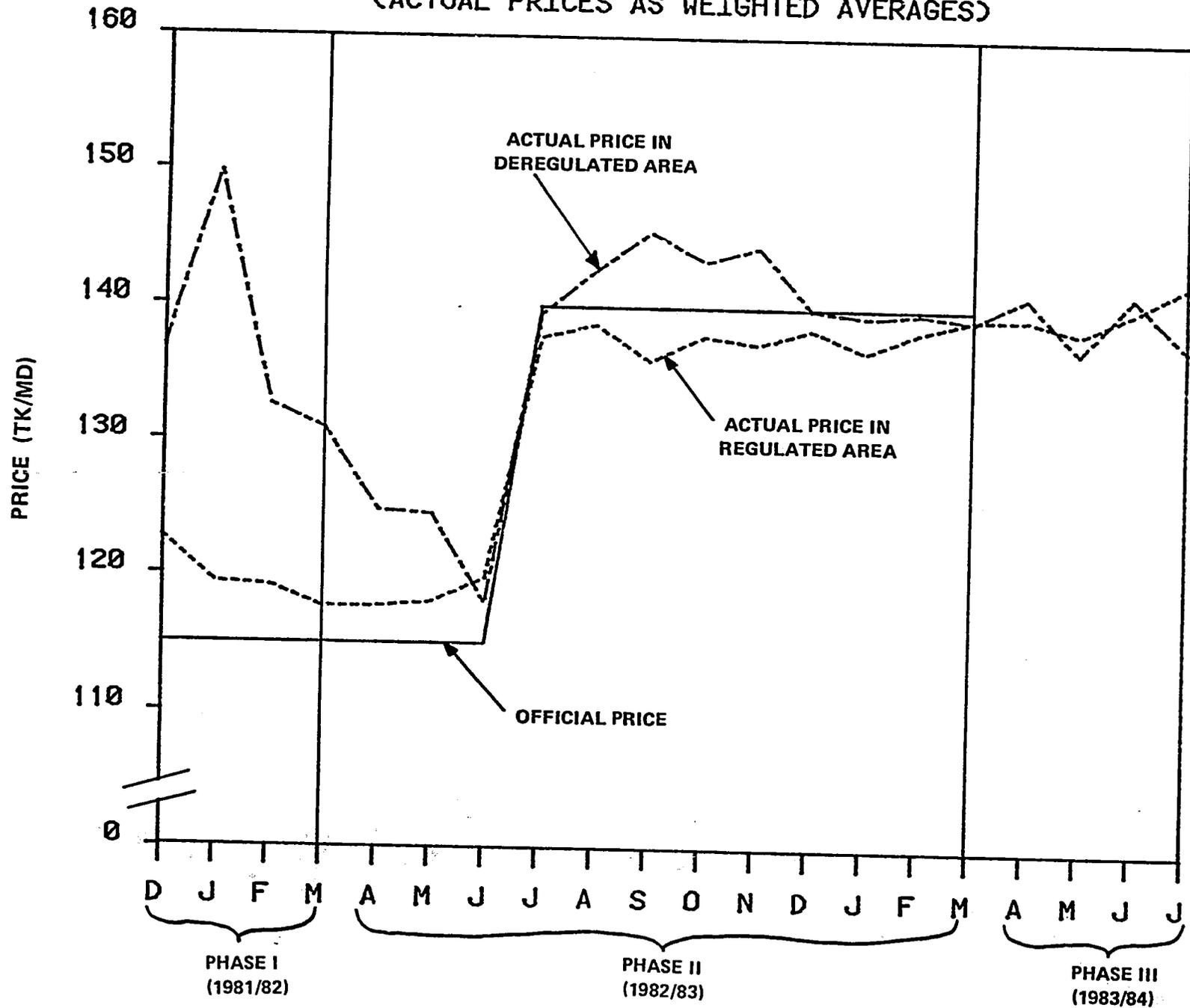


Table 5.5. Behavior of Farm-Level MOP Prices in Bangladesh

Price Policy Phase ^a	Month/Year		Official Regulated Price	Actual Price as Simple Average		Actual Price as Weighted Average	
				Regulated Area	Deregulated Area	Regulated Area	Deregulated Area
----- (TK/md) -----							
I	December	1981	90	93.18	91.74	93.15	91.58
	January	1982	90	92.84	90.00	91.00	90.00
	February		90	91.32	93.96	90.81	93.86
	March		90	92.38	94.64	91.67	94.15
II	April	1982	90	92.73	96.74	91.91	96.62
	May		90	91.54	94.88	91.16	94.69
	June		90	91.44	99.33	91.02	99.05
	July		110	107.76	- ^b	102.73	-
	August		110	112.09	114.67	115.03	114.35
	September		110	109.20	111.00	109.50	109.74
	October		110	111.30	113.02	111.13	114.01
	November		110	109.56	116.62	109.15	115.49
	December		110	109.20	115.90	109.17	113.74
	January	1983	110	108.79	116.07	107.59	115.47
	February		110	109.13	111.96	109.36	111.07
	March		110	112.14	115.22	110.90	115.88
	III	April	1983	c	111.90	113.10	110.26
May			c	111.60	114.35	110.56	113.42
June			c	113.60	115.73	111.02	115.16
July			c	112.91	114.12	111.19	113.46

a. For definition of price policy phases, see Table 5.1.

b. Data not available.

c. Effective April 1, 1983, there was no official regulated price at the retail level for MOP.

FIGURE 5.9: BEHAVIOR OF FARM-LEVEL MOP PRICES IN BANGLADESH
(ACTUAL PRICES AS SIMPLE AVERAGES)

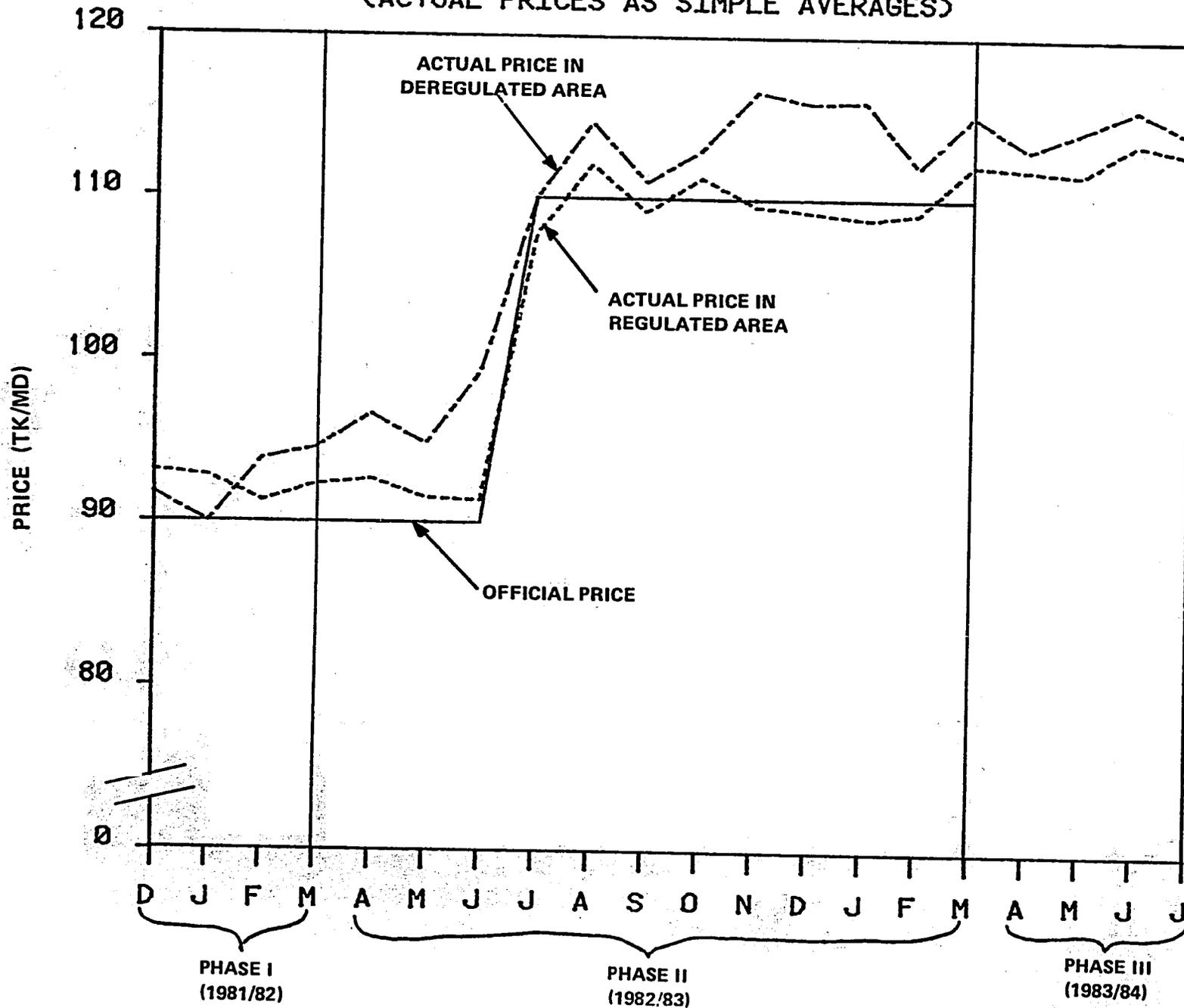


FIGURE 5.10: BEHAVIOR OF FARM-LEVEL MOP PRICES IN BANGLADESH
(ACTUAL PRICES AS WEIGHTED AVERAGES)

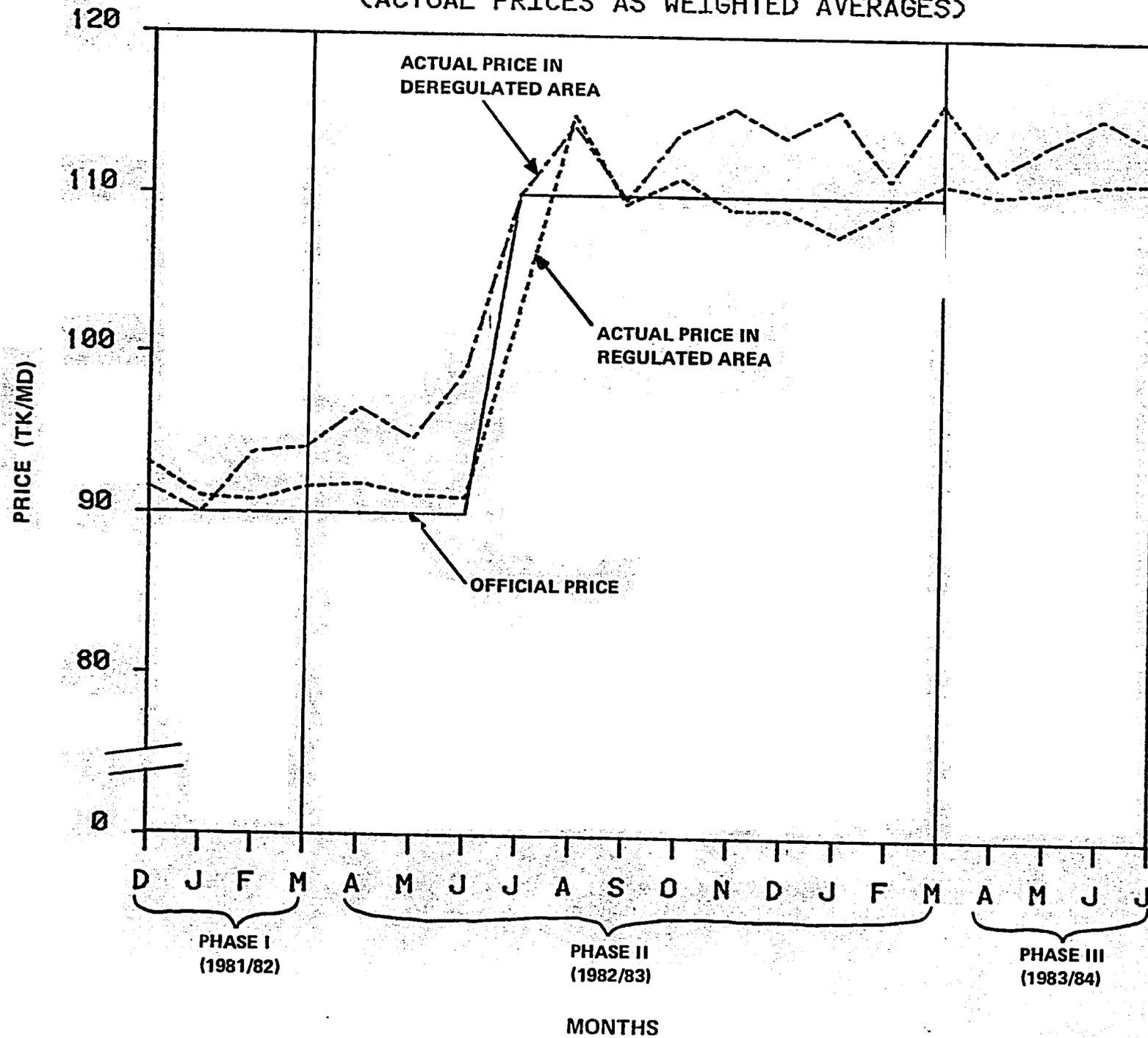


Table 5.6. Absolute and Relative Differences in Average Retail Fertilizer Prices for Regulated and Deregulated Areas During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea		TSPG		MOP	
		Absolute Difference ^b (TK/md)	Relative Difference ^c (%)	Absolute Difference ^b (TK/md)	Relative Difference ^c (%)	Absolute Difference ^b (TK/md)	Relative Difference ^c (%)
I	December 1981	9.46	6.42	9.97	8.11	-1.44	-1.55
	January 1982	23.19	16.66	27.51	22.63	-2.84	-3.06
	February	14.00	10.48	14.89	12.34	2.64	2.89
	March	5.55	4.15	14.37	12.16	2.27	2.45
II	April 1982	3.70	2.79	6.16	5.18	4.01	4.33
	May	4.94	3.73	4.49	3.77	3.34	3.65
	June	9.34	7.12	0.19	0.16	7.89	8.63
	July	10.95	7.63	1.56	1.13	- ^d	-
	August	5.39	3.68	5.20	3.74	2.57	2.30
	September	2.04	1.38	8.28	5.99	1.80	1.65
	October	4.24	2.87	4.83	3.46	1.72	1.55
	November	5.25	3.59	6.96	5.01	7.06	6.44
	December	2.37	1.61	2.84	2.04	6.70	6.14
	January 1983	4.35	2.97	3.08	2.23	7.27	6.68
	February	4.00	2.73	2.64	1.90	2.84	2.60
	March	3.09	2.11	2.40	1.72	3.08	2.75
	III	April 1983	1.51	1.01	3.05	2.18	2.73
May		0.75	0.50	-1.04	-0.74	2.75	2.46
June		0.84	0.57	0.41	0.29	2.13	1.87
July		-0.34	-0.22	-2.34	-1.64	1.21	1.07

a. Simple price averages.

b. Absolute price difference = average price in deregulated area - average price in regulated area.

c. Relative price difference = $\left[\frac{\text{Absolute Price Difference}}{\text{Average Price in Regulated Area}} \right] 100.$

d. Data not available.

Table 5.7. Absolute and Relative Differences in Average Retail Fertilizer Prices for Regulated and Deregulated Areas During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year		Urea		TSPG		MOP	
			Absolute Difference ^b (TK/md)	Relative Difference ^c (%)	Absolute Difference ^b (TK/md)	Relative Difference ^c (%)	Absolute Difference ^b (TK/md)	Relative Difference ^c (%)
I	December	1981	13.97	9.65	14.12	11.51	-1.57	-1.69
	January	1982	26.81	19.71	30.37	25.43	-1.00	-1.10
	February		15.00	11.42	13.48	11.30	3.05	3.36
	March		5.80	4.41	13.19	11.21	2.49	2.71
II	April	1982	3.32	2.52	7.02	5.96	4.71	5.12
	May		4.59	3.48	6.42	5.44	3.53	3.87
	June		10.16	7.88	-1.89	-1.58	8.02	8.82
	July		10.87	7.74	1.71	1.24	- ^d	-
	August		4.20	2.88	3.94	2.84	-0.69	-0.60
	September		0.10	0.07	9.44	6.94	0.24	0.22
	October		2.79	1.92	5.43	3.93	2.88	2.59
	November		5.94	4.11	7.11	5.17	6.34	5.81
	December		1.13	0.78	1.39	1.00	4.57	4.19
	January	1983	3.21	2.23	2.55	1.86	7.88	7.32
	February		1.37	0.94	1.36	0.98	1.71	1.57
	March		-0.06	-0.04	-0.17	-0.13	4.98	4.49
	III	April	1983	0.40	0.27	1.54	1.10	1.32
May			0.98	0.67	-1.38	-1.00	2.86	2.59
June			0.62	0.42	1.12	0.80	4.14	3.73
July			-1.59	-1.06	-4.64	-3.27	2.27	2.04

a. Weighted price averages.

b. Absolute price difference = average price in deregulated area - average price in regulated area.

c. Relative price difference = $\left[\frac{\text{Absolute Price Difference}}{\text{Average Price in Regulated Area}} \right] 100$.

d. Data not available.

Table 5.8. Statistical Test of Significance for the Differences in Average Deregulated and Regulated Retail Fertilizer Prices During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea				TSPG				MOP			
		D ^b (TK/md)	t Value	D.F.	PROB > T	D ^b (TK/md)	t Value	D.F.	PROB > T	D ^b (TK/md)	t Value	D.F.	PROB > T
I	December 1981	9.46	4.0761	328	0.0001	9.97	6.5073	184	0.0001	-1.44	-1.0462	88	0.2983
	January 1982	23.19	19.2752	405	0.0001	27.51	29.0667	263	0.0001	-2.84	-0.6385	136	0.5242
	February	14.00	12.7499	487	0.0001	14.89	10.6434	245	0.0001	2.64	3.6591	144	0.0004
	March	5.54	8.1867	568	0.0001	14.36	15.6760	191	0.0001	2.26	1.5435	47	0.1294
II	April 1982	3.69	5.7751	425	0.0001	6.17	7.7757	192	0.0001	4.01	4.9585	85	0.0001
	May	4.94	9.0543	334	0.0001	4.49	6.3506	160	0.0001	3.34	6.0094	61	0.0001
	June	9.34	11.9325	316	0.0001	0.19	0.1950	66	0.8460	7.89	8.1934	22	0.0001
	July	10.96	13.8185	307	0.0001	1.56	0.7443	78	0.4589	- ^c	-	-	-
	August	5.39	10.0400	223	0.0001	5.19	4.8766	85	0.0001	2.58	0.8262	26	0.4162
	September	2.04	3.9197	293	0.0001	8.28	3.5019	32	0.0014	1.80	0.6142	9	0.5543
	October	4.24	5.2666	290	0.0001	4.83	5.4829	74	0.0001	1.72	1.0610	28	0.2978
	November	5.25	11.4382	340	0.0001	6.97	6.7028	105	0.0001	7.06	4.9507	61	0.0001
	December	2.37	5.6796	295	0.0001	2.84	2.7132	72	0.0083	6.70	6.3844	68	0.0001
	January 1983	4.35	8.4140	326	0.0001	3.09	4.5577	150	0.0001	7.28	8.1152	95	0.0001
	February	4.00	8.0541	377	0.0001	2.64	4.2296	131	0.0001	2.83	3.0181	84	0.0034
	March	3.10	6.9669	496	0.0001	2.41	2.5535	42	0.0144	3.08	1.5298	25	0.1386
	III	April 1983	1.51	3.1961	429	0.0015	3.06	4.9097	95	0.0001	2.73	2.4572	41
May		0.75	1.4376	377	0.1514	-1.04	-1.2190	134	0.2250	2.75	2.3432	53	0.0229
June		0.84	1.8418	437	0.0662	0.41	0.7945	123	0.4284	2.13	1.1990	34	0.2388
July		-0.34	-0.6135	383	0.5399	-2.33	-3.1998	123	0.0017	1.21	0.7543	46	0.4545

a. Based on simple price averages.

b. D refers to absolute price difference which is equal to average price in deregulated area minus average price in regulated area. The price differences are considered statistically significant at $PROB \leq 0.05$.

c. Data not available.

Table 5.9. Statistical Test of Significance for the Price Differences Between Deregulated and Regulated Areas in Different Market Categories for Urea in Bangladesh^a

Price Policy Phase	Month/Year	Price Differences by Market Categories ^b							Average
		5/PDP/R	10/PDP/R	12-15/PdP/NR	15-20/PDP/NR	5/PDP/NR	5/TSC	10/TSC	
		(TK/md)							
I	December 1981	1.32	20.82**	26.06**	18.30**	8.62**	-10.44	3.19	9.46**
	January 1982	13.96**	26.26**	32.69**	26.81**	14.10**	21.83**	29.91**	23.19**
	February	6.70**	15.58**	26.29**	10.74**	5.44*	17.84**	23.91**	14.00**
	March	0.93	8.92**	9.70**	1.47	1.56	3.64*	12.38**	5.54**
II	April 1982	5.03**	4.97**	6.65*	0.99	-1.01	2.43	9.12**	3.69**
	May	4.23**	8.99**	4.14*	5.69**	-0.43	3.71**	6.82**	4.94**
	June	9.78**	12.09**	16.05**	3.33	5.25**	4.30**	21.28**	9.34**
	July	6.25**	15.46**	18.87**	7.07**	11.23**	2.61	15.19**	10.96**
	August	6.62**	3.96**	6.32**	7.14**	1.94*	4.46**	6.52*	5.39**
	September	0.00	0.98	3.12*	2.87**	1.39	-1.26	5.04**	2.04**
	October	3.22	5.68**	11.01**	6.21**	1.59	-2.22	5.32	4.24**
	November	1.36	6.52**	6.14**	7.49**	4.69**	3.98**	8.06**	5.25**
	December	0.18	3.22*	3.31**	4.55**	2.98**	-0.29	3.65**	2.37**
	January 1983	4.56**	1.66	6.55**	4.89**	2.13	4.47*	2.27**	4.35**
	February	1.81	3.66**	6.51**	4.64**	2.28*	3.06*	7.61**	4.00**
	March	0.32	4.37**	6.58**	1.97	0.61	3.55*	5.65**	3.10**
	III	April 1983	-1.72	3.11*	0.78	2.93**	0.62	1.33	10.90**
May		-1.32	4.51**	0.83	4.77**	0.31	-2.59	0.38	0.75
June		-1.45	5.47**	0.01	0.91	0.64	-1.09	6.07**	0.84
July		-2.81*	1.64	2.02	0.09	-2.52	-0.20	1.49	-0.34

a. The definition of symbols is as follows:

** → Significant at $\text{PROB} \leq 0.01$.

* → Significant at $0.01 < \text{PROB} \leq 0.05$.

The price difference without star was not statistically significant.

b. Actual urea price differences between deregulated and regulated market areas. For the definition of fertilizer market categories, see Table A-3.

Table 5.10. Statistical Test of Significance for the Price Differences Between Deregulated and Regulated Areas in Different Market Categories for TSPG in Bangladesh^a

Price Policy Phase	Month/Year	Price Differences by Market Categories ^b							
		5/PDP/R	10/PDP/R	12-15/PDP/NR	15-20/PDP/NR	5/PDP/NR	5/TSC	10/TSC	Average
		----- (TK/md) -----							
I	December 1981	11.08**	12.52**	11.33**	7.35*	9.00	2.59	19.80**	9.97**
	January 1982	15.45**	31.09**	34.70**	31.95**	23.56**	28.86**	32.78**	27.51**
	February	5.12	9.88**	23.09**	15.11**	9.87**	22.01**	21.53**	14.89**
	March	12.60**	20.47**	21.14**	10.44**	5.62**	16.06**	17.72**	14.36**
II	April 1982	3.53*	10.70**	12.30**	3.02	1.69	8.26**	10.03**	6.17**
	May	5.26**	10.05**	1.94	1.45	0.45	3.59	5.44**	4.49**
	June	0.00	-8.00	7.68	-3.11	-2.52	-0.81	4.00	0.19
	July	4.83	20.94*	6.29	1.35	11.05**	-12.17*	0.00	1.56
	August	7.68*	12.67**	6.81	0.96	0.79	2.06	6.58	5.19**
	September	3.43	4.77	12.33**	- ^c	5.35	5.49	17.07*	8.28**
	October	3.82**	8.14**	11.16	8.26	2.17	4.45	6.82*	4.83**
	November	3.97*	9.53**	6.80	6.29	3.33	11.30*	11.75**	6.97**
	December	-0.06	1.47	1.00	4.99	1.69	2.30	7.09	2.84**
	January 1983	3.66**	0.50	3.25*	4.43	1.98	2.86	4.31**	3.09**
	February	-0.06	2.48	4.08*	5.75*	3.32**	0.34	2.61	2.64**
	March	-1.55	6.14	3.71	3.33	0.67	-1.00	1.33	2.41*
	III	April 1983	2.47*	3.15	2.67	3.60	2.58	3.62	10.50**
May		0.10	1.90	-1.29	1.25	-4.12**	-1.10	-	-1.04
June		-0.06	0.85	-1.33	0.89	1.16**	-1.47	6.03*	0.41
July		-1.92	0.13	0.87	-3.69	-2.10	1.26	-4.67	-2.33**

a. The definition of symbols is as follows:

** → Significant at $\text{PROB} \leq 0.01$.

* → Significant at $0.01 < \text{PROB} \leq 0.05$.

The price difference without star was not statistically significant.

b. Actual TSPG price differences between deregulated and regulated market areas. For the definition of fertilizer market categories, see Table A-3.

c. Data not available.

Table 5.11. Statistical Test of Significance for the Price Differences Between Deregulated and Regulated Areas in Different Market Categories for MOP in Bangladesh^a

Price Policy Phase	Month/Year	Price Differences by Market Categories ^b							
		5/PDP/R	10/PDP/R	12-15/PDP/NR	15-20/PDP/NR	5/PDP/NR	5/TSC	10/TSC	Average
		----- (TK/md) -----							
I	December 1981	-4.00	-2.03	1.86	2.75	5.67	-10.34	-3.48	-1.44
	January 1982	- ^c	-	-	-2.06	-	-	-	-2.84
	February	1.72	6.00*	4.04*	-1.89	-0.10	4.24	5.38**	2.64**
	March	-0.22	7.93**	-	0.04	-1.08	-	7.33	2.26
II	April 1982	5.50*	9.68**	9.33**	-0.45	-0.11	4.30*	1.87	4.01**
	May	2.93**	7.01*	5.49**	-	-0.15	2.43	4.28**	3.34**
	June	4.00	-	-	-	-	7.33	12.40**	7.89**
	July	-	-	-	-	-	-	-	-
	August	9.51	-	-5.20	-	1.33	2.00	13.00**	2.58
	September	2.00	4.00	-	-	-	-	-	1.80
	October	-	-	7.33	-5.41	-1.37	3.95	-	1.72
	November	8.29*	0.71	9.33	2.23	6.09	18.67**	9.75**	7.06**
	December	9.50**	7.85**	8.89*	8.27**	4.77	0.00	10.47**	6.70**
	January 1983	9.30**	10.17**	2.60*	11.14	-1.80	4.25	10.24**	7.28**
	February	6.73*	1.46	-2.08	-1.33	0.18	-0.89	6.18**	2.83**
	March	8.00	10.67	4.48*	-9.50	6.00	-3.04	4.00	3.08
	III	April 1983	1.50	8.67**	-	-0.54	4.23	8.50**	-
May		2.84	-	5.42*	-	0.00	2.67	-	2.75*
June		-	8.00	2.33	-5.33	-0.41	4.00	0.00	2.13
July		-1.60	8.00	1.96	2.33	1.17	5.00	-3.67	1.21

a. The definition of symbols is as follows:

** → Significant at $PROB \leq 0.01$.

* → Significant at $0.01 < PROB \leq 0.05$.

The price difference without star was not statistically significant.

b. Actual MOP price differences between deregulated and regulated market areas. For the definition of fertilizer market categories, see Table A-3.

c. Data not available.

Table 5.12. Absolute Price Differences Between Actual and Official Fertilizer Prices During Two Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea ^b			TSPG ^b			MOP ^b		
		A ₁	A ₂	A ₃	A ₁	A ₂	A ₃	A ₁	A ₂	A ₃
I	1981 December	15.38	24.84	19.13	8.00	17.97	11.65	3.18	1.74	2.53
	1982 January	7.24	30.43	13.34	6.58	34.09	13.33	2.84	0.00	2.82
	February	1.50	15.50	6.97	5.64	20.53	11.70	1.32	3.96	2.24
	March	1.76	7.30	4.34	3.18	17.54	9.28	2.38	4.64	2.84
II	1982 April	0.45	4.14	2.27	3.96	10.13	6.66	2.73	6.74	4.34
	May	0.64	5.58	2.36	4.16	8.65	5.71	1.54	4.88	2.54
	June	-0.87	8.47	3.36	5.40	5.59	5.47	1.44	9.33	3.42
	July	-4.36	6.60	0.96	-2.03	-0.47	-1.56	-2.24	- ^c	-2.24
	August	-1.53	3.86	1.01	-1.00	4.19	1.45	2.09	4.67	3.47
	September	-0.45	1.59	0.50	-1.81	6.47	4.52	-0.80	1.00	0.18
	October	-0.12	4.12	2.05	-0.29	4.54	2.57	1.30	3.02	1.87
	November	-1.73	3.52	0.68	-1.04	5.93	3.45	-0.44	6.62	1.02
	December	-1.34	1.03	-0.09	-1.21	1.63	0.55	-0.80	5.90	1.21
	1983 January	-1.86	2.49	-0.03	-1.87	1.22	-0.99	-1.21	6.07	0.14
	February	-1.64	2.36	0.73	-0.83	1.81	-0.15	-0.87	1.96	-0.28
	March	-1.18	1.92	0.24	-0.54	1.87	0.34	2.14	5.22	3.63

a. Based on simple price averages.

b. Where: A₁ = Actual price in regulated market - official price.
A₂ = Actual price in deregulated market - official price.
A₃ = Overall actual price - official price.

c. Data not available.

Table 5.13. Absolute Price Differences Between Actual and Official Fertilizer Prices During Two Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea ^b			TSPG ^b			MOP ^b		
		A ₁	A ₂	A ₃	A ₁	A ₂	A ₃	A ₁	A ₂	A ₃
						(TK/md)				
I	1981 December	12.79	26.76	18.84	7.76	21.88	12.88	3.15	1.58	2.50
	1982 January	4.01	30.82	13.01	4.41	34.78	11.12	1.00	0.00	1.00
	February	-0.72	14.27	5.73	4.23	17.70	11.54	0.81	3.86	2.25
	March	-0.28	5.52	2.49	2.70	15.89	6.87	1.67	4.15	2.09
II	1982 April	-0.06	3.26	1.81	2.80	9.81	4.81	1.91	6.62	3.18
	May	-0.25	4.34	1.48	3.11	9.53	5.03	1.16	4.69	1.91
	June	-3.06	7.10	0.39	4.89	2.99	4.15	1.02	9.05	2.24
	July	-7.51	3.36	-1.10	-2.24	-0.53	-1.65	-7.27	- ^c	-7.27
	August	-2.35	1.85	-0.47	-1.28	2.65	0.99	5.03	4.35	4.75
	September	-1.54	-1.45	-1.48	-3.90	5.54	2.08	-0.50	-0.26	-0.34
	October	-2.67	0.11	-1.22	-2.07	3.53	0.19	1.13	4.01	2.23
	November	-3.41	2.53	-1.81	-2.63	4.48	0.87	-0.85	5.49	0.57
	December	-3.02	-1.89	-2.42	-1.50	-0.11	-0.44	-0.83	3.74	0.34
	1983 January	-4.19	-0.99	-2.86	-3.14	-0.59	-2.53	-2.41	5.47	-1.32
	February	-2.30	-0.94	-1.57	-1.63	-0.27	-1.35	-0.64	1.07	-0.33
	March	-1.93	-1.99	-1.95	-0.65	-0.83	-0.71	0.90	5.88	3.84

a. Based on weighted price averages.

b. Where: A₁ = Actual price in regulated market - official price.

A₂ = Actual price in deregulated market - official price.

A₃ = Overall actual price - official price.

c. Data not available.

Table 5.14. Relative Price Differences Between Actual and Official Fertilizer Prices During Two Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea ^b			TSPG ^b			MOP ^b		
		R ₁	R ₂	R ₃	R ₁	R ₂ (%)	R ₃	R ₁	R ₂	R ₃
I	1981 December	11.65	18.82	14.49	6.96	15.63	10.13	3.54	1.94	2.81
	1982 January	5.48	23.05	10.10	5.72	29.65	11.59	3.16	0.00	3.13
	February	1.14	11.74	5.28	4.90	17.85	10.17	1.46	4.40	2.49
	March	1.33	5.53	3.29	2.76	15.25	8.07	2.64	5.16	3.16
II	1982 April	0.34	3.14	1.72	3.45	8.80	5.79	3.03	7.49	4.82
	May	0.48	4.23	1.79	3.62	7.52	4.97	1.71	5.42	2.83
	June	-0.66	6.41	2.54	4.69	4.86	4.76	1.60	10.37	3.80
	July	-2.94	4.46	0.65	-1.45	-0.33	-1.12	-2.03	- ^c	-2.03
	August	-1.05	2.61	0.68	-0.72	3.00	1.03	1.90	4.24	3.16
	September	-0.30	1.07	0.34	-1.29	4.62	3.23	-0.73	0.91	0.17
	October	-0.08	2.78	1.39	-0.21	3.24	1.84	1.18	2.75	1.70
	November	-1.17	2.38	0.46	-0.74	4.23	2.47	-0.40	6.01	0.92
	December	-0.90	0.69	-0.06	-0.86	1.16	0.39	-0.73	5.36	1.10
	1983 January	-1.25	1.68	-0.02	-1.33	0.87	-0.71	-1.10	5.51	0.13
	February	-1.11	1.60	0.49	-0.59	1.29	-0.11	-0.79	1.78	-0.25
	March	-0.80	1.29	0.16	-0.38	1.33	0.24	1.95	4.75	3.30

a. Relative price difference = $\left[\frac{\text{actual price} - \text{official price}}{\text{official price}} \right] 100$; where the actual prices refer to simple price averages.

b. Where: R₁ = Relative price difference in regulated market.
R₂ = Relative price difference in deregulated market.
R₃ = Overall relative price difference.

c. Data not available.

Table 5.15. Relative Price Differences Between Actual and Official Fertilizer Prices During Two Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Urea ^b			TSPG ^b			MOP ^b		
		R ₁	R ₂	R ₃	R ₁	R ₂	R ₃	R ₁	R ₂	R ₃
						(%)				
I	1981 December	9.69	20.27	14.28	6.75	19.03	11.20	3.50	1.75	2.77
	1982 January	3.04	23.35	9.86	3.83	30.24	9.67	1.11	0.00	1.11
	February	-0.55	10.81	4.34	3.67	15.39	10.03	0.90	4.29	2.50
	March	-0.22	4.18	1.89	2.35	13.82	5.97	1.85	4.61	2.32
II	1982 April	-0.05	2.47	1.37	2.43	8.53	4.18	2.12	7.35	3.53
	May	-0.19	3.29	1.12	2.71	8.29	4.37	1.29	5.21	2.12
	June	-2.32	5.38	0.30	4.25	2.60	3.61	1.14	10.05	2.49
	July	-5.08	2.27	-0.74	-1.60	-0.38	-1.18	-6.61	- ^c	-6.61
	August	-1.59	1.25	-0.32	-0.92	1.89	0.71	4.58	3.95	4.32
	September	-1.04	-0.98	-1.00	-2.78	3.96	1.49	-0.45	-0.23	-0.31
	October	-1.80	0.08	-0.82	-1.48	2.40	0.14	1.03	3.65	2.02
	November	-2.31	1.71	-1.22	-1.88	3.20	0.62	-0.77	4.99	0.52
	December	-2.04	-1.28	-1.64	-1.07	-0.08	-0.32	-0.76	3.40	0.31
	1983 January	-2.83	-0.67	-1.93	-2.24	-0.42	-1.81	-2.19	4.97	-1.20
	February	-1.56	-0.63	-1.06	-1.16	-0.19	-0.97	-0.58	0.97	-0.30
	March	-1.30	-1.35	-1.32	-0.47	-0.59	-0.51	0.81	5.34	3.49

a. Relative price difference = $\left[\frac{\text{actual price} - \text{official price}}{\text{official price}} \right] 100$; where the actual prices refer to weighted price averages.

b. Where: R₁ = Relative price difference in regulated market.
R₂ = Relative price difference in deregulated market.
R₃ = Overall relative price difference.

c. Data not available.

Table 5.16. Statistical Test of Significance for the Differences in Actual and Official Prices During Two Phases of Fertilizer Pricing Policy for Urea in Bangladesh^a

Price Policy Phase	Month/Year	Regulated Districts ^b				Deregulated Districts ^b				Overall ^b			
		A ₁ (TK/md)	t	D.F.	PROB > T	A ₂ (TK/md)	t	D.F.	PROB > T	A ₃ (TK/md)	t	D.F.	PROB > T
I	1981 December	15.38	10.3562	196	0.0001	24.84	14.1107	130	0.0001	19.13	16.4592	329	0.0001
	1982 January	7.24	11.2823	299	0.0001	30.43	33.5766	106	0.0001	13.34	18.2059	406	0.0001
	February	1.50	3.0120	297	0.0028	15.50	13.7111	190	0.0001	6.97	11.2751	488	0.0001
	March	1.76	3.7584	303	0.0002	7.30	14.9100	265	0.0001	4.34	12.1638	569	0.0001
II	1982 April	0.45	1.4062	216	0.1611	4.14	7.3794	209	0.0001	2.27	6.8247	426	0.0001
	May	0.64	2.5781	218	0.0106	5.58	9.5340	116	0.0001	2.36	8.1457	335	0.0001
	June	-0.87	-2.5645	173	0.0112	8.47	11.1962	143	0.0001	3.36	7.1681	317	0.0001
	July	-4.36	-9.1489	158	0.0001	6.60	10.2868	149	0.0001	0.96	1.9092	308	0.0572
	August	-1.53	-7.9763	118	0.0001	3.86	7.3345	105	0.0001	1.01	3.1456	224	0.0019
	September	-0.45	-1.4066	157	0.1615	1.59	3.7753	136	0.0002	0.50	1.8819	294	0.0608
	October	-0.12	-0.3222	141	0.7478	4.12	5.9364	149	0.0001	2.05	4.8853	291	0.0001
	November	-1.73	-5.9245	184	0.0001	3.52	9.7678	156	0.0001	0.68	2.5306	341	0.0118
	December	-1.34	-4.9420	139	0.0001	1.03	3.3092	156	0.0012	-0.09	-0.4015	296	0.6883
	1983 January	-1.86	-6.3875	189	0.0001	2.49	5.4678	137	0.0001	-0.03	-0.0977	327	0.9223
	February	-1.64	-6.6271	154	0.0001	2.36	6.2827	223	0.0001	0.73	2.7506	378	0.0062
	March	-1.18	-8.0133	269	0.0001	1.92	4.2497	227	0.0001	0.24	1.0312	497	0.3029

a. Based on simple price averages. The price differences are considered statistically significant at $PROB \leq 0.05$.

b. Where: A₁ = Actual price in regulated market - official price.
A₂ = Actual price in deregulated market - official price.
A₃ = Overall actual price - official price.
t = t statistic.
D.F. = degrees of freedom.

Table 5.17. Statistical Test of Significance for the Differences in Actual and Official Prices During Two Phases of Fertilizer Pricing Policy for TSPG in Bangladesh

Price Policy Phase	Month/Year	Regulated Districts ^b				Deregulated Districts ^b				Overall ^b			
		A ₁ (TK/md)	t	D.F.	PROB > T	A ₂ (TK/md)	t	D.F.	PROB > T	A ₃ (TK/md)	t	D.F.	PROB > T
I	1981 December	8.00	10.1301	117	0.0001	17.97	12.1137	67	0.0001	11.65	14.2667	185	0.0001
	1982 January	6.58	17.0304	199	0.0001	34.09	29.3321	64	0.0001	13.33	15.9750	264	0.0001
	February	5.64	12.7308	146	0.0001	20.53	13.1468	100	0.0001	11.70	14.1127	247	0.0001
	March	3.18	7.9567	110	0.0001	17.54	19.0714	81	0.0001	9.28	13.5821	192	0.0001
II	1982 April	3.96	13.6664	108	0.0001	10.13	12.3884	84	0.0001	6.66	14.8151	193	0.0001
	May	4.16	19.1285	105	0.0001	8.65	9.7941	55	0.0001	5.71	15.2350	161	0.0001
	June	5.40	13.0199	41	0.0001	5.59	5.2110	25	0.0001	5.47	11.4257	67	0.0001
	July	-2.03	-3.6415	55	0.0006	-0.47	-0.1580	23	0.8759	-1.56	-1.6266	79	0.1078
	August	-1.00	-2.7609	45	0.0083	4.19	3.9816	40	0.0003	1.45	2.4165	86	0.0178
	September	-1.81	-1.9711	7	0.0894	6.47	5.0955	25	0.0001	4.52	3.8904	33	0.0005
	October	-0.29	-0.5512	30	0.5856	4.54	7.1500	44	0.0001	2.57	5.0417	75	0.0001
	November	-1.04	-3.0288	37	0.0045	5.93	7.9441	68	0.0001	3.45	5.8431	106	0.0001
	December	-1.21	-2.4365	27	0.0217	1.63	2.1509	45	0.0369	0.55	1.0458	73	0.2991
	1983 January	-1.87	-5.2122	108	0.0001	1.22	2.0988	42	0.0419	-0.99	-3.0689	151	0.0025
	February	-0.83	-3.3929	98	0.0010	1.81	2.2730	33	0.0297	-0.15	-0.5342	132	0.5941
	March	-0.54	-1.4959	27	0.1463	1.87	1.7235	15	0.1053	0.34	0.7020	43	0.4864

a. Based on simple price averages. The price differences are considered statistically significant at $PROB \leq 0.05$.

b. Where: A₁ = Actual price in regulated market - official price.

A₂ = Actual price in deregulated market - official price.

A₃ = Overall actual price - official price.

t = t statistic.

D.F. = degrees of freedom.

Table 5.18. Statistical Test of Significance for the Differences in Actual and Official Prices During Two Phases of Fertilizer Pricing Policy for HOP in Bangladesh

Price Policy Phase	Month/Year	Regulated Districts ^b				Deregulated Districts ^b				Overall ^b			
		A ₁ (TK/md)	t	D.F.	PROB > T	A ₂ (TK/md)	t	D.F.	PROB > T	A ₃ (TK/md)	t	D.F.	PROB > T
I	1981 December	3.18	2.9124	48	0.0054	1.74	2.3342	40	0.0247	2.53	3.6833	89	0.0004
	1982 January	2.84	7.5276	137	0.0001	0.00	- ^c	0	-	2.82	7.5166	138	0.0001
	February	1.32	3.6623	94	0.0004	3.96	5.4672	50	0.0001	2.24	6.2448	145	0.0001
	March	2.38	3.8972	38	0.0004	4.64	2.7599	9	0.0221	2.84	4.7320	48	0.0001
II	1982 April	2.73	6.9731	51	0.0001	6.74	8.4424	34	0.0001	4.34	9.6936	86	0.0001
	May	1.54	8.6121	43	0.0001	4.88	6.5430	18	0.0001	2.54	7.9653	62	0.0001
	June	1.44	6.6483	17	0.0001	9.33	5.8132	5	0.0021	3.42	4.1629	23	0.0004
	July	-2.24	-1.7282	16	0.1032	-	-	-	-	-2.24	-1.7282	16	0.1032
	August	2.09	0.6900	12	0.5033	4.67	3.7599	14	0.0021	3.47	2.2471	27	0.0330
	September	-0.80	-1.6330	4	0.1778	1.00	0.3816	5	0.7184	0.18	0.1287	10	0.9002
	October	1.30	1.7479	19	0.0966	3.02	1.7063	9	0.1221	1.87	2.4420	29	0.0209
	November	-0.44	-1.1169	49	0.2695	6.62	2.7573	12	0.0174	1.02	1.4999	62	0.1387
	December	-0.80	-2.1112	48	0.0400	5.90	4.3791	20	0.0003	1.21	2.0020	69	0.0492
	1983 January	-1.21	-3.6310	78	0.0005	6.07	5.0667	17	0.0001	0.14	0.3183	96	0.7510
	February	-0.87	-3.2690	67	0.0017	1.96	1.2703	17	0.2211	-0.28	-0.6975	85	0.4874
	March	2.14	1.7668	13	0.1007	5.22	3.1998	12	0.0076	3.63	3.5142	26	0.0016

a. Based on simple price averages. The price differences are considered statistically significant at $PROB \leq 0.05$.

b. Where: A₁ = Actual price in regulated market - official price.

A₂ = Actual price in deregulated market - official price.

A₃ = Overall actual price - official price.

t = t statistic.

D.F. = degrees of freedom.

c. Data not available.

Table 5.19. Coefficients of Variation in Retail Fertilizer Prices in Regulated and Deregulated Market Areas During Three Phases of Fertilizer Pricing Policy in Bangladesh

Price Policy Phase	Month/Year	Urea			TSPG			MOP		
		Regulated	Deregulated	Overall	Regulated	Deregulated	Overall	Regulated	Deregulated	Overall
I	1981 December	14.21	12.85	13.97	6.98	9.20	8.79	8.21	5.21	7.03
	1982 January	7.98	5.77	10.17	4.49	6.29	10.58	4.77	- ^c	4.76
	February	6.44	10.59	9.83	4.45	11.58	10.31	3.84	5.50	4.70
	March	6.09	5.73	6.25	3.56	6.29	7.64	4.12	5.62	4.53
II	1982 April	3.54	5.98	5.11	2.55	6.07	5.15	3.04	4.88	4.43
	May	2.77	4.60	3.95	1.88	5.2	3.96	1.29	3.43	2.74
	June	3.42	6.46	6.17	2.23	4.54	3.28	1.01	3.96	4.30
	July	4.18	5.08	5.94	3.03	10.38	6.20	4.95	-	4.95
	August	1.42	3.57	3.24	1.77	4.68	3.95	9.75	4.19	7.20
	September	2.71	3.30	3.07	1.88	4.42	4.69	1.00	5.78	4.25
	October	3.10	5.58	4.79	3.09	2.95	3.12	2.99	4.96	3.76
	November	2.72	2.98	3.35	1.52	4.25	4.26	2.54	7.42	4.84
	December	2.19	2.61	2.55	1.89	3.62	3.24	2.43	5.33	4.54
	1983 January	2.74	3.56	3.44	2.71	2.69	2.88	2.71	4.38	4.03
	February	2.10	3.74	3.46	1.75	3.28	2.39	2.02	5.86	3.38
	March	1.65	4.54	3.49	1.36	3.05	2.27	4.05	5.11	4.72
	III	1983 April	2.14	4.35	3.25	1.70	2.48	2.18	1.29	4.69
May		3.19	3.59	3.37	2.17	4.19	2.57	3.22	4.33	3.77
June		3.06	3.33	3.19	1.71	2.26	1.89	3.97	4.20	4.17
July		3.74	3.37	3.57	3.03	2.72	3.00	5.20	4.39	4.84

a. Based on simple price averages.

b. For definition of price policy phases, see Table 5.1.

c. Data not available.

FIGURE 5.11: COEFFICIENTS OF VARIATION IN AVERAGE RETAIL UREA PRICES IN REGULATED AND DEREGULATED AREAS IN BANGLADESH

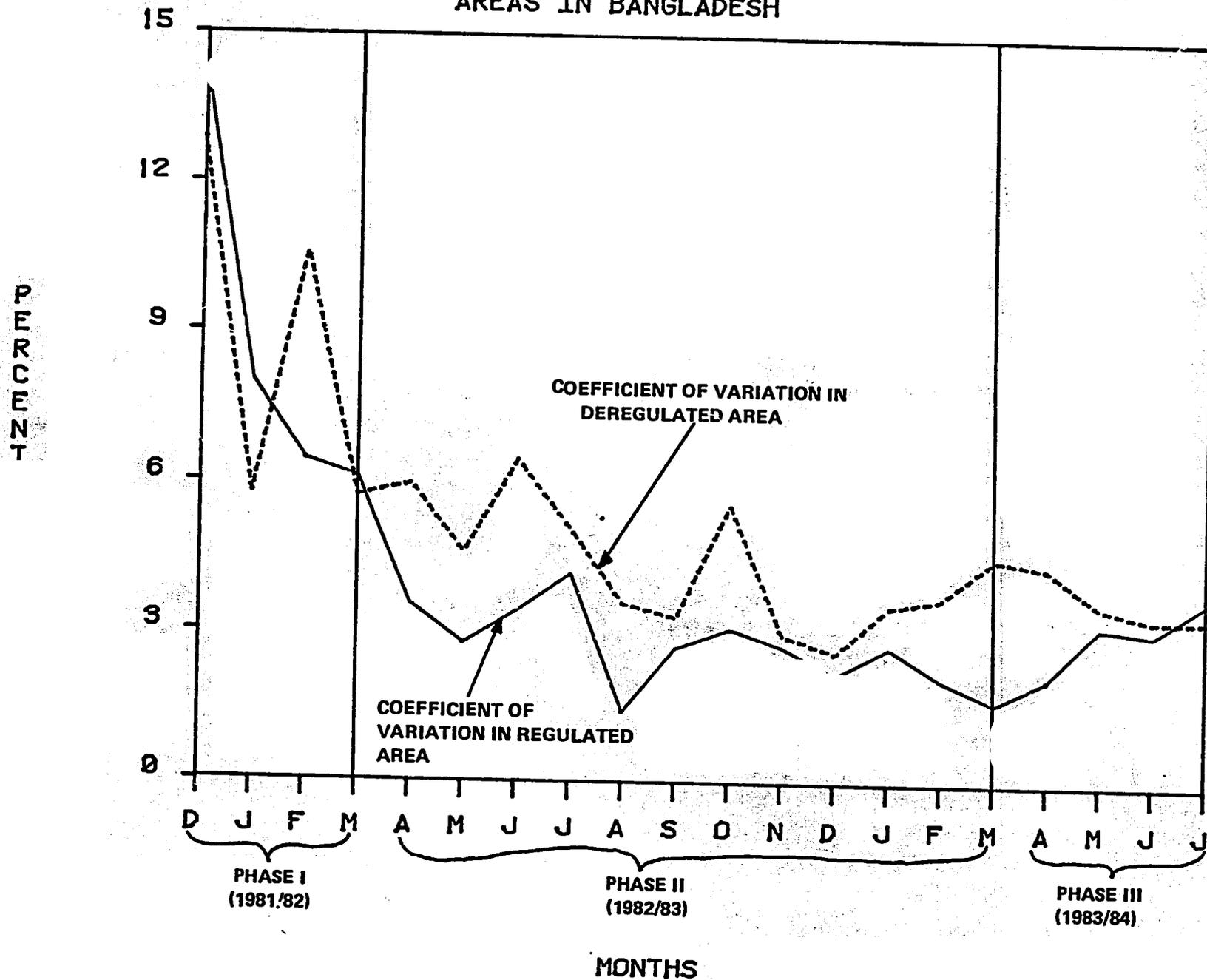


FIGURE 5.12: COEFFICIENTS OF VARIATION IN AVERAGE RETAIL TSPG PRICES IN REGULATED AND DEREGULATED AREAS IN BANGLADESH

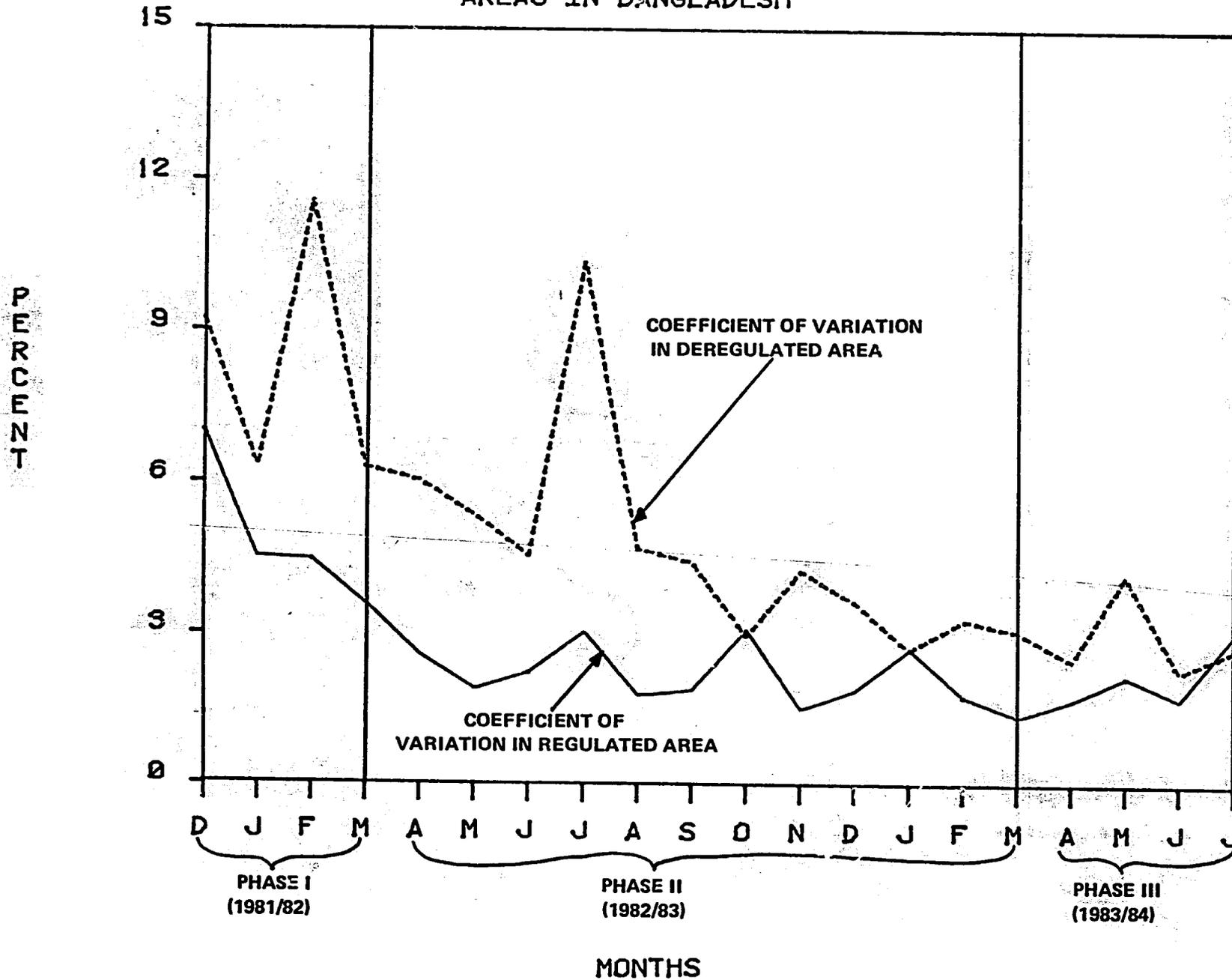
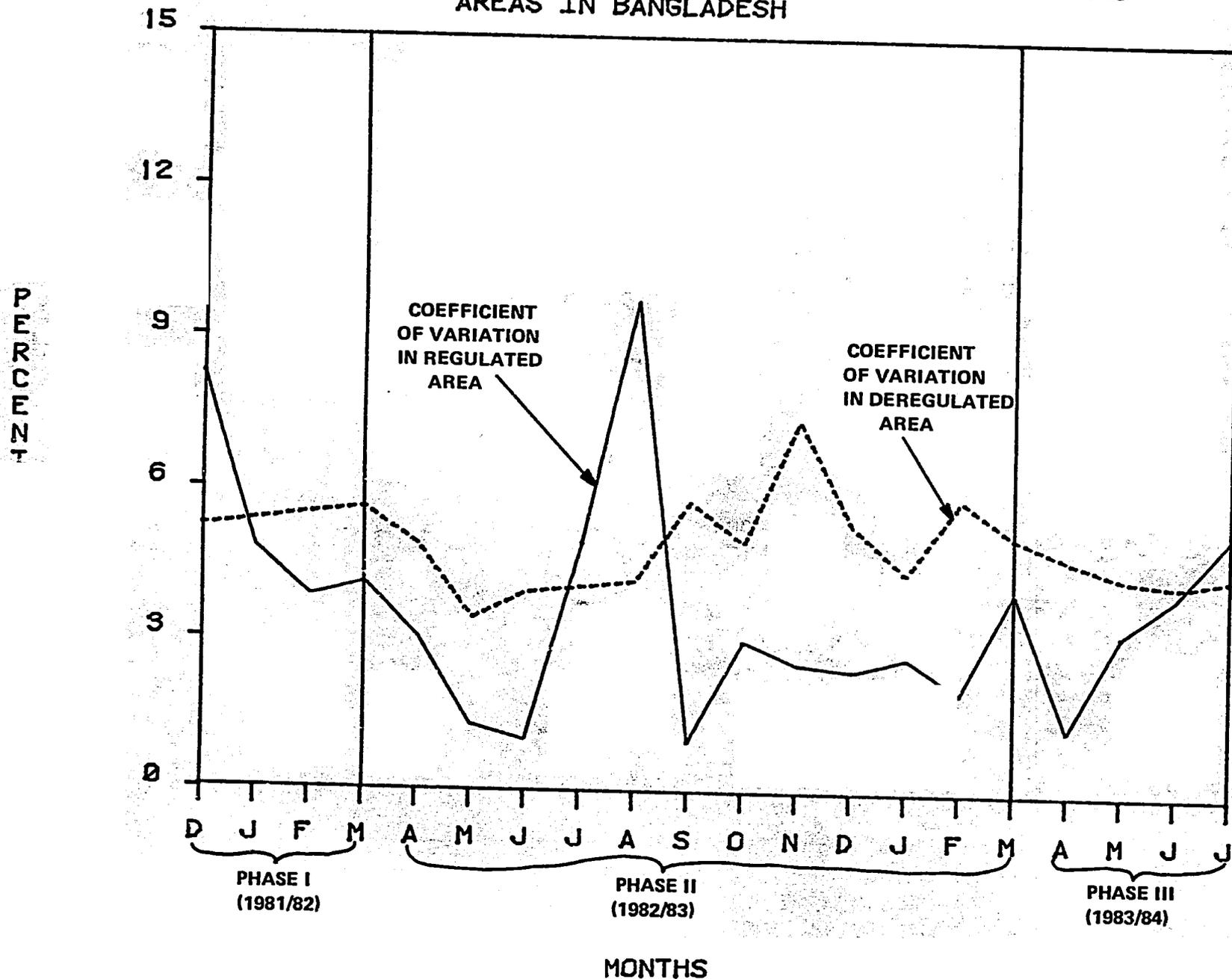


FIGURE 5.13: COEFFICIENTS OF VARIATION IN AVERAGE RETAIL MOP PRICES IN REGULATED AND DEREGULATED AREAS IN BANGLADESH



CHAPTER 6SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study deals with selected aspects of fertilizer price policy in Bangladesh and its relevance for other developing countries in Asia, Africa, and Latin America. Most developing countries follow a policy by which the government administers and regulates fertilizer prices. However, Bangladesh conducted a unique experiment for price policy in which retail fertilizer prices were deregulated in two stages--first in April 1982 in Chittagong Division and then in April 1983 price deregulation was extended to the whole country. At present the retail prices are not fixed by the government but rather are determined by prevailing fertilizer demand and supply conditions.

SummaryPurpose

The overall purpose of this study was to analyze the economic impact of fertilizer price deregulation on the level and variation in retail fertilizer prices in the context of fertilizer price and subsidy policy in Bangladesh.

Data

This study is based on both primary and secondary data. The primary data were collected through a "Farmer Fertilizer Price Survey" conducted monthly by BADC/IFDC. The secondary data were obtained from various BADC publications, including BADC monthly fertilizer newsletter.

Analysis

The impact of price deregulation was analyzed for a 20-month period from December 1981 to July 1983. The analysis based on secondary data deals with time-series data for a period of approximately 10 years.

The economic impact analysis deals mainly with three popular fertilizers: urea, TSPG, and MOP. Other fertilizers were excluded from monthly price policy analysis either because of lack of adequate data or because the fertilizers were of relatively minor importance. Even in the case of MOP, however,

the data were not always satisfactory, and the number of observations was limited.

Furthermore, the analysis deals with seven fertilizer market categories and 10 districts, simply because data were collected and available for these markets and districts. Several criteria, along with statistical analysis, were used to evaluate the impact of fertilizer price deregulation on retail fertilizer prices. The results are reported in both graphic and tabular formats.

This study provides a systematic framework for evaluating the impact of price deregulation on retail fertilizer prices. Although the results are based on the best available data, much more remains to be done to bridge data gaps, improve data quality, and further refine the analysis in the context of specific countries. There is also a need to test these hypotheses in other developing countries. Recognizing these considerations, the results have important implications for fertilizer price and subsidy policy in Bangladesh and in other developing countries of the world.

Conclusions

Price Deregulation

On the basis of detailed statistical analysis of prices paid by farmers, we can conclude that even though retail fertilizer price levels and price variability were higher in deregulated market areas than in regulated market areas, this difference cannot be attributed to the initiation of price deregulation policy. Both price differences and price variability declined gradually as Bangladesh switched from Phase I of complete price regulation to Phase III of complete price deregulation.

Administered Prices

The results indicate that the actual fertilizer prices paid by farmers were generally not the same as those officially administered by the government. As a result, one can conclude that the policy of administered fertilizer prices was not really effective. Thus, all the resources needed to enforce the administered price policy can be saved and invested in alternative projects with greater economic returns. The official administered prices, however, appeared to have served as a reference for market prices.

Subsidy Policy

On the basis of the border price approach, the level, rate, and cost of subsidy for fertilizers, except local urea, were slightly lower than those estimated by BADC. However, urea accounted for 99% of nitrogen consumption in 1982/83; and nitrogen in turn accounted for 65% of nutrient consumption. During 1982/83, domestic production accounted for 91% of urea procurement. Since urea production subsidy is not included in urea subsidy calculations, subsidy on urea is substantially underestimated. Government intervention through fertilizer subsidy or protection of high-cost fertilizer industry does lead to misallocation of resources and hence reduction in resource use efficiency.

In addition to the farmers who use fertilizer, food consumers and fertilizer producers also benefit from fertilizer subsidy. Any effort to lower or eliminate fertilizer subsidy must be accompanied by elimination of controls on crop prices, an upward shift in fertilizer response function, and an improvement in fertilizer use efficiency. Farmers should not be asked to bear the high cost of inefficiencies in fertilizer production, procurement, and marketing. Rather, the government should provide production incentives to farmers in order to achieve the stated national goal of food self-sufficiency.

Recommendations

Price Policy

Since administered fertilizer price policy does not appear to be very effective, retail fertilizer prices need to be deregulated. Fertilizer subsidies are not the long-term solution to higher fertilizer prices. Fertilizer prices need to be lowered through improvements in production, procurement and marketing efficiencies. The maintenance of price stability at the retail level should be an important consideration. However, this can be accomplished through adjustment of fertilizer price levels at PDP and TSC. Economic incentives to expand fertilizer use can also be provided through an improvement in fertilizer use efficiency.

Supply Management

The economic impact of fertilizer price deregulation on retail fertilizer prices would be favorable only under an efficient fertilizer marketing system, stable fertilizer supply situation, and competition among fertilizer

dealers. Further improvements are needed in these areas and can be achieved through reforms in the fertilizer marketing system, as have been initiated under NMS. Merely regulating retail fertilizer prices does not solve the more basic problem of inefficiencies in fertilizer production, procurement, and marketing systems. However, government can play an important role in fertilizer sector through fertilizer quality control; monitoring fertilizer prices, availability and quality; increasing competition and incentives for dealers; and elimination of constraints with respect to marketing infrastructure.

Research Agenda

Despite many studies dealing with fertilizer price policy in Bangladesh, there is limited analytical information on at least three important and related areas. These are (1) fertilizer price formation and price policy, (2) economic benefits and costs of fertilizer subsidy (direct and indirect) policy, and (3) the economic impact of protection of the domestic fertilizer industry. These studies would provide the needed information to formulate effective fertilizer price and subsidy policy in Bangladesh and should be given high priority.

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APPENDIXES

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List of Appendixes

Appendix A: Data, Scope, and Price Survey in Bangladesh

Appendix B: Analysis of Prices by Market Categories and Districts

APPENDIX ADATA, SCOPE, AND PRICE SURVEY IN BANGLADESH

This study is based on both primary and secondary data. The primary data were collected through the "Farmer Fertilizer Price Survey" which was initiated under the BADC/IFDC fertilizer marketing and consultancy services agreement in October 1980. With the exception of May, June, July, and August 1981, the price survey has been conducted continuously since October 1980. The data collected through this survey, with all its advantages and disadvantages, form the core of this study. On the other hand, the secondary data were collected from various BADC publications, including BADC (1981), BADC (1983), and Hoque (1982); and non-BADC publications including Bangladesh Bureau of Statistics (1982a, 1982b), Food and Fertilizer Planning and Monitoring Secretariat (1983), Bangladesh Ministry of Agriculture and USAID (1982), and USAID (1978). In some cases the immediate source of data may be other than BADC; the original source for most fertilizer-related data was BADC.

Time Period

The major focus of this study is the 20-month period from December 1981 to July 1983. The primary data prior to December 1981 were not available. Even though the price survey is still continuing, the primary data after July 1983 were not available at the time when the analysis for this study began. On the other hand, the secondary data do deal with other relevant years prior to December 1981.

Fertilizers Included

The primary data were collected for prices of urea, TSPP, TSPG, DAP, and MOP. This study deals mainly with three fertilizers: urea, TSPG, and MOP. DAP and TSPP were excluded because of a lack of adequate data. Furthermore, DAP was introduced in Bangladesh only a few years ago and it is still sold only in a few districts of the country. On the other hand, TSPP is no longer being marketed in Bangladesh since the domestic phosphate fertilizer factory which produced TSPP has been converted to produce TSPG. Any other fertilizers were of minor importance at the time of the price survey.

Districts Covered

As reported in Table A-1 and Figure A-1, Bangladesh is divided into four divisions and 21 districts. The fertilizer price survey was conducted in 10 districts, representing each of the four divisions. The price survey districts are identified in Figure A-1 and are reported in Table A-2 for each of the 20 study months. With the exception of January, June, and December 1982, all of the 10 districts were surveyed throughout the study period.

Fertilizer Market Categories

Each study district is further divided into seven strata, each stratum representing a separate market category. The list of these market categories is given in Table A-3. The classification of fertilizer market categories is based on the distance between the dealer's shop and his existing supply source, such as PDP or TSC. These seven market categories have varying degrees of remoteness. The major distinction between remote and nonremote market categories is their relative accessibility to the fertilizer supply source. Furthermore, the transport system in remote market categories is not well established and the dealers may have to depend upon multiple transport modes.

Sample Size

The ultimate sampling unit is the farmer who purchased fertilizer on the date of survey. The information was collected immediately after fertilizer purchases by using a structured questionnaire in interviews with randomly selected farmers. The surveyor had no control on the sampling units to be interviewed on a particular day or month. The sample size depended on the season, location, and market category. The sample sizes for each fertilizer over time and for different market categories are reported in Tables A-4, A-5, A-6, and A-7. As shown in these tables there is large variability in sample size for different fertilizers, different market categories, and different months.

Table A-1. Geographical Distribution of Bangladesh

<u>Division</u>	<u>District</u>	<u>Remarks</u>
I Chittagong	1 Chittagong	a
	2 Noakhali	a
	3 Comilla	a
	4 Sylhet	a
	5 Chittagong Hill Tracts	b
II Dhaka	6 Dhaka	a
	7 Kishoreganj	
	8 Mymensingh	
	9 Jamalpur	c
	10 Tangail	a
	11 Faridpur	
III Rajshahi	12 Rajshahi	a
	13 Dinajpur	
	14 Rangpur	
	15 Bogra	a
	16 Pabna	a
IV Khulna	17 Khulna	
	18 Barisal	
	19 Patuakhali	
	20 Jessore	
	21 Kushtia	a

a. Included in farm-level fertilizer price survey during the period under study.

b. Not part of the New Marketing System, whereas the other 20 districts are.

c. Effective December 26, 1978, Jamalpur has been declared a separate district. Prior to this it was part of the Mymensingh district.

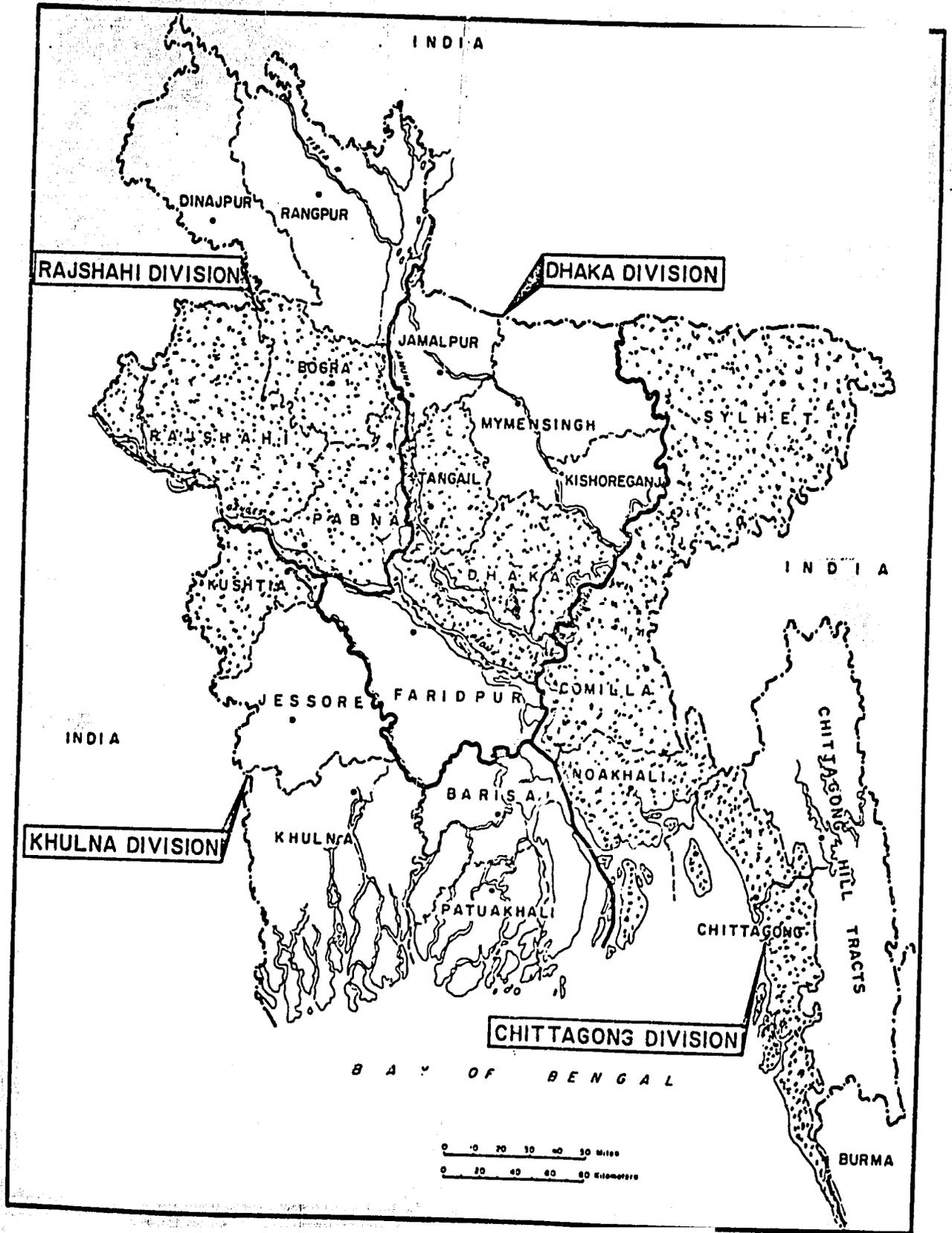


Figure A-1. Bangladesh BADC Marketing Divisions and Districts (Shaded) Covered by Farm-Level Fertilizer Price Survey.

Table A-2. Districts Covered by Farm-Level Fertilizer Price Survey in Bangladesh

Year	Month	Divisions/Districts				Total Number of Districts
		Chittagong ^a	Dhaka ^b	Rajshahi ^c	Khulna ^d	
1981	December	C N C S	D T	R P B	K	10
1982	January	C N	D T	R P B	K	8
	February	C N C S	D T	R P B	K	10
	March	C N C S	D T	R P B	K	10
	April	C N C S	D T	R P B	K	10
	May	C N C S	D T	R P B	K	10
	June	C N C S	T	R B	K	8
	July	C N C S	D T	R P B	K	10
	August	C N C S	D T	R P B	K	10
	September	C N C S	D T	R P B	K	10
	October	C N C S	D T	R P B	K	10
	November	C N C S	D T	R P B	K	10
	December	C N C S	D T	R B	K	9
1983	January	C N C S	D T	R P B	K	10
	February	C N C S	D T	R P B	K	10
	March	C N C S	D T	R P B	K	10
	April	C N C S	D T	R P B	K	10
	May	C N C S	D T	R P B	K	10
	June	C N C S	D T	R P B	K	10
	July	C N C S	D T	R P B	K	10

a. C = Chittagong, N = Noakhali, C = Comilla, S = Sylhet.

b. D = Dhaka, T = Tangail.

c. R = Rajshahi, P = Pabna, B = Bogra.

d. K = Kushtia.

Table A-3. Fertilizer Market Categories for Farm-Level Fertilizer Price Survey in Bangladesh^a

<u>Number</u>	<u>Type</u>	<u>Symbol</u>
1	5 miles from PDP--remote	5/P/R
2	10 miles from PDP--remote	10/P/R
3	12-15 miles from PDP--remote	12-15/P/R
4	15-20 miles from PDP--nonremote	15-20/P/NR
5	Within 5 miles from PDP--nonremote	5/P/NR
6	5 miles from TSC	5/T
7	10 miles from TSC	10/T

a. Effective April 1983, two new market categories were added in Chittagong and Comilla districts. These categories are (1) 20-25 miles from PDP--nonremote and (2) over 25 miles from PDP--nonremote.

Table A-4. Sample Size for Urea, TSPG, and MOP Prices During Survey Months in Bangladesh

<u>Year</u>	<u>Month</u>	<u>Sample Size for</u>			<u>Total</u>
		<u>Urea</u>	<u>TSPG</u>	<u>MOP</u>	
1981/82	December	330	186	90	606
	January	407	265	138	810
	February	489	247	146	882
	March	570	193	49	812
1982/83	April	427	194	87	708
	May	336	162	63	561
	June	318	68	24	410
	July	309	80	17	406
	August	225	87	28	340
	September	295	34	11	340
	October	292	76	30	398
	November	342	107	63	512
	December	297	74	70	441
	January	328	152	97	577
	February	379	133	86	598
	March	498	44	27	569
1983/84	April	431	97	43	571
	May	379	136	55	570
	June	439	125	36	600
	July	385	125	48	558

a. Other fertilizers included in the survey were TSPP and DAP. However, the number of observations were too few for analysis.

Table A-5. Sample Size for Urea Price Survey in Bangladesh

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total	
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC
I	1981/82	December	D	15	21	18	20	20	18	19	131
			R	28	27	19	38	17	36	34	199
			T	43	48	37	58	37	54	53	330
		January	D	18	18	15	16	16	10	14	107
			R	51	51	44	31	45	42	36	300
			T	69	69	59	47	61	52	50	407
		February	D	31	27	19	33	32	27	22	191
			R	43	37	35	58	47	37	41	298
			T	74	64	54	91	79	64	63	489
		March	D	35	41	32	40	32	46	40	266
			R	38	35	60	48	35	42	46	304
			T	73	76	92	88	67	88	86	570
II	1982/83	April	D	35	34	19	29	35	31	27	210
			R	37	39	20	34	35	27	25	217
			T	72	73	39	63	70	58	52	427
		May	D	21	16	19	15	13	20	13	117
			R	35	30	24	38	26	34	32	219
			T	56	46	43	53	39	54	45	336
		June	D	20	10	14	22	31	26	21	144
			R	20	17	24	27	36	25	25	174
			T	40	27	38	49	67	51	46	318
		July	D	27	24	16	25	18	17	23	150
			R	23	18	25	33	19	15	26	159
			T	50	42	41	58	37	32	49	309
		August	D	18	15	15	18	9	17	14	106
			R	12	16	14	20	24	19	14	119
			T	30	31	29	38	33	36	28	225
		September	D	19	17	21	18	22	18	22	137
			R	23	15	15	26	35	24	20	158
			T	42	32	36	44	57	42	42	295
		October	D	20	17	19	27	22	23	22	150
			R	21	22	23	18	22	17	19	142
			T	41	39	42	45	44	40	41	292

(Continued)

Table A-5. Sample Size for Urea Price Survey in Bangladesh (Continued)

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total			
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC		
II	1982/83	November	D	24	25	23	19	31	17	18	157		
			R	33	29	20	26	25	24	28	185		
			T	57	54	43	45	56	41	46	342		
		December	D	28	21	23	21	23	23	18	157		
			R	22	15	20	18	24	20	21	140		
			T	50	36	43	39	47	43	39	297		
		January	D	24	11	25	21	13	25	19	138		
			R	21	25	33	30	31	19	31	190		
			T	45	36	58	51	44	44	50	328		
		February	D	42	24	21	33	32	38	34	224		
			R	21	21	23	32	19	26	13	155		
			T	63	45	44	65	51	64	47	379		
		March	D	33	41	35	32	43	21	23	228		
			R	42	38	45	46	33	37	29	270		
			T	75	79	80	78	76	58	52	498		
		III	1983/84	April	D	30	31	22	34	36	10	9	172
					R	41	39	36	40	50	17	36	259
					T	71	70	58	74	86	27	45	431
May	D			33	30	33	26	24	15	2	163		
	R			28	42	43	33	23	20	27	216		
	T			61	72	76	59	47	35	29	379		
June	D			28	29	34	30	38	19	13	191		
	R			36	33	19	43	45	41	31	248		
	T			64	62	53	73	83	60	44	439		
July	D			32	19	27	39	25	18	18	178		
	R			17	23	31	39	41	17	39	207		
	T			49	42	58	78	66	35	57	385		

a. Where D = price deregulated effective April 1, 1982; R = price remained regulated effective April 1, 1982; and T = overall total.

Table A-6. Sample Size for TSPG Price Survey in Bangladesh

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total	
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC
I	1981/82	December	D	10	7	14	13	10	7	7	68
			R	15	25	10	18	11	16	23	118
			T	25	32	24	31	21	23	30	186
		January	D	13	11	11	10	8	5	7	65
			R	28	22	27	22	36	38	27	200
			T	41	33	38	32	44	43	34	265
		February	D	15	16	11	15	15	13	16	101
			R	24	18	10	23	22	23	26	146
			T	39	34	21	38	37	36	42	247
		March	D	11	8	14	16	13	8	12	82
			R	15	13	14	20	14	21	14	111
			T	26	21	28	36	27	29	26	193
II	1982/83	April	D	12	12	7	13	18	14	9	85
			R	14	16	12	20	24	11	12	109
			T	26	28	19	33	42	25	21	194
		May	D	9	12	10	4	9	4	8	56
			R	18	12	11	15	19	12	19	106
			T	27	24	21	19	28	16	27	162
		June	D	4	3	2	3	2	8	4	26
			R	5	1	9	6	9	2	10	42
			T	9	4	11	9	11	10	14	68
		July	D	2	1	2	4	5	6	4	24
			R	4	2	8	13	12	8	9	56
			T	6	3	10	17	17	14	13	80
		August	D	9	1	9	6	3	6	7	41
			R	3	6	5	9	13	6	4	46
			T	12	7	14	15	16	12	11	87
		September	D	2	2	6	4	5	2	5	26
			R	1	1	1	0	2	2	1	8
			T	3	3	7	4	7	4	6	34
		October	D	6	5	2	5	13	7	7	45
			R	7	4	1	2	7	4	6	31
			T	13	9	3	7	20	11	13	76

(Continued)

Table A-6. Sample Size for TSPG Price Survey in Bangladesh (Continued)

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total	
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC
II	1982/83	November	D	11	10	10	6	15	8	9	69
			R	8	8	2	4	4	5	7	38
			T	19	18	12	10	19	13	16	107
		December	D	9	10	4	4	6	7	6	46
			R	2	2	1	5	6	6	6	28
			T	11	12	5	9	12	13	12	74
		January	D	12	3	5	4	5	10	4	43
			R	13	13	17	10	21	21	14	109
			T	25	16	22	14	26	31	18	152
		February	D	8	4	3	7	6	1	5	34
			R	14	16	11	13	16	21	8	99
			T	22	20	14	20	22	22	13	133
		March	D	2	4	1	2	4	1	2	16
			R	4	4	4	6	2	5	3	28
			T	6	8	5	8	6	6	5	44
III	1983/84	April	D	3	1	11	7	3	1	1	27
			R	9	11	6	11	15	7	11	70
			T	12	12	17	18	18	8	12	97
		May	D	3	5	3	1	5	3	0	20
			R	13	15	15	18	24	17	14	116
			T	16	20	18	19	29	20	14	136
		June	D	7	5	9	7	5	2	3	38
			R	12	8	7	18	21	11	10	87
			T	19	13	16	25	26	13	13	125
		July	D	11	8	13	9	9	5	4	59
			R	2	10	9	11	13	7	14	66
			T	13	18	22	20	22	12	18	125

a. Where D = price deregulated effective April 1, 1982; R = price remained regulated effective April 1, 1982; and T = overall total.

Table A-7. Sample Size for MOP Price Survey in Bangladesh

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total	
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC
I	1981/82	December	D	5	8	4	8	6	7	3	41
			R	4	11	7	10	3	5	9	49
			T	9	19	11	18	9	12	12	90
		January	D	0	0	0	1	0	0	0	1
			R	16	20	19	21	22	24	15	137
			T	16	20	19	22	22	24	15	138
		February	D	7	6	8	6	9	7	8	51
			R	12	8	9	22	14	12	18	95
			T	19	14	17	28	23	19	26	146
		March	D	1	2	0	3	2	0	2	10
			R	3	5	5	7	8	5	6	39
			T	4	7	5	10	10	5	8	49
II	1982/83	April	D	4	4	3	4	5	9	6	35
			R	4	11	6	11	7	8	5	52
			T	8	15	9	15	12	17	11	87
		May	D	5	2	3	0	4	4	1	19
			R	6	3	5	8	8	6	8	44
			T	11	5	8	8	12	10	9	63
		June	D	1	1	0	0	0	3	1	6
			R	1	0	4	3	4	1	5	18
			T	2	1	4	3	4	4	6	24
		July	D	0	0	0	0	0	0	0	0
			R	1	0	3	4	6	2	1	17
			T	1	0	3	4	6	2	1	17
		August	D	3	0	3	2	2	2	3	15
			R	1	2	3	0	3	2	2	13
			T	4	2	6	2	5	4	5	28
		September	D	1	1	1	1	2	0	0	6
			R	1	2	0	0	2	2	0	5
			T	2	3	1	1	2	2	0	11
		October	D	0	0	2	3	3	2	0	10
			R	3	6	1	2	1	2	5	20
			T	3	6	3	5	4	4	5	30

(Continued)

Table A-7. Sample Size for MOP Price Survey in Bangladesh (Continued)

Phase	Year	Month	Price Regulated Area ^a	Market Category						Total			
				5/PDP/R	10/PDP/R	12-15/PDP/R	15-20/PDP/NR	5/PDP/NR	5/TSC		10/TSC		
II	1982/83	November	D	2	2	1	3	2	2	1	13		
			R	7	9	6	7	8	5	8	50		
			T	9	11	7	10	10	7	9	63		
		December	D	1	5	3	4	4	3	1	21		
			R	4	6	3	10	7	9	10	49		
			T	5	11	6	14	11	12	11	70		
		January	D	5	1	3	2	2	1	4	18		
			R	7	10	10	7	17	12	16	79		
			T	12	11	13	9	19	13	20	97		
		February	D	5	3	1	1	3	2	3	18		
			R	6	11	8	9	11	12	11	68		
			T	11	14	9	10	14	14	14	86		
		March	D	2	2	2	1	4	1	1	13		
			R	1	1	3	4	1	3	1	14		
			T	3	3	5	5	5	4	2	27		
		III	1983/84	April	D	1	2	6	5	2	2	0	18
					R	4	4	0	3	9	4	1	25
					T	5	6	6	8	11	6	1	43
May	D			4	0	5	0	5	4	0	18		
	R			3	2	4	6	12	3	7	37		
	T			7	2	9	6	17	7	7	55		
June	D			1	6	4	5	5	3	2	26		
	R			0	2	3	1	2	1	1	10		
	T			1	8	7	6	7	4	3	36		
July	D			5	1	5	3	1	1	5	21		
	R			2	3	5	6	3	4	4	27		
	T			7	4	10	9	4	5	9	48		

a. Where D = price deregulated effective April 1, 1982; R = price remained regulated effective April 1, 1982; and T = overall total.

APPENDIX BANALYSIS OF PRICES BY MARKET CATEGORIES AND DISTRICTS

The purpose of this appendix is twofold: (1) to report analytical results on the statistical significance of fertilizer price differences between deregulated and regulated areas for different market categories, and (2) to report results on district-level average fertilizer prices in deregulated and regulated market areas in Bangladesh. The fertilizer prices refer to urea, TSPG, and MOP. The results are reported separately for each month over a period of 20 months, covering three phases of fertilizer price policy. The fertilizer market categories refer to the seven market categories, as defined in Appendix A. Finally, the results are also reported for average prices (average of market categories) for each fertilizer during each month under study.

Table B-1. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase I for Urea in Bangladesh^a

Market Category	December 1981				January 1982				February 1982				March 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	1.32	0.3809	41	0.7052	13.96	5.8572	67	0.0001	6.70	3.4950	72	0.0008	0.93	0.4331	71	0.6662
10/PDP/R	20.82	4.2258	46	0.0001	26.26	15.9428	67	0.0001	15.58	7.7144	62	0.0001	8.92	5.0491	74	0.0001
12-15/PDP/R	26.06	4.6290	35	0.0001	32.69	8.8689	57	0.0001	26.29	7.4168	52	0.0001	9.70	5.0743	90	0.0001
15-20/PDP/NR	18.30	3.4022	56	0.0012	26.81	8.5035	45	0.0001	10.74	4.6744	89	0.0001	1.47	1.2388	86	0.2166
5/PDP/NR	8.62	2.4848	35	0.0179	14.10	4.7040	59	0.0001	5.44	2.4925	77	0.0148	1.56	1.4373	65	0.1554
5/TSC	-10.44	-1.9311	52	0.0589	21.83	5.9608	50	0.0001	17.84	4.3329	62	0.0001	3.64	2.1999	86	0.0305
10/TSC	3.19	0.3525	51	0.7259	29.91	8.3141	48	0.0001	23.91	8.2277	61	0.0001	12.38	7.3570	84	0.0001
Average	9.46	4.0761	328	0.0001	23.19	19.2752	405	0.0001	14.00	12.7499	487	0.0001	5.54	8.1867	568	0.0001

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

Table B-2. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for Urea in Bangladesh^a

Market Category	Phase II															
	April 1982				May 1982				June 1982				July 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	5.03	3.3661	70	0.0012	4.23	4.0387	54	0.0002	9.78	5.8098	38	0.0001	6.25	3.6089	48	0.0007
10/PDP/R	4.97	3.2590	71	0.0017	8.99	6.1775	44	0.0001	12.09	4.4233	25	0.0002	15.46	7.8867	40	0.0001
12-15/PDP/R	6.65	2.6368	37	0.0122	4.14	2.1007	41	0.0419	16.05	6.8353	36	0.0001	18.87	8.2034	39	0.0001
15-20/PDP/NR	0.99	0.7255	61	0.4709	5.69	4.4770	51	0.0001	3.33	1.7543	47	0.0859	7.07	4.8435	56	0.0001
5/PDP/NR	-1.01	-1.1506	68	0.2539	-0.43	-0.3916	37	0.6976	5.25	6.6269	65	0.0001	11.23	6.5349	35	0.0001
5/TSC	2.43	1.7944	56	0.0781	3.71	3.4255	52	0.0012	4.30	4.3475	49	0.0001	2.61	1.1176	30	0.2726
10/TSC	9.12	3.9068	50	0.0003	6.82	6.1268	43	0.0001	21.28	9.1090	44	0.0001	15.19	6.9894	47	0.0001
Average	3.69	5.7751	425	0.0001	4.94	9.0543	334	0.0001	9.34	11.9325	316	0.0001	10.96	13.8125	307	0.0001

Market Category	Phase II															
	August 1982				September 1982				October 1982				November 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	6.62	3.7750	28	0.0008	0.00	0.0036	40	0.9972	3.22	1.6954	39	0.0980	1.36	1.2686	55	0.2099
10/PDP/R	3.96	3.2568	29	0.0029	0.98	0.6708	30	0.5075	5.68	3.0049	37	0.0047	6.52	6.8757	52	0.0001
12-15/PDP/R	6.32	4.8540	27	0.0001	3.12	2.3094	34	0.0271	11.01	4.5085	40	0.0001	6.14	3.9361	41	0.0003
15-20/PDP/NR	7.14	5.7158	36	0.0001	2.87	4.4426	42	0.0001	6.21	4.0033	43	0.0002	7.49	6.6197	43	0.0001
5/PDP/NR	1.94	2.6995	31	0.0111	1.39	1.9422	55	0.0572	1.59	1.4069	42	0.1668	4.69	9.6728	54	0.0001
5/TSC	4.46	3.6741	34	0.0008	-1.26	-0.7249	40	0.4727	-2.22	-1.0771	38	0.2882	3.98	2.8107	39	0.0077
10/TSC	6.52	2.7385	26	0.0110	5.04	2.9050	40	0.0060	5.32	1.9271	39	0.0613	8.06	5.4712	44	0.0001
Average	5.39	10.0400	223	0.0001	2.04	3.9197	293	0.0001	4.24	5.2666	290	0.0001	5.25	11.4382	340	0.0001

(Continued)

Table B-2. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for Urea in Bangladesh^a (Continued)

Market Category	Phase II															
	December 1982				January 1983				February 1983				March 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	0.18	0.2500	48	0.8036	4.56	3.0389	43	0.0040	1.81	1.6087	61	0.1128	0.32	0.3341	73	0.7393
10/PDP/R	3.22	2.1695	34	0.0371	1.66	1.3876	34	0.1743	3.66	2.8008	43	0.0076	4.37	3.3919	77	0.0011
12-15/PDP/R	3.31	4.0587	41	0.0002	6.55	5.9227	56	0.0001	6.51	4.8639	42	0.0001	6.58	7.9727	78	0.0001
15-20/PDP/NR	4.55	3.0897	37	0.0038	4.89	3.5539	49	0.0009	4.64	4.4238	63	0.0001	1.97	1.6463	76	0.1038
5/PDP/NR	2.98	4.7445	45	0.0001	2.13	1.9029	42	0.0639	2.28	2.1936	49	0.0330	0.61	0.7328	74	0.4660
5/TSC	-0.29	-0.2368	41	0.8140	4.47	2.5159	42	0.0158	3.06	2.2852	62	0.0257	3.55	2.3498	56	0.0223
10/TSC	3.65	3.1330	37	0.0034	2.27	3.2384	48	0.0022	7.61	4.7562	45	0.0001	5.65	4.2889	50	0.0001
Average	2.37	5.6796	295	0.0001	4.35	8.4140	326	0.0001	4.00	8.0541	377	0.0001	3.10	6.9669	496	0.0001

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

Table B-3: Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase III for Urea in Bangladesh^a

Market Category	Phase III															
	April 1983				May 1983				June 1983				July 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	-1.72	-1.6228	69	0.1092	-1.32	-1.1804	59	0.2426	-1.45	-1.4088	62	0.1639	-2.81	-2.3970	47	0.0206
10/PDP/R	3.11	2.2622	68	0.0269	4.51	3.7838	70	0.0003	5.47	5.1245	60	0.0001	1.64	1.0483	40	0.3008
12-15/PDP/R	0.78	0.8378	56	0.4057	0.83	0.9704	74	0.3350	0.01	0.0193	51	0.9847	2.02	1.6497	56	0.1046
15-20/PDP/NR	2.93	2.9111	72	0.0048	4.77	4.0489	57	0.0002	0.91	0.7719	71	0.4427	0.09	0.0634	76	0.9496
5/PDP/NR	0.62	0.9093	84	0.3658	0.31	0.3151	45	0.7542	0.64	1.0849	81	0.2812	-2.52	-1.9693	64	0.0533
5/TSC	1.33	0.9133	25	0.3698	-2.59	-1.7495	23	0.0895	-1.09	-1.4843	58	0.1431	-0.20	-0.1875	33	0.8524
10/TSC	10.90	5.1575	43	0.0001	0.38	0.0910	27	0.9281	6.07	2.8449	42	0.0068	1.49	0.8807	55	0.3823
Average	1.51	3.1961	429	0.0015	0.75	1.4376	377	0.1514	0.84	1.8418	437	0.0662	-0.34	-0.6135	383	0.5399

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

Table B-4. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase I for TSPG in Bangladesh^a

Market Category	Phase I															
	December 1981				January 1982				February 1982				March 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	11.08	3.4295	23	0.0023	15.45	10.2406	39	0.0001	5.12	1.8651	37	0.0701	12.60	5.4565	24	0.0001
10/PDP/R	12.52	3.4008	30	0.0019	31.09	12.8640	31	0.0001	9.88	3.1046	32	0.0040	20.47	12.7781	19	0.0001
12-15/PDP/R	11.33	2.8301	22	0.0097	34.70	20.3538	36	0.0001	23.09	4.4146	19	0.0003	21.14	28.7709	26	0.0001
15-20/PDP/NR	7.35	2.1288	29	0.0419	31.95	19.1229	30	0.0001	15.11	5.2057	36	0.0001	10.44	4.7164	34	0.0001
5/PDP/NR	9.00	1.8791	19	0.0757	23.56	12.7477	42	0.0001	9.87	3.8662	35	0.0005	5.62	3.5153	25	0.0017
5/TSC	2.59	0.4437	21	0.6618	28.86	8.1565	41	0.0001	22.01	4.3699	34	0.0001	16.06	9.5785	27	0.0001
10/TSC	19.80	5.1140	28	0.0001	32.78	13.2166	32	0.0001	21.53	6.7858	40	0.0001	17.72	7.0811	24	0.0001
Average	9.97	6.5073	184	0.0001	27.51	29.0667	263	0.0001	14.89	10.6434	245	0.0001	14.36	15.6760	191	0.0001

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

Table B-5. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for TSPG in Bangladesh

Market Category	Phase II															
	April 1982				May 1982				June 1982				July 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	3.53	2.6441	24	0.0142	5.26	2.9179	25	0.0074	0.00	0.0000	7	1.0030	4.83	1.2663	4	0.2741
10/PDP/R	10.70	4.6844	26	0.0001	10.05	4.9155	22	0.0001	-8.00	-	2	-	20.94	12.7964	1	0.0496
12-15/PDP/R	12.30	5.9868	17	0.0001	1.94	0.9297	19	0.3642	7.68	2.0649	9	0.0689	6.29	0.9070	8	0.3909
15-20/PDP/NR	3.02	1.3808	31	0.1772	1.45	0.8631	17	0.4001	-3.11	-1.0802	7	0.3159	1.35	1.0508	15	0.3100
5/PDP/NR	1.69	1.3833	40	0.1742	0.45	0.5418	26	0.5926	-2.52	-1.1985	9	0.2613	11.05	5.2077	15	0.0001
5/TSC	8.26	3.1516	23	0.0045	3.59	2.1041	14	0.0539	-0.81	-0.4781	8	0.6454	-12.17	-2.9511	12	0.0121
10/TSC	10.03	6.9221	19	0.0001	5.44	3.0327	25	0.0056	4.00	1.6903	12	0.1168	0.00	-0.0001	11	0.9999
Average	6.17	7.7757	192	0.0001	4.49	6.3506	160	0.0001	0.19	0.1950	66	0.8460	1.56	0.7443	78	0.4589

Market Category	Phase II															
	August 1982				September 1982				October 1982				November 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	7.68	2.7641	10	0.0200	3.43	3.4742	1	0.1784	3.82	3.2173	11	0.0082	3.97	2.2851	17	0.0354
10/PDP/R	12.67	7.1813	5	0.0008	4.77	1.4441	1	0.3856	8.14	8.8421	7	0.0001	9.53	5.9396	16	0.0001
12-15/PDP/R	6.81	1.5267	12	0.1528	12.33	4.5953	5	0.0059	11.16	2.8185	1	0.2170	6.80	1.9175	10	0.0842
15-20/PDP/NR	0.96	1.3998	13	0.1850	-	-	-	-	8.26	2.4203	5	0.0601	6.29	2.0806	8	0.0711
5/PDP/NR	0.79	0.6000	14	0.5581	5.35	2.3576	5	0.0649	2.17	2.0945	18	0.0506	3.33	1.5434	17	0.1412
5/TSC	2.06	1.0368	10	0.3243	5.49	2.5651	2	0.1243	4.45	1.6162	9	0.1405	11.30	2.3557	11	0.0381
10/TSC	6.58	1.3303	9	0.2161	17.07	3.3442	4	0.0287	6.82	2.4257	11	0.0337	11.75	8.9795	14	0.0001
Average	5.19	4.8766	85	0.0001	8.28	3.5019	32	0.0014	4.83	5.4829	74	0.0001	6.97	6.7028	105	0.0001

(Continued)

Table B-5. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for TSPG in Bangladesh^a (Continued)

Market Category	Phase II															
	December 1982				January 1983				February 1983				March 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	-0.06	-0.0434	9	0.9663	3.66	2.9759	23	0.0068	-0.06	-0.0551	20	0.9566	-1.55	-0.4571	4	0.6713
10/PDP/R	1.47	0.4080	10	0.6919	0.50	0.5016	14	0.6238	2.48	1.5019	18	0.1505	6.14	2.3423	6	0.0577
12-15/PDP/R	1.00	0.4472	3	0.6850	3.25	2.2388	20	0.0367	4.08	2.2825	12	0.0415	3.71	1.4369	3	0.2463
15-20/PDP/NR	4.99	2.0448	7	0.0801	4.43	1.5663	12	0.1433	5.75	2.6204	18	0.0173	3.33	1.8464	6	0.1144
5/FDP/NR	1.69	0.8060	10	0.4390	1.98	1.3181	24	0.1999	3.32	2.8739	20	0.0094	0.67	0.3855	4	0.7195
5/TSC	2.30	1.3639	11	0.1999	2.86	1.4060	29	0.1703	0.34	0.1982	20	0.8449	-1.00	-0.4082	4	0.7040
10/TSC	7.09	1.6934	10	0.1213	4.31	3.4273	16	0.0035	2.61	1.0710	11	0.3071	1.33	0.7746	3	0.4950
Average	2.84	2.7132	72	0.0083	3.09	4.5577	150	0.0001	2.64	4.2296	131	0.0001	2.41	2.5535	42	0.0144

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

b. Data not available.

Table B-6. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase III for TSPG in Bangladesh

Market Category	Phase III															
	April 1983				May 1983				June 1983				July 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	2.47	3.1582	10	0.0102	0.10	0.4677	14	0.6472	-0.06	-0.0451	17	0.9646	-1.92	-0.7641	11	0.4609
10/PDP/R	3.15	0.9840	10	0.3483	1.90	0.8878	18	0.3864	0.85	0.7997	11	0.4408	0.13	0.0586	16	0.9540
12-15/PDP/R	2.67	1.9257	15	0.0733	-1.29	-0.5193	16	0.6107	-1.33	-1.7419	14	0.1034	0.87	0.8647	20	0.3975
15-20/PDP/NR	3.60	2.0933	16	0.0526	1.25	0.5625	17	0.5811	0.89	1.1622	23	0.2571	-3.69	-1.7202	18	0.1025
5/PDP/NR	2.58	2.1193	16	0.0501	-4.12	-3.0358	27	0.0751	1.16	3.0618	24	0.0054	-2.10	-1.3925	20	0.1790
5/TSC	3.62	2.0258	6	0.0892	-1.10	-0.4002	18	0.6937	-1.47	-0.6056	11	0.5570	1.26	1.0469	10	0.3198
10/TSC	10.50	4.8933	10	0.0006	-	-	-	-	6.03	2.7617	11	0.0185	-4.67	-1.9460	16	0.0694
Average	3.06	4.9097	95	0.0001	-1.04	-1.2190	134	0.2250	0.41	0.7945	123	0.4284	-2.33	-3.1998	123	0.0017

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

b. Data not available

Table B-7. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase I for MOP in Bangladesh^a

Market Category	December 1981				January 1982				February 1982				March 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	-4.00	-1.3944	7	0.2058	^b	-	-	-	1.72	0.7624	17	0.4563	-0.22	-0.0465	2	0.9672
10/PDP/R	-2.03	-1.5516	17	0.1392	-	-	-	-	6.00	2.2445	12	0.0444	7.93	4.4440	5	0.0067
12-15/PDP/R	1.86	0.8599	9	0.4122	-	-	-	-	4.04	2.2445	15	0.0403	-	-	-	-
15-20/PDP/NR	2.75	1.1062	16	0.2850	-2.06	-0.4460	20	0.6604	-1.89	-1.7478	26	0.0923	0.04	0.0172	8	0.9867
5/PDP/NR	5.67	1.6727	7	0.1383	-	-	-	-	-0.10	-0.0867	21	0.9317	-1.08	-0.2823	8	0.7849
5/TSC	-10.34	-1.4620	10	0.1744	-	-	-	-	4.24	2.0818	17	0.0528	-	-	-	-
10/TSC	-3.48	-0.7885	10	0.4487	-	-	-	-	5.38	3.1895	24	0.0040	7.33	2.1040	6	0.0800
Average	-1.44	-1.0462	88	0.2983	-2.84	-0.6385	136	0.5242	2.64	3.6591	144	0.0004	2.26	1.5435	47	0.1294

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.
b. Data not available.

Table B-8. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for MOP in Bangladesh

Market Category	Phase II															
	April 1982				May 1982				June 1982				July 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	5.50	3.2205	6	0.0181	2.93	3.8121	9	0.0041	4.00	^b	0	-	-	-	-	-
10/PDP/R	9.68	4.0809	13	0.0013	7.01	4.6361	3	0.0189	-	-	-	-	-	-	-	-
12-15/PDP/R	9.33	4.1940	7	0.0041	5.49	5.5108	6	0.0015	-	-	-	-	-	-	-	-
15-20/PDP/NR	-0.45	-0.2006	13	0.8441	-	-	-	-	-	-	-	-	-	-	-	-
5/PDP/NR	-0.11	-0.0835	10	0.9351	-0.15	-0.1010	10	0.9216	-	-	-	-	-	-	-	-
5/TSC	4.30	2.4759	15	0.0257	2.43	2.2303	8	0.0563	7.33	2.7500	2	0.1107	-	-	-	-
10/TSC	1.87	0.9741	9	0.3555	4.28	5.7643	7	0.0007	12.40	12.6557	4	0.0002	-	-	-	-
Average	4.01	4.9585	85	0.0001	3.34	6.0094	61	0.0001	7.89	8.1934	22	0.0001	-	-	-	-

Market Category	Phase II															
	August 1982				September 1982				October 1982				November 1982			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	9.51	1.9212	2	0.1947	2.00	-	0	-	-	-	-	-	8.29	2.9934	7	0.0201
10/PDP/R	-	-	-	-	4.00	-	1	-	-	-	-	-	0.71	0.1887	9	0.8545
12-15/PDP/R	-5.20	-0.3997	4	0.7098	-	-	-	-	-	-	-	-	9.33	1.8479	5	0.1239
15-20/PDP/NR	-	-	-	-	-	-	-	-	7.33	-	1	-	2.23	0.8986	8	0.3951
5/PDP/NR	1.33	1.5492	3	0.2191	-	-	-	-	-5.41	-1.0338	3	0.3773	6.09	1.9845	8	0.0825
5/TSC	2.00	-	2	-	-	-	-	-	-1.37	-0.2537	2	0.8234	18.67	4.6960	5	0.0054
10/TSC	13.00	17.4413	3	0.0004	-	-	-	-	3.95	0.8792	2	0.4720	9.75	5.5076	7	0.0009
Average	2.58	0.8262	26	0.4162	1.80	0.6142	9	0.5543	1.72	1.0610	28	0.2978	7.06	4.9507	61	0.0001

(Continued)

Table B-8. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase II for HOP in Bangladesh^a (Continued)

Market Category	Phase II															
	December 1982				January 1983				February 1983				March 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	9.50	8.4971	3	0.0034	9.30	6.8262	10	0.0001	6.73	2.6652	9	0.0258	8.00	-	1	-
10/PDP/R	7.85	4.0966	9	0.0027	10.17	6.7203	9	0.0001	1.46	0.5121	12	0.6179	10.67	4.6123	1	0.1359
12-15/PDP/R	8.89	3.2886	4	0.0303	2.60	2.4973	11	0.0297	-2.08	-1.4495	7	0.1905	4.48	3.6948	3	0.0344
15-20/PDP/NR	8.27	3.2795	12	0.0066	11.14	2.2342	7	0.0606	-1.33	-0.3990	8	0.7003	-9.50	-1.9160	3	0.1512
5/PDP/NR	4.77	1.9766	9	0.0795	-1.80	-1.0821	17	0.2943	0.18	0.0824	12	0.9357	6.00	0.6708	3	0.5504
5/TSC	0.00	0.0003	10	0.9997	4.25	0.9488	11	0.3631	-0.89	-0.6303	12	0.5403	-3.04	-0.5706	2	0.6258
10/TSC	10.47	5.4420	9	0.0004	10.24	34.9272	18	0.0001	6.18	3.0574	12	0.0099	4.00	-	0	-
Average	6.70	6.3844	68	0.0001	7.28	8.1152	95	0.0001	2.83	3.0181	84	0.0034	3.08	1.5298	25	0.1386

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

b. Data not available.

Table B-9. Behavior of Retail Fertilizer Prices In Deregulated Areas as Compared to Regulated Areas in Different Market Categories During Phase III for MOP in Bangladesh^a

Market Category	April 1983				May 1983				June 1983				July 1983			
	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T	D	t	D.F.	PROB > T
5/PDP/R	1.50	1.3416	3	0.2722	2.84	0.8341	5	0.4422	b	-	-	-	-1.60	-0.3366	5	0.7501
10/PDP/R	8.67	8.6567	4	0.0010	-	-	-	-	8.00	-	6	-	8.00	1.0000	2	0.4226
12-15/PDP/R	-	-	-	-	5.42	2.7385	7	0.0290	2.33	0.6491	5	0.5449	1.96	1.1062	8	0.3008
15-20/PDP/NR	-0.54	-0.1594	6	0.8786	-	-	-	-	-5.33	-1.2914	4	0.2662	2.33	0.5842	7	0.5774
5/PDP/NR	4.23	1.6397	9	0.1355	0.00	0.0000	15	1.0000	-0.41	-0.1485	5	0.9878	1.17	0.7048	2	0.5539
5/TSC	8.50	11.3333	4	0.0003	2.67	1.1952	5	0.2856	4.00	0.7494	2	0.5318	5.00	0.7454	3	0.5101
10/TSC	-	-	-	-	-	-	-	-	0.00	-	1	-	-3.67	-1.4999	7	0.1773
Average	2.73	2.4572	41	0.0183	2.75	2.3432	53	0.0229	2.13	1.1990	34	0.2388	1.21	0.7543	46	0.4545

a. Where D (TK/md) = Average price in deregulated area - average price in regulated area; t = t statistic; and D.F. = Degrees of Freedom.

b. Data not available.

Table B-10. Behavior of Average Retail Price for Urea in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Regulated Districts						Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla	Sylhet			
I	1981 Dec	160.78	134.60	196.51	152.38	140.03	142.10	155.63	164.26	164.40	139.71	147.38	156.84	151.13
	1982 Jan	135.08	130.23	152.97	138.50	136.42	156.74	162.01	162.74	- ^b	-	139.24	162.43	145.34
	Feb	129.92	129.61	148.73	133.47	129.12	155.00	152.62	158.61	134.00	137.43	133.50	147.50	138.97
	Mar	128.42	128.88	145.23	133.36	132.90	150.49	138.75	138.42	133.85	145.11	133.76	139.30	136.34
II	1982 Apr	130.79	128.73	141.82	132.60	131.71	139.24	133.72	132.93	135.72	144.21	132.45	136.14	134.27
	May	130.84	130.14	136.43	133.49	130.87	135.44	130.70	144.00	136.48	139.35	132.64	137.58	134.36
	Jun	133.76	130.89	132.39	-	128.19	129.54	136.31	133.47	138.43	145.31	131.13	140.47	135.36
	Jul	147.72	146.10	143.00	137.46	141.80	140.58	151.77	152.65	153.46	161.81	143.64	154.60	148.96
	Aug	146.25	146.39	147.56	147.37	145.04	147.38	149.06	150.88	153.21	159.71	146.48	151.86	149.01
	Sep	146.40	146.08	147.67	149.88	147.15	147.02	147.42	148.16	153.12	157.56	147.55	149.59	148.50
	Oct	147.94	145.52	148.51	154.33	147.20	147.11	146.60	149.84	153.53	158.73	147.88	152.12	150.05
	Nov	147.01	145.37	146.15	149.77	144.21	148.00	149.60	152.00	147.25	153.97	146.66	149.03	147.91
	Dec	145.58	145.41	147.52	-	147.59	147.58	148.33	148.68	147.25	153.97	146.66	149.03	147.91
	1983 Jan	146.39	143.40	147.54	148.54	145.97	149.02	149.53	151.29	147.82	151.79	146.14	150.49	147.97
	Feb	145.52	144.03	147.16	148.58	145.01	148.33	150.37	149.77	145.90	154.84	146.36	150.36	148.73
	Mar	147.11	145.47	146.76	147.62	146.88	147.86	149.01	149.01	148.37	154.69	146.82	149.92	148.24
	III	1983 Apr	148.22	146.62	147.03	148.13	150.30	147.88	147.09	149.32	148.94	155.94	148.32	149.83
May		151.10	149.23	146.41	148.32	144.51	150.18	146.59	149.68	148.96	153.26	149.01	149.76	149.33
Jun		150.63	148.57	151.35	149.35	147.24	148.39	147.67	149.58	148.72	153.58	149.17	150.01	149.54
Jul		149.56	147.56	154.65	151.98	144.92	152.04	147.49	150.77	149.53	154.51	150.66	150.32	150.50

a. Prices are simple averages.

b. Data not available.

Table B-11. Behavior of Average Retail Price for TSPG in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh

Price Policy Phase	Month/Year	Regulated Districts						Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla	Sylhet			
I	1981 Dec	132.76	117.63	129.40	120.78	123.92	121.82	140.08	142.48	119.83	119.80	123.00	132.97	126.65
	1982 Jan	122.30	123.08	120.18	122.57	121.86	119.42	148.78	149.30	-	-	121.58	149.09	128.33
	Feb	120.63	116.83	119.52	122.31	122.26	122.78	142.33	146.45	124.34	127.21	120.64	135.53	126.70
	Mar	113.54	113.14	119.16	118.00	121.19	120.54	136.10	133.83	125.22	128.20	118.18	132.54	124.28
II	1982 Apr	116.00	110.00	118.84	118.56	119.95	119.46	128.11	122.76	122.56	126.92	118.96	125.13	121.66
	May	116.68	-	119.13	119.03	120.76	119.43	114.22	121.87	124.24	126.19	119.16	123.65	120.72
	Jun	120.00	118.00	120.09	-	122.18	119.50	118.38	118.86	124.00	125.52	120.40	120.59	120.47
	Jul	139.17	137.20	136.15	139.74	137.77	140.00	131.79	-	140.41	149.72	137.97	139.53	138.44
	Aug	139.43	137.44	140.00	141.28	-	140.00	138.58	139.98	143.64	149.29	139.00	144.19	141.45
	Sep	138.00	136.50	-	-	-	140.00	140.00	-	146.44	148.22	138.19	146.47	144.52
	Oct	139.34	133.93	148.00	140.42	-	140.00	-	-	143.08	145.82	139.71	144.54	142.57
	Nov	138.85	138.50	136.36	-	139.33	140.00	146.04	149.09	140.00	144.61	138.96	145.93	143.45
	Dec	138.37	136.00	-	-	140.00	140.00	139.61	140.11	140.33	147.11	138.79	141.63	140.55
	1983 Jan	139.40	135.09	140.00	140.67	139.93	140.00	139.77	141.30	139.96	141.81	138.13	141.22	139.01
	Feb	138.79	136.42	139.40	140.62	140.00	140.00	136.07	139.37	138.81	144.69	139.17	141.81	139.85
	Mar	138.64	140.00	-	140.00	140.00	140.00	-	132.89	140.55	144.65	139.46	141.87	140.34
	III	1983 Apr	139.56	138.58	138.80	140.83	141.00	140.00	-	139.06	140.88	145.43	139.71	142.76
May		139.80	137.34	139.36	142.30	139.48	140.19	135.19	-	138.67	143.04	140.30	139.26	140.14
Jun		143.00	140.00	141.20	141.19	140.00	141.34	140.00	140.68	140.56	142.65	140.80	141.21	140.92
Jul		140.85	140.70	139.43	144.92	142.00	-	138.13	137.34	141.33	142.89	142.18	139.85	141.08

a. Prices are simple averages.

b. Data not available.

Table B-12. Behavior of Average Retail Price for NOP in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Regulated Districts					Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average		
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla				Sylhet	
I	1981 Dec	91.25	88.80	107.67	97.50	92.80	92.67	90.00	- ^b	90.52	93.33	93.18	91.74	92.53	
	1982 Jan	91.13	90.30	94.60	95.83	95.06	94.00	-	90.00	-	-	92.84	90.00	92.82	
	Feb	89.11	88.80	92.39	90.45	92.33	96.17	-	90.00	92.30	98.51	91.32	93.96	92.24	
	Mar	89.33	89.64	94.36	89.80	90.00	96.00	-	86.67	94.67	95.78	92.38	94.64	92.84	
II	1982 Apr	88.00	96.00	92.34	94.00	90.55	93.94	96.00	-	93.49	100.03	92.73	96.74	94.34	
	May	88.00	-	91.85	90.88	92.00	91.53	-	100.00	94.77	94.38	91.54	94.88	92.54	
	Jun	90.00	-	91.47	-	-	92.00	-	-	-	99.33	91.44	99.33	93.42	
	Jul	108.00	110.00	106.80	106.00	108.00	110.00	-	-	-	-	107.76	-	107.76	
	Aug	109.60	107.07	122.67	-	-	110.00	-	-	-	-	112.89	117.33	112.09	114.67
	Sep	-	108.00	110.00	-	-	110.00	-	-	-	-	111.50	110.00	109.20	111.00
	Oct	109.00	108.50	-	113.40	-	110.00	-	-	-	-	108.42	116.09	111.30	113.02
	Nov	109.60	107.45	109.60	111.87	110.00	110.00	-	-	120.00	110.00	117.00	-	109.56	116.62
	Dec	108.44	105.86	109.88	-	112.00	109.83	-	100.00	113.22	118.56	109.20	115.90	111.02	111.02
	1983 Jan	108.80	106.64	109.42	110.90	110.12	110.00	120.00	-	111.80	115.80	108.79	116.07	110.14	
	Feb	108.80	107.04	109.33	110.81	110.00	109.73	-	100.00	109.48	116.25	109.13	111.96	109.72	
	Mar	113.00	112.00	-	111.00	110.00	-	-	-	112.24	120.00	112.14	115.22	113.63	
	III	1983 Apr	111.04	109.20	110.00	111.33	-	110.00	-	-	109.43	118.86	110.37	113.10	111.51
May		108.00	108.00	112.61	110.40	110.00	113.60	-	-	113.33	114.64	111.60	114.35	112.50	
Jun		-	-	114.11	-	-	112.83	-	-	114.33	116.93	113.60	115.73	115.14	
Jul		112.20	112.62	117.33	110.49	-	-	-	-	113.36	116.53	112.91	114.12	113.44	

a. Prices are simple averages.

b. Data not available.

Table B-13. Behavior of Average Retail Price for Urea in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh

Price Policy Phase	Month/Year	Regulated Districts						Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average	
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla	Sylhet				
		-(TK/md)-													
I	1981 Dec	156.90	132.66	152.93	147.03	139.58	137.87	156.26	163.79	166.38	141.70	144.79	158.76	150.84	
	1982	Jan	131.51	129.15	142.34	138.38	135.85	152.84	163.46	162.28	-	136.01	162.82	145.01	
		Feb	128.80	128.50	143.06	131.93	128.44	151.67	154.46	156.68	132.48	136.28	131.28	146.28	137.73
		Mar	127.97	128.03	137.46	131.92	131.81	145.12	137.12	136.38	132.44	143.77	131.72	137.52	134.49
II	1982	Apr	129.39	127.60	141.26	131.39	131.42	139.02	132.21	132.04	132.82	144.37	131.94	135.26	133.81
		May	129.18	129.53	133.80	132.46	130.08	134.78	130.61	145.12	134.72	138.01	131.75	136.34	133.48
		Jun	130.27	129.86	130.49	-	128.28	126.19	133.03	133.03	136.64	143.60	128.94	139.10	132.39
	Jul	145.98	144.80	139.30	136.17	140.07	140.77	149.62	147.70	153.07	158.65	140.49	151.36	146.90	
	Aug	145.22	145.32	146.01	146.86	145.16	145.17	146.72	147.99	153.04	159.53	145.65	149.85	147.53	
	Sep	144.25	145.60	145.98	148.78	146.79	146.33	144.42	146.03	152.16	155.13	146.46	146.55	146.52	
	Oct	144.74	143.63	144.81	152.04	146.92	144.66	143.20	147.30	153.27	157.08	145.33	148.12	146.78	
	Nov	143.86	143.92	144.28	149.66	144.39	147.22	147.14	151.25	151.37	154.45	144.59	150.53	146.19	
	Dec	144.07	144.10	143.97	-	147.63	146.65	145.17	145.28	147.04	152.99	144.98	146.11	145.58	
	1983	Jan	144.23	141.47	144.66	148.42	146.01	148.48	145.88	146.12	148.02	150.52	143.81	147.01	145.14
		Feb	144.87	144.06	144.24	148.16	145.13	147.48	144.58	146.54	145.42	153.75	145.70	147.06	146.43
		Mar	147.04	144.58	144.91	147.14	146.45	147.66	143.03	143.77	148.03	153.46	146.07	146.01	146.05
	III	1983	Apr	146.85	146.07	145.42	147.89	150.15	147.63	143.98	147.57	148.45	155.98	147.36	147.76
May			148.13	148.79	144.14	147.98	144.59	146.82	144.34	148.97	147.88	152.20	146.80	147.78	147.24
Jun			149.09	148.45	149.11	148.94	146.58	147.55	146.04	149.08	147.98	152.31	148.22	148.84	148.43
Jul			147.66	146.62	152.69	150.50	144.82	149.21	145.75	149.01	148.82	153.45	150.14	148.55	149.40

a. Prices are weighted averages.

b. Data not available.

Table B-14. Behavior of Average Retail Price for TSPG in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh

Price Policy Phase	Month/Year	Regulated Districts						Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla	Sylhet			
I	1981 Dec	133.84	118.04	122.60	121.77	123.31	118.76	141.64	141.42	119.76	119.71	122.76	136.88	127.88
	1982 Jan	120.90	120.79	117.27	119.11	122.00	118.13	148.96	150.51	- ^b	-	119.41	149.78	126.12
	Feb	119.12	116.34	118.25	121.84	121.15	120.40	144.93	146.24	123.36	126.37	119.23	132.70	126.54
	Mar	112.93	113.30	117.20	117.88	125.41	119.07	136.58	133.14	124.44	126.56	117.70	130.89	121.87
II	1982 Apr	116.00	110.00	116.36	118.49	122.41	118.48	128.20	122.96	121.87	127.66	117.80	124.81	119.81
	May	116.68	-	117.22	118.43	122.60	118.48	113.80	126.53	124.26	126.30	118.11	124.53	120.03
	Jun	120.00	117.33	118.62	-	122.37	119.46	115.29	118.91	124.80	124.00	119.89	117.99	119.15
	Jul	138.56	137.26	137.44	140.00	136.78	140.00	138.29	-	140.33	147.56	137.76	139.47	138.35
	Aug	139.09	136.66	140.00	141.78	-	140.00	142.06	139.98	142.89	149.44	138.72	142.65	140.99
	Sep	137.71	135.20	-	-	-	140.00	140.00	-	145.36	148.05	136.10	145.54	142.08
	Oct	139.19	133.22	148.00	140.16	-	140.00	-	-	142.15	144.36	137.93	143.35	140.19
	Nov	137.11	137.74	136.43	-	139.20	140.00	144.07	149.38	140.00	143.75	137.37	144.48	140.87
	Dec	138.24	135.56	-	-	140.00	140.00	139.45	138.71	140.35	147.26	138.50	139.89	139.56
	1983 Jan	140.13	134.65	140.00	140.43	139.93	140.00	136.87	138.98	136.98	141.82	136.86	139.41	137.47
	Feb	138.68	135.37	138.51	140.71	140.00	140.00	132.93	138.41	138.61	143.75	138.37	139.73	138.65
	Mar	137.83	140.00	-	140.00	140.00	140.00	-	132.89	140.47	143.27	139.35	139.17	139.29
	III	1983 Apr	140.28	140.82	136.13	140.73	141.09	140.00	-	138.21	140.07	145.70	139.46	141.00
May		139.67	137.14	137.10	141.65	139.22	139.58	133.37	-	142.22	142.67	138.39	137.00	138.27
Jun		143.00	142.00	139.59	141.19	139.38	140.72	140.00	138.76	140.58	143.32	140.05	141.17	140.28
Jul		140.50	139.96	139.07	144.53	142.15	-	135.32	135.49	141.18	143.74	142.05	137.40	139.99

a. Prices are weighted averages.

b. Data not available.

Table B-15. Behavior of Average Retail Price for MOP in Regulated and Deregulated Districts During Three Phases of Fertilizer Pricing Policy in Bangladesh^a

Price Policy Phase	Month/Year	Regulated Districts						Deregulated Districts				Regulated District Average	Deregulated District Average	Overall District Average		
		Dhaka	Tangail	Rajshahi	Pabna	Bogra	Kushtia	Chittagong	Noakhali	Comilla	Sylhet					
I	1981 Dec	91.24	87.97	97.63	97.81	92.80	91.14									
	1982 Jan	91.51	88.89	91.29	91.78	94.93	91.03	90.00	- ^b	90.52	93.13	93.15	91.58	92.50		
	Feb	88.75	88.95	91.12	90.35	92.22	92.93	-	90.00	-	-	91.00	90.00	91.00		
	Mar	89.20	89.25	91.73	89.87	90.00	94.44	-	90.00	91.06	96.88	90.81	93.86	92.25		
II	1982 Apr	88.00	96.00	91.04	94.36	90.67	92.55	96.00	-	86.67	94.54	95.00	91.67	94.15	92.09	
	May	88.00	-	91.41	90.80	92.00	90.98	-	-	93.19	99.80	91.91	96.62	93.18		
	Jun	90.00	-	90.96	-	-	92.00	-	100.00	94.49	94.45	91.16	94.69	91.91		
	Jul	108.00	109.60	97.39	103.50	108.00	110.00	-	-	-	99.05	91.02	99.05	92.24		
	Aug	109.57	106.62	119.50	-	-	110.00	-	-	-	-	102.73	-	102.73		
	Sep	-	108.00	110.00	-	-	110.00	-	-	111.85	117.27	115.03	114.35	114.75		
	Oct	108.67	108.44	-	113.65	-	110.00	-	-	111.30	107.50	109.50	109.74	109.66		
	Nov	109.08	107.14	109.82	111.40	110.00	110.00	-	-	108.70	116.43	111.13	114.01	112.23		
	Dec	107.16	105.49	109.75	-	112.00	109.53	120.00	110.00	115.17	-	109.15	115.49	110.58		
	1983 Jan	108.24	104.91	108.63	110.86	110.10	110.00	-	100.00	111.37	117.35	109.17	113.74	110.34		
	Feb	109.43	107.32	108.93	110.90	110.00	109.50	120.00	-	112.00	115.28	107.59	115.47	108.68		
	Mar	110.81	112.00	-	111.00	110.00	-	-	100.00	108.75	115.81	109.36	111.07	109.67		
	III	1983 Apr	110.67	109.19	110.00	111.33	-	110.00	-	-	113.50	120.00	110.90	115.88	113.84	
May		108.00	108.00	111.13	110.33	110.00	111.49	-	-	109.17	119.13	110.26	111.58	110.76		
Jun		-	-	111.53	-	-	110.25	-	-	112.22	113.79	110.56	113.42	111.38		
Jul		110.46	112.00	116.92	110.49	-	-	-	-	114.11	116.05	111.02	115.16	113.46		
										112.36	116.57	111.19	113.46	112.28		

a. Prices are weighted averages.

b. Data not available.