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WAS FERTILIZER DISTRIBUTION SYSTEM ALONE RESPONSIBLE FOR SHORTFALL OF *BORO RICE* PRODUCTION IN BANGLADESH IN 1995?

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ABSTRACT

It is generally alleged that defective fertilizer distribution system which created artificial crisis of Urea was mainly responsible for shortfall of Boro rice production in 1995. Based on macro level as well as micro level data, the present study mainly aimed at investigating whether there were other important factors which aggravated the production environment in that year. The analysis showed that there was an absolute shortage of Urea supply during the peak period (January-March) of fertilizer demand in 1995 Boro season. Further, additional demand as a result of increased area under Boro paddy and high price of Aman rice at the end of 1994 also contributed to higher Urea rice in 1995 Boro season. Increased fertilizer prices also caused significant reduction in its use which affected Boro production. In addition to fertilizer (Urea) crisis, severe drought in the Boro season of 1995 significantly increased cost of irrigation and additional cost of irrigation was found to be more than that of fertilizer cost. Therefore, fertilizer crisis along with drought condition affected yield as well as farmers profitability in 1995 Boro season. Particularly, production of small farmers was mostly affected since compared to rich and medium farmers they spent less on these high cost inputs. The findings indicated that even under privatized distribution system, government intervention may be needed to ensure fertilizer at the right time, in the right quantity and at the right price. Further, more research is needed to assess impact of drought on production even with irrigation facilities.

I. INTRODUCTION

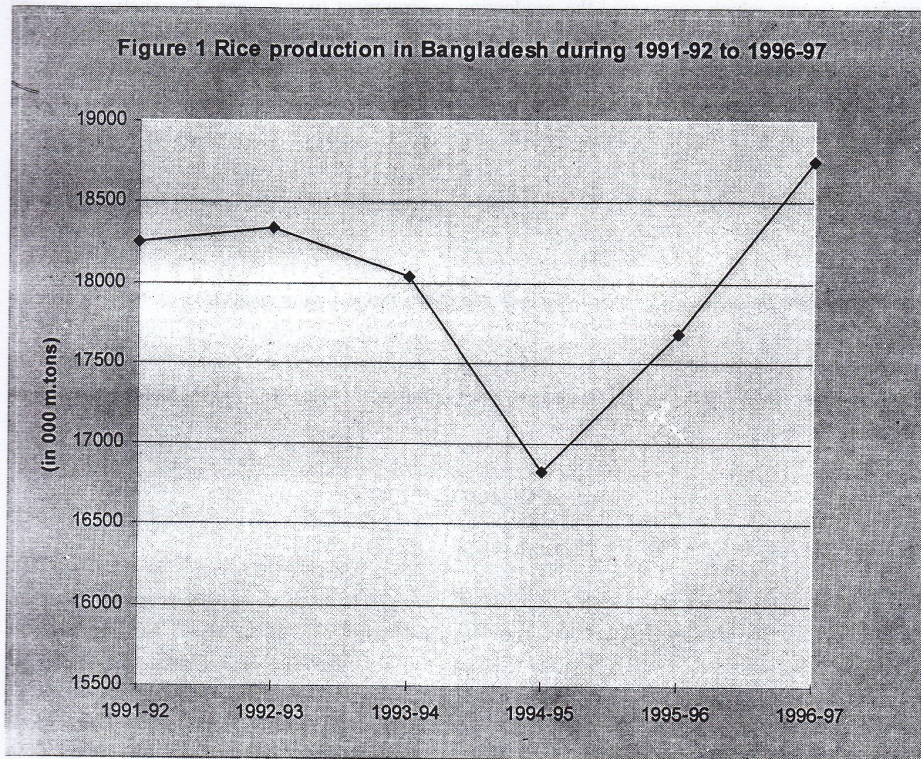
Rice production in 1994-95 Compared to Recent Years

Rice production in Bangladesh in 1994-95 was the lowest in recent years (Figure 1). Production of rice dropped from 18.04 million tons in 1993-94 to 16.83 million tons in 1994-95, a decline by 1.21 million tons compared to the previous year. Drastic reduction in

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rice production in 1994-95 was attributed to a decline in the production of both *Aman* and *Boro* paddy. Drought in *Aman* season with its adverse impact on minor irrigation due to lowering of water table, and the crisis of fertilizer distribution during *Boro* season of 1995 have been identified as the major reasons for this shortfall in rice production in 1994-95 (Abdullah and Shahabuddin, 1997). However, besides crisis of fertilizer drought condition which continued in *Boro* season of 1995 has got less importance by the researchers and it was generally alleged that defective fertilizer distribution system was the main reason for shortfall in *Boro* production.

Production of *Boro* in 1995 was 6538 thousand tonnes compared to 6772 thousand tonnes in the previous year. Even compared to the level attained in 1992, *Boro* production in 1995 decrease by 266 thousand tonnes. Further, not only total *Boro* production, yield per acre also decreased from 1.06 tonnes in 1994 to 0.993 tonnes in 1995.



Data source : BBS (1997) and Directorate of Food

Fertilizer Distribution in 1995 Boro Season

Availability of fertilizers at the right time, in the right quantity and at the right places is considered crucial for expanding agricultural production. To make the supply of fertilizer easily available to the farmers, privatization of fertilizer distribution took place in phases; starting with the retail level in some selected areas in the late seventies. Fertilizer distribution in Bangladesh is now completely under private sector although the prices at which wholesalers purchase from factories of the two main domestically produced fertilizers, Urea and TSP, are set by the government. Beyond this level there is no price control as a result of which the wholesalers and retailers can charge any price according to market demand.

It was felt that the market would be superior to a bureaucracy in responding quickly to changing demand conditions and delivering fertilizer at the right time in the right quantities, with competition ensuring the elimination of excessive profits (Abdullah et al., 1995). However, rapid rises in retail prices of Urea in the last quarter of 1994 and the first quarter of 1995 (and this in spite of a Cutback in the issue price), have caused widespread concern since Urea is the main fertilizer in terms of farmer's use.

Allgoods report 1995) states that, during the 1994-95 Rabi / Boro season, prices oil the 'paper sale' of fertilizer (Urea) allotments near some factories exceeded Tk. 250 per hag and the price at which fertilizer was delivered at the retail level was more than double. As a result, the farmers had to pay even Tk 10.00 to Tk 12.00 for one kg. of Urea while the normal retail price was only Tk. 6. I 2 per Kg.

Emergence of new dealers in fertilizer trade around October 1994 caused artificial crisis in the market which resulted in high prices of fertilizer, particularly Urea. During that period, with the instruction of the Government of Bangladesh, the Deputy Commissioners selected new dealers in their respective districts. However, the selections were largely determined by the influences of others. The new dealers in addition to the dealers already listed with particular factories were given permits to collect fertilizer from Bangladesh Chemical Industries Corporation (BCIC) factories located in adjacent areas. It has been reported (Abdullth et al., 1995) that these new dealers got priority over regular dealers in receiving permits and many of them sold their permits to the regular dealers, thus shared high retail mar-in offered by the market.

Emergence of new dealers into the market so much disturbed the prevailing mechanism of fertilizer distribution that Urea was directly delivered to Deputy Commissioners (DC;) and Thana Nirballi Officers (TNOs) for distribution and during February and March 1995. 2.32.000 tonnes of Urea were distributed through them (Abdullah et al., 1995). Further, the crisis of fertilizer reached to such a level that there were instances of public attacks on vehicles delivering fertilizer to market point which led to the involvement of army into the delivery

system. Army trucks were used for carrying fertilizers from the mills under military escort for local distribution by district officials. This however, further complicated the prevailing system of fertilizer distribution. The situation in 1995 Boro season itself clearly explains that there was severe fertilizer (Urea) crisis which was mainly due to induction of new dealers in the market. It may be mentioned that there had been some radical policy changes in the fertilizer distribution system in 1996 and the 'crisis' was over.

Key Questions for Investigation

Fertilizer crisis in 1995 Boro season accompanied by high price deprived farmers to accrue benefit of subsidized Urea price which is sold below cost of production. High price of Urea had also adverse effect on the its use which consequently affected production of HYV Boro in 1995. Now the Key questions (besides artificial crisis created due to defective fertilizer distribution system) are : whether there were other factors which caused sharp increase in Urea price : ' Secondly. how the increased Urea price affected its use as well as production of Boro in 1995 ? Finally, was fertilizer (Urea) crisis alone responsible for significant reduction in Boro production in 1995 "

Keeping in mind the above key questions, at first, availability of Urea in 1995 Boro season compared to its demand at the macro level has been examined to assess whether there was actual shortage of Urea supply (which also influenced increased Urea price)? Further, based on micro level data, impact of Urea crisis in 1995 Boro season has been investigated in terms of its use in HYV Boro production compared to normal years. Consequences of fertilizer crisis on yield and profitability of HYV Boro have also been investigated.

However, not only fertilizer crisis in early 1995 affected HYV Boro production, drought condition which prevailed in the same period also seemed to had an adverse effect on yield and profitability of HYV Boro. Therefore, in addition to fertilizer crisis, effect of drought condition has also been considered in analyzing farmers' profitability from HYV Boro production in 1995.

II. METHODOLOGY

As stated earlier, serious fertilizer (particularly Urea) crisis existed throughout Bangladesh in 1995 Boro season while in the previous year (i.e. 1994) there was no such crisis. Therefore, with respect to fertilizer crisis, Boro seasons of the years 1995 and 1994 have been considered to represent crisis and normal periods respectively.

Both macro and micro level data were collected for this study. For macro-level analysis, secondary data relating to fertilizer availability, prices, etc. were used (mostly from published reports) while for micro level analysis, primary data with respect to comparative profitability of HYV Boro in the crisis and normal periods were collected from two villages (namely, Gazipur and Pajulia) of Gazipur Sadar Thana of Gazipur district.

Out of 386 farmers in these two villages who produced HYV Boro in 1994 and 1995, 76 farmers were selected randomly. Again, out of 76 farms, 44 were small farms (up to one hectare of cultivated land), 21 were medium farms (above one hectare to 2 hectares) and 11 were large farms (above 2 hectares). For analytical purpose, mainly tabular technique with some descriptive statistics and where applicable T-tests have been applied. Further, price elasticity of demand for different types of fertilizers has also been estimated in order to examine uses of fertilizer in response to price changes.

III. RESULTS AND DISCUSSIONS

Findings from Macro Level Analysis

Availability of Urea at the National Level during 1995 Boro Season

To examine whether there was real shortage of Urea supply in 1995 Boro season, the difference in production and consumption of Urea for the whole country during the peak period of 1995 Boro season has been compared with that of 1994. The opening stock as well as export of Urea during January - March of 1994 and 1995 have also been considered in estimating availability of Urea. Further, area planted for Boro production in 1995 compared to 1994 was taken into consideration in assessing demand for Urea in relation to supply in these two years.

For Boro crop, fertilizer (Urea in this case) is mostly used during the period from January to March which can be considered as peak demand period of fertilizer. Availability and consumption of Urea during 1993-94 and 1994-95 and particularly during January to March in 1994 and 1995 can be seen in Table 1 from which the following points emerge :

Total production of Urea during the period from January to March, 1994 was 570 thousand MT, while for the same period of 1995, it was 539 thousand MT. This indicates a shortfall of production by 31,000 MT, in Boro season of 1995.

The actual local sale or local consumption during the period from January to March 1994 was 559 thousand MT while for the same period of 1995, it was 596 thousand MT, a rise in sale of 6.6% in 1995.

Finally the availability of Urea for domestic sale has been examined. To calculate the availability, opening stocks for the sub-period January - March for both the years were added to the production figures and the export figures were excluded. Thus the total availability for domestic sales for January - March 1994 was calculated as 671 thousand MT while for the corresponding period in 1995 it was 623 thousand MT. This indicates a shortfall of availability of Urea by 48 thousand MT in the peak period of 1995 compared to the same period in 1994. For the former period, total local sales were 83% of the availability, while for the latter period it was 96%.

Table 1. Monthwise break-up of opening stock of total production, local sale and export sales of Urea : 1993-94 and 1994-95

(in '000' MT)

Month	1993-94				1994-95			
	Opening stock	Production	Local sales	Export sales	Opening stock	Production	Local sales	Export sales
July	273	129	132	53	361	174	130	69
August	216	178	189	44	336	122	151	94
September	161	187	177	05	213	183	200	63
October	166	188	89	30	133	193	173	62
November	235	185	150	56	91	157	102	58
December	214	166	166	84	88	167	84	66
January	130	194	226	27	105	212	198	21
February	71	175	203	00	98	159	190	00
March	43	201	130	02	67	168	208	00
April	112	189	20	48				
May	233	200	41	42				
June	350	190	61	118				

source : Independent Review of Bangladesh Development, BIDS, April, 1995; Pages 47 and 48.

On the other hand, compared to 1994, the area under Boro production in 1995 increased by 204 thousand acres (BBS, 1997) implying higher demand for Urea in 1995 Boro season. Further, high rice prices at the end of 1994 (Baulch, et.al. 1998) as a result of the weak Aman harvest also encouraged farmers to invest more in fertilizer to recoup the effects of poor Aman harvest. This has also created additional demand for Urea during the 'crisis' period of fertilizer in 1995. Thus, the above evidences suggest that in addition to defective fertilizer distribution system, absolute shortage of Urea accompanied by increased demand for Urea as a result of increased area under Boro production and rising Aman prices (at the end of 1994) caused sharp increase in Urea price in 1995 Boro season.

Comparative Retail Margin of Urea in 1995 Boro Season Compared to Other Years

In this section retail margin of Urea in 1995 Boro season has been compared with that of previous four years. Table 2 shows monthly retail prices, issue prices and retail margins for Urea for the years 1993, 1994 and 1995.

Table 2. Retail and issue price of Urea for the years 1993 to 1995

Month	Tk./bag (50kg.)								
	1993			1994			1995		
	Retail price	Issue price	Retail margin	Retail price	Issue price	Retail margin	Retail price	Issue price	Retail margin
Jan	287.00	232.71	54.29	270.00	202.08	67.92	317.00	186.00	131.00
Feb	287.50	234.58	52.92	275.50	202.08	73.42	302.00	186.00	116.00
March	316.50	234.58	81.92	254.00	202.08	51.92	371.00	186.00	185.00
April	289.00	234.58	54.42	251.50	202.08	49.42	377.50	186.00	191.50
May	285.50	231.67	53.83	250.50	202.08	48.42			
June	329.50	231.67	97.83	243.00	202.08	40.92			
July	266.00	204.00	62.00	242.50	186.00	56.50			
August	259.00	204.00	55.00	242.00	186.00	56.00			
Sept	252.50	204.00	48.50	277.00	186.00	91.00			
Oct	251.00	202.00	48.92	264.50	186.00	78.50			
Nov	253.00	202.00	51.00	293.50	186.00	107.50			
Dec	250.00	202.00	48.00	306.00	186.00	120.00			
Average	277.21	218.16	59.05	264.17	194.04	70.13		186.00	155.88

Source: Independent Review of Bangladesh, BIDS, April 1995; page 45.

It can be observed from the Table that issue price of Urea was reduced from July 1994 which continued in 1995 also. The table further shows that up to June 1994, actual retail margins were normal compared to the subsequent period and the monthly fluctuations were close. But from August 1994, it started increasing and from November 1994 the increase was very rapid.

Again, Table 2 shows monthly retail margins of Urea in 1995 Boro season compared to margins of the same period in the normal years of 1991 to 1994. Average monthly retail margin for 1995 Boro season was Tk 155.88 per bag (Table 3) while it was Tk 60.17 per bag in 1994 and Tk 60.89 in 1993 (Table 3) which were almost the same. Retail margins for the

previous two years (1991 and 1992) were further lower (Tk.48.08 and Tk. 47.23 respectively) which can also be seen from the Table 3. Therefore, it can be said that at least up to June 1994 private traders were not extracting an unduly high profit.

Table 3. Retail margins of Urea for Boro seasons of 1991 to 1995

Month	Retail Margin				Average retail margin (1991-1994)	Retail margin in 1995	Difference in retail margins between 1994 & 1995
	1991	1992	1993	1994			
January	44.25	41.65	54.29	67.92	52.03	131.00	63.08
February	39.50	52.25	52.92	71.42	54.02	116.00	42.58
March	64.25	55.00	81.92	51.92	63.27	185.00	133.08
April	44.15	40.00	54.42	49.42	47.00	191.00	141.58
Average	48.04	47.23	60.89	60.17	54.08	155.88	95.71

Sources : Computed from Table 2, and BIDS, 1995; Page 45.

Further, it was also found from the table that issue price for Urea was lowered from Tk 202 per bag to Tk 186 per bag in July 1994, but there was no relative price fall in the retail price. Thus, the traders made windfall gain from the low issue price and raised their margins from an average of Tk. 60.67 per bag in 1994 (January to April) to Tk. 155.88 per bag in 1995 (January to April). Therefore, it can be safely concluded that the retailers extracted a very high profit margin throughout the Boro season of 1995 compared to other years. From the above findings, it is difficult to judge what is a reasonable marketing margin which allows for normal profits for wholesalers and retailers of Urea.

Findings from Micro Level Analysis

Comparative Profitability of HYV Boro Paddy in 1994 and 1995

To compare farmers' profitability of HYV Boro in the fertilizer crisis year of 1995 in relation to normal year of 1994, Gross Margin analysis was used. In order to estimate Gross Margin, variable costs were excluded from total revenue (value of main product and by-products). The analysis showed that compared to 1994, per hectare Gross Margin of HYV Boro in 1995 was reduced by 56 % for all farms. The reduction in Gross Margin was found (Table 4) to be the highest for small farms (62 %) followed by medium farms (54 %) and large farms (40 %).

Table 4. Per hectare Gross Margin of HYV Boro for different farm size groups in 1994 and 1995

(In Tk.)

Item	Farm Size Groups							
	Small		Medium		Large		All farm	
	1994	1995	1994	1995	1994	1995	1994	1995
Total Revenue	33907	25921	34627	28869	33138	30026	33970	27069
Variable Cost	17643	19793	18076	21258	17197	20383	17711	19957
Gross margin (GM)	16264	6218	16551	7610	15942	9643	16259	7112
Change in GM (in %)	- 62		- 54		- 40		- 56	

Source : Field survey, 1995.

The table further shows that total returns in 1995 have decreased for all farm size groups while variable costs have increased. Despite increase in paddy price in 1995 (from Tk. 590 to 670 per quintal), total return decreased due to significant reduction in yield in 1995 compared to 1994. Table 5 showed that yield in 1995 was reduced by 1645 kg per hectare (31 % reduction) compared to 1994. The Table further showed that for all farm size groups, reduction in yield was significant; however, it was the highest for small farmers followed by medium and large farmers (Table 5). Therefore, small farmers were affected most among all the farm size groups.

Table 5. Yield variation by different farm size groups in 1994 and 1995

Farm	Yield (in kg)		Difference (in kg) c=(a-b)	T-value	Remarks
	1994 (a)	1995 (b)			
Small farm	5308	3505	1803	9.12	s
Medium farm	5455	3962	1493	6.52	s
Large farm	5201	4133	1068	2.43	s
All farm	5329	3685	1644	5.86	s

Source: Field survey 1995.

Note: s = Significant at 5%

On the other hand, analysis of variable costs, showed that among various cost items (i.e. human labour, animal labour, seed / seedlings, fertilizer, irrigation and insecticides); costs of fertilizer and irrigation made substantial differences in total variable cost in 1995 compared to 1994. Variable cost components under 3 broad categories of fertilizer cost, irrigation cost and all other costs showed that compared to 1994, cost of fertilizer increased by 12 % while cost

of irrigation increased by 44 %. On the other hand, cost of all other inputs increased by only 4 %. The findings confirmed that compared to 1994, production cost of HYV Boro in 1995 increased mainly due to increased irrigation cost. Role of fertilizer was found to be relatively small in increasing production cost (of HYV Boro) in 1995 which goes against the general believe that production cost of HYV Boro in 1995 was increased substantially due to increase in fertilizer price. This has been further investigated in the following sections.

Table 6. Break-down of Variable Costs of HYV Boro Production in 1994 and 1995

Cost Items	Cost in 1994 (a)	Cost in 1995 (b)	Change (c) = (b-a)	% of Change
Fertilizer	3406	3824	418	12
Irrigation	3243	4657	1414	44
All other items	11062	11476	414	4
Total variable cost	17711	19957	2246	13

Source : Field survey, 1997.

Change in Fertilizer Price and Use of Fertilizer in 1995 Compared to 1994

It can be seen from Table 7 that except Urea there had been little change in total fertilizer cost in 1995 compared to 1994. Again, as a result of increased Urea price, total cost of fertilizer did not increase much because use of Urea which represented 42 % of the total cost of fertilizer was significantly reduced (significant at 5 % level).

The table further shows that compared to 1994, on the average Urea price in 1995 increased by 50.19 percent as a result of which use of Urea decreased by 15.26 percent. For other types of fertilizers like TSP there was slight increase in price while for MP there was no price increase. In the case of Zinc, there had been 20 % increase in price in 1995 compared to 1994. However, use of Zinc was not so much compared to other types of fertilizers; thus had little effect on total production cost. The demand for Zinc in relation to price was found to be elastic, particularly for the small farms. Demand for other types of fertilizers in relation to price was found to be inelastic. This indicated that despite increase in Urea price, although there had been significant reduction in its use; the reduction was not drastic. The Table also shows that except Urea, uses of other types of fertilizers in 1995 were insignificantly affected. For example, while use of Urea per hectare decreased by 40.45 kg, uses of TSP, MP, and Zn decreased by only 1.70 kg, 1.19 kg, and 3.99 kg respectively in 1995 compared to 1994.

Table 7. Changes in prices and fertilizer use (per hectare of HYV Boro) by farm size groups in 1995 compared to 1994

Items	Small Farm				Price elasticity of demand for fertilizer
	1994	1995	Difference (1995 compared to 1994)	% change	
Urea use (kg/ha)	271.51	221.76	-49.7z5*	-18.47	0.33
Price (Tk/kg)	5.28	8.21	2.93	55.50	
TSP use (kg/ha)	93.69	91.60	-2.09	-2.23	0.38
Price (Tk/kg)	8.50	9.00	0.50	5.88	
MP use (kg/ha)	85.35	83.94	-1.41	-1.65	0.26
Price (Tk/kg)	8.00	8.50	0.50	6.52	
Zn use (kg/ha)	17.11	10.05	-7.06	-41.26	2.06
Price (Tk/kg)	25.00	30.00	5.00	20.00	
Medium Farm					
Urea use (kg/ha)	259.01	224.73	-34.28*	-13.22	0.27
Price (Tk/kg)	5.25	7.82	2.57	48.95	
TSP use (kg/ha)	106.13	104.20	-1.93	-1.81	0.31
Price (Tk/kg)	8.50	9.00	0.50	5.88	
MP use (kg/ha)	90.82	89.45	-1.37	-1.56	0.15
Price (Tk/kg)	8.00	8.50	0.50	6.52	
Zn use (kg/ha)	22.39	21.31	-1.08	-4.82	0.24
Price (Tk/kg)	25.00	30.00	5.00	20.00	
Large Farm					
Urea use (kg/ha)	255.28	233.04	-22.24	-8.71	0.19
Price (Tk/kg)	5.00	7.30	2.30	46.00	
TSP use (kg/ha)	103.08	103.08	0.00	0.00	0.00
Price (Tk/kg)	8.50	9.00	0.50	5.88	
MP use (kg/ha)	90.89	90.89	0.00	0.00	0.00
Price (Tk/kg)	8.00	8.50	0.50	6.25	
Zn use (kg/ha)	17.96	17.96	0.00	0.00	0.00
Price (Tk/kg)	25.00	30.00	5.00	20.00	
All Farms					
Urea use (kg/ha)	265.00	224.55	-40.45*	-15.26	0.30
Price (Tk/kg)	5.12	7.84	2.72	50.19	
TSP use (kg/ha)	99.23	97.53	-1.70	-1.71	0.29
Price (Tk/kg)	8.50	9.00	0.50	5.88	
MP use (kg/ha)	88.02	86.83	-1.19	-1.35	0.21
Price (Tk/kg)	8.00	8.50	0.50	6.52	
Zn use (kg/ha)	18.96	14.97	-3.99	-21.04	1.05
Price (Tk/kg)	25.00	30.00	5.00	20.00	

Source: Field survey, 1995.

Note: Negative values of elasticity are shown in absolute term.

*indicates significant difference in the use of Urea at 5 % level.

Table 7 further showed that among the farm size groups, except large farms, Urea uses for all other farms (i.e. small and medium) were significantly (significant at 5% level) lower in 1995 compared to 1994. The Table also showed that reduction in uses of Urea for small farms in 1995 compared to 1994 was the highest (50.24 kg. per hectare) while it was the lowest for large farms (40.45 kg. per hectare). This implied that among the farm size groups, small farmers were mostly affected by Urea crisis in 1995.

Effects of Drought Condition on the Production Cost of HYV Boro in 1995

As found earlier, production cost of HYV Boro in 1995 was more compared to that of 1994 mainly because of high irrigation cost and increase in irrigation cost was found to be much higher than that of fertilizer cost. The rainfall in Boro season of 1995 was considerably low compared to 1994 (as well as other normal years). Total rainfall during Boro season (January to April) in 1994 was 293.80 mm while it was only 105.06 mm in 1995. The rainfall distribution during each of the months from January to April in 1995 was also considerably lower compared to 1994 as can be seen from Table 8.

Table 8. Rainfall data in the Boro season of 1994 and 1995

Month	Rainfall (mm) in 1994	Rainfall (mm) in 1995
January	14.60	7.40
February	36.00	26.00
March	84.40	3.40
April	158.80	68.80
Total	293.80	105.60

Source : Bangladesh Meteorological Department, Joydebpur, Gazipur.

As a result of low rainfall in 1995 Boro season, farmers had to pay more for irrigation compared to 1994. There were mainly two components of irrigation charge which the farmers had to bear. One component of the charge was directly paid to the owner of the irrigation equipment (Deep Tubewell / Shallow Tubewell) for using irrigation facilities. The other component was, payment for fuel which the farmers directly had to bear. That is, farmers individually bought their own fuel (diesel) to irrigate their land. The charge for irrigation for the irrigation equipment owner(s) was fixed at Tk. 1411.83 per hectare for HYV Boro in both the years, 1994 and 1995. However, due to drought in 1995 Boro season, all the farmers had to buy more diesel in 1995 compared to 1994 for irrigating their Boro crop which increased their irrigation cost significantly. Average use of diesel per hectare in 1994 was only 127.12 liters while it was 228.22 liters in 1995 which caused additional cost of Tk.1414 compared to 1994. With respect to farm size, the small, medium and large farm size groups used 131.53,

140.29 and 109.62 liters in 1994 while the corresponding figures in 1995 were 232.29, 240.71 and 201.63 liters respectively (Table 9). The differences in the use of diesel in 1994 and 1995 by farm size groups were found to be statistically significant (Table 9)

Table 9. Use of diesel (in Liters) in 1994 and 1995 by farm size groups

Item	Small Farms	Medium Farms	Large Farms	All Farms
Diesel used in 1994	131.53	140.29	109.62	121.12
Diesel used in 1995	232.79	240.72	201.16	219.72
Difference in diesel use (1995 compared to 1994)	101.26 (9.47)*	100.43 (5.02)*	90.44 (5.42)*	98.60 (11.89)*

Source : Field survey, 1995.

Note : Figures in the parentheses indicates T-values

*indicates significant at 5% level.

Compared to 1994, in 1995 the differences in cost of irrigation for small, medium and large farmers were Tk.1417.60, Tk.1405.96, and Tk.1421.21 respectively. Again although low rainfall in 1995 was compensated by more irrigation, yet due to high temperature and other associated environmental factors which prevailed in 1995 caused low yield in 1995.

Analysis in the above sections showed that compared to 1994, in 1995 farmers on the average had to pay Tk. 374 more per hectare for fertilizer while for irrigation they had to pay Tk. 1414 more. This indicated that the financially farmers were more affected by drought condition than that of fertilizer crisis.

IV. CONCLUSIONS

It may be concluded from the study that in relation to demand for Urea in 1995 Boro season, there was actual shortage of Urea. Increased demand for Urea as a result of increased area under Boro crop as well as propensity to use more Urea to accrue benefit of high rice price through higher Boro production also led to abnormally high price of Urea in 1995 Boro season.

The analysis also showed that although fertilizer price went up, total cost of fertilizer did not increase much due to reduction in its use. However, there had been significant increase in production cost (of HYV Boro) due to severe drought condition in 1995 Boro season which caused excessive irrigation cost. The additional cost of irrigation in 1995 (compared to 1994) was found to be more than that of fertilizer cost. Therefore, farmers were more affected by increased irrigation cost than fertilizer cost. Although low rainfall in 1995 was compensated by more irrigation, yet due to high temperature and other associated environmental factors

which prevailed in 1995 caused low yield in 1995. Therefore, fertilizer crisis coupled with drought condition in 1995 caused significant reduction in HYV Boro production in 1995 compared to 1994. Again, among the farm size groups, the small farmers were mostly affected as the use of fertilizer and irrigation (as reflected by the cost of diesel) were the lowest for small farmers which affected their production as well as profitability from HYV Boro in 1995.

To ensure production of HYV Boro, adequate and timely availability of fertilizer should be ensured. Farmers expressed that the traders were mainly responsible for the Urea crisis. So, even under privatized environment, the distribution system of fertilizer need proper attention by the public sector. It may be suggested that buffer stock of fertilizer should be build up in every thana headquarters and system of giving an explanation for traders should be introduced. Further, consequences of drought on farmers' production cost is often overlooked by the researchers which needs proper attention in formulating national price policies.

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