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TREND AND INTER-TEMPORAL PADDY PRICE FLUCTUATION IN BANGLADESH

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ABSTRACT

The article examines the trend and annual and seasonal paddy price fluctuations in Bangladesh. The terms of trade improved in favour of agriculture in the 80s as revealed by the trend in real paddy prices and trend in agricultural prices compared to industrial prices. Annual paddy price fluctuation in the 80s was comparatively less. The seasonal variations of paddy prices have been found to have declined in the recent years. The study shows that the internal procurement has no significant impact on seasonal variation of paddy prices in Bangladesh. However, seasonal storage period and production of Aus, Boro and wheat have influenced the seasonal price variation of Aman paddy significantly.

I. INTRODUCTION

Agricultural product prices have assumed new importance in view of recent policy changes in agricultural pricing. Since the early 1960's, the strategic agricultural price policies were procurement and distribution of modern inputs, subsidization input prices and price support. Over more than a decade, the public sector role in input procurement and distribution have been circumscribed and subsidies reduced.

Output pricing policies have two basic concerns: the level and stability in prices. The level of prices should be such that producers get incentives while fluctuations in prices should be minimized so that price risks do not distort producers' incentives.

Examination of these two aspects of agricultural output prices from the viewpoint of recent policy shifts, is very important in Bangladesh. Particularly, the recent trade liberalization policy under which unrestricted import and export of rice and wheat at zero duty have been permitted, has great importance for agricultural prices (Abdullah 1992; Alamgir 1992).

In this article, the level and stability in paddy prices have been examined by measuring the trend, annual and seasonal price fluctuations. The article has been organised as follows. After introduction data sources are given in section II. Section III and IV respectively discuss the trends and fluctuation of paddy prices. Section V deals with the factors which influence seasonal paddy price variation. Conclusions have been made in Section VI.

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II. DATA SOURCES

Annual harvest prices of Aus, Aman and Boro during 1960-61 to 1989-90 were obtained from the Directorate of Agricultural Marketing and Statistical Yearbook (various issues) published by Bangladesh Bureau of Statistics, Government of Bangladesh. The monthly prices of Aman paddy since independence were collected from Directorate of Agricultural Marketing. Directorate of Food provided data on annual internal procurement and import of foodgrain in Bangladesh. For determining trend and annual variation of paddy prices the data period (1960/61-89/90) has been divided into three subperiods: pre-liberation period (1960/61-70/71), the 70s (1971/72-79/80) and the 80s (1980/81-89/90).

III. TRENDS IN PADDY PRICES AND PRICE INDICES

In calculating trend, semi-log function was found to fit better. Semi-log trend for nominal and real paddy prices and wholesale price indices during different periods are shown in Table 1 and 2. For the purpose of calculating real price, nominal prices were deflated by the price index of manufactured goods as the rice weight is very high in the general price index in Bangladesh (Ahmed and Bernard 1989). Household Expenditure Survey, 1988/89 shows that about 66% of the consumers' expenditure are spent on food of which 45% are spent on rice in Bangladesh.

Table 1. Trend in Nominal and Real Price of Paddy.

		(Percentage)	
Period		Nominal Price	Real Price
1960/61-89/90	Aus	11	0.6
	Aman	12	1
	Boro	12	0.9
1960/61-70/71	Aus	4	2
	Aman	5	3
	Boro	11	8
1971/72-79/80	Aus	15	-0.4
	Aman	14	-2
	Boro	13	-3
1980/81-89/90	Aus	9	4
	Aman	8	3
	Boro	8	3

Nominal Price Trend

Overall trends in nominal prices for all paddy were positive and significant (Appendix Table 1). The trends were almost same for different types of paddy but varied substantially during the subperiods. The nominal price trends during 70s were higher compared to other periods. The price trend was 13-15% per annum in the 70s against 11-12% in the 80s and 4-11% in the 60s. In the 60s, Boro price trend was significantly higher than other paddy prices

mainly due to the fact that Boro price trend was calculated during 1963/64-70/71 because of non-availability of data. During 70s and 80s Aus price trend was higher compared to Aman and Boro. This indicates that price of coarse rice increased at a faster rate than fine rice since independence.

Table 2. Trend in Wholesale price Indices.

Period	(Percentage)		
	Agriculture/Food	Industry/Manufacture	General
1960/61-70/71	5	2	4
1971/72-89/90	11	9	10
1971/72-79/80	13	11	12
1980/81-89/90	10	6	9

Real Price Trend

The real price trends in the overall period were very low and except Aman, they were insignificant. This indicates that real paddy prices remained more or less constant during the study period. That means the paddy prices moved in congruence with the price of manufactured goods since 1960/61.

In the pre-liberation period, except Boro price all the real paddy prices trends were insignificant. On the other hand, price trends for all types of paddy were negative and insignificant in the 70s. However, in the 80s, all the real paddy prices but Aman paddy showed significantly upward trend. Thus it is revealed that the real prices of paddy were more or less same in the 60s and 70s but they increased slightly in the 80s. The low 't' values of the coefficients in the 70s (Appendix Table 1) indicates that the yearly fluctuation of real price in this period was higher. Furthermore, the 70s has higher nominal trends but negative real trends indicating prices in the 70s declined in real terms.

Trend in Wholesale Price Indices.

Due to non-availability of price indices data for agriculture and industry in the pre-liberation period, trends of food and manufacture price indices were calculated for that period. Trend in food price was two and half times higher than the trend in manufacture price during pre-liberation period (Table 2). Agricultural price increased at 11% per annum, compared to 9% for industrial prices since independence. However, the difference between agricultural and industrial price trend in the 80s (4%) is two times higher than that in the 70s (2%). The result thus indicates that since independence agricultural prices increased at faster rates than industrial price and this is more prominent in the 80s. Therefore, it may be concluded that the terms of trade improved in favour of agriculture in the 80s in Bangladesh.

IV. PRICE FLUCTUATION

Annual Price Fluctuation

In Table 3, the year-to-year fluctuations of nominal prices were measured by subtracting the actual prices from the three years' moving average and were expressed in percentage of actual prices. In case of Aus paddy, annual nominal price fluctuation ranged from less than 1 to 16 percent, plus or minus, during 1960/61-70/71, compared to a range of 3 to 29 percent and less than 1 to 14 percent during 1971/72-79/80 and 1980/81-89/90 respectively. The price fluctuation greater than 10 percent prevailed in 3 out of 10 years in the pre-liberation period, compared to 6 out of 9 years and 4 out of 9 years in the 70s and 80s respectively. The price fluctuation of other paddy are, more or less, similar to Aus. However, in the 80s Boro price fluctuation was less (none is higher than 10 percent), compared to Aus and Aman. Thus the result indicates that annual paddy price in the pre-liberation period and in the 80s were more stable than in the 70s.

Seasonal Price Variation

Due to non-availability of data, the seasonal price variation of Aman paddy was estimated for the period 1972-73 to 1989-90 by applying 12 months centred moving average method. The average monthly price ratios between the actual price to the corresponding centred moving average were calculated for each successive three years and are given in Table 4.

In a fiscal year Aus paddy comes first and is available in the market from the middle of July. Aman comes next and is available from November onward. Boro, the last paddy of the fiscal year, enters the markets from April to May. During the harvest and Post-harvest periods Aman paddy prices remain low and then they gradually rise up to the next harvesting period. But the arrival of Boro and Aus paddy retards the rising tendency of Aman prices.

It is observed from Table 4 that the Aman prices are low during November-December as it is the harvesting period. The price begin to rise from January and with few exceptions they fall from May due to the arrival of Boro and Aus paddy in the market. They again start to rise from August, reach the peak level, and then decline in November. The highest price was not found in the same month for all the periods, But the peak prices generally prevail during August to October. During the last two periods, the prices decline in the month of May due to arrival of Boro paddy. This indicates that the influence of Boro supply on Aman price increased in the recent past. The percentage spreads between the highest and the lowest price relatives and the coefficient of variation of prices within a year for all periods were calculated (Table 4). The seasonal price spread (declined by 5% per annum) as well as seasonal coefficient of variation were found to decline during the study period.

The monthly price relatives were averaged for 1970s and 1980s and the seasonal percentage spreads and coefficient of variation for these two periods were calculated. These estimates are presented in Table 5. It is found from the table that the percentage spread and coefficient of variation have declined during 1980s against 1970s. Thus, it may be concluded

that the seasonal variations in paddy price in general and the Aman price in particular have declined in the recent years. This supports the earlier studies made by Chowdhury (1987) and Rahman and Mahmud (1988).

Table 3. Annual Price Fluctuation of Paddy, 1960/61-89/90.

Year	Percentage of deviation from the 3 years moving average		
	Aus	Aman	Boro
1961/62	3.72	6.47	-
62/63	3.22	-0.71	-
63/64	-8.78	-0.14	-
64/65	-13.08	-6.81	-3.73
65/66	-9.71	-8.31	0.93
66/67	15.61	15.08	12.71
67/68	-8.30	-11.45	-13.41
68/69	6.31	7.42	6.30
69/70	-0.33	0.12	0.19
70/71	-8.40	-10.42	-13.05
71/72	-19.53	-17.08	-13.77
72/73	-10.27	20.36	-9.20
73/74	-9.50	-18.21	-2.86
74/75	20.34	33.48	27.28
75/76	2.91	-35.11	-39.73
76/77	-29.15	-8.37	4.50
77/78	9.93	4.53	-12.89
78/79	-19.25	-8.49	9.58
79/80	22.15	11.81	3.04
80/81	-23.48	-13.14	-11.11
81/82	-3.30	5.45	4.03
82/83	7.10	-5.37	-4.42
83/84	-11.30	8.48	8.17
84/85	14.06	9.50	-6.04
85/86	-12.35	-14.87	-3.50
86/87	-0.48	6.52	8.61
87/88	7.95	3.51	-9.08
88/89	-3.50	-1.73	5.22

Table 4. Seasonality in Wholesale Prices of Aman Paddy: 1972-73 to 1989-90.

Months	Ratio between Actual Monthly prices to Corresponding Centred Moving Averages					
	1972/73 to 1974/75	1975/76 to 1977/78	1978/79 to 1980/81	1981/82 to 1983/84	1984/85 to 1986/87	1987/88 to 1989/90
July	98.97	110.77	108.50	100.70	103.90	108.57
August	106.13	108.50	110.27	100.67	104.87	111.20
September	108.27	107.13	109.67	104.87	107.73	102.17
October	115.47	100.50	102.47	104.50	105.83	110.90
November	88.30	78.20	83.27	84.93	91.27	82.57
December	78.20	80.53	86.67	86.57	92.80	84.80
January	90.13	89.53	89.67	93.30	92.20	91.60
February	97.13	93.83	93.03	98.53	95.23	97.87
March	107.20	94.87	97.50	99.20	101.67	102.13
April	111.60	103.00	103.57	106.07	105.77	103.33
May	107.07	103.17	105.47	108.17	101.73	97.47
June	104.10	104.20	106.10	102.23	99.77	95.47
Highest	115.47	110.77	110.27	108.17	107.73	111.20
Lowest	78.20	78.20	83.27	84.93	91.27	82.57
Percentage Spread	47.66	41.65	32.42	27.36	18.03	34.67
Coefficient of Variation	10.32	10.43	9.04	7.13	5.63	9.05

V. FACTORS AFFECTING SEASONAL PADDY PRICE FLUCTUATION

The seasonal price fluctuations of Aman paddy are mainly caused by factors affecting its demand and supply and expectations of market actors concerning future prices. Among the demand factors public procurement of Aman paddy is considered to be the main policy variable expected to have impact upon seasonal price fluctuations (Chowhury 1987). This is because, procurement programme is undertaken during the harvesting months so as to prevent the slumps in prices. In other words, procurement shifts the demand curve upward thereby raising prices.

The supply factors affecting seasonal price fluctuations of Aman paddy include mainly production of cereal crops. While Aman production determines the level of price with demand constant, the seasonal fluctuations are affected by production of Aus, Boro and Wheat. A higher production of these crops prevents Aman price from rising during nonharvest months of Aman paddy.

Table 5. Seasonality in Wholesale Prices of Aman Paddy During 1970s and 1980s.

Months	Ratio Between Actual Monthly Price to Corresponding Central Moving Average	
	1970s	1980s
July	106.86	103.93
August	109.53	104.87
September	109.16	104.62
October	107.09	106.23
November	82.99	86.17
December	80.14	88.76
January	89.65	92.21
February	94.44	97.14
March	99.79	101.84
April	106.34	104.93
May	105.08	102.86
June	105.20	99.40
Highest	109.53	106.23
Lowest	80.14	86.17
Percentage spread	36.67	23.28
Coefficient of Variation	9.97	6.61

The expectations of market participants can be represented by storage period. The difference between the highest and the lowest price seems to be higher if farmers or traders need to store longer period for selling their products before the next price fall. As Chowdhury (1987) points that the lower seasonal spread was due to shorter seasonal storage period in the recent past.

The model describing the seasonal price fluctuations of Aman paddy thus consists of three explanatory variables representing supply, demand and market participants' expectations (Equation 1).

$$1) \quad \text{LnPS} = 6.83 + 0.02 \text{ LnPR} + 0.41^* \text{ LnST} - 0.97^{**} \text{ LnAW}$$

(0.21) (1.87) (2.54)

$R^2 = 0.61$

Figures in the parentheses are "t" values.

** Significant at 5% level.

* Significant at 10% level.

Where, PS = seasonal price spread
 PR = percentage of Aman production procured
 ST = maximum number of months paddy can be stored
 AW = production of Aus, Boro and Wheat

The procurement variable was found to be insignificant with wrong sign. This implies that procurement as demand variable could not impact upon seasonal fluctuations of prices. There could be several reasons. First, procurement constituted an insignificant proportion of total production (about 1 to 6%). Second, procurement activities were carried out for a short period of time after harvest of Aman paddy. So it could not influence prices throughout the year. Finally, often there are not much difference between procurement price and open market prices (Osmani and Quasem 1990).

The coefficient of storage period is significant with expected sign. This supports Chowdhury (1987) that the lower seasonal variation in the recent past was due to the low seasonal storage period.

The most important result is indicated by the production variable. The equation shows that there was almost one to one negative correspondences between seasonal price fluctuations and production of Aus, Boro and wheat. Thus, the reduced seasonal price fluctuations were contributed by the increased production of Boro, Aus and Wheat.

VI. CONCLUSION

In this paper, the level and stability in paddy prices and factors affecting seasonal fluctuations were analysed. The study reveals several important points. Nominal and real price trends varied significantly between decades. Nominal price trends were quite low for all paddy except Boro in the 60s but they were quite high in the 70s. However, real price trends were negative in the 70s which were positive in the 60s and the 80s. This indicates that high nominal price trends in the 70s were due to high inflation rates. The trend analysis also shows that agricultural prices increased at faster rate than industrial prices.

The study shows that the annual paddy price in the 80s was more stable, compared with the 70s. Price stability in the 80s arises from the stable production of paddy. Hossain (1988) and Chowdhury (1990) pointed out that an intricate seasonality of production has set on in-built production stabilizers: losses in one season being offset by gain in the following season.

Like other studies, it is found that the seasonal paddy price variations have declined in the 80s in Bangladesh. The contribution of procurement programme is not significant in decreasing the seasonal paddy price fluctuations in Bangladesh. To uplift the harvesting price at a reasonable level, large scale procurement of paddy is necessary during the year of good harvest.

The study shows that the seasonal storage period and the total production of Aus, Boro, and wheat have influenced the seasonal price variation of Aman paddy in Bangladesh. Thus, it may be concluded that the seasonal variations of paddy prices declined due to the change in cropping pattern which resulted in higher production of Boro and wheat.

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APPENDICES

Appendix Table 1. Semi-log Trend in Nominal and Real Price of Paddy.

Year		Nominal Price		Real Price	
		Coefficient	R ²	Coefficient	R ²
1960/61-89/90	Aus	0.11** (17.37)	.92	0.006 (1.63)	.09
	Aman	0.12** (18.02)	.92	0.01* (2.98)	.24
	Boro	0.12** (12.27)	.92	0.009 (1.76)	.11
1960/61-70/71	Aus	0.04 (1.89)	.28	0.02 (0.94)	.09
	Aman	0.05* (2.45)	.40	0.03 (1.62)	.23
	Boro	0.11** (3.43)	.66	0.08* (2.67)	.54
1971/72-79/80	Aus	0.15* (3.08)	.57	-0.004 (0.21)	.007
	Aman	0.14* (2.65)	.50	-0.02 (0.86)	.10
	Boro	0.13* (3.03)	.57	-0.03 (1.07)	.14
1980/81-89/90	Aus	0.09** (5.91)	.81	0.04* (2.62)	.46
	Aman	0.08**	.83	0.03 (2.21)	.38
	Boro	0.08** (8.16)	.89	0.03* (2.52)	.44

Figures in the parentheses are significant at 5% level 't' values.

* Significant at 5% level

** Significant at 1% level

Appendix Table 2. Semi-log Trend in Wholesale Price Indices of Agricultural/Food and Industrial/Manufactured Products.

Period	Agriculture/Food		Industry/Manufacture		General	
	Coeffi.	R ²	Coeffi.	R ²	Coeffi. .	R ²
1960/61-70/71	0.05 (8.70)	.89	0.02 (6.87)	.84	0.04 (8.14)	.88
1971/72-89/90	0.11 (20.25)	.96	0.09 (14.15)	.93	0.10 (18.76)	.96
1971/72-79/80	0.13 (5.14)	.81	0.11 (3.64)	.69	0.12 (4.57)	.78
1980/81-89/90	0.10 (16.99)	.97	0.06 (17.54)	.97	0.09 (19.60)	.98

Figures in the parentheses are 't' values.

All the coefficients are significant at 1% level.