BJAE, VII, 2 (December 1984) 1-27

PRICE MOVEMENT AND AGRICULTURE'S TERMS OF TRADE IN BANGLADESH, 1901-81[*]

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ABSTRACT

Agriculture has performed very poorly in the past. Among others, changes in relative prices of agricultural and non-agricultural commodities exchanged between sectors are thought to be responsible for this poor performance. The study, therefore, endeavours to analyse the nature of price movement and the terms of trade between agriculture and non-agricultural sectors for the period 1901-81.

The study reveals that during the study period agricultural prices were more fluctuating than non-agricultural prices and that instability in all prices increased in Bangladesh since 1971, but again the degree was higher for agricultural than for non-agricultural prices. The long term trend analysis shows that during 1947-81 terms of trade gradually moved against agriculture and the situation was more adverse for cash crops and non-cereals. In conclusion, it has been suggested that price stabilization should be an important objective of agricultural price policy and that agricultural price parity should be given due emphasis in determining prices of inputs and output.

I. INTRODUCTION

Agriculture holds a strategic position in the national economy of Bangladesh contributing over 50 percents to the country's Gross Domestic Product (GDP) and providing employment to about 85 percent of the total labour force. In comparison to its key position the national economy, agriculture performed poorly in the past. During 1950 – 60, while the growth rate of agricultural population was 2.5 percent per annum, the rate of agricultural output was only 1.5 percent (Alamgir and Beriage 1974). The situation deteriorated further between 1964-65 and 1977-78; during this period population at the rate of 2.6 percent per annum while agricultural output grew only at the rate of 0.91 percent (Hossain 1980). Another estimate shows that between 1970 and 1977

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the growth rate of agricultural GDP was only 1 percent in Bangladesh while it was about 5 percent in most of the Far-East-Asian countries (FAO 1981).

This poor performance of agriculture is generally attributed to low and unproductive public investment in this sector, low capacity utilization of invested capital e.g. irrigation equipment, inadequate use of fertilizers, improper distribution of land and unfavourable tenure system (Clay 1978 ; Jabbar 1977). The hypothesis of this study is that, in addition to the above factors, unfavourable terms of trade[1] has also contributed to the slow growth of agriculture. Adequate knowledge and information on the long-term terms of trade in agriculture is not available. In this study agriculture's terms of trade over the period 1901-81 will be studied. However, because of data limitations the situation of agriculture's terms of trade during 1901-1946 will be discussed only briefly in section II. Detailed analysis will be done for 1947-1981 and presented in the subsequent sections. Section III discusses the nature of price movement, the degree of its variability and the price trends. An analysis of agriculture's terms of trade is made in section IV. while the conclusion is drawn in the final section of this paper. Methodology of analysis is discussed in appropriate sections.

II. PRICE MOVEMENT, TERMS OF TRADE AND AGRICULTURAL GROWTH DURING 1901-1947

Adequate empirical information about agricultural situation in Bangladesh for the period 1901-1947 were not available. Moreover, most of the available information were with respect to the 'Bengal' Province of British India of which the present Bangladesh was a less developed region. Because of these limitations the results of this section should be considered only as indicative of the situation prevailing during the above mentioned period.

Agriculture upto the First World War

In the early years of this century dependency on agriculture was much higher and agriculture was less diversified than what it is today. Agriculture virtually meant the production of two main crops—rice and jute. During 1920-46 these two crops accounted for 91 percent of total cropped acreage and 90 percent of total agricultural production in Bangladesh (Islam 1978). Betwen 1901 and 1914 the harvest prices of both rice and jute fluctuated considerably (FAO 1957 ; Ahamed 1966), though there was a steady rise in general price level, particularly the prices of manufacturing commodities. As a result the real purchasing power of agriculture relative to other economic sectors declined which caused much sufferings to the people in rural Bangladesh (Huque 1939).

The outbreak of World War I coincided with a bumper crop of jute but due to war, exports and imports were seriously handicapped. Between 1914-1916 raw jute prices declined by 64 percent (Ahamed 1966, p. 40). The prices of other crops also received a setback during the war. Against this declining trend in agricultural prices, there was phenomenal rise in the prices of imported manufactuted articles and also of salt, clothing, kerosine oil, matches and other necessities of life (Huque 1939, p. 41).

Agriculture During 1920-1939

After the cessation of hostility the abnormal rise in prices of non-agricultural commodities had fallen considerably and thus the relative position of agriculture improved gradually in the post-war period. But this trend continued only upto 1926-27 and again a falling trend in agricultural prices was set in motion owing to the worldwide economic depression in the late twenties. However, the falling trend in prices of different crops were not similar ; the highest decline took place in case of jute and the lowest in case of wheat. Again the highest fluctuation was found in jute prices and the lowest in the prices of rape and mustard (Table 1). An examination of wholesale prices in Calcutta also shows that while all commodity price indices declined by 41 percent during the priod of economic depression, those of cereals and jute fell by 49 and 67 percent respectively (Table 2).

TABLE 1. FLUCTUATION OF HARVEST PRICES OF MAJOR AGRICULTURAL CROPS IN BANGLADESH, 1920-21 to 1934-35

	Aman rice (Cleaned)	Wheat	Rape & Mustard	Tobacco	Jute
Price per maund[a] (Taka)	5.4	4.8	7.3	12.8	7.6
Co-efficient of variation	31.2	28.7	28.1	29.4	54.6
Percentage change in the triennial average of 1932-35 compared with 1923-26	-52.6	-45.9	-51.1	-46.1	-73.6

[a]One maund = 37.3261 kg.

Source : Huque 1939.

TABLE 2. FLUCTUATIONS OF WHOLESALE PRICES IN CALCUTTA, 1924-25 to 1939-40 (July 1914 = 100)

	Raw jute price index	Cereals price index	All commodities price index
Mean level	72.3	96.1	113.8
Co-efficient of variation	46.8	30.4	23.4
Percentage change in the triennial average of 1932-35 compared with 1923-26	-67.0	-46.2	-41.3

Source : Ahamed 1966.

This disproportionate fall in prices of agricultural commodities particularly those of rice and jute, with considerably high degree of fluctuations accentuated the hardship of the farming community. The value of jute represented nearly 80 prcent of the free purchasing power during 1920-30 and during the worst years of depression it was virtually the only source of purchasing power in rural Bangladesh. The volume of this essential purchasing power declined from a ten year average of Taka 44.71 crores (1 crore = 10 millions) to only Taka 4.40 crores in 1932-33, mainly due to sharp fall in jute price. Thus, the disproportionate fall in agricultural prices in general and jute price in particular aggravated the effects of depression and caused serious distress to agriculture as the monetary liabilities of the farming community remained almost the same (Table 3). The fallilg trend in agricultural prices slowed down by 1934-35 but there was little improvement till 1938-39 due to the residual effects of economic depression.

Agricultue During the Second World War

The Second World War started in 1939 and hostility with all its associates left no corner of the Bangladesh economy untouched. The prices of all imported commodities, manufacturing, clothing, kerosine oil and other bare necessities of life went up sharply. The prices of cereals and other food crops had also increased. But a mixed picture was observed for jute. Although the expected war demand for jute and jute goods resulted in substantial increase in price of raw jute in 1939-40, the tide was very shortlived. The price of raw jute declined sharply in the following year as the position of shipping route

TABLE 3. SHARE OF JUTE IN THE TOTAL VALUE OF MARKETABLE CROPS AND IN AGGREGATE FREE PURCHASING POWER OF AGRICULTURISTS IN BANGLADESH, 1920-33

Year	Value of marketable crops (Crore Taka)	Monetary liabilities of the cultivators (Crore Taka)	Free purchasing power (Crore Taka)	Value of jute crop in Bengal at harvest price (Crore Taka)	Share of jute in free purchasing power
	(1)	(2)	(3=1—2)	(4)	5=(4÷3) x100
1920/21	62.5	26.8	35.7	15.7	43
/22	54.9	27.3	27.6	10.8	38
/23	27.4	47.4	23.7	74.8	50
/24	59.3	27.9	31.4	33.6	108
/25	74.1	28.0	46.1	43.0	93
/26	117.2	28.1	89.0	74.7	83
/27	68.4	28.0	40.4	43.7	109
/28	42.5	28.5	14.0	33.9	263
/29	102.7	28.3	74.4	38.3	51
/30	69.8	28.5	41.3	36.7	89
10 year average	72.6	27.9	44.7	35.7	79
1930/31	53.3	29.4	23.9	17.6	73
/32	39.3	28.3	11.3	10.0	93
/33	32.7	28.3	4.4	8.6	195

Source : Ahamed 1966.

became critical in 1941 when Japan entered the war. Again due to inadequate transport facilities to send jute from the then East Bengal to Calcutta Mills, a great disparity prevailed between prices in Calcutta market and in local markets in the periphery. For example, the bottom quality jute was sold in Calcutta at Taka 6.00 to 6.50 per maund while its price in the primary markets of East Bengal ranged from Taka 2.50 to 3.50 (Ahamed 1966). As jute was the main cash crop, the steep fall in its price caused much suffering to the peasantry in Bangladesh. Moreover, there was a devastating famine in Bengal in 1943 which seriously affected the districts of Dhaka, Mymensingh, Faridpur, Pabna, Rangpur and Noakhali. This famine further deteriorated the position of agriculture in the economy. In the following years the situation improved slightly as the prices of essential commodities began to decline gradually and the prices of rice and jute began to rise.

Thus, over the entire period the economic condition of the farming community in Bangladesh deteriorated, because neither in good years nor in lean years, the growers could get the price they deserved for their produce. The obvious result of this was a virtually stagnant agriculture during 1920-46. During this period agricultural output grew at the rate of 0.5 percent per annum, but the rate of growth for two major crops, rice and jute, was only 0.07 percent per annum (Table 4). Contrary to this, population in Bangladesh increased at a rate of 0.83 percent per annum during the same period (Islam 1978, p. 50).

TABLE 4 : ANNUAL PERCENTAGE RATE OF GROWTH IN INDIVIDUAL CROP OUTPUT IN BANGLADESH, 1920-46

Crops	Dhaka division (1)	Rajshahi division (2)	Chittagong division (3)	Bangladesh 4=(1+2+3)/3
Rice	0.5	0.4	−0.7	0.07
Wheat	3.3	1.1	—	2.20
Rape & mustard	−0.5	0.6	0.2	0.10
Jute	−0.4	0.7	−0.1	0.07
Sugarcane	5.6	4.3	1.4	3.77
Tobacco	3.3	1.8	2.0	2.37
All crops	0.4	0.5	0.7	0.53

Source : Islam 1978.

III. PRICE MOVEMENT AND THEIR TRENDS

Method of Analysing Price Movement

A group of agricultural commodities (included in which are : paddy, wheat, masur, gram and mustard, potato, jute, sugarcane, tobacco and tea) and another group of non-agricultural commodities (included in which are : agricultural production inputs, salt, clothing, C.I. sheets, writing paper, kerosine oil, matches, and drugs and medicines) were selected. For analysing their price movement and measuring terms of trade, harvest prices for all crops other than tea, auction price for tea, and retail prices for all non-agricultural commodities have been used. Time series data on prices of the selected agricultural and non-agricultural commodities and production data of the selected crops have been collected from various published and unpublished sources (for details see, Sarker 1982).

Some adjustments had to be made in the price data of the selected agricultural and non-agricultural commodities. In addition, inter-and extra-polations were made to complete the series in a few cases. The adjusted price data were then transformed into price indices. The price indices were worked out for individual commodities and group of commodities by using the method of average weighted price relatives, the formula used being :

$$I_{Ar} = \frac{\Sigma\left(\frac{P_{ti}}{P_{oi}} \times Q_{ti}\right)}{\Sigma Q_{ti}} \times 100, \; i = 1, \ldots, k \; ;$$

Where

I_{Ar} = Aggregate index of prices of a particular crop group in period t,

P_{ti} = Price index of the i_{th} commodity in period t,

P_{oi} = Price index of the i_{th} commodity in the base year,

Q_{ti} = Weight of the i_{th} commodity in period t.

The proportion of contribution of an individual crop or crop-group in the gross value of output in a particular year has been considered as the weight for that crop or cropgroup in that year.

The aggregate price indices for all non-agricultural commodities were computed with the help of the following formula :

$$I_{Nt} = \frac{\Sigma\left(\frac{P_{cjt}}{P_{cjo}} \times W_j\right)}{\Sigma W_j} \times 100, j=1, \ldots, n;$$

Where

I_{Nt} = Price index of all non-agricultural commodities in period t,

P_{cjt} = Price index of the j_{th} group of non-agricultural commodities in period t,

P_{cjo} = Price index of the j_{th} group in the base period,

W_j = Weight of the j_{th} group of commodities.

All these weights have been estimated from the report on the household expenditure survey of Bangladesh, 1973-74 taking expenditure pattern of only the rural households. The weights were calculated on the basis of the ratio of expenditure on the items under each group to the total expenditure made on the selected commodities.[2] Because of data limitations, the same weights have been used for all the periods under study, assuming that the pattern of agricultural sector's purchase of non-agricultural commodities remained unchanged over time and that there was no significant substitution among different commodities due to changes in their relative prices.[3]

For analytical purposes, the years 1947-81 has been divided into three periods, viz.,

Period I : 1947-48 to 1959-60

Period II : 1930-31 to 1970-71

Period III : 1971-72 to 1980-81.

Movement of Agricultural Prices

The growth rate and unstability in the prices of all individual crops and major crop groups increased substantially in period III in comparison to periods I and II. The prices of all crops increased at the rate of 1.8, 2.0 and 23.7 percent per annum during the periods I, II and III respectively. But the annual growth rate and degree of variability

in the prices of food crops were higher than those of cash crops in all periods except in period I. In period II, while food crops prices grew at the rate of 4.3 percent per annum, it was only 0.6 percent for cash crops. This extreme disparity between the growth rates of two prices possibly resulted from the exploitative policy of the then Government of Pakistan. To appropriate maximum, possible margins from cash crops, particularly from jute, the domestic price of jute was kept artificially at a low level and the Government did not allow it to move in response to any change in its export market. The prices of jute increased at a rate of 1.2 percent per annum while there was a negative growth rate in the prices of tobacco during this period.

Among food crops both the rate of yearly increase and instability in prices were higher for cereals than for non-cereal food crops in period II but in periods I and II while the growth rates were higher for non-cereal food crops the degree of price variability were higher for cereals in Bangladesh (Table 5).

TABLE 5 : MOVEMENT OF HARVEST PRICES OF SELECTED CROPS AND CROP GROUPS IN BANGLADESH, 1947-81

(Percent)

Crop/crop groups	1947-60		1960-71		1971-81	
	Annual average price change	Co-efficient of variation	Annual average price change	Co-efficient of variation	Annual average price change	Co-efficient of variation
Cereals	2.3	25.0	4.8	27.4	24.2	40.0
Paddy	2.3	25.0	4.8	27.5	24.5	40.3
Wheat	1.4	13.5	4.5	27.6	27.8	44.3
Other food crops	3.9	14.8	0.3	9.5	26.1	39.9
Masur	8.4	29.7	3.9	18.2	30.7	54.6
Mustard	6.0	19.1	3.8	19.7	27.1	42.2
Potato	1.1	4.1	(-) 0.6	19.6	27.1	37.2
All food crops	2.1	24.6	4.3	25.7	24.3	40.0
Cash crops	8.5	20.6	0.6	9.7	18.3	37.3
Jute	6.6	29.5	1.2	18.6	15.9	39.8
Sugarcane	3.7	16.6	5.3	19.9	22.4	37.8
Tobacco	14.6	38.1	(-)1.7	37.7	31.9	58.5
Tea	18.8	28.7	7.[illegible]	18.3	16.2	51.7
All crops	1.8	19.4	2.0	20.3	23.7	39.4

Movement of Non-Agricultural Prices

Like agricultural prices, the growth rate and instability in non-agricultural prices increased considerably in period III than in periods I and II. The prices of all non-agricultural commodities rose at the rate of 3.6, 4.1 and 19.6 percent during periods I, II and III respectively. The growth rates and degree of variability, however, were substantially different for individual commodity/group in each period. The prices of drugs and medicines were most unstable during periods I and II while in period III the prices of agricultural production inputs were most unstable. In period I highest rise in price took place for sheet tins and the lowest for salt. During period II, the growth rate of price was the highest for clothing and the lowest for agricultural production inputs. In period III, however, the highest price rise took place for salt and the lowest for clothing. The price of salt went up sharply in 1974-75 and continued through 1975-76 and this actually inflated its growth rate during this period (Table 6).

A comparison of estimated values of the co-efficient of variations indicates that the prices of both agricultural and non-agricultural commodities became relatively more unstable after 1971. The prices were more unstable in the early seventies than in the late seventies. Index of agricultural prices rose from 241 in 1971-72 to 1215 in 1974-75 increasing at a rate of 72 percent per annum while those of non-agricultural prices grew at a rate of 45 percent during this period. This phenomenal rise in all prices in the early seventies was due to the abnormal situation prevailing in the country during that period. Domestic production of both agricultural and non-agricultural commodities came down substantially after independence in 1971 and in 1972-73 they fell by 17 and 19 percent respectively. Moreover, in 1973-74 and 1974-75 floods, cyclones and storms caused serious damage to crops, particularly to paddy of all kind, jute and sugarcane. Secondly, the early seventies constituted a period of re construction and rehabilitation. In order to reconstruct the war revaged economy and rehabilitate about 10 million people badly affected during the war, the Government had to resort to huge public expenditure during this period leading to substantial monetary expansion in the economy. Between 1971-72 and 1974 75 total money supply in the country increased from Taka 486 crores to Taka 815 crores. Not only the supply of money but money circulation had also increased from Taka 176 crores to Taka 293 crores due to economic instability during this period (BBS 1976). Finally, there were two major devaluations of currency during this period ; one on 1st January 1972 by 52.86 percent and the other on 19th May 1975 by 58.16 percent. All these led to substantial monetary expansion and rise in all prices in the economy, but because of inelastic nature of demand and supply for agricultural products, agricultural prices were more affected during this period.

TABLE 6 MOVEMENT OF RETAIL PRICES OF SELECTED NON-AGRICULTURAL COMMODITIES IN BANGLADESH, 1947-81.

(Percent)

Non-agricultural commodities	1947-60		1960-71		1971-81	
	Annual average price change	Co-efficient of variation	Annual average price change	Co-efficient of variation	Annual average price change	Co-efficient of variation
Clothing	4.8	16.2	6.8	21.8	15.3	23.2
Sheet tins	9.9	10.2[a]	2.8	9.5	27.3	43.5
Agricultural Production inputs	b	b	1.0	3.0	29.5	55.8
Salt	0.8	9.2	2.3	10.1	76.4	34.3
Writing paper	2.7	5.5[a]	4.1	12.2	18.2	44.9
Drugs & Medicine	7.5	20.2	3.8	18.3	16.7	36.3
Fuel & lighting	0.9	5.2	4.7	14.3	18.2	39.7
All Non-agricultural commodities	3.6	12.3	4.1	12.5	19.6	34.3

a. Based on only four years price data.

b. Not available.

Price Trends

In order to determine the overall direction in which the prices actually moved during the periods considered, time trend equations were fitted to the price data of agricultural crops and non-agricultural commodities. Instead of selecting a particular type, treatments were made with different types of equations and on the basis of the significance of estimated F-values, the best fitted equations were chosen.[4]

The selected time trend equations for individual crops and crop groups for three different periods are presented in Tables 7, 8 and 9 while the selected trend equations for non-agricultural commodities for the corresponding periods are presented in Tables 10, 11 and 12.

An appraisal of the trend equations fitted to the prices of agricultural commodities in different periods indicates that the structure of prices were different for different crops during a particular period and in some cases different for the same crop in different periods. Thus, for rape and mustard prices a third degree polynomial gave best fit in period I and a second degree parabola in period II, for the third period a semi-logarithmic trend line was found to give the best fit. An examination of the signs of the estimated regression coefficients further indicates that the structure of the second degree parabolas presented in Table 7 were different from those presented in Tables 8 and 9. As the structure determines the behavioural pattern, the observed differences in the structure of the fitted equations imply that the behaviour of agricultural prices were not uniform between periods.

A comparison of the fitted trend equations for all crops and all non-agricultural commodities in different periods reveals that while for non-agricultural prices a clear cut rising trend in all periods was observed, agricultural prices showed a downward trend during Phase II and in each of the rst two periods a line of both rising and falling trends were found. A more important observation, however, is that as against the swinging trends in agricultural prices over periods the rising trends in non-agricultural prices became progressively higher and higher with the elapse of each successive period as indicated by the magnitudes of the regression co-efficients of the fitted equations in three different periods.

TABLE 7 PRICE TRNNDS FOR CROPS AND CROP GROUPS IN BANGLADESH, 1947-48 to 1959-60

Crop/Crop group	Fitted trend equations	R^2	F-value
Paddy	$Y = 63.689 + 280.036X - 2.048X^2$	0.67	19.541**
Wheat	$Y = 113.867 - 2.618X$	0.35	4.304
Pulse : Masur	$Y = 150.631 - 5.808X$	0.25	2.642
Oilseed : Rape & Mustard	$Y = 65.374 + 43.30X - 8.013X^2 + 0.403X^3$	0.57	5.824*
Jute	$Y = 50.304 + 22.577X - 1.537X^2$	0.38	5.867*
Sugarcane	$Y = 61.352 + 6.24X - 0.434X^2$	0.19	2.318
Tobacco	$Y = 79.199 - 10.175X$	0.48	10.118**
Tea	$Y = 212.266 + 143.195X - 42.334X^2 + 3.132X^3$	0.78	9.37*
Cereals	$Y = 63.628 + 28.026X - 2.047X^2$	0.66	19.302**
Non-cereals	$Y = 102.451 + 7.33X - 0.751X^2$	0.29	1.974
Food crops	$Y = 64.095 + 27.592X - 2.012X^2$	0.66	19.22**
Cash crops	$Y = 103.157 - 3.74X$	0.33	4.732
All crops	$Y = 89.313 + 19.555X - 1.506X^2$	0.64	16.12**

**and *indicate that the F-values are significant at 1 and 5 percent levels of error probability respectively.

TABLE 8 PRICE TRENDS FOR MAJOR CROPS AND CROP GROUPS IN BANGLADESH, 1960-61 to 1970-71

Crop/Crop group	Fitted trend line	R^2	F-value
Paddy	$Y = 230.442 - 11.324X$	0.71	21.827**
Wheat	$Y = 136.957$	0.55	10.986**
Pulse : Masur	$Y = 209.72 - 20.654X$	0.56	3.853
Oilseed : Rape & Mustard	$Y = 246.991 - 32.058X + 2.358X^2$	0.62	9.661*
Potato	$Y = 165.357 - 56.393X + 12.854X^2 - 0.763X^3$	0.77	21.56**
Jute	$Y = 193.696 - 4.085X$	0.19	2.05
Sugarcane	$Y = 39.623 + 60.722X - 12.188X^2 + 0.633X^3$	0.70	13.828**
Tobacco	$Y = 2.83 + 38.633X - 3.355X^2$	0.35	4.152
Tea	$Y = 354.378 + 100.716X - 25.567X^2 + 1.578X^3$	0.44	3.30
All cereals	$Y = 229.772 - 11.273X$	0.71	21.909**
All non-cereals	$Y = 161.155 - 12.082X + 0.999X^2$	0.52	8.555*
All food crops	$Y = 223.837 - 10.517X$	0.71	22.38**
All cash crops	$Y = 203.213 - 3.026X$	0.31	4.131
All crops	$Y = 218.12 - 8.414X$	0.68	18.692**

**and * indicate that the estimated F-values are significant at 1 and 5 percent levels of error probability respectively.

TABLE 9 PRICE TRENDS FOR MAJOR CROPS AND CROP GROUPS IN BANGLADESH, 1971-72 to 1980-81

Crop/Crop-groups	Fitted trend line	R^2	F-value
Paddy	$Y = 1378.512 - 280.416X + 25.233X^2$	0.35	3.82
Wheat	$\text{Log } Yc = 2.3702 + 0.0506X$	0.30	3.43
Pulse : Masur	$Y = 1918.447 - 432.782X + 34.798X^2$	0.41	3.66
Oilseed : Rape & Mustard	$\text{Log } Yc = 2.589 + 0.053X$	0.43	5.913*
Potato	$Y = 707.672 - 151.152X + 13.946X^2$	0.49	6.572*
Jute	$Y = 326.44 + 407.846X - 112.05X^2 + 7.467X^3$	0.94	47.074**
Sugarcane	$Y = 416.006 + 267.481X - 85.092X^2 + 6.338X^3$	0.91	22.04**
Tobacco	$Y = 1263.208 - 346.242X + 32.254X^2$	0.50	6.919*
Tea	$Y = 567.058 + 646.613X - 174.162X^2 + 11.075X^3$	0.90	15.442**
All cereals	$Y = 1344.638 - 270.71X + 24.46X^2$	0.35	3.693
Non-cereals	$Y = 1050.889 - 200.087X + 17.201X^2$	0.31	2.948
All food crops	$Y = 1328.305 - 267.084X + 24.072X^2$	0.35	3.681
All cash crops	$Y = 681.151 + 138.865X - 58.397X^2 + 4.539X^3$	0.92	31.172**
All crops	$Y = 1285.902 - 258.829X + 23.181X^2$	0.36	3.87

**and * indicate that the estimated F-values are significant at 1 and 5 percent levels of error probability respectively.

TABLE 10 PRICE TRENDS OF SELECTED NON-AGRICULTURAL COMMODITIES GROUP OF COMMODITIES IN BANGLADESH, 1947-48 to 1959-60

Commodity/group	Fitted trend equation	R^2	F-value
Salt	$\log Y_c = 1.982 + 0.007X$	0.41	7.64*
Clothing	$\text{Log } Y_c = 1.927 + 0.014X$	0.50	11.00**
Drugs & medicine	$\text{Log } Y_c = 1.951 + 0.022X$	0.69	20.03**
Fuel and lighting	$Y = 117.09 - 4.227X + 0.303X^2$	0.50	9.897*
All non-agricultural commodities	$\text{Log } Y_c = 1.955 + 0.01X$	0.49	10.57**

**and *indicate that the F-values are significant at 1 and 5 percent levels of error probability respectively.

TABLE 11 PRICE TRENDS OF SELECTED NON-AGRICULTURAL COMMODITIES GROUP OF COMMODITIES IN BANGLADESH, 1960-61 to 1970-71

Commodity/group	Fitted trend equation	R^2	F-value
Salt	$\text{Log } Y_c = 2.057 + 0.011X$	0.62	14.68**
Clothing	$\text{Log } Y_c = 2.101 + 0.028X$	0.94	141.00**
Sheet tins	$\text{Log } Y_c = 2.042 + 0.011X$	0.74	25.615**
Writing paper	$\text{Log } Y_c = 2.017 + 0.016X$	0.95	171.00**
Drugs & medicine	$\text{Log } Y_b = 2.172 + 0.018X$	0.61	14.08**
Fuel & lighting	$\text{Log } Y_c = 1.992 + 0.012X$	0.45	7.36*
All non-agricultural commodities	$\text{Log } Y_c = 2.055 + 0.016X$	0.92	103.50**

**and *indicate that the the F-values are significant at 1 and 5 percent levels of error probability respectively.

TABLE 12 PRICE TRENDS OF SELECTED NON-AGRICULTURAL COMMODITIES/GROUP OF COMMODITIES IN BANGLADESH, 1971-72 to 1980-81

Commodity/group	Fitted trend equation	R^2	F-Value
Salt[1]	$\text{Log } Y_c = 2.268 + 0.069X$	0.53	7.873*
Clothing	$\text{Log } Y_c = 2.84 + 0.032X$	0.82	16.24**
Sheet tins	$\text{Log } Y_c = 2.38 + 0.076X$	0.92	92.16**
Writing paper	$\text{Log } Y_c = 2.297 + 0.063X$	0.88	58.67**
Agricultural production inputs	$\text{Log } Y_c = 2.125 + 0.089X$	0.92	92.00**
Drugs and Medicine	$\text{Log } Y_c = 2.488 + 0.05X$	0.85	45.33**
Fuel and lighting	$\text{Log } Y_c = 2.442 + 0.056X$	0.90	72.00**
All non-agricultural commodities	$\text{Log } Y_c = 2.547 + 0.054X$	0.90	72.00**

[1]The trend line was fitted avoiding the extreme value of the price index in 1974-75.

**and * indicte that the F-value are significant at 1 and 5 percent levels of error probability respectively.

IV. AGRICULTURE'S TERMS OF TRADE IN BANGLADESH

The implications of the wide fluctuations of agricultural and non-agricultural prices for relative sectoral position of agriculture is described in this section in relation to the movement in the terms of trade between agriculture and non-agricultural sectors. In this connection, the following two types of parity ratios have been estimated :

(i) Parity between the prices of all agricultural commodities and all non-agricultural commodities called agriculture's terms of trade. It was worked out as :

$$\text{Index of Agriculture's Terms of Trade} = \frac{\text{Aggregate harvest price index of all crops}}{\text{Aggregate retail price index of all non-agricultural commodities}}$$

(ii) Parity between the prices of individual crops or crop groups and all non-agricultural commodities known as purchasing power parity for individual crops/crop groups. Thus :

$$\text{Index of purchasing power parity for } j_{th} \text{ crop/crop group} = \frac{\text{Index of harvest prices received for the } j_{th} \text{ crop/crop group}}{\text{Aggregate retail price index of all non-agricultural commodities.}} \times 100$$

Agriculture's terms of trade and parity ratios for major crop groups fluctuated considerably between years in each of the three periods. With frequent ups and downs agriculture's terms of trade were in favour of this sector for 9 years during each of the periods I and II, but only for 3 years during period III. Parity ratios were more in favour of cash crops than food crops during periods I and II, but in period III food crops enjoyed relatively better purchasing power than cash crops. In fact, the parity ratios had always been favourable to cash crops during the second period but unfavourable during the third period. Among foodcrops, parity-ratios were more favourable to cereals than of other (non-cereal) food-crops in all periods and except in 1974-75 the parity ratios had always been unfavourable to non-cereal food crops in period III. Thus terms of trade were more in favour of agriculture during first and second periods than in the third period and the parity-ratios for foodcrops and cash-crops gradually became unfavourable since 1971 (Table 13).

The purchasing power parities for individual crops during periods I, II and III are presented in tables 14, 15 and 16 respectively. The parity ratios had been unfavou-

TABLE 13 AGRICULTURE'S TERMS OF TRADE AND PRICE PARITY FOR CROP GROUPS IN BANGLADESH, 1947-81

Year	Aggregate price index		Index of agricul-	Index of price parity for major crop groups			
	Non-agri-cultural commo-dities	All crops	ture's terms of trade	Food crops	Cash crops	Cereals	Other food crops
				I			
1947/48	80.8	151.3	187.2	202.5	140.7	202.5	—
/49	87.7	171.0	195.0	202.4	168.5	202.4	—
/50	94.5	129.8	137.4	141.7	118.1	142.4	112.1
/51	100.0	100.0	100.0	100.0	100.0	100.0	100.0
/52	112.7	135.5	120.3	112.6	135.9	112.6	113.7
/53	112.4	107.1	95.4	103.5	64.2	104.4	78.5
/54	129.9	97.6	75.2	71.3	87.1	70.5	89.4
/55	110.9	98.9	89.2	62.9	142.7	61.7	82.7
/56	108.3	111.2	102.7	96.7	117.1	97.4	85.3
/57	111.4	153.0	137.4	142.1	120.2	143.4	112.9
/58	110.9	156.7	141.2	143.6	133.7	144.8	112.7
/59	108.8	145.9	134.1	136.7	126.0	137.8	120.9
/60	119.1	149.1	125.1	121.5	139.1	122.3	105.8
				II			
1960/61	120.3	164.0	136.3	125.4	167.2	126.7	102.0
/62	122.6	158.5	129.3	122.7	145.7	123.9	101.7
/63	135.4	135.6	100.1	91.1	124.7	90.9	94.0
/64	131.9	110.6	83.9	74.5	108.5	71.8	106.9
/65	131.3	129.7	98.8	82.6	136.8	79.1	121.6
/66	136.1	152.3	111.9	102.6	136.1	102.8	98.6
/67	145.4	202.1	139.0	139.7	136.7	141.9	109.1
/68	148.8	178.6	120.1	119.4	122.6	121.2	92.9
/69	153.9	211.2	137.2	138.5	132.5	141.8	85.6
/70	163.4	207.1	127.1	129.5	118.9	132.6	76.7
/71	179.1	193.8	108.2	107.1	111.5	109.5	72.5

(Contd.)

Table 13. (Contd.)

Year	Aggregate price index		Index of agricul-	Index of price parity for major crop groups			
	Non-agri-cultural commo-dities	All crops	ture's terms of trade	Food crops	Cash crops	Cereals	Other food crops
				III			
1971/72	272.6	241.4	88.6	90.4	81.3	91.9	70.1
/73	482.2	399.8	82.9	87.7	64.8	89.6	63.1
/74	593.5	673.0	113.4	120.9	56.2	122.7	94.8
/75	794.7	1215.1	152.9	162.1	80.6	165.0	116.1
/76	709.1	661.5	93.3	95.2	83.2	96.9	69.7
/77	737.8	644.1	87.3	89.8	76.2	90.9	74.3
/78	813.1	786.7	96.8	99.8	82.0	100.5	89.3
/79	898.6	876.1	97.5	100.8	83.8	102.5	76.2
/80	983.0	1081.7	110.0	115.2	83.9	117.3	75.9
/81	1177.5	968.9	82.3	84.9	67.4	85.3	80.4

table for wheat, potato and sugarcane in almost all the years under each period. However, for paddy, masur, mustard, jute and tobacco mixed pictures were observed in each of the three periods. Notably, the parity ratios for two major crops, paddy and jute, became more unfavourable in period III than those in the two other periods. Tea is the only cash crop which enjoyed favourable parities during periods I and II. In period III also the condition of tea was better than all other crops. But it is to be emphasized here that in all periods Bangladesh agriculture hardly received any real benefit from tea plantation in terms of its relative aggregate purchasing power because tea, as a cash crop is grown mostly in a few estates of Sylhet and Chittagong and the ownership is vested in the hands of such persons/agencies who by no means can be termed as "farmer" under Bangladesh situation. A favourable parity ratio for tea brought some absolute benefit to these estate owners and not to the peasant community. Therefore, exclusion of tea from the specified group of crops and re-estimation of agriculture's terms to trade seem to be more meaningful (though not done in this study), as the estimates will then better represent the true economic position of the peasant agriculture in Bangladesh.

TABLE 14 PURCHASING POWER PARITY FOR INDIVIDUAL CROPS IN BANGLADESH, 1947-60

Year	Price parity for individual crops								
	Paddy	Wheat	Masur	Mustard	Potato	Jute	Sugarcane	Tobacco	Tea
1947/48	202.5	—	—	—	—	151.8	92.0	135.3	—
/49	202.4	—	—	—	—	190.5	86.9	92.7	—
/50	142.4	—	—	—	—	134.6	88.4	95.9	—
/51	100.0	100.0	100.0	100.0	—	100.0	100.0	100.0	100.0
/52	112.6	92.5	138.1	99.3	—	148.9	63.9	161.8	112.3
/53	104.4	96.8	78.6	78.4	—	54.1	56.3	69.9	138.8
/54	70.8	61.0	59.8	97.4	—	69.0	58.1	91.4	195.0
/55	61.7	67.3	70.7	87.4	—	60.1	57.0	229.3	294.6
/56	97.5	85.7	83.6	81.2	100.0	79.2	58.4	166.6	285.7
/57	143.5	101.9	133.8	118.1	95.6	113.3	74.3	140.2	233.5
/58	144.9	102.2	128.3	128.4	86.8	118.1	94.6	176.1	286.0
/59	139.9	96.9	157.5	125.8	97.2	91.0	71.8	185.5	292.9
/60	122.4	86.3	112.1	125.8	86.8	90.7	61.1	173.7	340.2

TABLE 15 PURCHASING POWER PARITY FOR INDIVIDUAL CROPS IN BANGLADESH, 1960-71

	Price parity for individual crops								
	Paddy	Wheat	Masur	Mustard	Potato	Jute	Sugarcane	Tobacco	Tea
1960/61	126.8	83.4	104.3	112.7	94.2	176.6	73.3	197.8	259.4
/62	124.1	77.0	99.2	104.6	100.7	149.9	83.8	166.9	238.2
/63	91.1	49.7	86.8	85.5	99.3	83.2	60.5	141.5	345.6
/64	71.9	56.4	78.6	91.5	117.1	95.8	64.2	70.1	264.8
/65	79.2	51.3	126.9	141.5	108.9	139.4	81.1	103.2	274.2
/66	102.9	54.1	105.5	137.1	64.7	107.1	83.1	58.5	373.3
/67	142.2	69.7	118.2	144.1	87.7	138.1	68.5	97.3	306.3
/68	121.4	76.8	127.6	199.8	72.5	105.5	68.0	78.9	298.5
/69	142.3	83.1	106.8	111.0	69.8	118.2	93.1	112.6	313.6
/70	133.1	87.6	96.5	107.3	65.8	99.4	87.0	62.0	306.0
/71	109.9	75.6	84.3	104.8	47.6	109.0	72,1	46.9	245.6

TABLE 16 PRICE PARITIES FOR INDIVIDUAL CROPS IN BANGLADESH, 1971-81

	Price parity for individual crops								
	Paddy	Wheat	Masur	Mustard	Potato	Jute	Sugarcane	Tobacco	Tea
1971/72	92.3	61.8	92.9	100.3	45.8	74.0	73.1	125.8	141.9
/73	89.9	41.7	71.6	85.4	51.7	58.6	73.3	66.5	58.1
/74	123.1	81.3	114.0	122.7	81.3	49.5	58.4	50.3	49.9
/75	165.7	115.5	105.3	185.4	62.2	58.2	92.8	73.4	57.4
/76	97.5	51.7	93.0	90.5	59.7	70.9	82.7	125.6	84.8
/77	91.5	65.4	99.4	107.6	44.0	72.2	60.0	70.0	145.3
/78	101.6	63.9	118.1	130.4	52.4	87.1	56.1	51.9	141.9
/79	104.1	59.6	125.0	106.5	45.6	87.8	70.7	36.3	123.6
/80	120.3	66.8	131.5	104.0	52.3	73.0	82.8	98.9	127.9
/81	87.8	53.5	161.3	101.0	58.0	55.6	60.5	113.3	90.9

Time Trends

As the parity indices were fluctuating considerably in each period and it was difficult to infer clearly about the overall direction of movement of the parity ratios, the trend analysis seemed essential. Instead of fitting trend equations assuming any specific form of relationship betwee the variables, the parity ratios were tested for the existence of the nature of trend by a non-parametric method. The method was primarily developed for a short series but with slight modification it can be used for a longer series as well. It consists of ranking each observation and computation of total scores (S), Kendall's rank-coorelation co-efficient (T) and the standardized normal variate (Z) for $N \geq 10$ (for details see, Siegel 1956, pp. 213-23 ; Tintner 1952, pp. 212-15). For each period 14 sets of data were tested by this method and the results obtained are summarized in Table 17.

There was a negative overall movement of agriculture's terms of trade during period I, but the terms of trade moved slightly in favour of this sector during periods II and III. None of the estimated trends were found statistically significant. However, a significantly negative trend emerge when all the three periods are merged together. Thus, although for individual periods agriculture's terms of trade consist only of fluctuations, the terms of trade have gradually moved against this sector in the last 34 years.

Among major crop groups negative trends in parity ratios were seen for food crops and cereals during period I, for cash crops and non-cereals during period II, but in period III the parity ratios moved slightly in favour of all major crop groups. Only the negative trends in period II were found significant. When the analysis is made for the entire 34 years, negative trends appeared for all the major crop groups and those for cash crops and non-cereals were found highly significant. Thus, over the last 34 years parity ratios moved against the specified crop groups which, in their turn, resulted in a significantly deteriorating terms of trade for the agriculture sector.

Regarding individual crops, negative trends were found for paddy, potato, jute and sugarcane in period I, for potato, jute and tobacco in period II and for wheat, potato, sugarcane and tobacco in period III. Significant trends in movement of parity ratios were found for potato, tobacco and tea in period I, for potato and tobacco in period II, but only for masur in period III. When all the three periods are considered together, negative trends in parities were found for all individual crops except masur and mustard ; but only for wheat, potato, jute and tobacco the trends were found statistically significant. Thus for the rest of the crops the broad conclusion appears to be a slight trend movement against the prices of paddy, sugarcane and tea, but in favour of the prices of masur and mustard in the last 34 years.

The most important thing to be noted from the trend analysis is that the recognizable fluctuating nature of agriculture's terms of trade in Bangladesh have been largely due to

TABLE 17 TIME TRENDS OF AGRICULTURE'S TERMS OF TRADE AND OF THE PARITY RATIOS OF SELECTED CROPS AND CROP GROUPS IN BANGLADESH

Crop/Crop groups	1947-60		1960-71		1971-81		1947-81	
	T	Z	T	Z	T	Z	T	Z
Paddy	-0.205	-0.977	0.200	0.855	0.022	0.090	-0.180	-1.500
Wheat	0.111	0.448	0.236	1.010	-0.022	-0.090	-0.312	-2.457*
Masur	0.244	0.986	0.018	0.078	0.733	2.957**	0.135	1.067
Mustard	0.378	1.523	0.127	0.544	0.022	0.090	0.127	1.000
Potato	-0.600	NA	-0.564	-2.409*	-0.067	-0.269	-0.594	-4.255**
Jute	-0.308	-1.465	-0.236	-1.010	0.200	0.806	-0.326	-2.717**
Sugarcane	-0.179	-0.855	0.200	0.855	-0.067	-0.269	-0.070	-0.583
Tobacco	0.410	1.954*	-0.600	-2.564*	-0.067	-0.269	-0.301	-2.508*
Tea	0.778	3.136**	0.164	0.699	0.156	0.627	-0.174	-1.370
All crops	-0.128	-0.609	0.027	0.117	0.022	0.090	-0.258	-2.150*
Cash crops	0	0	-0.527	-2.253*	0.333	1.344	-0.767	-6.392**
Food crops	-0.205	-0.977	0.164	0.699	0.022	0.090	-0.205	-1.708
Cereals	-0.205	-0.977	0.164	0.699	0.022	0.090	-0.194	-1.617
Non-cereals	0.164	0.701	-0.527	-2.253*	0.200	0.806	-0.355	-2.960**

NA=Not applicable.

**and * indicate that the estimated Z-values are significant at 1 and 5 percent levels of error probability respectively.

greater variations in agricultural prices. Compared to non-agricultural prices agricultural prices behaved with greater flexibility both in the upswing and in the down swing trends in their movement.)

V. CONCLUSIONS

High fluctuations in the harvest prices of major crops is a serious hindrance to effective farm planning in Bangladesh. Farmers often do not get the price they deserve for their produce and in most cases because of wide fluctuations in harvest prices they can not even make themselves sure that a particular enterprise will bring a reasonable margin in a given period. This restricts the scope of commercial pursuit in agriculture. Progress of agriculture in Bangladesh depends largely, among others, on reducing fluctuations in prices. In order to reduce price fluctuations to a reasonable limit, price stabilization measures should be strengthened.

The Government of Bangladesh is currently embarking on a policy of gradual withdrawal of subsidy from agricultural production inputs, particularly from seeds, fertilizer and irrigation equipment. Whatever may be the logic behind it, parity aspects of agriculture should be duly emphasized while determining the amount of subsidy to be withdrawn from or retained in a particular input or group of inputs. During the seventies the highest price increase took place for agricultural production inputs; further reduction of subsidies will raise this price and will inflate the price paid by the farmers. This will lead to further deterioration of agriculture's terms of trade and unless otherwise supplemented, it will invariably lead to a stagnant agriculture in Bangladesh.

Notes :

1. 'Terms of trade' as a concept originally belongs to the theory of International Economics, where it purports to measure the position of its trading parter in foreign trade. However, the concept is used in this study in a different sense ; to measure the relative trading power of different sectors of the economy, under the assumption of a closed economic system.

2. As the household expenditure survey did not cover the agricultural production inputs included in this study the weights for the individual inputs and inputs as a group have been taken from Rahman (1981). However, a careful comparison of the expenditure characteristics of the sample households was made with those at the national level, in estimating the weights for production inputs.

3. Biases may be introduced into the indices depending upon the degree of substitution between commodities due to changes in their relative prices. But in practice, it is very difficult to diminate such bias. So, the assumption was made.

4. A summary of these statistical treatments with different types of equations and different crops in different periods is presented in (Sarker 1982 ; Appendix XI).

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