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**MARKET TRANSITION  
AND  
PRICE-WAGE DYNAMICS:  
THE CASE OF THE BANGLADESH RICE  
MARKET**

**K.A.S. MURSHID  
SHAHIDUR RASHID**

**JUNE 2001**

*FMRSP Synthesis Report No. 5*

**FMRSP** Bangladesh  
Food Management & Research Support Project  
Ministry of Food, Government of the People's Republic of Bangladesh

**International Food Policy Research Institute**

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*This work was funded by the United States Agency for International Development (USAID)*

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*The views expressed in this report are those of the author and do not necessarily reflect the official position of the Government of Bangladesh or USAID.*

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## **FMRSP** Bangladesh

**Food Management & Research Support Project  
Ministry of Food, Government of the People's Republic of Bangladesh**



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## 1. INTRODUCTION

There have been major forces at work in the rural economy over the past decade and a half, with quite striking implications, in particular, for the rural food economy. On the production front, large increases in foodgrain productivity have taken place ushering in an era of near self-sufficiency in rice. The incentive regime facing agriculture has undergone a major transformation, resulting in rapid technological change (widespread adoption of the Green Revolution technology and modern irrigation practices).<sup>1</sup> Significant improvements have taken place in physical infrastructure (rural roads, telecommunications and rural electrification) and in the delivery system of rural services, including financial and extension services. The rice market has also had to contend with withdrawal/reduction of food subsidies, reforms of the Public Food Distribution System, trade (import) liberalization of rice and expanded production and marketed quantities.<sup>2</sup>

The purpose of this paper is to explore changes in the structure of the rice market and in the rice price - wage relationship. This has been attempted using two quite distinct approaches: (a) a review of evidence of the evolution of a more developed, efficient (impersonal) market structure (e.g. see Platteau, 1994), and (b) a re-examination of the rice price-wage debate (Palmer-Jones, 1992, Boyce and Ravallion 1991, Ravallion 1994) and the question of efficiency wages in Bangladesh agriculture.

### IMPERSONAL MARKETS?

Platteau (1994) argues that traditional, personalized markets will not automatically give way to more advanced (impersonal) forms, in the face of e.g. market deregulation or

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<sup>1</sup> Mainly through structural adjustment policies and trade liberalization.

<sup>2</sup> Since 1971 food production doubled in Bangladesh and marketed quantities increased by a factor of six (Ahmed et al ed. 2000).

liberalization. Indeed he suggests that the imposition of market forms on unprepared soil could backfire with serious consequences for development. On the other hand, Srivastava (1989) suggests that inter-linked exchange (based on personalized markets) can either sustain "precapitalist" relations or assist in their dissolution. In a more recent study, Crow and Murshid (1994) presented evidence to suggest that both these tendencies were present in two different, contrasting agricultural areas of Bangladesh. Fresh evidence from the Bangladesh rice market is presented here in support of our argument that a structural transition is underway with distinct signs of dissolution of traditional market forms and their replacement by impersonal forces.

#### THE RICE PRICE - WAGE DEBATE REVISITED

There are three major questions at the center of this debate: i) have increases in agricultural productivity through Green Revolution technology translated into a reduction in rural poverty through lower prices or increased wage income?<sup>3</sup> ii) what has been the trend in the long-term movement of real agricultural wages (in relation to rice prices)? and iii) how do agricultural wages respond to changes in wage goods, especially rice prices? In the face of low per capita income and increasing dependence of the poor on labor markets, these questions assume significant importance for policy.<sup>4</sup>

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<sup>3</sup> In the context of the Green Revolution in India, the debate over this question went on for long time. A collection of papers in the book edited by Mellor and Desai (1985) discuss different dimensions of this basic issue.

<sup>4</sup> While there is overwhelming micro-level evidence to suggest that the new technology has had positive impacts in alleviating poverty through direct productivity gains and through indirect linkage effects, macro-econometric analyses present quite a different set of results. Using time series data from 1949/50 to 1980/81, available studies argue that real agricultural wage has been on a downward trend in the period in which the country experienced positive growth in overall agricultural productivity (Khan 1984, Boyce and Ravallion 1991, Ravallion 1994). Furthermore, Boyce and Ravallion (1991) express concerns that an increase in nominal rice price can have detrimental affects on the poor, for whom wage is the main source of income and rice occupies major share of their expenditure.

## 2. METHODOLOGY

### MARKET EVOLUTION

The data generated for this study has been obtained from a selective re-survey of the original Crow and Murshid (1994) study areas in late 2000 in order to have comparative evidence between two points in time separated by over a decade.<sup>5</sup> This has provided us with a rare opportunity to take a close look at various aspects of the rice market: structure, trade finance and forms of transactions. It is an opportunity to examine whether the charges of stagnation and lack of dynamism that is often levied on the countryside is an apt description of current realities, in the context of a specific market, namely the domestic rice market in Bangladesh.

The study areas relate to three distinct sets of markets. An agriculturally progressive or "advanced" Green Revolution area in Bogra in the North-west, an agriculturally "backward", mono-cropped *char* area in Noakhali in the South and the major urban market configurations in the Dhaka - Narayanganj belt, consisting of Badamtoli, Madanganj and Kamlaghat.

### RICE-PRICES AND WAGES

The wage-rice price relationship is re-examined using the most recent data with the help of co-integration analysis. The development of co-integration analyses has changed the way time series econometrics used to be done just a decade ago. Since all of the past studies are based on the classical regression method, a methodological re-examination was considered worthwhile.

The data set reported in Palmer-Jones (1993), (containing data from 1949/50 through 1989/90) was used. For the purpose of analyzing dynamics of wages and prices during the

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<sup>5</sup> The fieldwork for the original study was conducted in 1988-89.

post-famine period (i.e. after 1974), four time series variables—agricultural wages, urban wages, rice price, and cloth price index—were constructed. The daily average wage rates of unskilled construction workers in seven major cities (Dhaka, Chittagong, Narayangonj, Rajshahi, Khulna, Sylhet, and Rangpur) are taken as a proxy for the urban wage rate. This is different from the manufacturing wage rate used in previous studies, which was an average wage rate of the unskilled workers in the manufacturing sectors such as the jute and textile industries. Since labor unions are significantly strong in the industrial sector in Bangladesh, wage rates of unskilled construction workers are likely to better reflect urban wages than the average wage of the unskilled workers in the manufacturing sectors. Rice price is the daily average of the district level prices of coarse rice, commonly consumed by the poor. Finally, the cloth price index is the merged cloth price index reported in the monthly statistical bulletin. All variables are transformed into natural logarithm and 1977/78 is taken as the base year. The empirical analyses are based on cointegration techniques (Banarjee et. al., 1993; Muscatelli and Hurn, 1992), the first step of which is to examine stationarity of the variables (order of integration (Engle and Granger (1987))). The next step is to examine whether the non-stationary variables form a cointegrating relationship among them. This can be checked using an error correction model for any set of  $I(1)$  variables (Engle and Granger, 1987). The methodology proposed in Johansen (1988) is considered superior and has therefore been used in this study.<sup>6</sup>

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<sup>6</sup> See Enders (1995) for a detailed discussion.

### 3. BACKWARD AND ADVANCED AREAS: CHANGING CONTRASTS IN THE RICE EXCHANGE REGIME

#### A BACKWARD AREA: CHARS OF NOAKHALI, 1988

The backward area studied is in the South of Bangladesh in the district of Noakhali where we focused on two large foodgrain markets collecting paddy and distributing rice, two local village markets within the hinterland of the collection markets, and a sample of rural households selected from the areas served by the village markets. One of the collection markets was found to dominate an area of *char* land (land newly formed by riverine action). When the area was first visited in 1988 it was found to be predominantly single-cropped with *Aman* paddy cultivation (from August to November) constituting the main agricultural activity. Land productivity was low, with a high incidence of tenancy and sharecropping, a predominance of absentee landlords and relative lack of alternative employment opportunities. The area was poorly served by infrastructure, services and institutions. Communications were difficult, very few development agencies or programmes were seen to operate here and access to schools, clinics and hospitals remained very limited.

Despite low yields and little apparent district-wide surplus there were sizeable exports of paddy from the *chars* in the months following the main *aman* harvest and of imports of rice during six to eight months of the year. Since the emergence of the *chars* in the 1960s there has been a rapid expansion of traders and village markets to procure paddy and distribute rice, which in turn led to the expansion of trading capital.

#### TRADE CIRCUITS, CREDIT HIERARCHY AND TYPES OF CREDIT RELATIONS

The large *char* grain collection market stood at the apex of a hierarchy of financial relationships that served to channel cheap paddy from its hinterland to money-lending traders and absentee landlords. The hierarchy was found to operate through a network of trading-financial arrangements that extended up to the grower's level and was sustained by its

dominance over the local power structures (including the police and *lathials*), as well as control over transport from within and from the area. Its principal functions were to secure paddy supply for the traders at the apex (at a low rate) in exchange for financing cultivation costs and consumption during the growing stages of the crop.

There were two principal forms of trade or merchant capital operating in the backward area that could be viewed as the basic economic links binding the hierarchy - designated here by *dhaner upore* and *dadon*. The first is a pre-harvest price-fixing loan to cultivators to be repaid in kind at harvest. The second is a trade-tying working capital loan to a subordinate trader by a money-lending trader. *Dadon* was found to be common in many markets in Bangladesh while *dhaner upore* seemed to be more ubiquitous in single-cropped areas. Both forms depended critically on the lack of alternative sources of credit or working capital for the smaller traders and peasants and their acute poverty.

*Dadon* are rapidly circulating loans with a number of interesting features. In return for the loan the subordinate trader delivers to the lender the entire supply of paddy that he procures during the entire season (or until such time as the loan is repaid). The lender benefits in two ways: he has access to paddy supplies far in excess of what would be warranted by the amount of loan provided (i.e. supplies procured by own capital plus the loan), and secondly the price that he pays is typically lower than the comparable market price (Crow et al).

The main elements of the credit-trade hierarchy as it influences the circulation of grain may be summed up as follows: At the apex are money-lending merchants and absentee landlords. The merchants (few in number) collect paddy and supply rice and other grocery items through two types of subordinate traders: paddy collecting traders and grocery stores. The money-lending merchants make *dhaner upore* loans (cash to be repaid in paddy) to the subordinate traders who then on-lend to peasants at a higher rate. Indeed, it is not unusual to find an additional layer of intermediaries between the subordinate trader and the peasant. A variation of the *dhaner upore* loan is the "advance purchase" usually made just a few weeks

before harvest at a negotiated price in paddy. Cash-paddy repayment combinations were also reported to cash loans with the principal paid in cash and the interest in paddy. All these different forms basically solve a simple problem - essentially a principal-agent problem, with the money-lending trader operating as the principal and the different subordinate traders working as his agents. The role of the agents is two-fold: bring superior information on the peasants to bear and ensure contractual compliance (of unequal contracts). The entire hierarchy is geared to achieving these fundamental goals. Table 1 below describes the different financial relations encountered in the backward area. Of these the first three directly serve the goals of the mercantile hierarchy, while the last serves to benefit the surplus farmer-landlord.

**Table 1 — Different Types of Financial Relations in the Backward Area**

Type	Parties	Amount (Tk)	Terms (implicit r. i.)
Dhaner Upore ("money on paddy")	Sub-Trader to Poor Peasant	Usually 1000- 3000	Cash for paddy at harvest (100-180%)
Dadon	Big Trader to Small	15000-100000	All the small trader's procurement promised to the big
Advance Purchase	Trader to peasant	1000-3000	Cash loan for paddy at harvest (very high)
Paddy loans	Big Grower to Trader	1000-50000	Paddy loan repaid in cash at above market price

Source: Crow and Murshid (1994)

#### A GREEN REVOLUTION (ADVANCED) AREA: BOGRA, 1988

An advanced area of Bogra district that was studied stands out in sharp contrast with the Noakhali *chars* discussed above. The area is situated in the very old alluvium of the Barind Tract, unlike the still active *chars*, and is much more densely populated. The area is characterized by intensive irrigation development and adoption of the Green Revolution

technology, in the 1980s. Multiple cropping is universal, communications are good and electrification was expanding quickly. Sharecropping was found to be rare with the predominant form of tenancy being in terms of fixed cash rents. The area posts a healthy surplus in both the *aman* and *boro* seasons.

In terms of credit related to the grain trade, very few cases of *dhaner upore* were found. There is some lending from rich to poor peasants but the most prominent form of loans were those from rich growers to traders and millers. These were usually kind loans extended as working capital that had to be repaid at the end of the season at the highest price of the season or at a pre-negotiated price (higher-than-market price loans)<sup>7</sup>. Short-term supplier's credit (*paikari baki*) is used widely to increase turnover and is given by millers to Trader-brokers (*aratdars*). The main condition of these loans is that the *aratdar* may not buy from any other miller in the same market.

The main trading circuits identified show two distinct flows: a relatively small, local flow meant for the local market and a much larger flow catering to the deficit markets to the South and in Dhaka.

#### CHANGING CONTRASTS IN THE TRADING REGIME, 1988-2000

The original Crow and Murshid study identified three main contrasts in the exchange regime between the two types of areas:

- in the proportion of free and tied transactions in rice,
- in the number and types of intermediaries in the main trade circuits, and
- in the form and direction of credit.

#### *Nature of Transactions*

The most striking contrast was found in the extent of tied and non-tied transactions in the advanced and backward areas and markets. Transactions of growers with traders in the

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<sup>7</sup> HMP refers to as "higher than or highest market price".

former were largely untied while those in the latter exhibited considerable tying, mainly through sharecropping and *dhaner upore* loans<sup>8</sup>. Thus over 92 percent of sales by growers in the advanced areas were non-tied while this was only 30 percent in the backward areas. A form of credit popular amongst surplus growers in the advanced areas (mostly to processors and traders) was the higher-than-market price loan in which the debtor pays back the creditor at the end of the season at the highest price of the season. In other words the origin of capital in advanced areas is "free" agriculture while that in backward areas is primarily mercantile (big traders) or semi-feudal (large sharecropping landlords).

These contrasts remain even today but have diminished greatly in a number of ways. Sub-ordinate traders tied to urban trader-financier-brokers who were central in channeling *dhaner upore* loans to poor cultivators in backward areas have all but ceased their lending functions. The incidence of *dhaner upore* remains significant<sup>9</sup> but the role of the trader-financier-brokers who used these as a well-structured mechanism to procure paddy supplies cheaply, no longer exists. The number of traders has sharply declined (by 60 percent) and those that have survived now transact principally in cash to procure supplies. One possible factor may be the lower returns to *dhaner upore* today compared to the situation in the late 1980s, making it unattractive to traders (but not to absentee landlords)<sup>10</sup>. Thus Table 3 shows the sharp drop in the *dhaner upore* rate, and if one considers the associated costs (including the risk of default) of channeling such loans to growers through intermediaries as before, then the returns on offer would appear to be paltry. It also almost certainly reflects the rapidly diminishing power of the trader-financier-brokers in maintaining what used to be a profitable and tightly controlled hierarchy of surplus appropriation ten years ago.

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<sup>8</sup> These are loans in cash provided to cultivators before harvest to be repaid in kind (paddy). The rate reported from backward areas in 1989 was 7 maunds (maund=40 kg.).

<sup>9</sup> However, the source of such *dhaner upore* are now primarily absentee landlords giving credit to their own share-croppers.

<sup>10</sup> Transaction costs at the margin for absentee landlords providing *dhaner upore* loans to their own sharecroppers is small. It also helps in stabilising production levels and therefore lowers the risks associated with sharecropping.

**Table 2 — Regional Contrasts in the Exchange Regime, 1989-2000**

	Advanced Area	Backward Area	Change (1989-2000)
Trade Circuits	Simpler	Complex (involved two additional layers of intermediaries)	Advanced areas: more complex circuit; backward area circuit shortened/simplified
Credit			
- source	Rich peasants	Merchants/Absentee landlords	Advanced area: low demand for kind for cash loans;
- type	Kind (paddy) for cash		Backward area: merchant capital no longer used for trade finance; hierarchy dismantled.
- direction	To mills, traders and poor households	Mainly cash repaid in paddy To producers	
Market Institutions			
- type of contract	Not tied (free) Impartial	Tied contracts Selective	Type of trade contracts in both advanced areas and backward area
- security	Competitive	Cartel	"free" (not tied) and competitive.
- transport	Standard	Localised/hybrid	
- weights			

Source: Adapted from Crow and Murshid (1994)

**Table 3 — Changes in the *Dhaner Upore* Rate over Time**

Year	Implicit DU price (Tk/md)	Market price (Tk/md)	% Loss to grower
2000	182	215	15
1989	143	200	29
1975	83	115	28
1972	20	67	70
1953	10	13	23

In the advanced area, higher-than-market price loans have declined greatly. The bulk of these paddy loans provided useful working capital for medium and large processors (*chatahs*) and mills. This demand appears to have now dried up with the rise of the paddy

*aratdar* in advanced area markets who now supply the bulk of the paddy (and short-term credit) to the milling sector.

### *Market Structure and Trade Circuits*

A second contrast between the two areas was in the market structure and in the circuits of trade. A decade ago the circuit in the backward areas was longer compared to that of advanced area because of the need to engage additional intermediaries to finance and channel the *dhaner upore* loans originating from the trader-financier-brokers (namely the paddy collecting subordinate trader). An interesting reversal has occurred a decade later. The *cycle bepari* (paddy collecting agent or *faria*) and the paddy *aratdar* have emerged as important players in the advanced area markets (thereby elongating the circuit). Previously, the role of the *cycle bepari* was essentially that of a small or microprocessor cum trader using family labour to process the paddy (soaked, sun-dried and parboiled before husking in a mill) for ultimate sale to the rice *aratdar* or outside buyer. The role of the *cycle bepari* today is simply to buy directly from the grower for sale to the newly emerged paddy *aratdars*.

By contrast, in the backward area, the near demise of trader-financier-brokers and their tied, subordinate agents have shortened the circuit. Both these changes have had interesting repercussions on the nature and extent of trade finance - diminishing longer-period tied finance and replacement by cash or short-term trade credit. The old and new trade (and financial) circuits are shown below.

Quite apart from the question of elongation or shortening of trade/financial circuits, there is the question of the changing composition of different types of traders in the market and volumes transacted. There has been massive investment in milling capacity in the advanced areas over the last 10 years. In one of the markets examined (Dhupchachia), the milling-processing capacity increased from around 17000 MT to 44600 MT (i.e. by more than 150 percent). Some 2000 small processors used to operate in the advanced area market ten years ago. Today their numbers have come down to 50. There used to be over 200

Kanda beparis (micro processors) - these no longer exist. Bullock cart owners used to be engaged in this trade and also acted as local buyers and sellers although their numbers have come down from around 1000 to less than 30 today. On the other hand the *Cycle bepari* and Paddy *Aratdar* have now emerged as principal actors in the paddy market, as already observed. The number of *cycle beparis* (faria or local trader) has increased from around 100 to over 5000 while the number of paddy *aratdars* has increased from 5 to 35. *Chatals* (medium processors) no longer exist today as all of them have been converted to rice mills - further evidence of surplus accumulation. In the backward area markets, the reduced role of the trader-financier-brokers has been matched by the rise of independent paddy collecting traders, unlike the tied subordinate traders of a decade ago.

**Table 4 — Changes in Numbers of Market Participants and Facilities, 1988-2000 (Dhupchachia Upazilla)**

Trader /Transport Type	Number 2000	Number 1988
Rice <i>aratdar</i>	35	12
Paddy <i>aratdar</i>	35	5
Crusher	100	30
<i>Cycle bepari</i>	5000	100
Micro processors	50	2200
Bullock carts	30	1000
Telephones	250	50
Trucks	50	10

#### *Form and Direction of Credit*

The realignments in the structure of trade as described above has meant that the downward flowing trade finance (to growers) in backward area no longer exists as has been the fate of the upward flowing higher-than-market price credit from growers to millers or traders, in advanced areas. Thus, the *dhaner upore*-led trade finance to growers has lost its

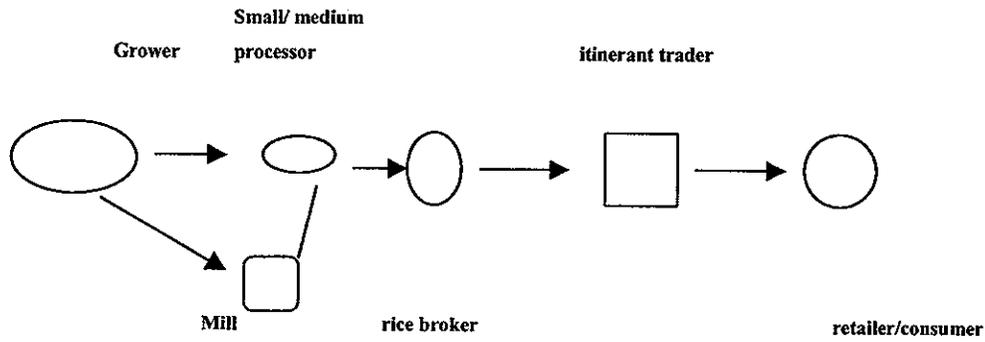
significance in backward areas. In advanced areas, surplus growers are no longer able to transfer their price and storage risks on to medium processors or mills through higher-than-market price credit. The bulk of trade credit now available in both backward areas and advanced area markets are short-term sales on credit (typically rolled over every 7-15 days and settled at the end of each trading season) provided by paddy *aratdars*, millers and wholesalers to their customers. Transactions at both ends of the trading circuit, i.e. with growers on the one hand and retailers on the other are strictly in cash.

These realignments in the trade circuits and trade relationships however, have not been preceded by any fundamental changes in the structure or conditions of (rice) production in the two areas, where the level and kind of agricultural technology in use has remained essentially the same.

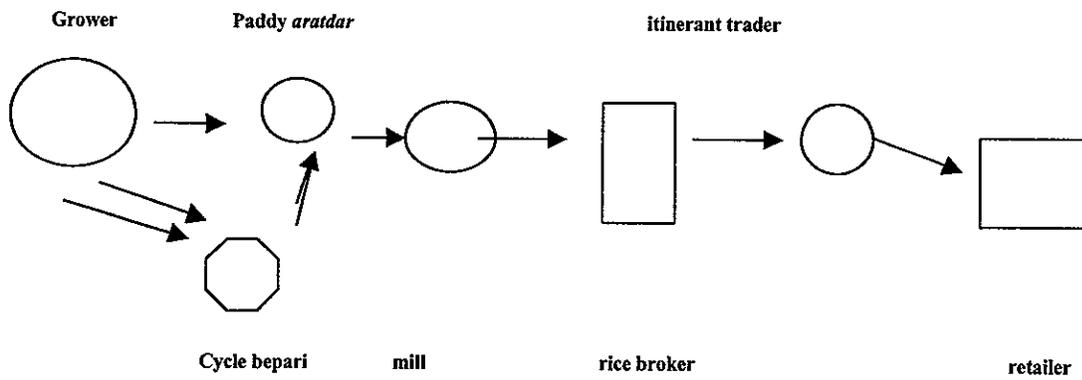
There has thus been a shift in the relationship between traders, millers/processors and growers. Direct purchase from the primary market has now given way to bulk purchases (frequently on credit) from the paddy *aratdar* in advanced areas - thereby reducing transaction costs and speeding up turnover. Similarly, growers now rarely sell directly at the market but prefer to sell to the *cycle bepari* from his homestead. Keen competition at the grower level assures that market prices are paid. This has also served to reduce the returns to large surplus farmers in advanced areas. Previously, they would sell paddy (frequently on higher-than-market price) to poor peasants and *chatal* and rice mills. Today, sales are in cash, especially to the latter.

The major change in the backward areas has also been at the lower levels of the market tier - amongst growers and trader-financier-brokers and their intermediaries. Credit no longer flows downward from trader-financier-brokers but moves upward from paddy *aratdars* and millers.

Figure 1 — Advanced Area Trade Circuits, 1989 and 2000

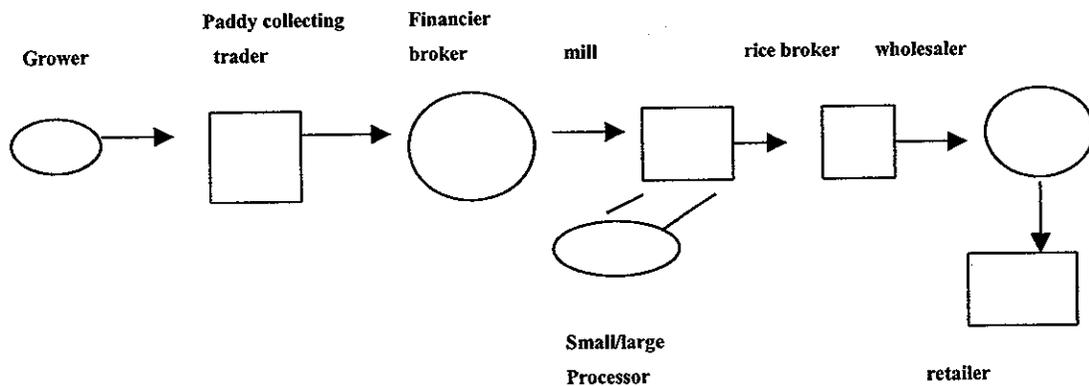


Advanced Area Trade Circuit, 1989

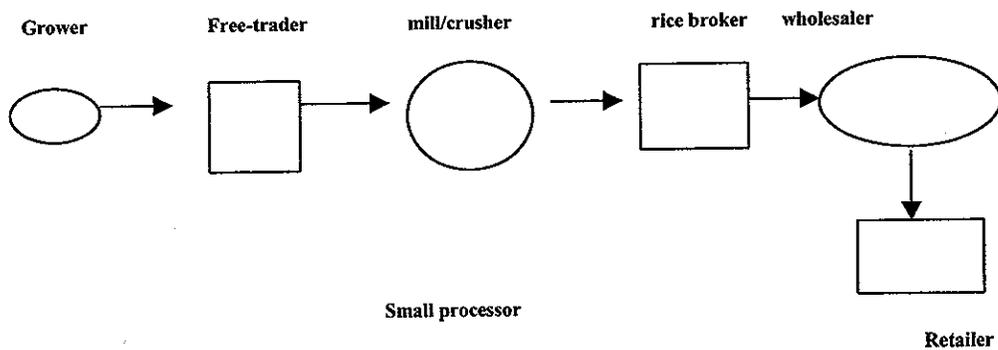


Advanced Area Trade Circuit, 2000

Figure 2 — Backward Area Trade Circuits, 1989 and 2000



Backward Area Trade Circuit, 1989



Backward Area Trade Circuit, 2000

#### 4. TRADE TYING IN LONG DISTANCE TRADE

Trade tying loans, generally known by the generic name of *dadon*, have been reported from many major markets in Bangladesh, e.g. Badamtoli, which used to be one of the largest wholesale markets of the country. Similarly large markets in Narayanganj (e.g. Kamlaghat and Madanganj, just outside Dhaka) also reported widespread use of *dadon* as well as *dhaner upore* loans given by large traders to subordinate traders as a key business strategy to segment the market. For example, traders in Badamtoli estimated in 1988-89 that half of their colleagues used *dadon* for itinerant merchants bringing grain in from rural areas. These arrangements have significant consequences for prices paid and received by different buyers and traders (Crow et al, 1991).

Revisiting these areas in 2000 we were surprised to find that both *dadon* and long distance *dhaner upore* had almost completely disappeared from Badamtoli and Narayanganj. In fact Badamtoli was found to be in severe decline, and of the two Narayanganj markets studied, the major paddy market (Madanganj) had completely disappeared. These changes are striking and remain incompletely understood. A number of explanations are possible: intense competition from many newly developed markets that have sprung up in the Dhaka-Narayanganj belt; the inability of traditional, slow riverine markets like Madanganj and Kamlaghat to compete with markets with reliable and speedy road communication links; the physical suffocation suffered by markets like Badamtoli (which was also built on the river) by growing traffic log-jams and urban congestion. The traditional dependence on *dadon* and *dhaner upore* by traders to sustain market operations were clearly not enough to ensure their ultimate survival.

Other changes have also been reported from long-distance trade. Direct cash payment has declined sharply as most payments by e.g. rice *aratdars* to distant wholesalers are made largely through telegraphic transfer from bank to bank. However, transactions were generally

partly settled at the time of initiation - typically 40 percent was paid immediately and the remaining 60 percent was settled usually within 7-15 days. Although the speed and security of transactions appear to have increased, the problem of debt recovery (from buyers making credit purchases) remains a serious cause for worry. The relative abundance of grain supplies tends to accelerate credit-led sales, and unless mechanisms for recovery are adequate, can lead to large number of bankruptcies. Such a situation however, has not yet emerged.

## 5. FINDINGS FROM THE CO-INTEGRATION ANALYSIS

Two distinct exercises were carried out. First, the historical data used in previous studies within the classical regression mould was re-applied within a co-integration framework, to enable comparisons. Secondly, the data series was updated to 1998-99 in order to examine the effect of policy changes of the 1980s and 1990s (after taking into account the effect of the 1974 famine).<sup>11</sup>

The first exercise reveals that conclusions based on previous studies (Boyce-Ravallion 1991; Palmer-Jones 1993) do not hold when the same models are estimated using (Johansen's) co-integration method. In particular the conclusion of an alarming downward trend in agricultural wages relative to the rice price is not supported. A strong co-integrating relationship between agricultural wages and rice prices is revealed during the period 1949-50 to 1979-80. Extending the data up to 1988-89 causes the rice price - wage relationship to weaken significantly.<sup>12</sup>

The post 1974 (famine) data was separately examined. A reversal of the wage-price relationship is strongly suggested. The rice price relationship with agricultural wages was found to be insignificant in the wage equation estimated for 1977-78 to 1998-99 period. Urban wage (measured as wage rate of unskilled construction workers in major cities) was found to be the most important variable explaining the dynamics of agricultural wages.

These results are described more fully below.<sup>13</sup>

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<sup>11</sup> Estimation details are available in Rashid, S. (2000).

<sup>12</sup> Two structural hypotheses tests were carried out, one on proportionality and the other on the stationarity relationship between the two variables. Neither hypotheses could be rejected for the period up to 1979-80 (suggesting that relative decline of real agricultural wages cannot be supported). Extension of the data to 1988-89 causes the stationarity hypotheses to be rejected, indicating a weakening co-integrating relationship.

<sup>13</sup> For a full and detailed discussion of the results see Rashid (2000).

## ANALYSES OF THE LONG-RUN RELATIONSHIP

The basic long-run models estimated are as follows:<sup>14</sup>

**1949/50-1979/80 data set (Boyce-Ravallion data)**

$$w^a = 0.42p^r + 0.65w^m + 0.14p^c + 0.28p^j - 2.51Q^b$$

(2.84) (5.26) (1.06) (3.48) (7.11)

**1949/50 -1988/89 data set (Palmer-Jones)**

$$w^a = 0.76p^r + 0.45w^m + 0.014p^c + 0.042p^j - 2.45Q^b + 0.0155$$

(5.20) (5.00) (0.57) (0.11) (4.87)

(The figures in brackets are Likelihood Ratio tests)

Three observations may be made on the basis of the above results: the (negative) significance of  $Q^b$  (per acre output) is spurious; the price of cloth is not significant in either equation (although Boyce-Ravallion found this to be significant), and the models do not pass ARCH and normality of residuals tests. Thus two new models were set up:

**1949/50 - 1979/80**

$$w^a = 0.72p^r + 0.21w^m$$

(8.68) (3.55)

**1949/50 - 1988/89**

$$w^a = 0.69p^r + 0.31w^m$$

(22.56) (7.5)

The model estimates are very similar and pass both the ARCH and normality of residual tests. The question that may be raised now is whether the agricultural wage rate responds proportionately and if so, whether this is a stable or stationary relationship. The

<sup>14</sup> Three steps had to precede these, including determination of maximum lag-length of the variables, whether the residuals were white noise and the existence or relevance of 'deterministic components' (constant and trend).

first is not rejected by an appropriate test (the Likelihood Ratio test) but the second is rejected for the longer data set but not for the shorter data set.

A separate exercise was conducted with data for the "post famine period" from 1976/77 to 1998/99. The basic model estimates are provided below:

$$W^a = 1.75w^u - 0.86p^r$$

(11.6)    (3.19)

$$W^a = 1.51w^u - 0.73p^r + 0.012t$$

(11.58)    (2.72)    (0.74)

These results point clearly to the fact that rice prices and wages are not cointegrated, and that they fail both the proportionality and the stationarity tests as well. It may be significant that the urban wage rate is now found to be strongly significant instead.

## 6. THE NATURE OF THE TRANSITION – A DISCUSSION

This paper began from the observation that there have been major changes in the policy regime facing agriculture and the rural economy over the last 10-15 years. At the same time, significant structural and demographic shifts have taken place, e.g. resulting in a declining contribution of agriculture to GDP on the one hand, and within agriculture, a rising share of non-crop and non-farm output. These are perhaps early indications of a process of transition that is already underway in rural Bangladesh that remains incompletely understood. This paper represents an attempt to further this understanding by focusing on the rural rice market in Bangladesh, and the relationship between rice prices and agricultural wages.

At this point it is necessary to discuss the meaning of the word transition as used in the context of market performance. It is instructive to refer to North who says that the dilemma posed by impersonal exchange, is central to the major issues of development; and again, that “the inability of societies to develop effective, low cost enforcement of contracts (that is, impersonal contracts) is the most important source of both historical stagnation and contemporary underdevelopment in the third world” (North, 1990: 54). Thus the concept of transition principally relates to a shift from traditional, personalized market relationships to impersonal exchange, usually enabled by a set of low cost, formal and informal rules and enforcement mechanisms. Thus market roles that are of special interest relate to three distinct aspects: (a) reduction in information asymmetries, (b) enabling low-cost contract enforcement/dispute resolution, and (c) enhancing competition. This is the notion of transition that is relevant to the findings related to rice market structure. An aspect of change that has also been addressed relates to the *changing dynamics* between rice prices and rural wages over time.

## RICE MARKETS IN TRANSITION

In the rice markets investigated, we found that significant changes have taken place in the nature of transactions. In advanced areas, transactions have been speeded up through a number of ways: (a) greater reliance on bank to bank transfers to settle payment for larger consignments in the (long-distance) inter-district, rice trade, replacing dependence on direct cash transactions, (b) greater availability of telephone connections (the number of connections increased from around 50 to around 250 in one advanced area market) and better roads, and (c) credit sales by paddy and rice *aratdars* as the main mechanism to increase turnover.

In backward areas, traditional transactions entailing inter-linked exchange such as *dhaner upore* were found to have sharply diminished in importance. Similarly the nature of trade finance changed from seasonal, roll-over credit used to tie-in subordinate, paddy/rice procuring traders, to short-term, credit sales and purchases and cash transactions. There has been a lot of change in the nature of informal credit markets - generally more exploitative forms have declined in importance while those that remain appear to charge lower implicit rates of interest. Further, the power of the trader-landlord-transport cartel (referred to as the backward hierarchy in the Crow and Murshid study) has been broken and the structure of trade has become "freer" and much more impersonal.

Major changes have been reported from the large, urban rice markets. The dominant role of markets like Badamtoli<sup>15</sup> has withered with time, replaced by a large number of smaller markets that have sprouted up all over the Dhaka-Narayanganj belt (annex table 1). The stiff competition has meant that even the remaining *aratdars* in Badamtoli are finding that their turnover has reduced sharply (by over 50 percent). The hugely increased competition has also resulted in some major markets being shut down completely - the paddy-rice market in Madanganj is a dramatic example of this.

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<sup>15</sup> Badamtoli was once referred to as the "Central Market" in Bangladesh largely determining rice prices for the country as a whole.

The nature of transactions too have altered in these markets. The overwhelming dependence on tied, subordinate traders or agents for supplies that was pervasive of Badamtoli and Madanganj markets a decade ago, has been almost totally replaced by "free" trade. Long distance trade financing of paddy production through *dhaner upore* loans also appears to have perished.

### RICE PRICE AND WAGES

The implications of the changing relationship between rice prices and agricultural wages are complex. The traditional efficiency wage-level, determined by rice prices no longer seems valid, suggesting that perhaps agricultural wages are determined by larger, more dominant forces. It is also likely that the dominance of agricultural wages in the incomes of the rural poor no longer exists with the significant rise in non-farm and off-farm income sources. Its strong link with urban labour markets is suggestive of these trends towards a more integrated labour market influenced by wider supply-demand conditions. Part of the explanation also almost certainly lies in the developments in the rice market itself where substantial productivity increases combined with trade liberalization and the development of market infrastructure served to lower real rice prices steadily over the last decade and a half (Annex figures 1.1 and 1.2).

Thus, there are a number of implications of the findings presented in this paper. More impersonal markets have improved efficiency and competition. This is most evident in the backward area markets, marked by the fall of the "hierarchy" as well as thickening of participation (annex table 2). There are also significant implications for the return to growers and other participants, and may serve to explain at least in part, the underlying causes leading up to the rapid spurt in rice production noted in the 1990s. We also found that market forces have exerted tremendous power in the face of traditional hierarchies based on market inter-linkages and domination over the local power structure.

The dramatic change in the long-term relationship between rice prices and agricultural wages also has implications for farm profitability and farmer incentives. In addition the

growing integration of urban-rural labour markets has important implications for e.g. rural-urban migration. While a full explanation of these results and their interpretation warrants further research and analysis of rice and labour markets (including the rural, non-agricultural labour market) it is clear nevertheless, that the hypotheses of change and rural transition introduced in this paper is underlined by the findings from both the co-integration exercises and the rice market-structure analyses. There is also a strong suggestion that the observed changes in the price-wage equation stems largely from the changes in the rice market itself -- an impression reinforced by the fact of an increasing real agricultural wage (in relation to rice prices) but a static or even declining real agricultural wage when compared to non-rice prices (Murshid, 2000).<sup>16</sup>

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<sup>16</sup> It may well be the case that agricultural wages are downwardly more rigid and that if real food prices moved up over time instead of down, labour wages too would rise as expected under the efficiency wage theory.

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## ANNEX TABLES

Table A1 — New Rice Markets in the Dhaka-Narayanganj Belt

Wholesale Market for Rice	Number of <i>Aratdars</i>
Mirpur 1	100
Kachu Khet	160
Jatra Bari	150
Mukda	30
Malibagh	125
Badda	40
Fatullah	50
Keraniganj	80

Table A2 — Some Indications of Change in Market Participation in the BA Markets

Market Actor/Facility	2000	1988
Rice <i>aratdar</i>	47	25
Paddy <i>aratdar</i>	12	35
Crushers	120	75
Buying <i>bepari</i>	200	150
Supplying <i>bepari</i>	100	85
Rice mills (no.)	40	19
Capacity (MT)	305	180
Trucks (no.)	5	2
Telephone connections	30	15

Table A3 — Stationarity Tests on Selected Variables<sup>a</sup>

Series	Levels			First-difference		
	ADF	KPSS	PERRON	ADF	KPSS	PERRON
<b>1949/50 – 1980/81 Data</b>						
$p_i^r$	-2.69	0.667	-2.697	-5.73	0.229	-5.738
$p_i^c$	-2.08	0.599	-1.625	-4.31	0.201	-4.309
$p_i^j$	-3.44	0.646	-3.445	-7.67	0.152	-7.668
$w_i^a$	-1.84	0.672	-1.997	-3.65	0.412	-3.618
$w_i^m$	-0.99	0.709	-0.988	-4.04	0.387	-4.352
$q_i^b$	-1.13	0.707	-5.619	-9.62	0.164	-7.617
<b>1949/50 – 1980/89 Data</b>						
$p_i^r$	-3.20	0.870	-3.207	-6.88	0.188	-6.886
$p_i^c$	-2.50	0.831	-1.986	-4.86	0.156	-4.860
$p_i^j$	-0.82	0.855	-4.069	-6.52	0.163	-8.628
$w_i^a$	-2.34	0.864	-2.342	-3.98	0.387	-3.979
$w_i^m$	-0.74	0.835	-0.740	-5.52	0.432	-5.524
$q_i^b$	-1.36	0.903	-3.269	-9.01	0.340	-6.383

<sup>a</sup> All variables are in natural logarithm. Note that while ADF tests  $H_0 : X_t \sim I(1)$  against  $H_0 : X_t \sim I(0)$ , KPSS method tests the reverse. The ADF and KPSS critical values at 5% level of significance are -3.07 and 0.463 respectively. Critical value for ADF test is taken from Mackinnon (1991). The break functions for Perron test are calculated as  $\lambda = Tb/T$ , where  $Tb$  is total number of observations unit the break year and  $T$  is total sample size. In this analysis, 1971 is considered to be the break year. For 1949/50-1979/80 data,  $\lambda = 0.40$  and  $T = 30$ ; the critical value at 5% level of significance for this test (null hypothesis of unit root) is -3.99. For the other data set,  $\lambda = 0.50$  and  $T = 39$ ; the corresponding critical value at 5% level of significance is -3.56.

**Table A4a — Determination of Co-integration Rank and Selection of Model for Deterministic Components (1949/50 to 1979/80, k=1)**

Null hypotheses	Model 1		Model 2	
	$\lambda_{max} stat$	$\lambda_{max} (0.95)$	$\lambda_{max} stat$	$\lambda_{max} (0.95)$
<b><math>\lambda_{max}</math> test:</b>				
$r = 0$	41.91 →	39.37	48.46	43.9
$r \leq 1$	31.69	33.46**	32.54	37.52
$r \leq 2$	17.42	27.07	20.60	31.46
$r \leq 3$	15.97	20.97	16.21	25.54
$r \leq 4$	10.35	14.07	14.33	18.96
$r \leq 5$	2.04	3.76	2.85	→ 12.25
	<b>Trace Stat</b>	<b>Trace (0.95)</b>	<b>Trace Stat</b>	<b>Trace (0.95)</b>
<b>Trace test:</b>				
$r = 0$	119.38 →	94.15	134.99	114.90
$r \leq 1$	77.47	68.52	86.53	87.31**
$r \leq 2$	45.77	47.21	53.99	62.99
$r \leq 3$	28.35	29.68	33.38	42.44
$r \leq 4$	12.13	15.41	17.18	25.32
$r \leq 5$	2.04	3.76	2.85	→ 12.25

Notes: \* 95% Critical values are taken from Osterwald-Lenum (1992).

\*\* Indicates that the null hypothesis of number of co-integrating vectors indicated by first column cannot be rejected for that particular model.

**Table A4b — Determination of Co-integration Rank and Selection of Model for Deterministic Components (1949/50 to 1979/80, k=2)**

Null hypotheses	Model 1		Model 2	
	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)
<b><math>\lambda_{\max}</math> test:</b>				
$r=0$	41.07 →	39.37	42.79	43.97
$r \leq 1$	35.79	33.46	36.19	37.52**
$r \leq 2$	22.23	27.07	25.72	31.46
$r \leq 3$	10.22	20.97	16.23	25.54
$r \leq 4$	8.13	14.07	9.45	18.96
$r \leq 5$	2.19	3.76	6.17	→ 12.25
	<b>Trace Stat</b>	<b>Trace (0.95)</b>	<b>Trace Stat</b>	<b>Trace (0.95)</b>
<b>Trace test:</b>				
$r=0$	119.62 →	94.15	136.54	114.90
$r \leq 1$	78.56	68.52	93.75	87.31
$r \leq 2$	42.76	47.21**	57.56	62.99
$r \leq 3$	20.53	29.68	31.85	42.44
$r \leq 4$	10.32	15.41	15.62	25.32
$r \leq 5$	2.19	3.76	6.17	→ 12.25

Notes: \* The critical values for  $\lambda_{\max}$  and *trace* are taken from Osterwald-Lenum (1992).  
 \*\* Indicates that the null hypothesis of number of co-integrating vectors indicated by first column cannot be rejected for that particular model.

Table A5 — Residual Misspecification Tests for Equations 7 and 8\*

Equation	1949/50 – 1979/80 data		1949/50 – 1988/89 data	
	ARCH Test	Normality	ARCH Test	Normality
$w^a$	9.47	4.63	0.51	6.44
$w^m$	5.70	1.46	2.60	4.26
$p^r$	0.34	2.18	0.75	2.10
$p^i$	0.02	16.85	0.27	36.95
$p^t$	0.91	7.64	0.06	8.10
$Q^b$	3.14	1.33	3.06	0.62

\* Test statistics for normality should be compared with  $\chi^2_{(2)}$ , the critical value of which is 5.99 at 5% level of significance. For ARCH test, degrees of freedom for  $\chi^2$  is equal to the number of lags used in each model. For example, tests statistics for 1949/59 – 1979/80 and 1949/50 – 1979/80 are compared with  $\chi^2_{(1)}$  and  $\chi^2_{(2)}$  respectively.

Table A6a — Rank Tests on Parsimonious Model (1949/50 to 1988/89, k=2)

Null hypotheses	Model 1		Model 2	
	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)
<b><math>\lambda_{\max}</math> test:</b>				
$r = 0$	22.04	20.97	28.58	25.54
$r \leq 1$	17.33	14.07	17.51	18.96**
$r \leq 2$	1.50	3.76	6.63	→ 12.25
	<b>Trace Stat</b>	<b>Trace (0.95)</b>	<b>Trace Stat</b>	<b>Trace (0.95)</b>
<b>Trace test:</b>				
$r = 0$	40.87	29.68	47.73	42.44
$r \leq 1$	18.83	15.41	24.15	25.32**
$r \leq 2$	1.50	3.76	6.63	→ 12.25

Notes: \* 95% Critical values are taken from Osterwald-Lenum (1992).

\*\* Indicates that the null hypothesis of number of co-integrating vectors indicated by first column cannot be rejected for that particular model.

Table A6b — Rank Tests on Parsimonious Model (1949/50 to 1979/80, k=2)

Null hypotheses	Model 1		Model 2	
	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)
$\lambda_{\max}$ test:				
r = 0	21.32	20.97	21.33	25.54
r ≤ 1	12.99	14.07**	12.99	18.96
r ≤ 2	4.37	3.76	6.08	→ 12.25
	Trace Stat	Trace (0.95)	Trace Stat	Trace (0.95)
Trace test:				
r = 0	38.58	29.68	40.40	42.44
r ≤ 1	17.26	15.41	19.08	25.32**
r ≤ 2	4.27	3.76	6.08	→ 12.25

Notes: \* The critical values for  $\lambda_{\max}$  and *trace* are taken from Osterwald-Lenum (1992).

\*\* Indicates that the null hypothesis of number of co-integrating vectors indicated by first column cannot be rejected for that particular model.

Table A7 — Residual Misspecification Tests on Equations 9 and 11\*

Equations	1949/50 – 1979/80 data		1949/50 – 1988/89 data	
	ARCH Test	Normality	ARCH Test	Normality
$w^a$	0.176	5.92	0.32	5.34
$w^m$	0.835	0.75	1.87	1.75
$p^r$	0.540	4.50	0.62	5.58

Note: \* All test statistics follow  $\chi^2$  distribution with two degrees of freedom, the 5% critical value of which is 5.99.

**Table A8 — Test of Proportionality and Stationarity of Agricultural Wage Rate and Rice Price**

Parameter Restrictions	LR test statistics	P-Value
1949/50 – 1979/80 Data		
$\alpha_{wa} = \alpha_{wm} = 0$	$\chi^2_2 = 0.51$	0.78
$(\alpha_{wa} = \alpha_{wm} = 0) \cap (\beta_{wa} = \beta_{pr})$	$\chi^2_3 = 4.04$	0.26
$(\alpha_{wa} = \alpha_{wm} = \beta_{wa} = 0) \cap (\beta_{wa} = \beta_{pr})$	$\chi^2_4 = 5.46$	0.24
<hr/>		
$\alpha_{wa} = \alpha_{wm} = 0$	$\chi^2_2 = 1.74$	0.42
$(\alpha_{wa} = \alpha_{wm} = 0) \cap (\beta_{wa} = \beta_{pr})$	$\chi^2_3 = 4.65$	0.20
$(\alpha_{wa} = \alpha_{wm} = \beta_o = \beta_{wm} = 0) \cap (\beta_{wa} = \beta_{pr})$	$\chi^2_4 = 9.29$	0.10

**Table A9 — Stationarity Tests on 1977/78 – 1998/99 Data**

Series	Levels		First difference	
	ADF	KPSS	ADF	KPSS
$w^a$	-0.13	0.76	-4.45	0.42
$w^a$	-1.55	0.77	-3.74	0.44
$p^r$	-2.22	0.60	-6.61	0.22
$Q^h$	-0.79	1.08	-4.67	0.29

Note: <sup>a</sup> All variables are in natural logarithm. Note that while ADF tests  $H_o: X_i \sim I(1)$  against  $H_o: X_i \sim I(0)$ , KPSS method tests the reverse. The ADF and KPSS critical values at 5% level of significance are -3.07 and 0.463 respectively. Critical value for ADF test is taken from Mackinnon (1991).

Table A10 — Rank Tests on 1977/8 – 1998/99 Data

Null hypotheses	Model 1		Model 2	
	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)	$\lambda_{\max}$ stat	$\lambda_{\max}$ (0.95)
<b><math>\lambda_{\max}</math> test:</b>				
$r = 0$	26.30 →	20.97	26.77	25.54
$r \leq 1$	11.17	14.07**	11.25	18.96
$r \leq 2$	5.73	3.76	5.89	→ 12.25
	Trace Stat	Trace (0.95)	Trace Stat	Trace (0.95)
<b>Trace test:</b>				
$r = 0$	43.20	29.68	43.91	42.44
$r \leq 1$	16.90	15.41	17.14	25.32**
$r \leq 2$	5.73	3.76	5.89	→ 12.25

Notes: \* 95% Critical values are taken from Osterwald-Lenum (1992).

\*\* Indicates that the null hypothesis of number of co-integrating vectors indicated by first column cannot be rejected for that particular model.

Table A11 — Residual Misspecification Tests on Equation 16\*

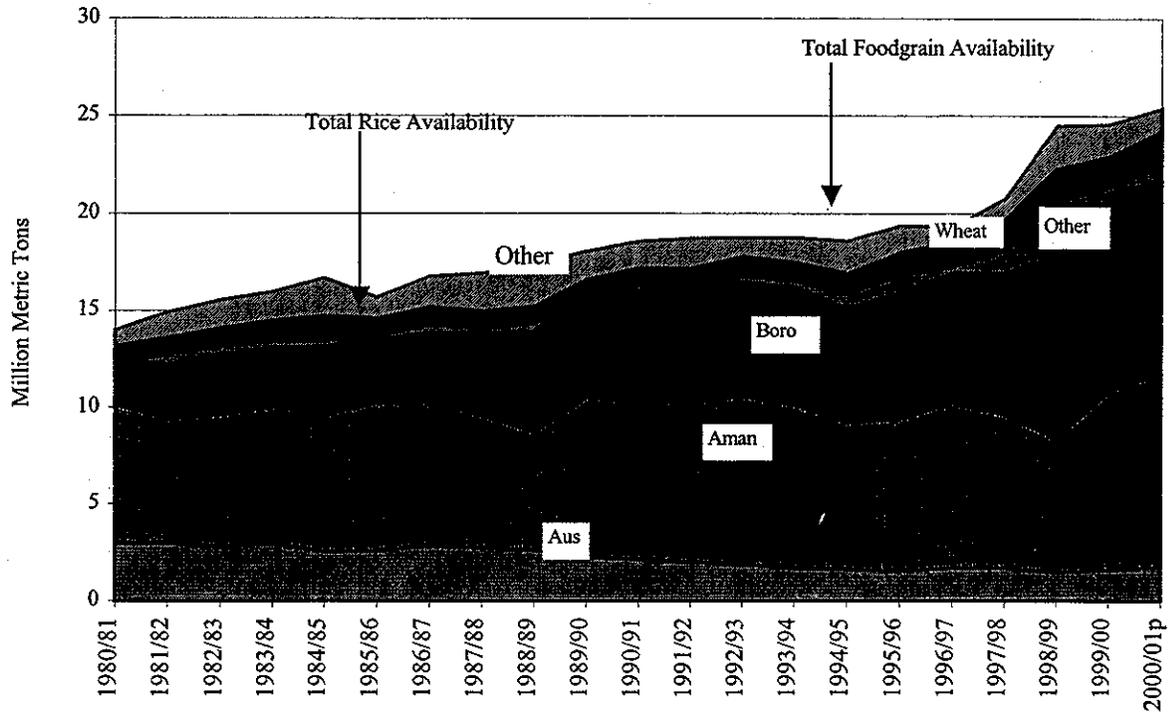
Equations	1949/50 – 1979/80 data	
	ARCH Test	Normality
$w^a$	0.109	4.62
$w^m$	0.376	3.48
$p^r$	0.231	1.86

Note: \* Test statistics for ARCH and normality follow  $\chi_1^2$  and  $\chi_2^2$ , the 5% critical value of which is 3.84 and 5.99 respectively.

Table A12 — Test of Proportionality and Stationarity of Agricultural Wage Rate and Urban Wage Rate

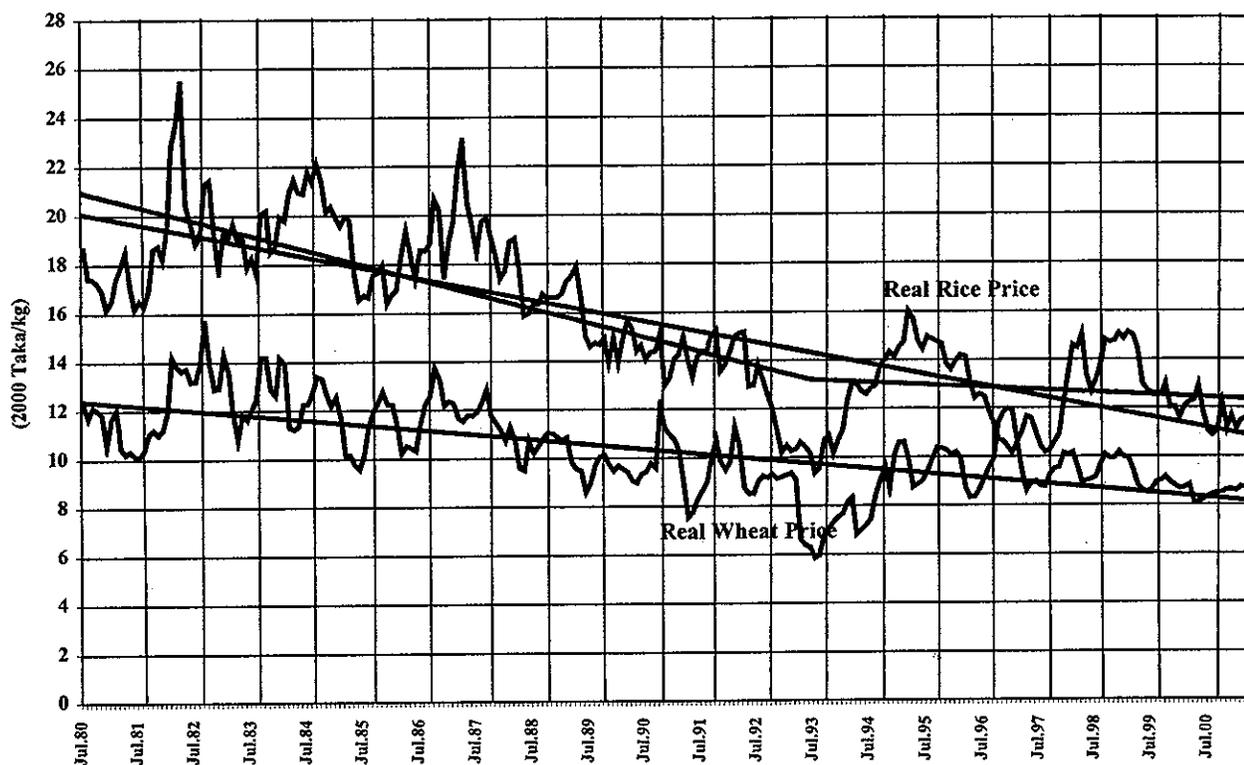
Parameter Restrictions	LR test statistics	P-Value
1977/78-1998/99 data		
$\alpha_{\text{rice}} = 0$	$\chi_1^2 = 0.00$	0.98
$(\alpha_{\text{rice}} = 0) \cap (\beta_{\text{agwage}} = \beta_{\text{unwge}})$	$\chi_2^2 = 6.49$	0.04
$(\alpha_{\text{rice}} = \beta_{\text{um}} = 0) \cap (\beta_{\text{wa}} = \beta_{\text{pr}})$	$\chi_3^2 = 5.46$	0.02

**Annex Figure 1.1 — Total Availability of Foodgrain in Bangladesh, 1980/81 to 2000/01p**



Note: "Other Rice" denotes net PFDS distribution plus private imports and "Other Wheat" denotes net PFDS distribution plus private imports.

Annex Figure 1.2 — National Average Real Wholesale Price of Rice and Wheat



Note: Prices are deflated using the non-food Dhaka middle-income Cost of Living Index (and the national CPI after June 1998).

Source: FPMU data and author's calculation.