# Re-emergence of Food Insecurity in Bangladesh? Instability in Food Production and Prices, Nature of Food Markets, Impact and Policy

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# *EXECUTIVE SUMMARY*

The overall theme of this study is agricultural market performance with a particular focus on food markets, especially in the face of acute market volatility. The study consists of four sub-themes as follows:

1. *"Assessing instability in food prices and production over time: this part provides context to the subsequent discussion on market performance, and includes analysis of production and price instability and seasonality (over 1973-2008)"*
2. *"Market Analysis: Revisiting market performance – market structure, costs and margins across value-chains; market integration across domestic markets and with the cross-border economy"*
3. *"Market Institutions – exploring the mechanisms of exchange, especially over longer distances, and the informal institutions and trading networks that underpin complex forms of trade"*

**Methodology**

The first sub-theme is explored using secondary data on prices, production and availability to assess year-to-year instability over time, using an appropriately specified ARIMA model. Seasonality is investigated using seasonal indices. The focus of this analysis is mainly on the instability of production, prices and consumption of food.

The second sub-theme conducts detailed investigations of market integration, vertical and spatial, using cost-margin analysis and cointegration methods. The markets for rice, potato and brinjal were analyzed.

The third sub-theme examines market institutions that are essential for proper functioning of competitive markets, e.g. those that enable smooth, unfettered, transactions to take place in an atmosphere of safety, security and trust, especially of complex transactions over time and distance, domestically and internationally.

The micro level impact and consumption adjustment due to sharp changes in food prices was captured using FGD and household data for before-after sharp price changes, in two areas – a food surplus area and a deficit area.

**Instability**

There were noticeable fluctuations in rice production between years, especially in the 1970s, less fluctuation during the period beginning from early eighties to mid-nineties, and again more fluctuation during the period after. Seasonality analysis also illustrates a significant seasonality in production of rice in Bangladesh. Fluctuations in rice prices appear to be due to both random and non-random elements.

Results show a clear upward trend in real rice price during 1995 till 2008 with noticeable fluctuation between the years. There also exists noticeable seasonality in rice price which shows February/March and September/October as peak and May/June as the trough.

No systematic relationship between domestic production and prices of rice in the local markets was found. This is also confirmed in a multivariate analysis which however shows a significant but perverse impact of PFDS operations.

Regarding other food items – potato and brinjal - results show a secular increase in production of both potato and brinjal during the period beginning from early seventies to mid nineties and sharp increase afterwards. It is also observed that fluctuation is increasing in recent years compared to previous years. Prices of potato and brinjal have also gone up during the period 1995-2008. Like production, prices have also increased at a faster rate in recent years compared to the previous years. Partial correlation exercises of rice price seasonality with that of potato and brinjal demonstrate that while potato price seasonality offsets rice price seasonality (i.e., negative correlation between the two), brinjal price seasonality accentuates it.

**Market Integration**

While growers share in the final consumer price is less than 50 per cent for brinjal, it is about 70 per cent for potato and rice. While the shares of market operators are evenly distributed for potato and rice, it is highly concentrated among wholesalers and retailers for brinjal.

Recent econometric approaches for measuring spatial market integration have focused on testing two important hypotheses: the existence of the LOP, and market dominance. Given cointegration between divisional-hinterland prices and hence market integration, two hypotheses are of interest: first, the hypothesis of perfect market integration where a price increase in one market leads to an equivalent effect in another, and second the hypothesis of market dominance where causality is unidirectional. Previous studies of rice market integration in Bangladesh conclude that there is limited integration. In contrast, we find a more nuanced picture with potato markets being well-integrated, rice markets generally well-integrated save for some specific locations, and brinjal markets poorly integrated.

**Market Institutions**

Agricultural markets are apparently complex but basic exchange mechanisms are simple. The key institution in the market is the *aratdari* system, especially for (non face-to-face) stranger-transactions. All the three markets examined (rice, potato and brinjal) exhibit a local circuit and a long-distance circuit. In the case of paddy-rice, the local circuit is dominated by traditional micro-processors responding to local demand and tastes, and surviving through product differentiation. The longer circuit is dominated by modern rice millers catering to deficit areas and large, urban centres. The exchange modalities are similar but the scale and terms of exchange differ depending on nature of risks faced.

Trust-building and personalized transactions are keys to successful exchange relations. Once trust is built, repeated transactions dominate exchange – new partners are introduced slowly and gradually. There are some supportive norms and institutions like *samitis* along with loyalty inducing values including a reliance on contracts. The market culture is conducive to building trade rapport quite quickly and for quick, verbal dissemination of information, e.g. on reputation.

Formal legal institutions to enforce contract are non-existent; judicial recourse is not commonly available as contracts are verbal. In terms of information, the weakest link is between consumers and retailers, as transactions are one-off, especially in urban centres, thus encouraging snatch (i.e. supply of sub-standard goods at a higher price). Only larger, institutional consumers (like restaurants) dealing with the same set of suppliers, can avoid this problem.

The market has become less tied and therefore more equitable. Bargaining power however, remains an important price-fixing element in exchange that gives advantage to the superior party.

**Micro Level Adjustments to price Shocks**

Price instability has a cost, and poor households try to adjust through complex mechanisms. In surplus rice producing areas with a good *boro* harvest, these adjustments were found to be easier as wages responded to high prices, the harvest itself stabilized rice prices while at the same time, generating broad-based demand in the economy for a variety of trade, services and other employment. In non-green revolution, single crop areas like Noakhali (especially *chars*) the adjustment process was found to be much harder with the poor having to devise complex responses to stave off hunger. The main point is that for large parts of the country (i.e. where rice production is good), the problem of high prices is transitory with adjustments in the labour market and the overall economy occurring quite rapidly. The concern is with backward areas where micro-level adjustments are indeed costly, and where the local economy is unable to adjust so well. The policy implication is clear: it is important to design safety net programs and development interventions especially for backward areas like *chars*, *haors*, and lowland zones where the impact of high prices is severe.

**Areas for Further Research**

- The price-production relationship for rice needs more detailed analysis.
- There is a presumption that seasonality in food prices declined in the 80s but may have become aggravated in more recent years. This needs to be verified as it has implications for PFDS operations.
- The finding of bidirectional causality of Bangladeshi and Indian rice prices requires further investigation.
- For rice, some areas appear not to be well integrated – these need to be identified and characterized. It is likely that these are the more backward, single-cropped areas.
- The modern food retailing sector is in its infancy. The trade off between this sector and the traditional sector needs to be understood.
- The single biggest threat to trading is default – its nature, extent, and redressal mechanisms need to be examined in depth to identify remedies.
- The *aratdari* system has been identified as the central pillar of the market. The task now is to promote this as a modern corporate entity. How can this be done?
- How to generate low cost consumer information that will reduce information asymmetry, especially at the interface with the retailer?
- Need to examine alternative shock-scenarios, the need for domestic stocks and costs compared to a strategy that depends more on a combination of stocks and imports to address food crises.

## *LIST OF ABBREVIATIONS*

| | |
|---|---|
| ACF | Autocorrelation Function |
| ARCH | Autoregressive Conditional Heteroskedastic model |
| ARIMA | Auto-Regressive Integrated Moving Average |
| BBS | Bangladesh Bureau of Statistics |
| BIDS | Bangladesh Institute of Development Studies |
| DAM | Department of Agricultural Marketing |
| FAO | Food and Agriculture Organization |
| FFW | Food For Work |
| FPMU | Food Planning and Monitoring Unit |
| GARCH | Generalized Autoregressive Conditional Heteroskedastic model |
| HIES | Household Income and Expenditure Survey |
| IFPRI | International Food Policy Research Institute |
| LOP | Law of One Price |
| NGO | Non-Government Organization |
| OMS | Open Market Sale |
| PACF | Partial Autocorrelation Function |
| TT | Telegraphic Transfer |
| VAR | Value at Risk |
| VGD | Vulnerable Group Feeding |
| WAPDA | Water and Power Development Authority |

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## *CHAPTER 1*

# INTRODUCTION

The Bangladesh food regime has undergone profound changes over the past thirty years as well documented in a number of publications (e.g. Ahmed, R. et al 2000). Indeed the very success in achieving near food self-sufficiency, stable prices and steadily rising real wages and incomes, ushered in a sense of complacency with the food security regime in the country. Past reforms in the agricultural sector has generally been hailed as positive, serving to reduce subsidies, streamlining the public food distribution system and re-aligning market incentives to raise efficiency and growth. These were also synchronized with the opening up of markets through trade liberalization, allowing input and output imports through the private sector. At around the same time, major changes were undertaken in the fertilizer market as the State moved out of its monopoly position as an importer and distributor of fertilizers. Generally, these market-friendly reforms were warmly applauded and appeared to have been successful. (Ahmed, N. et al, 2007). The 'losers' were to be compensated through expanded VGD and FFW programmes, bolstered by OMS of rice and wheat, as needed.

A critical factor underlying improved national food security of the post structural reforms period was the role played by the existence of massive grain stocks in India and ease of imports from Indian suppliers. In effect, the Indian stocks served as a buffer for Bangladesh as well, helping to stabilize supplies quickly when faced with short crops. At the same time, large acreage expansion of irrigation and *boro* cultivation led to reduced seasonality and price stability.

Events over the last 2-3 years however, tend to show that fundamental changes may be taking place in the food security regime. Inflation has been steadily growing over 2006-08, led by food prices and exacerbated by both domestic and international factors. Supply disruptions have been reported in the media with regard to fertilizer availability while a fuel crisis has made matters worse by adversely affecting irrigation. At the same time, there was much public disquiet about market behaviour with allegations of monopoly rents and collusion across a number of key markets for food and essentials.

The sense of panic began to abate after the bumper *boro* harvest of 2008. After another good harvest in a*man* 2008 and the prospects of a good crop in *boro* 2009, the market for rice began to stabilize. At the same time, the global recession set in, causing world and regional food prices to drop sharply. The combined effect of good domestic harvests and low world prices caused a slump in rice prices, even during the traditionally peak pre-harvest price period of March-April. The food market is therefore going through periods of sharp booms and busts, causing acute concerns in the minds of policy makers. Under the circumstances, there are likely to be renewed calls for price stabilization – a task that the Government, through policy statements by the Agriculture and Food ministers, appears to be seriously committed to. Stabilization policies however, are difficult to manage, having to strike the right balance between opposing or contradictory interests (e.g. of consumers, producers and traders). Further, price stabilization, usually within a well-defined band, is costly requiring large public stocks, with all the attendant problems of managing a large Public Food Distribution System. The best option would be of course, if the market could ensure price stability. While the food market, in general, is thought to be well-functioning there have been concerns that price instability is sometimes accentuated by its operations.

However, complex policy decisions cannot be taken on the basis of populist analysis of the food regime but require a systematic and careful analysis of the nature and causes of

instability, as well as an analysis of market performance. Household and individual-level responses and adjustments to shocks, especially by those who are thought to be at particular risk, also require examination. This study addresses itself to this challenging task.

Thus, the overall theme of this study is agricultural market performance with a particular focus on food markets, especially in the face of acute market volatility. In particular, it represents a concerted attempt to examine whether domestic market failure can be held responsible for the volatile performance of food prices experienced in 2007-2008. The study also affords an opportune moment to examine the impact of price volatility on household level consumption, and the manner in which micro-level adjustments occur. The study consists of four sub-themes as follows:

*"Assessing instability in food prices and production over time: this part provides context to the subsequent discussion on market performance, and includes analysis of production and price instability and seasonality (over 1973-2008)":*

This section tracks instability in production and prices of selected food items and assesses their impact on household food consumption. Although Bangladesh achieved near self-sufficiency in food production and stability in prices over the last three decades, this has been marked with periods of acute instability and heightened seasonality. Particularly, the abrupt rise in the price of staple foods in recent years led to a deteriorating food security situation with obvious implications for household food consumption, in particular for poor households.

Keeping these in mind, the section (a) assesses the trends, fluctuations and seasonality in production and prices of rice, potato and brinjal; (b) models volatility in production and prices of rice; and (c) estimates the impact of instability on food consumption.

*"Market Analysis: Revisiting market performance – market structure, costs and margins across value-chains; market integration across domestic markets and with the cross-border economy"*

This section examines vertical and spatial integration of markets for three food commodities, namely rice, potato and brinjal. Each of these commodities differs in terms of their importance and role for food security and in the national diet. Essentially, this component addresses itself to market efficiency and market integration, both for markets across Bangladesh and between Bangladesh and West Bengal markets.

*"Market Institutions – exploring the mechanisms of exchange, especially over longer distances, and the informal institutions and trading networks that underpin complex forms of trade"*

This sub-theme carefully explores the relationships in real markets between different market actors and institutions which underpin exchange. Traditional econometric analysis like co-integration, abstracts from these relationships to focus simply on prices in a bid to explain market performance. This is at best of partial relevance, as market behaviour cannot be analyzed or understood without also referring to market actors and their motivations, their behaviour patterns, strategies and mechanisms used to ensure complex but credible, safe and rapid exchange.

### 1.1 Literature Review

The objective of this brief review is to locate the proposed research within the broader literature in the Bangladesh context. In general, the literature on food-security in Bangladesh is large but the subject tended to be ignored in more recent years as food security concerns waned. The traditional focus on food self-sufficiency stimulated a large literature on, e.g. the

Green Revolution in the 1970s and 1980s (e.g. Alauddin and Tisdell, 1991; Hossain, M. 1988), concerned primarily with technology adoption constraints.

The focus then moved to reforms in agriculture and the food system, with a series of research onslaughts against the Public Food Distribution System, farmer subsidies for output and inputs, market and trade liberalization (see Ahmed 2002; Chowdhury, N. 2003; Dorosh and Murshid, 2001). A corollary to this discourse was studies on market integration, largely limited to rice markets (Ravallion, 1986, 1987; Dawson and Dey, 2002). The main findings of these exercises were that rice markets in Bangladesh were highly competitive, and therefore there was little need for public interventions. While sometimes research findings, e.g. from BIDS contradicted mainstream views (e.g. Osmani and Quasem 1990; Crow and Murshid 1994) these were noted but largely ignored. More recently in 1999, IFPRI collaborated with BIDS to launch another series of studies on food policy, covering a large gamut of issues and hypotheses (del Ninno 2003; Dorosh 2002; 2004; Murshid 1999; Murshid and Rashid 2001) including impact of floods and coping mechanisms, evaluation of remaining public interventions in the food sector, namely Food for Work, VGD and Food for Education projects, as well as studies on macro-micro linkages, cross-border rice trade, and price-wage relationships. An interesting finding from the cross-border study showed that private traders were able to respond very quickly to new opportunities – supporting the contention of competitive conditions and ease of entry into a new sector. The study on rice prices and wages clearly brought out the relatively sluggish response of wages to rice prices. At the household level most studies concentrated on vulnerable groups and the poor/ultra poor, with much of the energy devoted to measurement and estimation of poverty. However, there have been important contributions that have served to improve our understanding of chronic poverty, poverty dynamics, and factors affecting poverty (Sen and Hulme, eds. 2006). A corollary of these studies has been a steady stream of survey-based research on the link between micro-credit, infrastructure and poverty reduction (e.g. see Chowdhury et al, ed. 2003).

While household food consumption has been carefully observed and analyzed, intra-household food distribution was much more difficult to study. Recent efforts by the Bureau of Economic Research however, have served to address this gap. As expected significant intra-household variations are found but interestingly, the finding of a low, income-calorie elasticity somewhat confounds policy options (see Bureau of Economic Research 2007).

It is striking, however, that there is rather scant literature on the problem of food output and price instability, or seasonality either at the macro-level or at the micro-level – the only exception is Murshid (1986, 1987) which looked at rice output instability and its impact at the macro and micro (household) level. The proposed research will therefore fill a major gap in the literature. In addition, our focus on household-level consumption fluctuations and the problem of coping/adjustment to price/production shocks will also make a significant contribution to our understanding of micro behaviour, especially of vulnerable groups. Some attention to this is found in the risk literature, although highly dated (e.g Shahabuddin and Butterfield 1986; Shahabuddin et al 1986).

This research aims at covering the period 1973-2008 to examine the nature and trends in instability in outputs and prices for both rice and a non-rice food in an effort to track trends and structural changes that are likely to have taken place in the underlying rice/food economy. It also examines the nature of seasonality associated with the longer-run trends observed. A concern here is to test the possible hypothesis that the price-output relationship has changed fundamentally, and that due to a more open economy, prices have become much more linked to cross-border and international prices. This would also mean changing seasonal

price patterns that are becoming de-linked from production seasonality, with very interesting implications for public policy.

The research also takes a close look at agricultural commodity market structure and the underlying market institutions. In part, this is a continuation of previous studies on markets (integration, structure, etc.) with the caveat that we expect to look at non-rice foods as well. In addition, such market studies have become imperative today in the context of the growing accusation of collusion and monopoly rents in the food market. The part of the research on market institutions (generally ignored by previous researchers – for an exception see Murshid, 1997) will provide important insights into the fundamental strengths-weaknesses of real markets in Bangladesh.

### 1.2 Methodology and Data

The first sub-theme is explored using secondary data on prices, production and availability to assess year-to-year instability over time, using an appropriately specified ARIMA model. Seasonality is investigated using seasonal indices. The focus of this analysis is mainly on the instability of production, prices and consumption of rice. In addition, two other food items – potato (non-perishable) and brinjal (perishable) have also been taken into consideration to have an understanding of instability on other food items as well. In order to analyze the instability in production and prices, a time-series of 36 years of production data and another time-series of 14 years of monthly price data have been used. Data on production was collected from Statistical Yearbook of Bangladesh (several years) of the Bangladesh Bureau of Statistics (BBS) except for 2006/07 and 2007/08. Data for the last two years were collected from Food Planning and Monitoring Unit (FPMU). Data on prices were collected from the Department of Agricultural Marketing (DAM).

Analysis has been carried out in several stages. First, a descriptive analysis has been carried out to assess the trends and instability in production and prices as well as the output-price relationship of rice. Second, a similar descriptive analysis has been carried out for the other food items (potato and brinjal) taken into consideration in the present study. Third, an econometric analysis (using time-series data) has been carried out to model the seasonality and volatility in production and prices of rice. Fourth, in order to estimate the impact of instability on household consumption, a household consumption model has been estimated using data from the Household Income and Expenditure Survey (HIES) 2000 and 2005 of the Bangladesh Bureau of Statistics (BBS). Details of the model specification and estimation procedures are outlined in the respective sub-sections.

The second sub-theme conducts detailed investigations of marketing chains (costs-margins) and value chains, along with costs and returns for each segment of the chain. In addition, market integration studies have been conducted using co-integration and error-correction methods. The analysis will re-examine spatial integration of markets after a span of many years (for rice), and for the first time for the other commodities selected. Both primary and secondary data are used for the exercises.

The third sub-theme examines market institutions that are essential for proper functioning of competitive markets, e.g. those that enable smooth, unfettered, transactions to take place in an atmosphere of safety, security and trust, especially of complex transactions over time and distance, domestically and internationally. Institutions related to trade finance, dispute resolution and arbitration are very important. In particular, it is critical to understand the manner in which different actors/traders establish binding contracts. A new institutional framework approach was adopted to examine transaction relations (formal and informal) information asymmetries, relative bargaining power and enforcement mechanisms.

The impact at the macro level (inflation) and micro level (household income, wages, poverty) was assessed in Chapter 2 using HIES data for two periods (2000 and 2005). However, the sharp volatility in the food market occurred well after 2005, and thus is likely to have been missed. In this last chapter, an attempt is made to combine evidence garnered from purposive FGD and primary data collected from poor and non-poor households in an advanced and a backward area of Bangladesh. This exercise was conducted on a small scale, for illustrative purposes only, to help focus attention on the nature of micro level effects and adjustment processes that are employed to deal with a situation of high market volatility.

*CHAPTER 2*

# ASSESSING INSTABILITY IN PRODUCTION AND PRICES OF SELECTED FOOD ITEMS AND ITS IMPACT ON CONSUMPTION

## 2.1 Introduction

This chapter tracks the instability in production and prices of selected food items and assesses their impact on household food consumption. Although Bangladesh had achieved near self-sufficiency in food production and food price stability over the course of the last three decades, this was accompanied by periods of acute fluctuations in prices and production. In particular, the abrupt rise in prices of staple food in recent years has led to a further deterioration of the situation with obvious implications for household food security.

Several factors may be responsible for this instability in production, availability and prices of food items, including the policy regime, natural hazards, seasonality and instability in international food markets. On the other hand, consumption smoothing at the household level is not only dependent on availability of food items at the national level, but also the ability of the households to access them which is again dependent on stability and seasonality in household income and food prices. Keeping these in mind, this chapter examines/carries out the following: (a) estimates trends, fluctuations and seasonality in production and prices of rice, potato and brinjal; (b) models volatility in production and prices of rice; and (c) estimates the impact of instability on food consumption. Some policy lessons for improving food security in the country are drawn.

"Food security at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (World Food Summit 1996). Food security should also be looked into from both national and individual perspectives. From national perspectives, food security refers to availability of sufficient stocks to meet domestic demand till the stock can be replenished from domestic production and/or imports. From individual perspectives, it refers to access to food at all times from own production, market and/or government transfer mechanism. While achieving national level food security is a necessary condition to achieve household or individual level food security, there is no one to one correspondence between the two. Experiences from many countries demonstrate that while food security is achieved at the national level, many individuals and groups of people can go without sufficient food because either they don't have enough income to purchase them or any other means to access them (Pressman and Summerfield, 2000; Clay, Ed 1990).

Bangladesh experienced famine in 1974 due to destruction of infrastructure during the war of independence in 1971 and consecutive natural disasters leading to substantial reduction in food production. In respect of that experience, food security was considered as achieving self-sufficiency in rice production and stabilization in rice prices (Dorosh et al, 2004). In fact, from then on, Bangladesh has been able to increase its rice production substantially until the turn of the last century. Indeed, Bangladesh had been able to cross a major milestone with regard to achieving food self-sufficiency at the end of the 1990s since for the first time in its history, food grain production exceeded target requirements[1] (Hossain et al, 2005). However, because of relatively high population growth and instability and stagnation in rice production,

[1] Based on 454 gm/person/day.

particularly in recent years, Bangladesh has not been able to sustain food security. Domestic food production still remains susceptible to floods and droughts. Moreover, rice production has not been accompanied by significant increase in availability of other foods.

In a subsistence economy like Bangladesh, domestic food production is crucial in achieving food security in the country. In Bangladesh, major food items include rice, wheat, pulses, potato, vegetable and fish. These food items account for 85 percent of total calorie and protein intake. Rice and wheat together contribute to 74 percent and 57 percent of the total per capita calorie and protein intake in the diet (Hossain, Naheri and Shahabuddin, 2005). Rice occupies 71 percent of the gross cropped area and accounts for 94 percent of the food grain production (Hossain et al, 2005).

Significant changes has also taken place in Bangladesh food regime over the past three and half decades including reducing fertilizer subsidy, streamlining public food distribution system, liberalizing imports of both inputs and outputs, and re-aligning market incentives to raise efficiency. However, over the last two-three years, some new changes seem to have taken place in Bangladesh food regime including fast growing food inflation accompanied by supply disruptions with regards to fertilizer availability, fuel crisis, and instability in international food markets. It is therefore important to look into the instability in food supply before embarking on any new policy to stabilize the situation.

Although there is a large body of literature on food security in Bangladesh (e.g., Alauddin and Tisdell 1992, and Hossain, M. 1988 on green revolution; Ahmed, R. et al (ed.) 2000, Chowdhury, N. 2003, and Dorosh and Murshid 2001 on public food distribution system, subsidies, markets and trade liberalization), there has been very few (Murshid 1986 and 1987) on instability and seasonality of food production and prices either at the national or micro level. This paper serves to to fill an important gap in the literature.

The price data used in this chapter was directly obtained from the Department of Agricultural marketing. Research assistants were given permission to manually copy the price data from master sheets maintained by DAM. The production data is available in published form from the Bangladesh Bureau of Statistics, e.g. in the Yearbook of Agricultural Statistics.

## 2.2 Trends and Fluctuations in Rice Production

### *Area under rice cultivation*

Bangladesh has a relatively high population growth. There is strong pressure on land for many uses, e.g. for constructing houses, building physical infrastructure and meeting other requirements. Naturally, availability of land for crop agriculture is expected to be squeezed over the years unless new lands are reclaimed, e.g. from the sea – not a very likely prospect. Thus, to feed the growing population, food production must be increased, especially of the staples. Data shows that area under rice cultivation has increased only marginally (by only 0.30 percent annually) over the period 1972/73-2007/08. However, there has been a shift towards production of high yielding varieties, away from local varieties (Table 2.1).

### *Trends in rice production and yield per acre*

Total rice production has increased at a rate of about 3 percent per year over the period 1972/73-2007/08 of which *boro* registered the highest growth (over 16 per cent per year) (Table 2.2). Productivity of all varieties (as reflected by per acre production of rice) has also increased substantially over the same period (Table 2.3). Graphs 2.1 through 2.4 represent trends in rice production and yield per acre by both varieties of rice (i.e., *aus, amon* and *boro*) and technology used (i.e., local vs. high yielding). A three-yearly moving average was used

to remove the irregular fluctuations from data before fitting the trend line. As the graphs show, upward trends are observed for *amon, boro,* 'high yielding' and 'total rice production' as against the performance of *aus* and 'local' which show a declining trend. For yield per acre, however, a secular upward trend is observed for all crops.

In order to look into the trends in rice production between different sub-periods, the entire period has been divided into three sub-periods[2] based on different policy regimes and a similar trend analysis has been carried out for each of them separately as shown in Graph-2.5. Clearly, rice production has increased at a relatively faster rate in the later periods than the previous ones.

***Fluctuations and seasonality in rice production***

Although a secular upward trend is observed for rice production in Bangladesh, there is no reason to believe that it has gone through without any fluctuation. In order to assess the patterns of fluctuations in production between years, data were de-trended[3] using the linear trend line before looking into the inter-year fluctuation. Graph-2.6 represents the fluctuations in rice production between the years which shows more fluctuation during 1970s, less fluctuation during the period beginning from early eighties to mid-nineties, and again more fluctuation during the period afterwards. Seasonality in production has also been analyzed using *aus*, *amon* and *boro* as seasons. Results show a significant seasonality in production of rice in Bangladesh which has bearing on the supply and availability of rice in the domestic market (Graph-2.7).

**Table 2.1: Area under Rice Cultivation**

*('000' acres)*

| Variety | Year | | | Growth Rate (%) (1972/73-2005/08) |
|---|---|---|---|---|
| | 1972-80 | 1980-95 | 1995-08 | |
| **Amon** | 14210 | 14447 | 13710 | -0.29 |
| **Aus** | 7812 | 6267 | 3146 | -2.69 |
| **Boro** | 2618 | 4929 | 9088 | 4.31 |
| **Local** | 21099 | 166659 | 9596 | -3.10 |
| **HYV** | 3541 | 8985 | 16173 | 5.90 |
| **Total** | 24640 | 25643 | 25868 | 0.30 |

**Table 2.2: Trends in Rice Production**

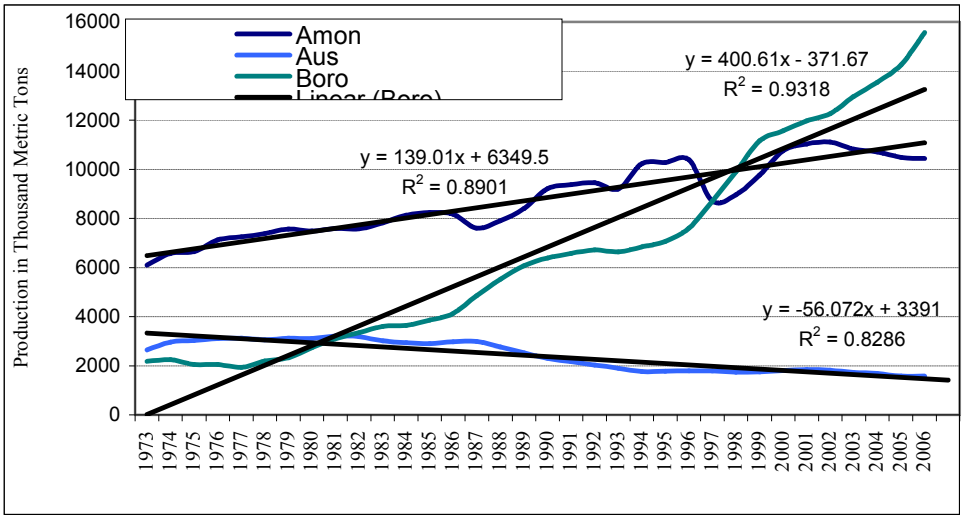
*('000' metric tons)*

| Variety | Year | | | Growth Rate (%) (1972/73-2005/08) |
|---|---|---|---|---|
| | 1972-80 | 1980-95 | 1995-08 | |
| **Amon** | 6799 | 8349 | 10383 | 1.53 |
| **Aus** | 2922 | 2671 | 1726 | -1.14 |
| **Boro** | 2134 | 4928 | 11822 | 6.15 |
| **Local** | 8484 | 7485 | 5043 | -1.60 |
| **HYV** | 3371 | 8464 | 18126 | 6.70 |
| **Total** | 11855 | 15949 | 23931 | 3.01 |

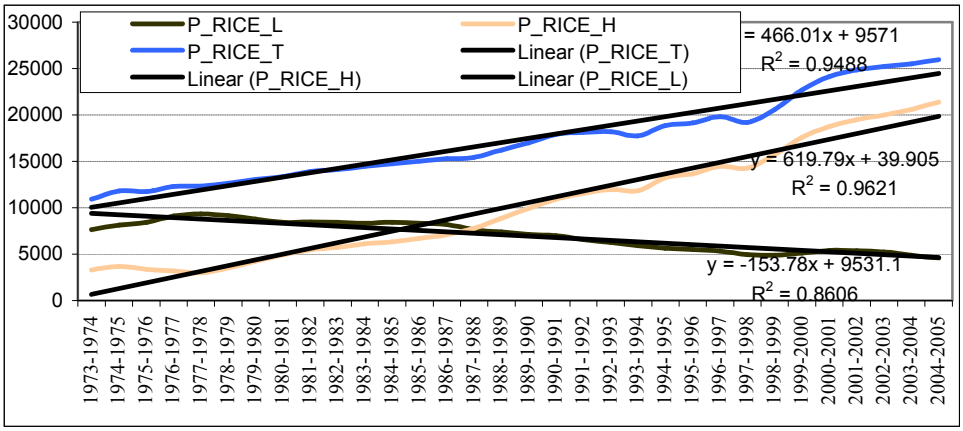
[2] Period 1: 1972/73-1979/80; Period 2: 1980/81-1994/95; and Period 3: 1995/96-2007/08.

[3] De-trending is the statistical operation of removing trend from the series.

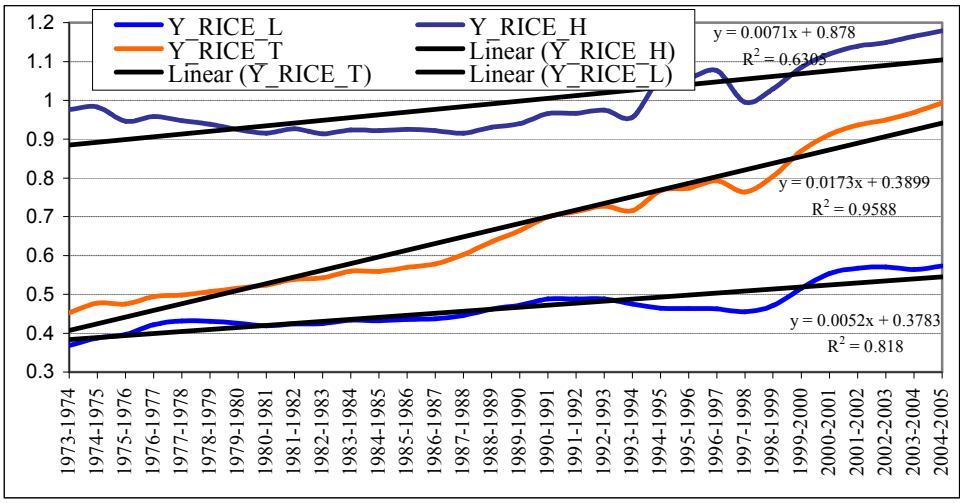
**Graph-2.1: Trends in Rice Production by Variety ('000 m.tons)**



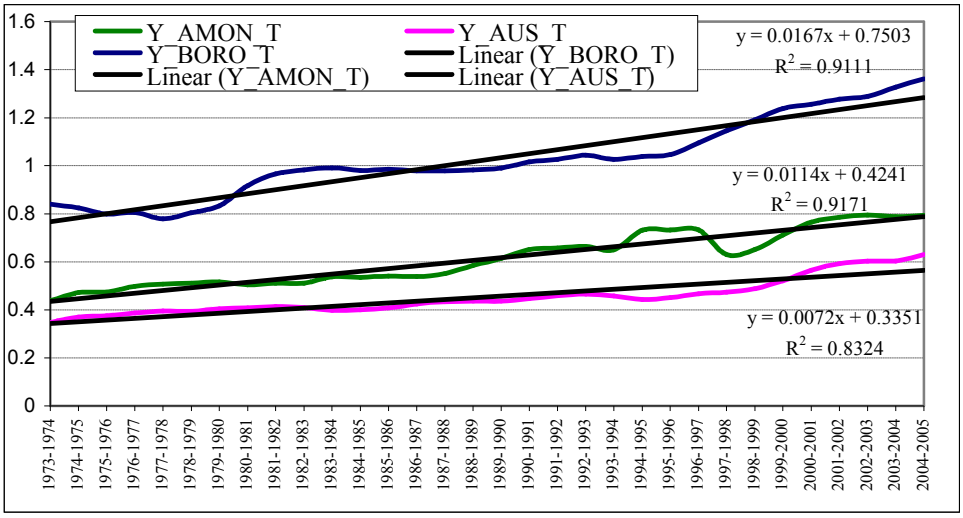

**Graph-2.2: Trends in Rice Production by Technology ('000 m.tons)**



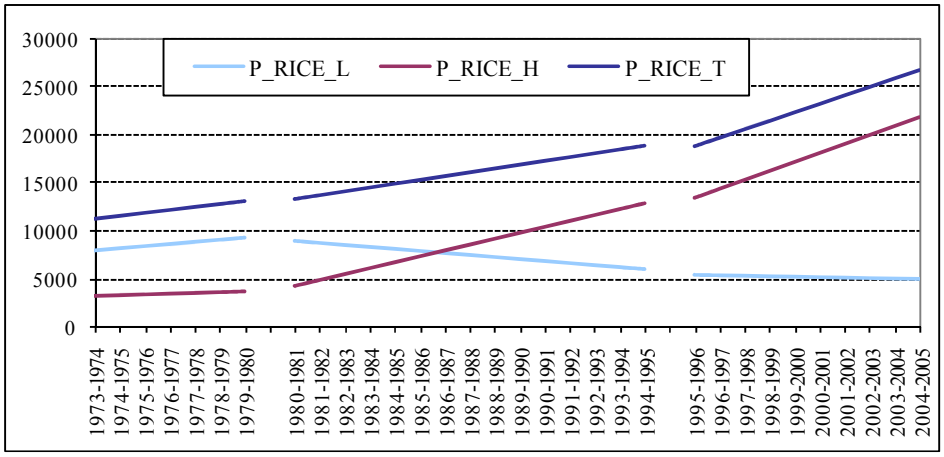

**Graph-2.3: Trends in Yield per acre of Rice by Technology (m.tons)**



**Graph-2.4: Trends in Yield per Acre of Rice by Variety (m.tons)**




**Graph-2.5: Trends in Rice Production by Three Sub-Periods ('000' m.tons)**




**Graph-2.6: Fluctuation in Rice Production**

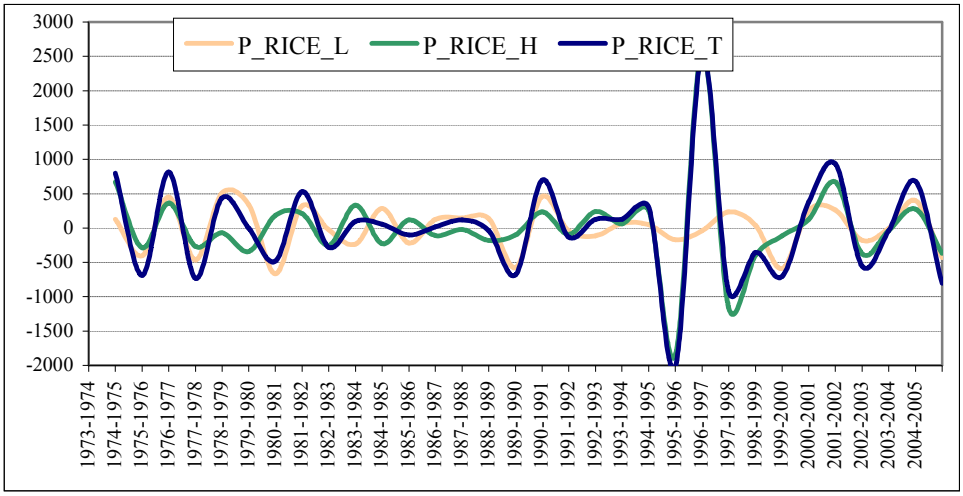
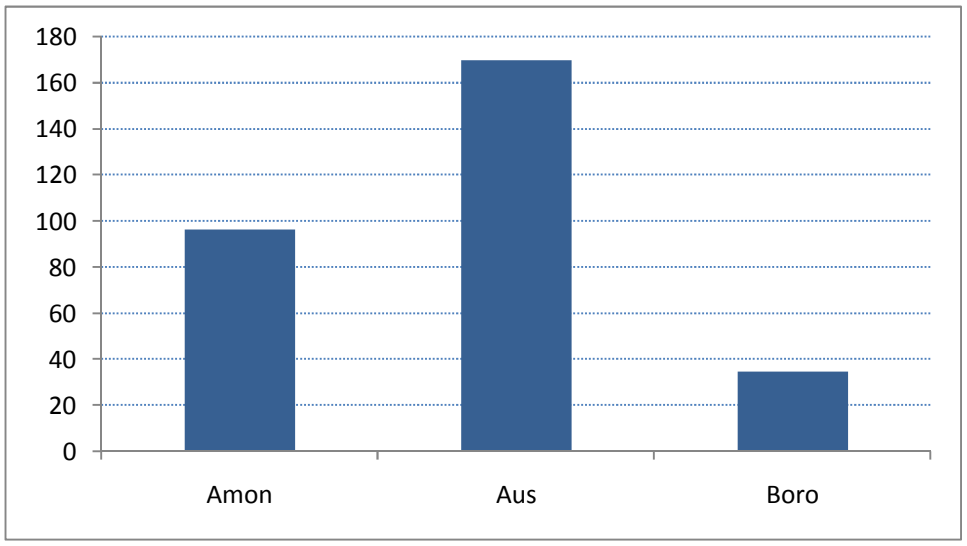


**Table 2.3: Trends in per acre Production of Rice**

*(metric tons per acre)*

| Variety | Year | | | Growth Rate (%) (1972/73-2005/08) |
|---|---|---|---|---|
| | 1972-80 | 1980-95 | 1995-08 | |
| **Amon** | 0.4780 | 0.5794 | 0.7584 | 1.89 |
| **Aus** | 0.3733 | 0.4303 | 0.5683 | 2.10 |
| **Boro** | 0.8146 | 0.9936 | 1.2800 | 1.70 |
| **Local** | 0.4016 | 0.4533 | 0.5258 | 1.60 |
| **HYV** | 0.9540 | 0.9374 | 1.1172 | 0.70 |
| **Total** | 0.4806 | 0.6232 | 0.8941 | 1.70 |

**Graph-2.7: Seasonality in Rice Production**




## 2.3 Trends and Seasonality in Rice Prices

***Trends and fluctuations in rice prices***

Price volatility of rice has been the major food security issue in recent years. Rice price has gone up significantly over the last two years both locally and internationally although a downward trend is now observed in more recent months. For analyzing the trends in rice prices, both nominal and real prices[4] have been considered. A three-yearly moving average has also been performed to eliminate the irregular fluctuations in prices. Results show a clear upward trend in rice price during 1995 till 2007 with noticeable fluctuation between the years as reflected in Graphs 2.8 through 2.10. It may be pointed out here that while both nominal and real price have shown a similar upward trend, inter-year fluctuations are much more pronounced for real prices than nominal prices.[5]

[4] Real prices of rice have been obtained by deflating the nominal price by non-food price index.

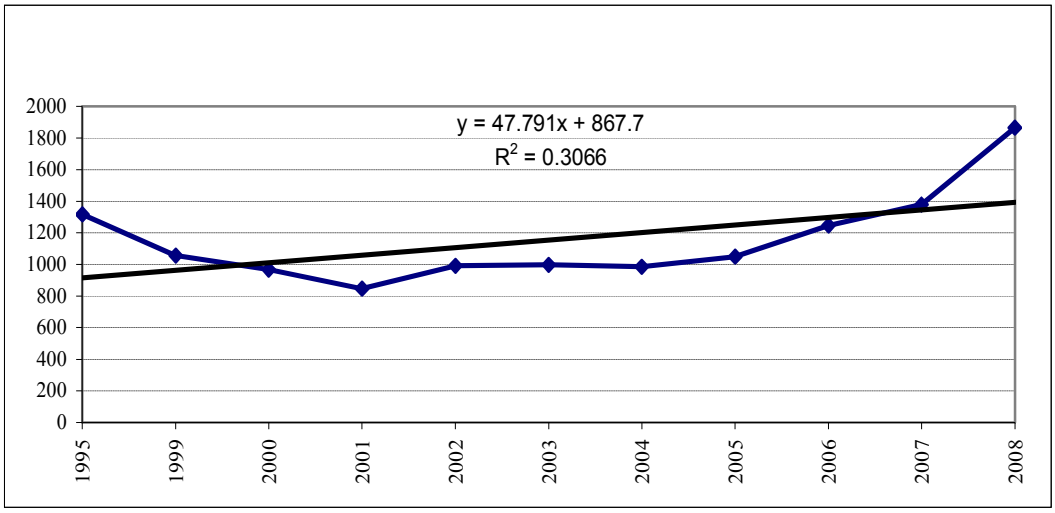
[5] The period covered corresponds to the post-reforms period in Bangladesh agriculture which brought significant gains in terms of production and stable prices. It is important to examine more recent trends in agricultural prices it is widely believed to have become much more uncertain in more recent years.

***Seasonality in rice prices***

There are several ways to construct seasonals. Perhaps the simplest is to produce a graph with the factor being studied (i.e., price in this case) on the vertical axis and time (i.e., months in this case) on the horizontal axis. For a seasonal to have any significance, a number of years' worth of data need to be accumulated. They can then be plotted on the chart or an average of the data can be plotted. These approach, however, are most appropriate for periods of relative stability in market conditions. Another technique is to construct a "seasonality index". The "denominator" for the index is generally the average for the time period being examined (i.e., months in this case). Then, each time period's price is expressed as a percentage of the season's average which produce a value equal to, greater than, or less than 100. This later methodology has been used here to construct the seasonality index to look into the seasonality in rice prices in Bangladesh. It may be noted here that before constructing the seasonality index, both irregular fluctuations and series trend were removed using moving average[6] and fitting linear trend lines. It may also be noted here that seasonality index is constructed here using the real prices only.

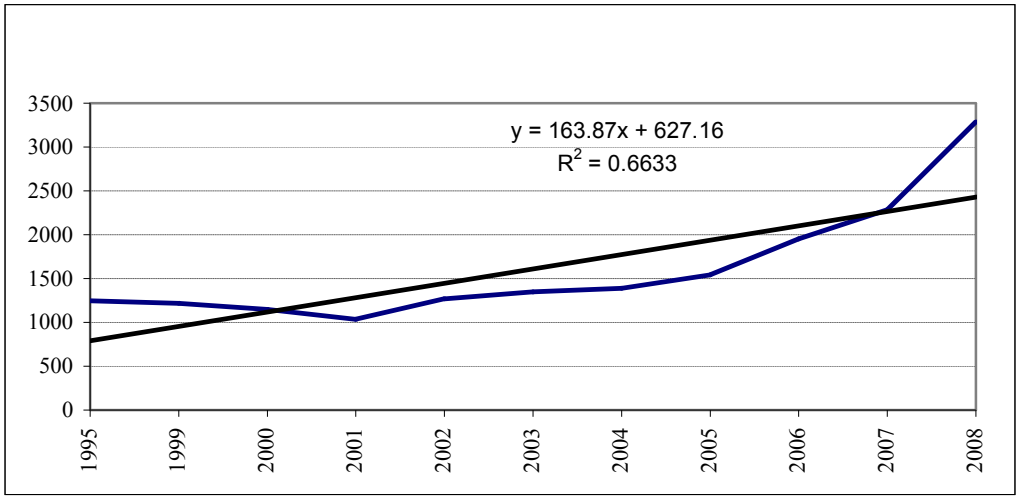
Rice price seasonality is presented in Graph-2.11. The graph shows that there exists noticeable seasonality in rice prices with February/March and September/October as peak and May/June as the bottom. This corroborates with the seasonality patterns observed earlier as well.

**Graph-2.8: Trends in Real Prices of Rice**

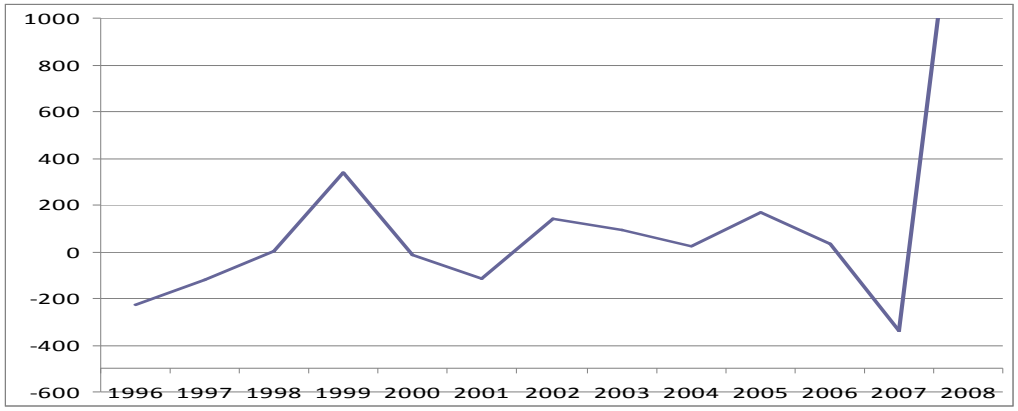



[6] Please note that while taking moving average, two observations are lost – one from the top and the other from the bottom and that's why the year mentioned in the graph will be one year less from both ends.

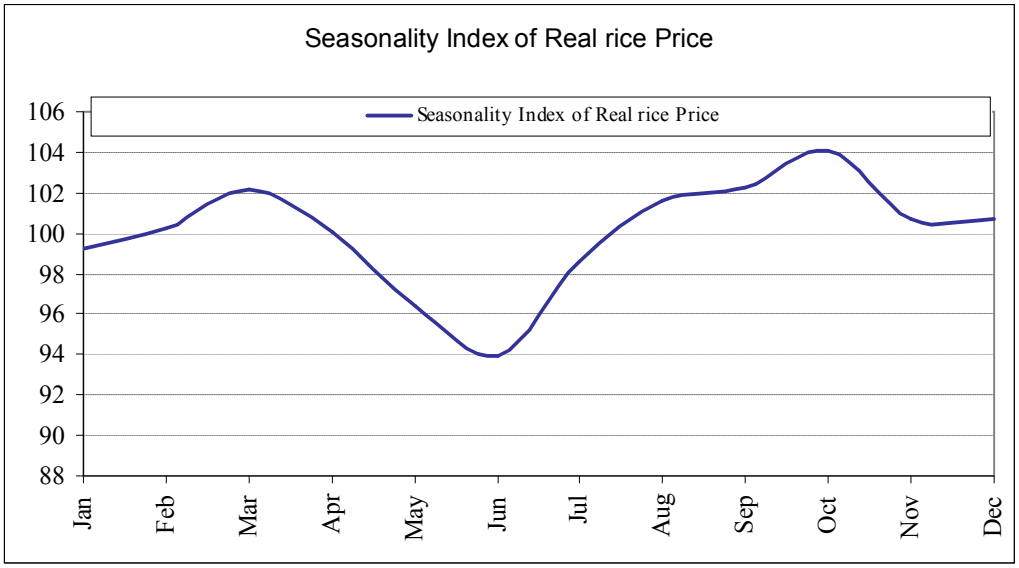
**Graph-2.9: Trends in Nominal Prices of Rice (Taka/Quintal)**




**Graph-2.10: Fluctuations in Rice Prices**




**Graph-2.11: Seasonality in Real Rice Prices**



## 2.4 Instability in Production-Price Relationship

We have seen that rice production has increased over the years but there are fluctuations and seasonality. We have also observed that rice prices have also increased over the years with significant inter-year fluctuation and intra-year seasonality. It would therefore be interesting to see whether there is any systematic relationship between the movement of production and prices of rice. In doing so, a common period of 1994/95-2007/08 has been taken into consideration. Comparison has also been made using both nominal and real prices. Both raw data and de-trended series have been used separately for this comparison. Graphs 2.12 through 2.14 illustrate the comparison of movements in production and prices of rice. Results show that there has not been any systematic relationship between domestic production and prices of rice in the local markets.

In order to look into the relationship in a multivariate framework, simple linear and logarithmic regression with price as the dependent variable and production, import, public food grain distribution system, international price and two seasonal dummies (one for aus and the other for amon) as independent variables have been estimated. Results confirm no statistically significant relationship between the prices and the production of rice (see the following table for regression results).

**Table 2.4: Regression Results with Price as the Dependent Variable**

| Variables | Linear | | Log-linear | |
|---|---|---|---|---|
| | Coefficients | Sig. Level | Coefficients | Sig. Level |
| Constant | 768.90 | .07 | 5.644 | .05 |
| Production | 0.014 | .64 | -0.029 | .92 |
| Imports | 0.018 | .75 | 0.0003 | .99 |
| PFDS | 0.326 | .12 | 0.279 | .04 |
| International Price | -0.115 | .88 | -0.025 | .88 |
| Dummy_Aus | 156.15 | .66 | -0.087 | .88 |
| Dummy_amon | 138.67 | .27 | 7.575 | .46 |
| Adjusted R-square | .45 | - | .48 | - |

This points to the fact that rice price is not solely dependent on domestic production, but on other factors as well. They might include seasonality in production, stock behaviour, and other unobservable behaviour. It may be noted that in the above model the log-linear form shows that PFDS distribution has a significant impact on prices but has the wrong sign, while production has the correct sign but is not statistically significant. Not too much can be made out of this simple econometric estimate. A much more rigorous price analysis is required to arrive at a more robust conclusion. This however does raise a clear hypothesis for future verification: domestic prices may be increasingly subjected to the influence of non-domestic factors. However, which external factors are likely to be important, how do external events translate into domestic price shocks (e.g. through imports or speculation) are matters that require investigation. The wrong sign of the PFDS variable is also of concern – does this mean that in fact PFDS has no price stabilization impact or is it the case that our variable

specification is incorrect, especially of price? It would probably be better to redefine the price variable in terms of pre- and post-harvest prices and relate this to Aman and Boro production, imports and off-takes through the PFDS and safety-net programmes. Further, the international price variable should probably be redefined in terms of Indian or Kolkata prices instead of the ex-Bangkok prices that was used. These refinements could not be carried out at this time, leaving this important analysis for future work.

**Modeling Volatility**

In the conventional econometric models, the variance of the disturbance term is assumed to be constant. However, many economic time series exhibit periods of unusually large volatility, followed by periods of relative tranquility. In such circumstances, the assumption of a constant variance (i.e., homoskedasticity) is inappropriate, and it is therefore important to model the variance of a series. The ARCH[7] and the GARCH[8] models have become very popular in this respect in that they enable the econometrician to estimate the variance of a series at a particular point in time.

Engle (1982) proposed the ARCH model which is specified as follows:

$$R_t = u_{t-1} + e_t$$
$$e_t \sim N(0, \sigma_t^2)$$
$$\sigma_t^2 = \alpha_0 + \sum \alpha_i e^2_{t-i} \ (i=1, 2, ...., q)$$

Where, $R_t$ is the variable of interest, $u_{t-1}$ is the conditional mean, and $e_t$ is the error term of the mean equation which is serially uncorrelated with mean zero. But the conditional variance of $e_t$ equals $\sigma_t^2$, which is a function of q past squared residuals. The ARCH model to be well defined, the parameters of conditional variance equation should satisfy the following: $\alpha_0 > 0$ and $\alpha_i \geq 0$.

Bollerslev (1986) extended the ARCH model in which volatility at time t is not only affected by q past squared residuals, but also by p lags of past estimated volatility, which is known as GARCH model. The specification of GARCH (p, q) is given by:

$$R_t = u_{t-1} + e_t$$
$$e_t \sim N(0, \sigma_t^2)$$
$$\sigma_t^2 = \alpha_0 + \sum \alpha_i e^2_{t-i} + \sum \beta_j \sigma^2_{t-j} \ (i = 1, 2, ...., q; j = 1, 2, ...., p)$$

The parameter $\alpha_i$ capture the ARCH effect whereas $\beta_j$ capture the GARCH effect.

Now, the volatility in production and prices in rice in Bangladesh is tested employing these ARCH/GARCH models. Data used for estimating these models is variety of rice (i.e., *amon*, *aus* and *boro*) data for 36 years (i.e., 108 observations in total) for production and monthly price data for 14 years for the prices. In order to select the appropriate lags in model estimation for both production and prices, autocorrelation function (ACF) and partial autocorrelation function (PACF) are carried out which indicates up to lag 3 for production and lag 1 for prices as appropriate lags for model specification (see Graph 2.14a and 2.14b in this respect). Estimated results are presented in the following tables respectively.

[7] Autoregressive Conditional Heteroskedastic model.

[8] Generalized Autoregressive Conditional Heteroskedastic model.

**Table 2.5: Volatility in Rice Production: Estimation of ARCH/GARCH (3, 3) Models**

| Variables | Coefficients | Standard Errors | Z-Statistic | P-Value |
|---|---|---|---|---|
| Constant | 2649.65 | 110.5048 | 23.98 | 0.0000 |
| ARCH | | | | |
| Lag-1 | 0.0116 | 0.0024 | 4.67 | 0.0000 |
| Lag-2 | 0.9028 | .... | .... | .... |
| Lag-3 | 4.7904 | .... | .... | .... |
| GARCH | | | | |
| Lag-1 | -2.7823 | 0.0077 | -360.62 | 0.0000 |
| Lag-2 | -6.6806 | 0.0109 | -609.20 | 0.0000 |
| Lag-3 | 4.8201 | .... | .... | .... |

**Table 2.6: Volatility in Rice Price: Estimation of ARCH/GARCH (1, 1) Models**

| Variables | Coefficients | Standard Errors | Z-Statistic | P-Value |
|---|---|---|---|---|
| Constant | 1239.27 | 74.9668 | 16.53 | 0.0000 |
| ARCH (1) | 0.8764 | 0.2577 | 3.40 | 0.0010 |
| GARCH (1) | -0.0162 | 0.0335 | -0.48 | 0.6280 |

Results show significant ARCH and GARCH effect for production and only ARCH effect for prices. This means, there exists significant instability in both production and prices of rice. However, the instability in prices is only affected by past squared residuals, whereas, the instability in production is affected by both past residuals and its volatility. This finding may be interpreted as showing that the error term is non-random and large, implying significant volatility in the series that is not due to chance, especially for production but also for prices. The economic implication of these findings is that we cannot treat these variables as random (and therefore unpredicatable) in nature.

## 2.5 Trends and Fluctuations in the Production and Prices of Potato and Brinjal

As mentioned earlier, in addition to rice, two other food items have also been analyzed as an attempt to observe the instability, if any, in other food items. Similar analyses have also been carried out for potato and brinjal like rice (except econometric analysis).

Results show a secular increase in production of both potato and brinjal during the period beginning from early seventies to mid nineties and sharp increase afterwards (Table 2.9 and Graphs 2.15 and 2.16). Both potato and brinjal production also register significant fluctuations between years (Graph 2.17 and 2.18). It is also observed that fluctuation is increasing in recent years compared to previous years.

Prices and potato and brinjal have also gone up during the period 1995-2008. Like production, prices have also increased at a faster rate in recent years compared to the previous years (Table 2.10 and Graphs 2.19 and 2.20). There also exists significant seasonality in both potato and brinjal prices (Graphs 2.21 and 2.22) and the seasonality in prices for these two food items are much more pronounced than the seasonality observed for rice prices as expected (Graph 2.23).

It is, however, important to look into the matter that whether the price seasonality observed for other food items (i.e., potato and brinjal) are offsetting the rice price seasonality or accentuating it. Partial correlation exercises of rice price seasonality with that of potato and brinjal demonstrate that while potato price seasonality offsets rice seasonality (i.e., negative correlation between the two), brinjal price seasonality accentuates it (see the following correlation matrices in this respect).

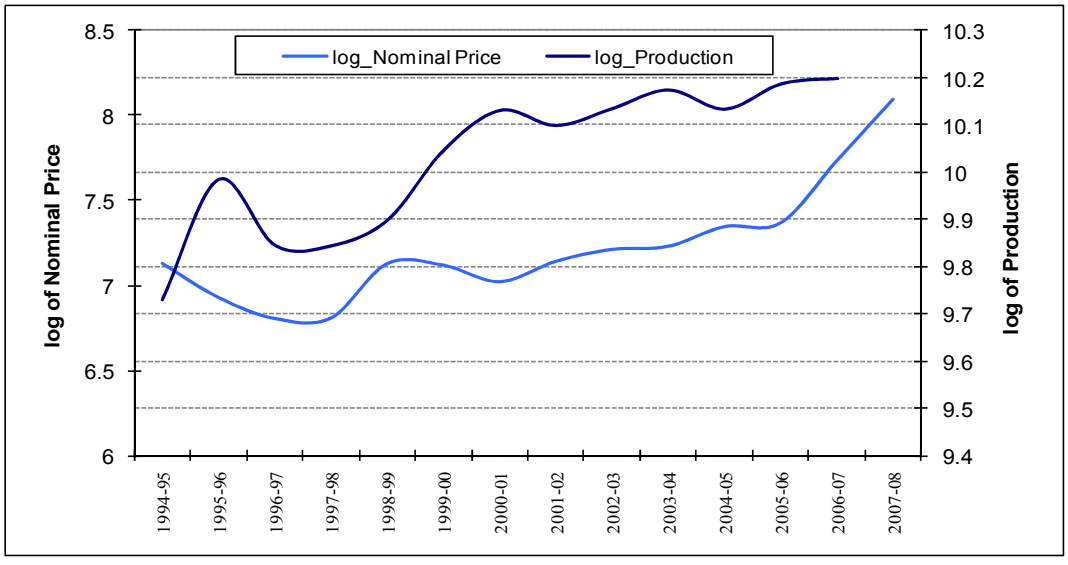
**Table 2.7: Correlation Matrix: Seasonality of Rice and Potato Prices**

| | Potato | Rice |
|---|---|---|
| Potato | 1.00 | -0.293 |
| Sig. Level | 0.00 | 0.383 |
| Rice | -0.293 | 1.00 |
| Sig. Level | 0.383 | 0.00 |

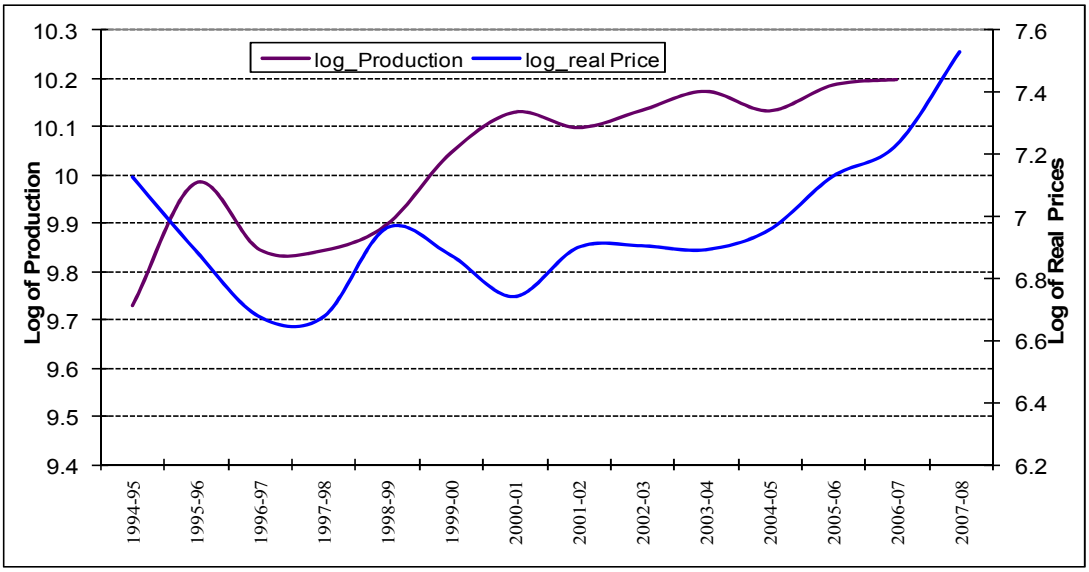
**Table 2.8: Correlation Matrix: Seasonality of Rice and Brinjal Prices**

| | Brinjal | Rice |
|---|---|---|
| Brinjal | 1.00 | 0.722 |
| Sig. Level | 0.00 | 0.012 |
| Rice | 0.722 | 1.00 |
| Sig. Level | 0.012 | 0.00 |

**Graph-2.12: Production and Price Movements**



**Graph-2.13: Production and Price Movements**




**Graph-2.14: Production and Price Fluctuation**

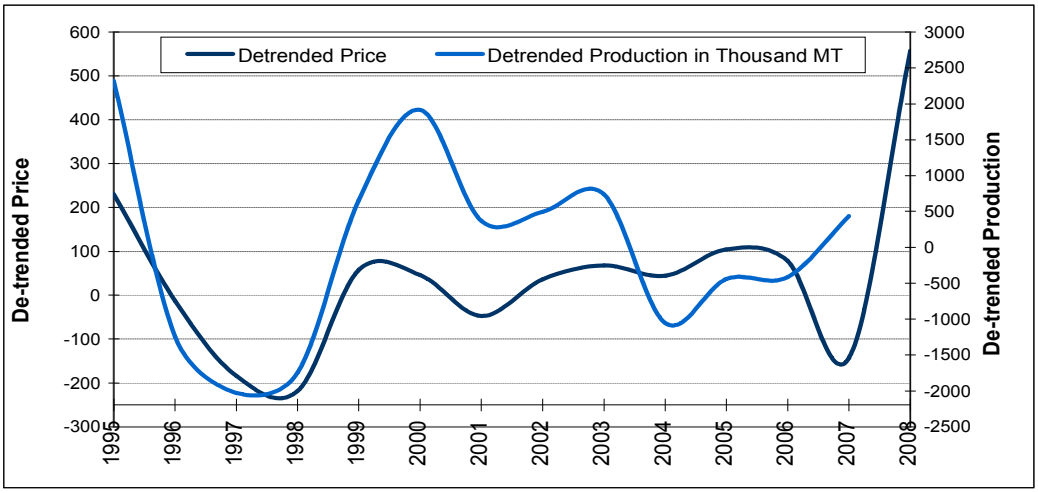



**Table 2.9: Trends in Average Production of Potato and Brinjal**

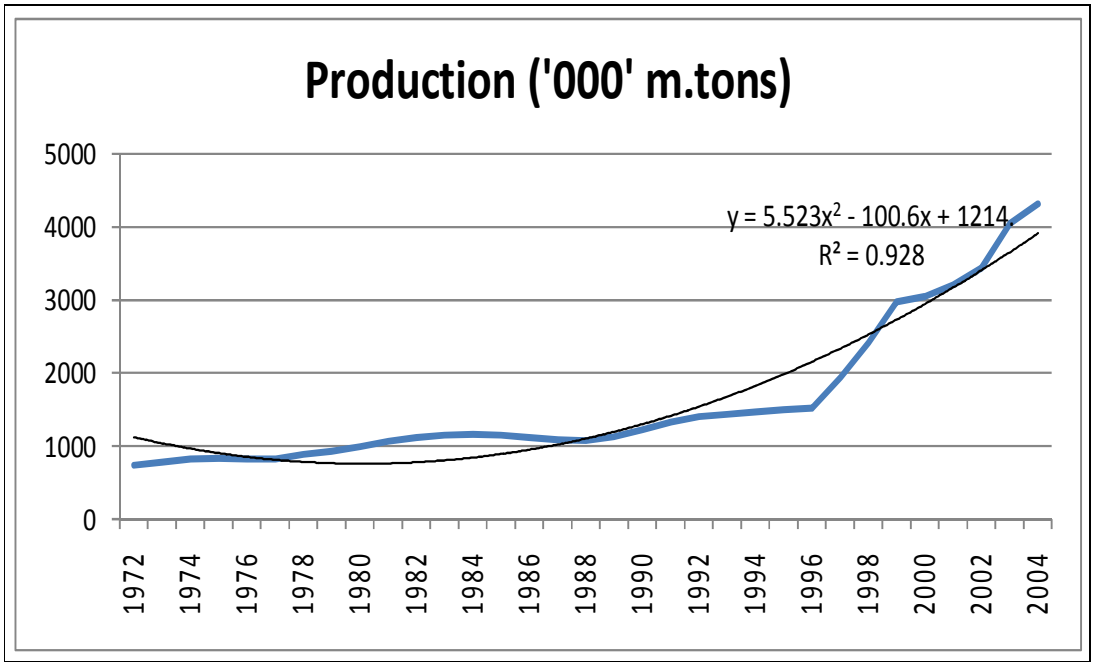
*('000' metric tons)*

| | Year | | | Growth Rate |
|---|---|---|---|---|
| | **1972-80** | **1980-95** | **1995-06** | |
| **Potato** | 824 | 1192 | 2979 | 0.535 |
| **Brinjal** | - | 177 | 308 | 0.319 |

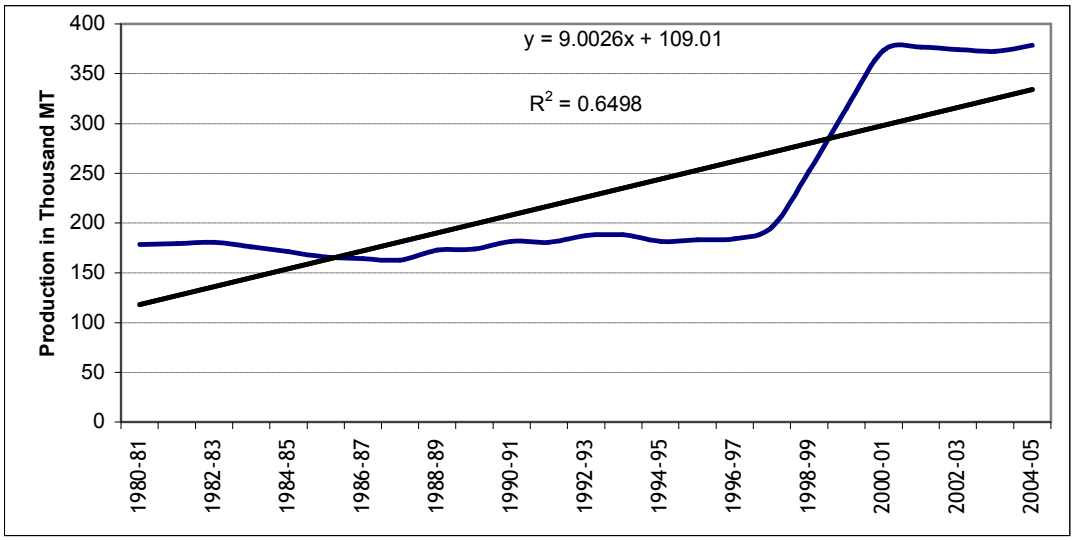
**Table 2.10: Trends in Average Wholesale Price (Tk/quintal) of Potato and Brinjal**

| Food Items | Year | | | | | Growth rate |
|---|---|---|---|---|---|---|
| | 1995-96 | 1997-98 | 2000-01 | 2003-04 | 2006-07 | |
| Potato (Holand White) | 647 | 625 | 610 | 872 | 1598 | 0.198 |
| Brinjal (High Quality) | 807 | 953 | 1052 | 1053 | 1352 | 0.108 |

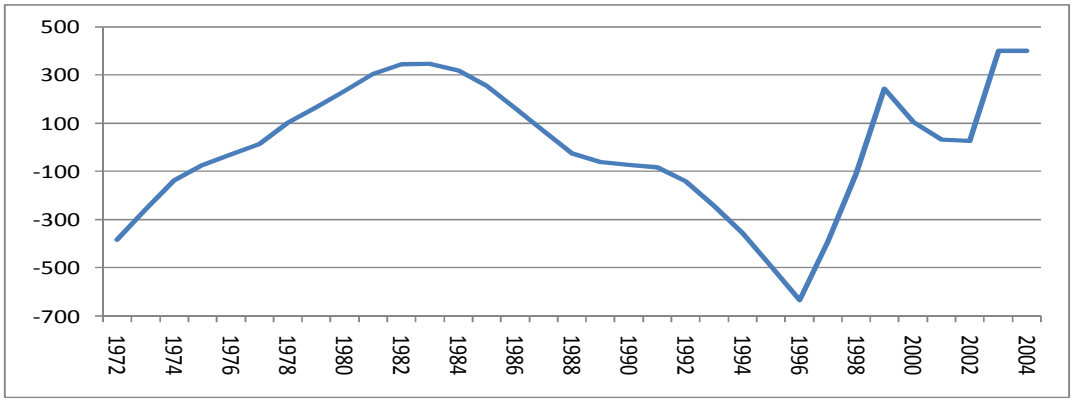
**Graph-2.15: Trends in Potato Production**



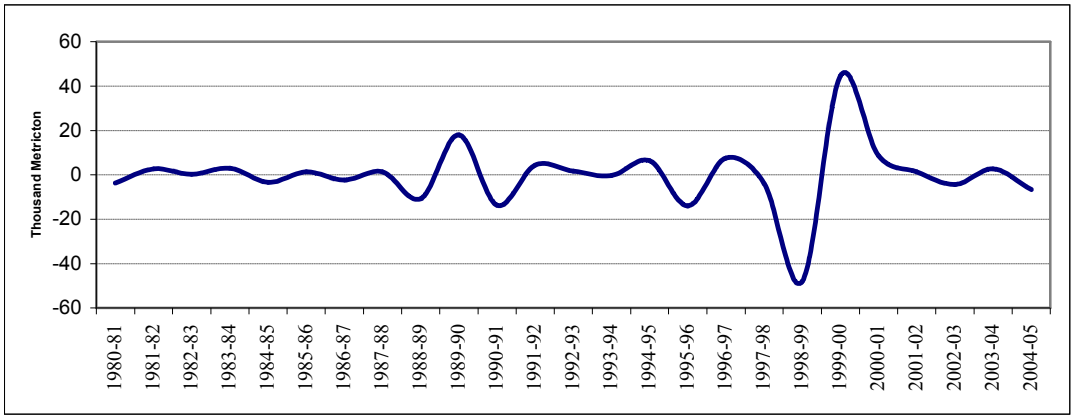

**Graph-2.16: Trends in Brinjal Production**



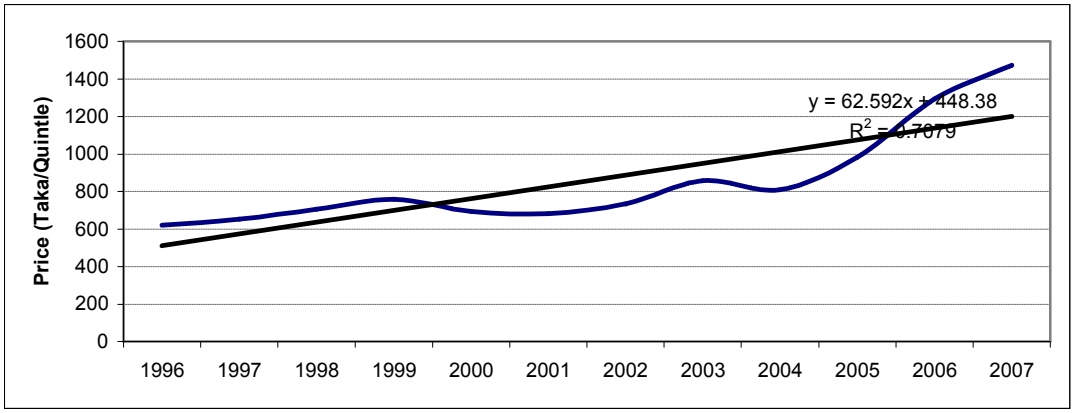
**Graph-2.17: Fluctuations in Potato Production**



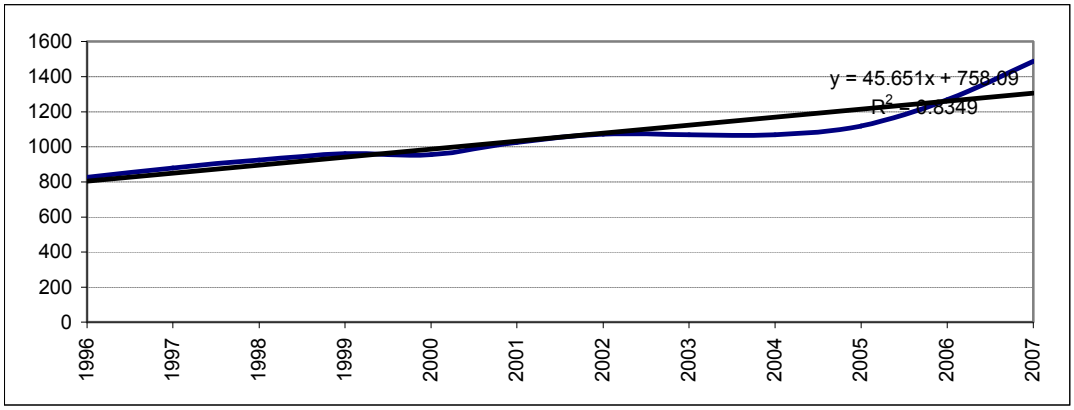

**Graph-2.18: Fluctuations in Brinjal Production**



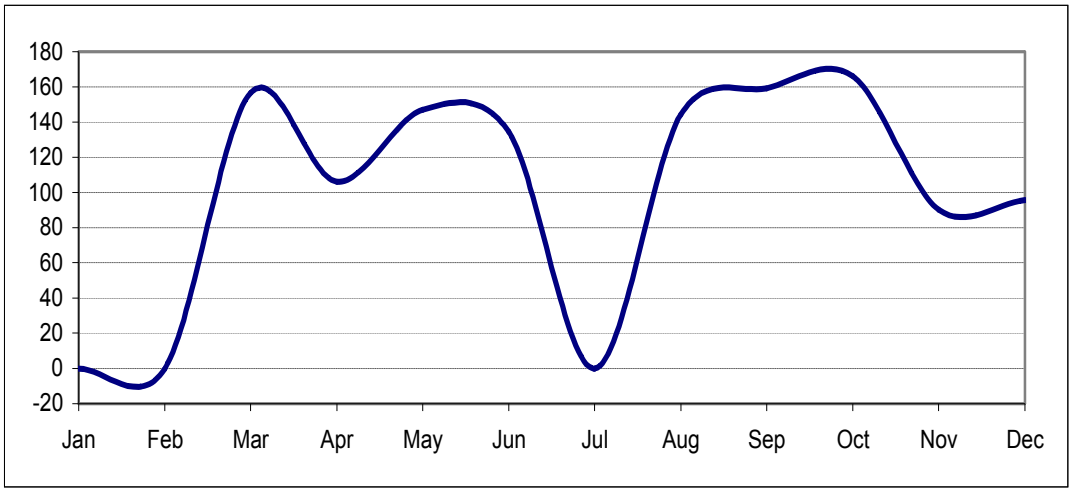

**Graph-2.19: Trends in Potato Price**



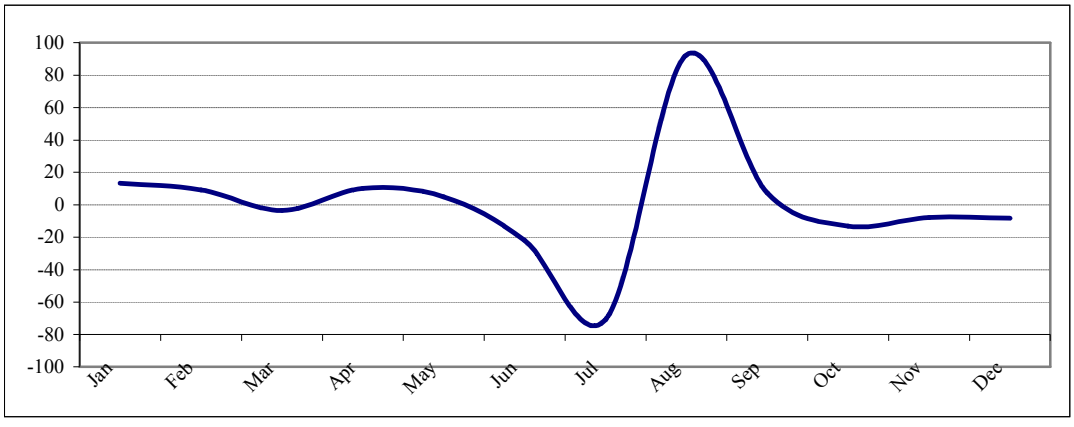
**Graph-2.20: Trends in Brinjal Price**



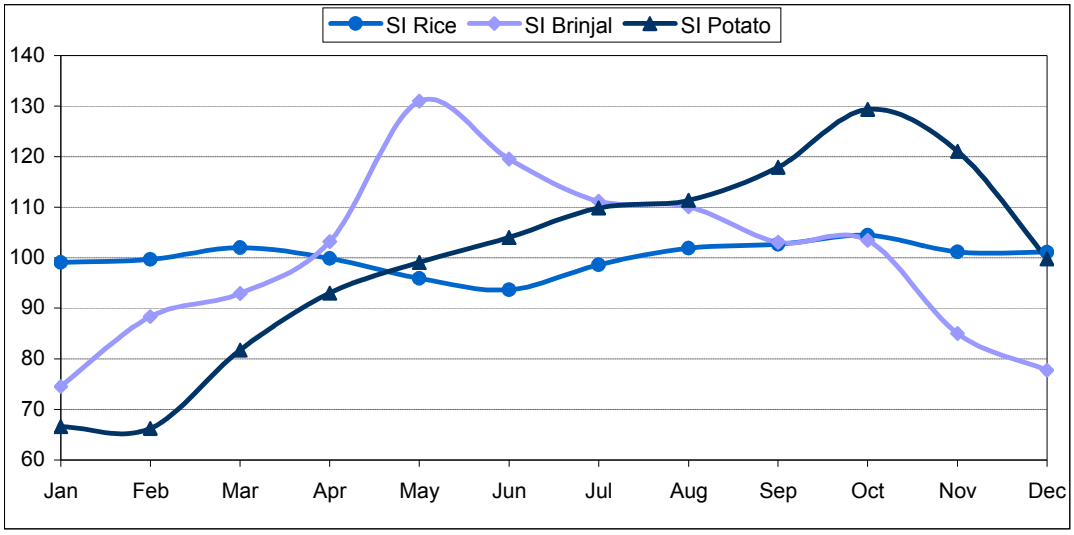

**Graph-2.21: Seasonal Fluctuations in Potato Prices**




**Graph-2.22: Seasonal Fluctuation in Brinjal Prices**



**Graph-2.23: Seasonality Comparisons: Prices of Rice, Potato and Brinjal**



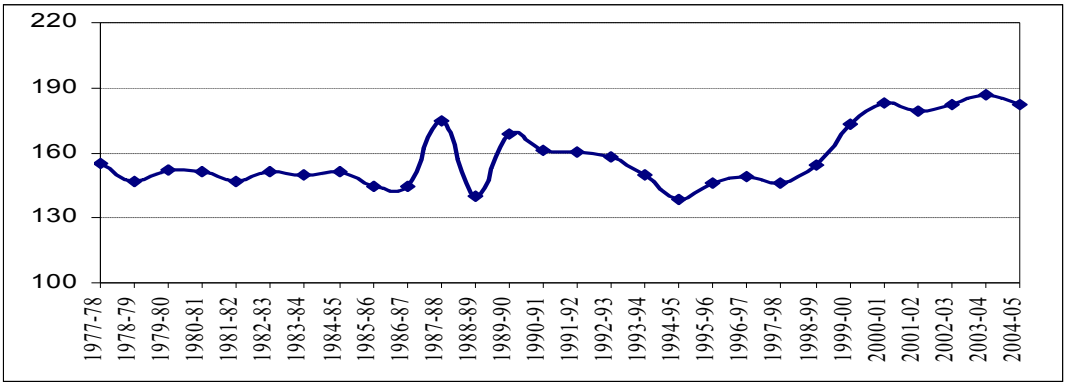

**Fluctuations in Availability and Consumption of Rice**

So far, we have analyzed the trends and fluctuations in production and prices of rice, potato and brinjal at the macro level. Production does not necessarily indicate availability and ensure access at the micro level. An attempt has been made in this sub-section to assess if there is any fluctuation in availability of rice at macro level and access at the micro level.

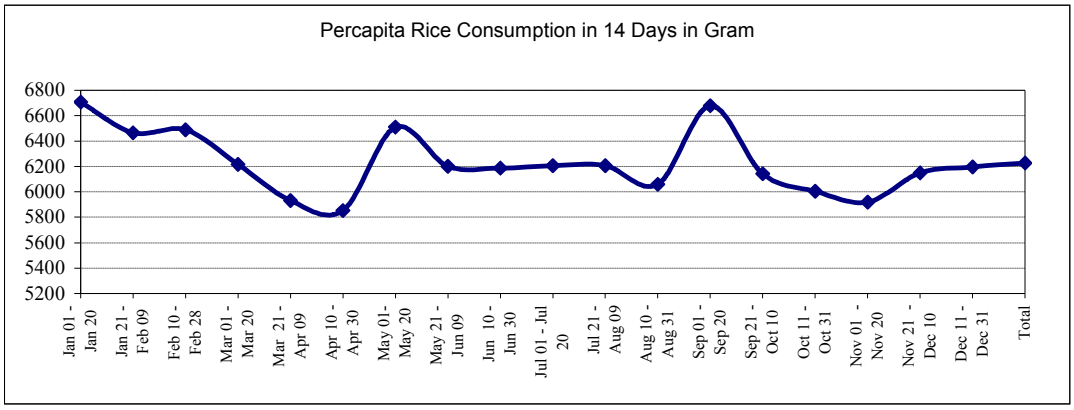
Per capita availability of rice is obtained here by dividing the total annual production and imports of rice by the total population for the respective years. Per capita availability show noticeable inter-year variation during the entire period. However, the results show a relatively higher per capita availability over the last decade compared to previous two decades (Graph 2.24).

Fluctuations in per capita rice consumption have also been analyzed using the Household Income and Expenditure Survey (HIES) Data of 2005. Although HIES is a cross-section data, data were collected during a full calendar year where a period of three-week successive intervals can be identified when the interviews were carried out. Assuming that the households interviewed during each period of interviews represent the total household interviews under HIES, fluctuations in per capita rice consumption has been estimated for each of the 18 consecutive time periods (beginning from 01-20 January, 21 January-10 February, and so on) during 2005. Results show significant fluctuation in rice consumption between months of the year with lowest in March/April and highest in January and May (Graph 2.25). If we compare this with rice price seasonality observed earlier, we observe that while price is high, demand is low and while price is low, demand is high which confirms the law of demand for any particular commodity. ***The relationship observed here also indicates that instability in prices has direct bearing on food consumption and, thus, maintaining stability in food prices, particularly for the staple food is crucial for ensuring food security for the vast majority of the people, particularly the poor people in the country.***

**Graph-2.24: Per Capita Availability of Rice**




**Graph-2.25: Fluctuations in Per Capita Rice Consumption**




## 2.6 Impact of Instability in Income and Prices on Food Consumption

In order to estimate the impact of instability in income (due to instability in production or employment or any other reason) and prices of rice on household food consumption, a logarithmic consumption function has been estimated here with per capita consumption of rice as the dependent variable and a range of other variables as explanatory variables. Important explanatory variables that have been considered here include household income classified into two categories (regular and seasonal), seasonal dummy (peak, lean and the rest), and the prices of rice (as reflected by unit cost). Specification of the model is presented below:

$$\ln C = \alpha + \beta_1 \ln RI + \beta_2 \ln SI + \beta_3 PR + \beta_4 SD + \beta_5 X + \varepsilon$$

Where, C = per capita consumption
RI = regular income
SI = seasonal income
PR = price of rice
SD = seasonal dummies
X = vector of selected household and community characterizes
$\varepsilon$ = disturbance term

A pooled cross-section and time-series data of HIES 2000 and 2005 have been used here to estimate the model applying ordinary last square method. Results are shown in Table 2.11 which indicates significant adverse effects of instability on household food consumption. Per capita regular income had a significant and positive impact on household food consumption as expected. Irregular or seasonal income did have the correct sign but was not found to be statistically significant. Land holding and prices have the correct sign but were only significant at lower levels of probability.

Two seasonal dummies – April and September as two extremes at both ends – were used here to capture the impact of seasonality on consumption but unexpectedly performed poorly in the equation.

**Table 2.11: Estimates of Per Capita Consumption of Rice**

| Selected Explanatory Variable | Estimated Co-efficient | t-statistic | Significance level |
|---|---|---|---|
| Per capita regular income | .045 | 3.87 | .000 |
| Per capita irregular/ seasonal income | -.004 | -0.28 | .777 |
| Total operated land | .019 | 1.42 | .156 |
| Earners per households | -.033 | -0.97 | .334 |
| Education of HH head | -.034 | -.094 | .349 |
| Prices of rice | -.265 | -1.592 | .112 |
| Prices of Ata | .009 | 0.077 | .938 |
| Seasonal dummy (April) | -.044 | -0.814 | .416 |
| Seasonal Dummy (September) | .083 | 0.799 | .425 |
| Access to electricity | -.020 | -0.597 | .551 |
| Dummy for survey year (2005) | .057 | 0.817 | .414 |
| $R^2$ | .08 | - | - |
| F-value | 3.99 | - | .000 |

The low power of the above regression is not unusual in cross-section analysis. The F statistic shows that the overall equation is significant. Prices, regular income and land cultivated were found to be significant and with the expected signs. Seasonal income or the dummies for seasonality failed to reveal any relationship.

## 2.7 Summary and Conclusion

Rice production has increased at a rate of about 3 percent per year over the period 1972/73-2007/08 of which *boro* registered the highest growth (over 16 per cent per year). Productivity of all varieties (as reflected by per acre production of rice) has also increased substantially over the same period. It is also observed that rice production increased at a relatively faster rate in the later periods.

However, the increase in production over the years was not smooth. There were noticeable fluctuations in production between years. It was also observed that there were more fluctuation during 1970s, less fluctuation during the period beginning from early eighties to mid-nineties, and again more fluctuation during the period afterwards. Seasonality analysis

also illustrates a significant seasonality in production of rice in Bangladesh which has bearing on the supply and availability of rice in the domestic market.

Rice price has also gone up significantly over the past years, and in particular, during the last two years both locally and internationally although a downward trend is now observed in more recent months. Results show a clear upward trend in rice price during 1995 till 2008 with noticeable fluctuation between the years. There also exists noticeable seasonality in rice price which shows February/March and September/October as peak and May/June as the bottom. This corroborates with the seasonality patterns observed earlier in the country.

An attempt was made to examine the domestic production-price relationship which tended to suggest that this was weak. A more thorough investigation of these issues is warranted, using preferably the marketed surplus (rather than production) to represent the supply side. Paucity of data of course, makes this difficult.

Regarding other food items – potato and brinjal - results show a secular increase in production of both potato and brinjal during the period beginning from early seventies to mid nineties and sharp increase afterwards. Both potato and brinjal production also register significant fluctuations between years. It is also observed that fluctuation is increasing in recent years compared to previous years. Prices and potato and brinjal have also gone up during the period 1995-2008. Like production, prices have also increased at a faster rate in recent years compared to the previous years. Partial correlation exercises of rice price seasonality with that of potato and brinjal demonstrate that while potato price seasonality offsets rice seasonality (i.e., negative correlation between the two), brinjal price seasonality accentuates it.

It was also observed that instability in prices has a direct bearing on food consumption and, thus, maintaining stability in food prices, particularly for the staple food is crucial for ensuring food security.

*CHAPTER 3*

# SPATIAL MARKET INTEGRATION

## 3.1 Introduction

Market integration is a necessary but not sufficient condition for food security. When markets work, the automatic adjustment process performs an awesome task of coordination with a minimum fuss, and economic resources are allocated efficiently. When markets fail, participants with inside information and economic power are able to exploit both producers and consumers, to the special detriment of the poor at each end (Timmer, Falcon and Pearson, 1983). Market integration per se has two dimensions: vertical and spatial (horizontal). For food security to have any meaningful connotation, attainment of both are an imperative.

When markets are vertically integrated resources are efficiently utilized and no one in the supply can earn supra normal return on their investment. In contrast, spatially integrated markets eliminate possibility of food deficit within a geographic location when there is no deficit at the national level. It may be noted that distinct policy measures are required to deal with disruption in vertical and spatial integrations.

The focus of this chapter is to look into the market integration for three food commodities in Bangladesh, viz. rice, potato, and brinjal. Rice, potato and brinjal are important because of their dietary values and sources of income for growers. These crops thus have important bearing for food security. While rice is the staple food for consumers in the country, the focus should be shifted away from it towards a substitute such potato, to hedge against rice insecurity. In addition, brinjal is an important vegetable in the palate of the low income consumers. Further, rice is hardly perishable and hence can be stored for quite long time. In contrast, brinjal is perishable item so the sellers wish to dispose it off as quickly as possible and also consumers, once they buy it, are required to consume without any delay. Potato comes in between these extreme points. Thus, these three commodities will cover the whole spectrum of food markets in the country. Successive governments have taken various steps to ensure just price for the growers and maintain stable prices of these and other food items. In such a backdrop it is important to see how far markets for these food items are efficient.

Most of the studies of spatial integration were limited to the rice market for obvious reasons. The other two commodities we considered were hardly given any attention in such discourses. So, the review of the works of spatial market integration will be limited to the rice market. Some of this line of studies includes Ravallion (1990), Ahmed and Bernard (1989), Chowdhury (1992), Goletti and Farid (1995), and Das, Zohir and Baulch (1997), and Dawson and Dey (2002).

Ravallion (1986) attempted to test the market integration using a radial market structure with a central market (Dhaka) and a group of five rural markets (Bogra, Dinajpur, Mymensingh, Rangpur, and Sylhet). Each of these five hinterland markets had a history of being surplus in rice. Within his framework the central market dominates the price(s) of the rural market(s) in presence of market integration and fails to persist in its absence. Using district level monthly coarse rice price data for the period July, 1972—June, 1975 which coincided with the famine 1974, he tested market integration. While his findings rejected segmented market structure, evidence on short run market integration was inconclusive. He attributed this apparent failure of market integration in the short run to trade impediments between the central market in Dhaka and the hinterland markets in the north and north-west rather than characterizing it non-competitive.

Ahmed and Bernard (1989) tested market integration in order to assess the efficacy of the aggregate price stabilization program. Even though the authors found higher spatial price spread during the *aus* season compared to *aman* season this did not lead to higher rice arbitrage. The authors estimated the 'Ravallion' model using monthly price data from 19 districts over 1981-1985 and found that only 25% of the *aus* market was segmented compared to 74% of the *aman* markets. Thus, the hypothesis of market integration was by and large could not be rejected.

Chowdhury (1992) tested the market integration together with the ensuing relevance of the 'Ravallion model' with monthly data of coarse rice in 64 districts over July, 1985—June, 1991. Similar to the previous results the hypothesis of integrated market could not be resoundingly rejected. However, Chowdhury also found that the hitherto popular 'Ravallion model' lost ground as Dhaka was no longer the central market which dictated the terms of integration; instead markets have become more diversified with several important nodal points.

Goletti, Ahmed and Farid (1995) attempted to identify the proximate non-price determinants of rice market integration in Bangladesh. The study analyzed prices of 64 districts for the period July, 1989 to June, 1992. Market integration was found to be negatively related to distance, and positively with paved roads among others.

Das, Zohir, and Baulch (1997) studied the market integration using weekly wholesale prices of rice in 14 spatial markets during the first week of December, 1987 to the last week of November, 1996 and found that markets are well integrated. However, they could not find support for the law of one price (LOP). In contrast, Dawson and Dey (2002) found support for it when they revisited the Ravallion model using the post liberalization monthly data from January, 1992 to December 1997.

Rahman (1993) calculated marketing margins of several key agricultural products including rice, potato and brinjal. He finds that marketing margins of different varieties of rice ranges between 14 and 19 percent. The coarse/medium quality Aman rice is comparable to the one considered in this paper. He finds the gross marketing margin of this variety about 16 per cent. Comparing this rate of return of the trading capital with the financial rate of interests of 18 per cent in the formal markets and 20-22 percents in the informal markets and observing that a large part of the wholesale price is received by the farmers he concludes that rice market is efficient and hence vertically integrated. In contrast, he finds that marketing margins for potato are substantially higher at 39 percent but that for brinjal is marginally higher at 17 percent. So, he concludes that markets for (fresh and chilled) potatoes are not efficient in view of the 'abnormal' rate of return. Rahman's (1993) marketing margins of potato are far higher than reported in Moazzem and Fujita (2004). The latter authors based on a village in Comilla find that traders' marketing margins are as low as 1.2 per cent.

CPD (2007) conducted a value chain analysis of a group of essential commodities based on checklist, focussed group discussions and individual case studies. Based on their findings the research team recommended to enact a regulation to deal dampen the volatility of the essential commodity prices, strengthen the market surveillance for these commodities and put zero tariffs on selected 'essential commodities'.

### 3.2 Vertical Integration

In understanding vertical integration, an attempt was made to examine (a) marketing channels and participants, and (b) costs, margins and profits associated with marketing and the process of price formation. To gauge these issues, this study covered the urban markets of Bogra,

Dhaka, and Noakhali for brinjal, potato and rice. To that end a two-stage process was followed. In the first stage the urban markets were visited to interview the market operators to identify intermediaries supplying the products from the production points. In the second stage, follow-up visits were made to farmers to deal with costs, margins and profits based on primary data. The general method used for computations of different margins was:

$$GMM = \sum_{k} P_e - P_b)_k \qquad (2.1)$$

In each kth market segment

$$P_e - P_b = \sum_{i} C_{i\ s,\ f} + \mu_{s,\ f}$$

$$NMM = \mu_{s,\ f} = GMM - \sum_{i} C_{i\ s,\ f} \qquad (2.2)$$

where, GMM = gross marketing margin, NMM = total net marketing margin obtained by all intermediaries e.g., s = suppliers, and f = farmers, $P_b$ = price prevailing in the first point of the marketing chain, $P_e$= price prevailing in the first point of the kth-segment of the marketing chain, $c_i$ = marketing cost of *i*th component (e.g., transport cost, labor cost, processing cost, etc.).

Marketing system plays two roles: physical distribution of commodities and addition of values as these commodities change hands in the process. With these ends in view the marketing margins for these three commodities are examined based on survey data from various actors at two different spatial locations—Bogra and Noakhali.[9] While Bogra is a surplus area for these commodities, Noakhali is a deficit area with only seasonal surplus at the margin. By and large, the marketing chain starts with *farias* and ends with the retailers.

**Market Structure and Intermediaries**

The market for agricultural produce can be thought of as comprising two kinds of circuits – a simple, local circuit catering to localized demand, and a more complex long-distance circuit that connects local supplies to distant markets. Trade basically revolves around spatial arbitraging although some degree of arbitrage over time also exists, especially where commodities are storable. Complexity of market structure increases when processing and packaging are involved. Typically, the market consists of a number of essential intermediation roles carried out by numerous specialized agents. It is important to bear in mind that while different names are used to denote different agents and their functions, there are a number of overlapping roles and functions carried out by the same agent as well as the use of different local names to refer to the same or similar functions that can lead to confusion. These functions and the associated nomenclature are described below.

The most common types of intermediaries referred to in the vernacular are *faria, bepari, aratdar*, and *paikar*. In addition there are various local names in different regions of the country like *cycle bepari, kanda bepari, bharkiwala* and *lai faria*. Things are further complicated by changing roles of some intermediaries with time although the name remains unchanged. The various types of intermediaries are defined below.

*Faria*: Faria operate in local village markets procuring supplies from growers in the market or at the farm gate and selling to beparis in the same market or to local aratdars. The dominant mode is for farias to sell to beparis within the village market. A faria has no fixed premises.

[9] Dhaka was not included in the vertical integration analysis as it is an urban centre where these commodities are not produced. It is a destination point where only a part of the value chain is physically located.

*Bepari*:A bepari trades long distance collecting from farias and growers in a village market, carrying out some sorting, grading and bulking and connecting to an aratdar generally located in a larger market some distance away. Like the faria, the bepari is also an itinerant trader.

*Aratdar*: An aratdar is a broker or a commission agent who connects sellers (beparis) with buyers (other beparis, millers or processors, paikars or even retailers). A fixed commission is charged from both buyers and sellers so that the main goal of an aratdar is to have a high turnover. While the pure function of the aratdar is that of a broker, he is known to wear other hats as well, combining direct (speculative) trading and wholesaling in addition. The aratdar is really the central actor in the market playing the all-important role of enabling stranger-transactions, creating trust, and in general, supporting credible contracts to be entered into and leading to repeat transactions. The aratdar is the ultimate guarantor in an exchange; without him, local village markets would remain unintegrated with larger regional markets, and with the rest of the country.

*Paikar*:Refers to a wholesale buyer purchasing directly from an aratdar or using a bepari to buy on his behalf.

*Retailer:* Procures supplies from a bepari or a paikar.

*Processors*: For some commodities, processors play an important role in the market. Thus the rice milling sector which has expanded astronomically in the last 20 years uses alternative supply chains to ensure raw material availability. While (paddy) aratdars continue to play an important role, increasingly larger millers are collecting their supplies directly from growers using their hired agents. In fact, for the major supply centers, this seems to be the dominant supply chain for large millers. In addition to millers, there are traditional, small-scale paddy processors variously referred to as *kanda bepari, cycle bepari, bharkiwala* and *lai faria* in different parts of the country. They procure paddy from growers and use family labor to dry and parboil the paddy before milling and sell to consumers in the local village market. A further category of processors – *chatals*, used to be ubiquitous 20 years ago but has now become virtually extinct. Their role was to dry, parboil and prepare the paddy for milling by independent millers. The *chital* business was essentially a larger-scale version of the role of the small processor.

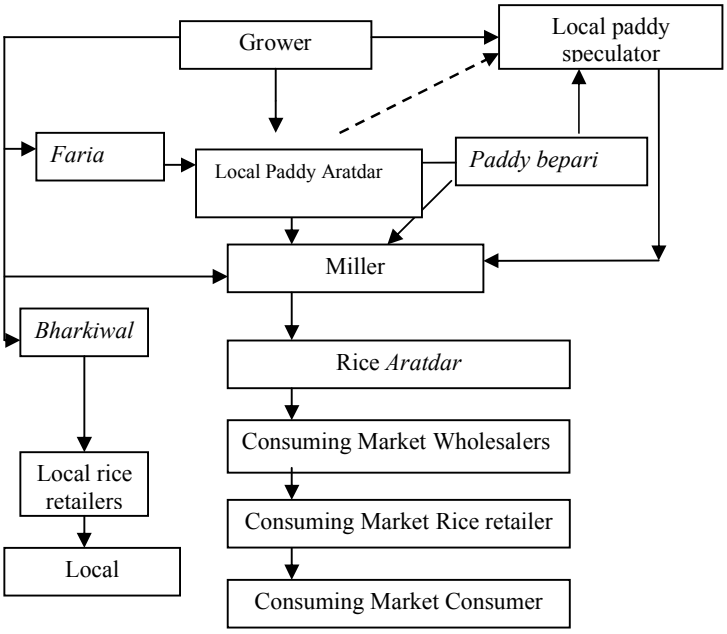
The structure of an agricultural market is illustrated in figure 3.1 using the paddy-rice market as an example. In fact, amongst the different agricultural commodity markets, the paddy-rice market is the largest and the most complex although at its core, the basic mechanics are simple. The market, as already noted, has two clear components: a local circuit and a long-distance circuit. In the diagram below the local circuit is shown on the left of the figure where the main actor is the traditional (small) processor referred to as *bharkiwala*.

The bulk of the market is accounted for by millers and rice aratdars, the former procuring paddy supplies directly from growers through hired agents. A smaller flow is also captured by the paddy aratdars – a category that had virtually disappeared 10 years ago but has now made a small comeback. Rice aratdars dominate the milled rice market playing the most important role of connecting up with large consuming centers with their network of *beparis* and *paikars*.

The top right-hand corner of figure 3.1 shows the paddy speculator: people with some surplus funds undertaking seasonal investments in commodities as a side business, in the hope of benefiting from expected price rise during the lean agricultural season when prices reach a peak. This segment of the market appears to have been growing with easier access to finance and use of remittance earnings sent by migrant labor abroad.

Other agricultural markets like that of brinjal or potatoes are similar in structure except that the circuits are more basic, lacking in a processing sector although, as in the case of potatoes, there is a (cold) storage sector. In order to understand how the market specifically addresses the problems associated with developing and enabling credible, binding (and perhaps equitable) contracts, it is necessary to examine the nature of transactions entered into and how these are structured, patterned and sustained.

**Figure 3.1: Paddy-Rice Trade Circuit**




The marketing channels for brinjal, potato and rice are roughly as follows:

a. *Brinjal: Farias →Beparis →Aratdars/Wholesalers →Retailers*
b. *Potato: Farias →Beparis →Aratdars/Wholesalers →Retailers*
c. *Rice: Paddy Farias →Paddy Beparis →Paddy Aratdars/Wholesalers →Rice Millers →Rice Aratdars/Wholesalers →Rice Retailers*

While some of the above intermediaries such as the miller are involved with production related activities, most of the others *farias*, *beparis*, *aratdars*/wholesalers, and retailers are related with distribution. An attempt has been made to bring about how consumers' buying price was actually shared by, and distributed among various market agents in terms of gross and net margins accrued to each of these agents. These margins may be compared with the formal and informal financial interest rates to see if such returns were unnaturally high. It was evident from the field works that all of the operators involved in the trading of these commodities follow the open bargaining method for determining price at the time of spot transactions.

*Brinjal*

Our intensive field works identified *four* major nodal points in the marketing chains for brinjal. These are *farias*, *beparis*, *aratdars*/wholesalers, and retailers (Table 3.1). The

monthly working capital ranges between one 100 thousands taka for the wholesalers and marginally above five thousands for the retailers. However, it may be noted that retailers sell an array of vegetables. For our purpose we collected data on brinjal only and hence a small amount of working capital. From the growers onwards the major components of consumer expenditures for it are attributable to the transportation and handling costs which ranged between low at 0.21 taka per kg at the *faria* level to as high as 1 taka at the *bepari*, *aratdar*/wholesaler, and retailer levels. The gross and net marketing margins of the agents are also shown in the same table. It appears that gross marketing margins of the *farias* are far below the financial rate of return of capital. In contrast, the *beparis* and the *aratdars*/wholesalers seem to earn normal rate of return on their capital. The retailers earn the highest rate of return of 36 percent on their capital. However, when net marketing margins are concerned it appears that only top half of the supply chain is financially viable.[10] For the *farias* and the *beparis* it is not financially viable business as both of them fail to earn normal net financial rate of return on their capital.

**Table 3.1: Marketing Margins of Brinjal, Potato, and Rice**

| | Costs and Returns | | | | | | Gross Marketing Margins | | Net Marketing Margins | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Price Paid | Marketing Costs | Total Direct Costs* | Interest Costs | Total Costs | Price Received | Tk/Kg | (%) | Tk/Kg | (%) |
| | Marketing Costs and Margins of Brinjal (Tk/Kg) | | | | | | | | | |
| Faria | 8.15 | 0.21 | 8.35 (38,462.97) | 0.10 | 8.46 | 8.49 | 0.34 | 4.19 | 0.03 | 0.35 |
| Bepari | 8.49 | 1.20 | 9.69 (42,378.50) | 0.12 | 9.81 | 10.21 | 1.73 | 20.33 | 0.41 | 4.19 |
| Aratdar/ Wholesaler | 10.21 | 0.84 | 11.05 (1,07,582.50) | 0.14 | 11.19 | 12.85 | 2.64 | 25.83 | 1.66 | 15.04 |
| Retailer | 12.85 | 0.77 | 13.62 (5,289.528) | 0.17 | 13.79 | 17.42 | 4.57 | 35.58 | 3.63 | 26.67 |
| | Marketing Costs and Margins of Potato (Tk/Kg) | | | | | | | | | |
| Faria | 9.18 | 0.17 | 9.35 (90,038.89) | 0.12 | 9.47 | 9.75 | 0.57 | 6.25 | 0.28 | 3.04 |
| Bepari | 9.75 | 1.04 | 10.79 (2,65,954.94) | 0.13 | 10.93 | 11.25 | 1.50 | 15.36 | 0.32 | 2.99 |
| Aratdar/ Wholesaler | 11.25 | 0.26 | 11.51 (16,53,598.16) | 0.14 | 11.66 | 11.74 | 0.49 | 4.36 | 0.08 | 0.72 |
| Retailer | 11.74 | 0.55 | 12.29 (4,9811.09) | 0.15 | 12.44 | 12.54 | 0.80 | 6.81 | 0.10 | 0.78 |
| | Marketing Costs and Margins of Rice (Tk/Kg) | | | | | | | | | |
| Paddy Faria | 17.09 | 0.31 | 17.40 (24,9457.67) | 0.22 | 17.62 | 20.83 | 3.74 | 21.87 | 3.21 | 18.45 |
| Paddy Bepari | 17.47 | 0.31 | 17.78 (5,88,696.64) | 0.22 | 18.00 | 18.09 | 0.62 | 3.55 | 0.08 | 0.48 |
| Paddy Aratdar/ Wholesaler | 19.46 | 0.09 | 19.54 (47,28,486.4) | 0.24 | 19.79 | 24.39 | 4.93 | 25.33 | 4.60 | 23.53 |
| Rice Miller* | 16.23 | 1.08 | 17.30 (63,78,761.28) | 0.22 | 17.52 | 29.96 | 5.37 | 33.11 | 3.41 | 19.73 |
| Rice Aratdar / Wholesaler | 29.96 | 0.37 | 30.33 (15,770,996.63) | 0.38 | 30.71 | 32.68 | 2.72 | 9.08 | 1.97 | 6.50 |

[10] For the purpose of net marketing margins the opportunity costs of total fund devoted to the business is added to the total direct costs.

| | Costs and Returns | | | | | | Gross Marketing Margins | | Net Marketing Margins | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Price Paid | Marketing Costs | Total Direct Costs* | Interest Costs | Total Costs | Price Received | Tk/Kg | (%) | Tk/Kg | (%) |
| Rice Retailer | 32.68 | 0.69 | 33.37 (3,11,098.29) | 0.42 | 33.78 | 37.24 | 4.56 | 13.95 | 3.46 | 10.36 |

Notes: Millers price paid is for paddy and price received is for rice. Figures in the parentheses indicate the total monthly costs in taka.

Market intermediaries at various stages take about 53% equivalent value of the retail price (Table 3.2). Of these, retailers appeared to receive the highest share of 26% of the retail price. However, two important aspects need to be considered before drawing any conclusion about retailers' margin. First, vegetables are highly perishable items and retailers add a premium to the price to offset the associated risks. Second, consumers tend to pick and choose better quality vegetables first, resulting in low quality residual items to be sold at lower prices; some part of the vegetables could also remain unsold at the end of the day. Retailers tend to add a premium to compensate for these losses. The *aratdars*/wholesalers capture about 15 per cent of the retail value. The *farias* and the *beparis* together capture only about 11 per cent of retail price. Thus, the brinjal market appears to be competitive. Despite this competitive nature of the market the growers seem to receive less than fair share of their contribution. While part of this phenomenon may be attributed to the perishable nature of the item, the other factor may be related to the economies of scale of the grower.

**Table 3.2: Distribution of Margins among Market Operators**

| Brinjal | | |
|---|---|---|
| | Percent | Cumulative Percent |
| Growers | 46.75 | 46.75 |
| Faria | 1.96 | 48.71 |
| Bepari | 9.90 | 58.62 |
| Aratdar/Wholesaler | 15.14 | 73.76 |
| Retailer | 26.24 | 100 |
| Potato | | |
| | Percent | Cumulative Percent |
| Growers | 73.20 | 73.20 |
| Faria | 4.57 | 77.77 |
| Bepari | 11.94 | 89.71 |
| Aratdar/Wholesaler | 3.91 | 93.62 |
| Retailer | 6.38 | 100 |
| Rice | | |
| Market Operators | Percent | Cumulative Percent |
| Growers | 69.55 | 69.55 |
| Paddy Faria | 1.51 | 71.06 |
| Paddy Bepari | 6.41 | 77.48 |
| Paddy Aratdar/Wholesaler | 4.01 | 81.49 |
| Rice Miller | 7.13 | 88.61 |
| Rice Aratdar/Wholesaler* | 2.69 | 91.30 |
| Rice Retailer | 8.70 | 100 |

*Potato*

Similar to brinjal, *four* market intermediaries were identified in the supply chain of fresh potato. The monthly working capital ranges from low at taka 5 thousands for the retailers to as high as taka 100 thousands for the *aratdars*/wholesalers. Again, the smaller amount of working is due to the fact these agents sell assorted vegetables and our survey collected data on the fresh potato only. The lowest marketing costs are paid by the *farias* at 0.17 taka/kg and the highest one are borne by *beparis* at 1 taka/kg. As *Beparis* collect potato from growers and *farias* and bring the procured potatoes to the aratdars/wholesalers at their own costs, they incur relatively higher transportation and handling costs. As fresh potato can be stored even outside cold storage for sometime it is not as perishable as some other items such as brinjals are. So, there is hardly any variation in the marketing margins across agents. The gross marketing margins ranges between 6 per cent for the *farias* to more than 15 per cent for the *beparis*. However, when imputed interests are considered the net marketing margins drop below sustainable level for all of the agents.

In case of potato the growers appear to receive about *three quarters* of the retail value. Both the *farias* and *aratdars*/wholesalers each get about 4 per cent of the retail value. While low margins for the aratdars/wholesalers can be explained by the fact that they are really commission agents, low margins for the *farias* can be deemed as an act of exploitation by the dominant agents in the supply chain. In contrast to brinjal the lower degree of perishability leads to shrinkage of the marketing margins of the agents as growers can withstand any unfavorable offer from the *farias* and *beparis*.

*Rice*

In the course of the field survey the supply chain of rice/paddy was identified with *six* nodal points where a separate and distinct agent operated. The monthly working capital for the agents in the supply chain ranges from taka 25 thousands for the paddy farias to as high as taka 6.4 million for the rice millers (Table 3.1). Marketing costs are the lowest at 0.09 taka/kg for the paddy aratdars/wholesalers and the highest at 1.08 taka/kg for the millers. Paddy/rice marketing is a profitable business for all the agents except the paddy beparis and rice aratdars/wholesalers. There is a high variation in marketing margins across the agents: the gross marketing margins for the paddy beparis were 4 per cent. This margin is not commercially viable as the opportunity costs of working capital both in the formal and informal markets are much higher than this rate. While the gross marketing margins of 33 per cent for the millers is the highest, this group drops to the second place when net marketing margins are considered. The net marketing margins of the paddy aratdars/wholesalers were found to the highest at 24 per cent. Considering that millers processing costs are not substantial, the margin accrued to the miller appears to be rather high. Our survey revealed that the millers are the most powerful players in the entire supply chain wielding a significant control over the market price. It was found in the course of the survey that millers tended to store rice procured from suppliers of various types of rice, during the harvesting season. Millers process the paddy according to the market demand; the rest is stored from where the rice is milled gradually as per market signal. The paddy *aratdars*/wholesalers are another group of dominant players in the market. This group procure paddy from the local markets through their agents at lower price and store them to sell at dearer prices.

The paddy growers appear to receive about *70 per cent* of the retail value of rice. Both the paddy *farias* and *beparis* get about 8 per cent of the retail value (Table 3.2). The paddy aratdars/wholesalers get about 4 per cent of the retail value. The low margins for the *aratdars*/wholesalers can be explained by the fact that they are really commission agents. In the rice segment of the supply chain millers get around 7 per cent, and the rice

aratdars/wholesalers get another 3 per cent of the retail value. The highest individual margins go to the rice retailers accruing about 9 per cent of the value.

For perishable items such as brinjal the marketing margins are higher at the latter stages of the transactions. For instance, the marketing margins for wholesalers and retailers are more than double of that earned by *farias* and *beparis*. For this commodity, small volume offered by the *farias* and *beparis* makes their bargaining strength weak. For potato, the marketing margins do not follow any systematic pattern. When looked at the margins of potato vis-à-vis brinjal one may conclude that potato market is more efficient than that of brinjal. In contrast, the marketing margins are higher for rice than potato or brinjal at almost all stages of transaction. Part of these higher margins may be attributed to the amount of capital necessary for doing business in paddy/rice vis-à-vis vegetables. While growers share in the final consumer price is less than 50 per cent for brinjal, it is about 70 per cent for potato and rice. While the shares of market operators are evenly distributed for potato and rice, it is highly concentrated among wholesalers and retailers for brinjal.

### 3.3 Spatial Integration of Markets

Research on the spatial integration of agricultural markets is often used to test the efficiency of agricultural markets. Perfectly integrated markets are usually assumed to be efficient as well. Tomek and Robinson (2003) defines the two axioms of the regional price differences theory: (i) the price difference in any two regions or markets involved in trade with each other equals the transfer costs, and (ii) the price difference between any two regions or markets not involved in trade with each other is smaller than the transfer costs.

Consider two spatially different markets, where the price of a given good in time $t$ is $P_{1t}$ and $P_{2t}$ respectively. The two markets are considered integrated, if the price on market 1 equals the price on market 2 corrected with transport costs, $K_t$:

$$P_{1t} = P_{2t} + K_t \tag{3.1}$$

Trade between the two markets occurs only if $|P_{1t}–P_{2t}| > K_t$. To put it other way, the arbitrage ensures that prices of the same good traded in spatially separate markets equalize. Early studies of spatial integration employed correlation and regression analysis. These papers usually tested some form of the *Law of One Price (LOP)*. Consider the equation:

$$P_{1t} = \beta_0 + \beta_1 P_{2t} \tag{3.2}$$

According of the *strong version* of *LOP*, prices of a given good on the spatially separated markets are equal, and they move perfectly together in time. Using the coefficients of equation (3.2), the necessary conditions are $\beta_0 = 0$, and $\beta_1 = 1$. In real life however, the *strong version* occurs only very rarely, therefore the *weak version* of *LOP* was also defined. The *weak version* states that only the price ratio is constant, the actual price level is different due to transport and other transfer costs. Using again the notation of equation (3.2), the necessary restrictions are $\beta_0 \neq 0$ and $\beta_1 = 1$. With the evolution of time series econometrics, recent papers test a more general (wider) notion of horizontal integration of spatially separated markets. In this case the long-run co-movement of prices is analysed, the *strong* and *weak versions* of *LOP* however, remain testable hypotheses.

To avoid the danger of spurious regression with potentially non-stationary variables, cointegration needs to be tested. The Johansen cointegration procedure is based on estimating the following Vector Error Correction Model (VECM):

$$\Delta P_t = \Pi P_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta P_{t-i} + \varepsilon_t \qquad (3.3)$$

,where $P_t = [\, P^1_t, P^2_t]'$, a (2 x 1) vector containing the prices in districts 1 and 2, both I(1), $\Gamma_i$ are (2x2) vectors of the short-run parameters, Π is (2x2) matrix of the long-run parameters, $\varepsilon_t$ is the white noise stochastic term. Π is a product of two terms written as

$$\Pi = \alpha\beta' \qquad (3.4)$$

where matrix $\alpha$ represents the speed of adjustment to disequilibrium and $\beta$ is a matrix which represents up to (n-1) cointegrating relationships between the non-stationary variables. Trace and maximum Eigen-value statistics are used to test for cointegration. Once equation (3.3) is estimated we can proceed to test for weak exogeneity and then for linear restrictions on the $\beta$ vector. One obvious candidate would be to test whether the elements of the vector are of the (-1, 1) form, i.e. the markets are perfectly integrated. The terms of vector $\alpha$ (factor loading matrix) measure the speed at which the variables adjust towards the long-run equilibrium after a price shock. The $\alpha$ vector of the weakly exogenous variable equals zero. To find the direction of the Granger causality between the two price series, restrictions are tested on the $\alpha$ vectors.

Given cointegration, two hypothesis tests are of interest. First, we test the null that $\beta_1=1$ and $\beta_2=-1$ using a likelihood ratio statistic. Non-rejection of the null implies perfect market integration, while rejection implies imperfect market integration. Second, we test the nulls of long-run non-causality following Mosconi and Giannini (1992) testing separately $\alpha_1=0$ and $\alpha_2=0$, again using LR-statistics; in (3.3), when k=1, this is equivalent to testing Granger non-causality. Consider the case where $\alpha_2=0$: in the second equation in (3.3) with $\Delta P_{2t}$ as the dependent variable, the error correction term (third term on the RHS) is excluded and the long-run solution to $P_{2t}$ is not affected by departures from the equilibrium defined by the cointegrating vector; here the market in which $P_{2t}$ is determined is dominant. Similarly, $P_{2t}$ does not cause $P_{1t}$ if $\alpha_1=0$ in (3.3) and the market in which $P_{1t}$ is determined is dominant. Feedback between $P_{1t}$ and $P_{2t}$ is also possible and is implied by $\alpha_1\neq0$ and $\alpha_2\neq0$. Estimates of $\alpha_1$ and $\alpha_2$ indicate speeds of adjustment of $P_{1t}$ and $P_{2t}$ to disequilibrium error in each period.

Our price data consist of monthly nominal wholesale prices of coarse rice (taka/ton) for Dhaka and 11 regional markets for the post-liberalization period, January, 1995–December, 2007. The three rice seasons are *aus*, *aman* and *boro*. Production in the Aus season is small (5–10 per cent of total production) and only the prices of Aman and Boro are used. Aman is harvested in November/December while Boro is harvested in May/June. Accordingly, we use the Aman price between November–April when Boro is not typically sold and the Boro price between May–October when Aman is not typically sold.

The source of the data is the Bangladesh Department of Agricultural Marketing (DAM). DAM has a permanent headquarters in each district of Bangladesh staffed by an officer and other investigators. Weekly wholesale prices for each crop are collected from a sample of local markets. The markets are typically in headquarters' towns but may be in nearby villages; also included are some government-notified markets. Sample prices are assumed to be representative of prices in all local markets, and their simple arithmetic average is the weekly wholesale price for the district. All weekly prices are discussed and checked for consistency each month at the district level before they are sent to the DAM head office in Dhaka which uses simple arithmetic averages to derive monthly prices for publication.

Table A1-A3 present the results of testing for unit roots in each price series for brinjal, potato and rice using ADF (Dickey and Fuller, 1981), PP (Phillips and Perron, 1988) and KPSS

(Kwiatowski, Phillips, Schmidt, and Shin, 1992) tests. Irrespective of whether a trend is included in the model or not all series are I (1).Thus, we seek cointegrating relationships between the pair of prices in each of the six regional markets. In doing so, we applied a 'modified' Ravallion model along the following line of argument: Each divisional market is cointegrated with one hinterland market and all divisional markets are cointegrated.

### 3.4 Divisional and Hinterland Price Pairs of Brinjal, Potato and Rice

The first step of the Johansen procedure is to select the order of the VAR for each price relationship. We use the LR-statistic, adjusted for small samples, to test the null hypothesis that the order of the VAR is k against the alternative that it is six where k=0, 1, 2 . . . 5 and for all cases, k=1. The Johansen procedure and trace statistics are used to test for the presence of a cointegrating vector in each price relationship using the so-called Pantula principle. For all price relationships of brinjal, potato and rice, one cointegrating vector (r=1) each was found and the results are reported in Table 3.1. Thus, the LOP holds between the sets of regional markets. The same table also shows the results of hypothesis tests.

First, the null hypothesis that $\beta_1 = 1$ and $\beta_2 = -1$ is rejected in all cases of brinjal implying that imperfect market integration for this commodity is widespread in Bangladesh. In contrast, the null cannot be rejected in any of the cases for potato implying that market for this commodity is perfectly integrated. The status of market integration for coarse rice is mixed: market integration is perfect for all regional markets except Dhaka-Mymensingh and Khulna-Kushtia pairs. The rice market results suggest that while markets are well integrated generally, there are pockets or areas where markets are not well integrated. These areas may need special attention of the government and thus requires identification, monitoring and further examination.

**Table 3.3: Maximum Eigen Value Statistics, Trace Statistics, and Hypothesis Tests**

| Market Pairs | $H_0(H_1)$ | $\lambda_{-Max}$ | Trace | $H_0$: B1=-1; β2=1 | $H_0$: $\alpha_1=0$ | $H_0$: $\alpha_2=0$ |
|---|---|---|---|---|---|---|
| | | | Brinjal | | | |
| Barisal | r=0(r=1) | 45.559* | 52.097* | 8.038* | 9.374* | 25.709* |
| Bhola | r≤1(r=2) | 6.538 | 6.538 | [0.005] | [0.002] | [0.000] |
| Chittagong | r=0(r=1) | 14.221* | 14.662* | 20.347* | 3.029* | 3.888* |
| Comilla | r≤1(r=2) | 0.441 | 0.441 | [0.000] | [0.082] | [0.049] |
| Dhaka | r=0(r=1) | 23.665* | 24.169* | 7.456* | 0.025 | 28.284* |
| Munshiganj | r≤1(r=2) | 0.503 | 0.503 | [0.006] | [0.875] | [0.000] |
| Khulna | r=0(r=1) | 33.398* | 38.888* | 6.106* | 1.511 | 9.961* |
| Kushtia | r≤1(r=2) | 5.490 | 5.490 | [0.014] | [0.219] | [0.002] |
| Rajshahi | r=0(r=1) | 19.739* | 19.908* | 1.002 | 16.837* | 1.274 |
| Bogra | r≤1(r=2) | 0.169 | 0.169 | [0.317] | [0.000] | [0.259] |
| Sylhet | r=0(r=1) | 20.025* | 20.664* | 19.623* | 3.944* | 3.194* |
| Moulavi Bazar | r≤1(r=2) | 0.638 | 0.638 | [0.000] | [0.047] | [0.074] |
| | | | Potato | | | |
| Barisal | r=0(r=1) | 18.794* | 20.875* | 0.063 | 0.067 | 11.525* |
| Bhola | r≤1(r=2) | 2.081 | 2.081 | [0.801] | [0.796] | [0.001] |
| Chittagong | r=0(r=1) | 18.921* | 20.890* | 0.045 | 0.247 | 11.841* |
| Comilla | r≤1(r=2) | 1.969 | 1.969 | [0.840] | [0.619] | [0.001] |
| Dhaka | r=0(r=1) | 31.700* | 33.727* | 0.282 | 0.192 | 5.756* |
| Munshiganj | r≤1(r=2) | 2.027 | 2.027 | [0.595] | [0.662] | [0.016] |
| Khulna | r=0(r=1) | 18.118* | 20.041* | 1.234 | 3.020* | 0.002 |
| Kushtia | r≤1(r=2) | 1.923 | 1.923 | [0.267] | [0.082] | [0.960] |

| Market Pairs | $H_0(H_1)$ | $\lambda_{-Max}$ | Trace | $H_0$: B1=-1; β2=1 | $H_0$: $\alpha_1=0$ | $H_0$: $\alpha_2=0$ |
|---|---|---|---|---|---|---|
| Rajshahi | r=0(r=1) | 19.863* | 22.816* | 0.052 | 0.999 | 6.171* |
| Bogra | r≤1(r=2) | 2.953 | 2.953 | [0.820] | [0.318] | [0.013] |
| Sylhet | r=0(r=1) | 16.869* | 20.040* | 0.135 | 0.924 | 3.861* |
| Moulavi Bazar | r≤1(r=2) | 3.171 | 3.171 | [0.714] | [0.336] | [0.049] |
| | | | Coarse Rice | | | |
| Barisal | *r=0(r=1)* | 27.164* | 28.401* | 0.338 | 11.999* | 1.012 |
| Patuakhali | *r≤1(r=2)* | 1.236 | 1.236 | [0.561] | [0.001] | [0.314] |
| Chittagong | *r=0(r=1)* | 25.425* | 26.597* | 0.392 | 3.316* | 8.334* |
| Feni | *r≤1(r=2)* | 1.172 | 1.172 | [0.531] | [0.069] | [0.004] |
| Dhaka | *r=0(r=1)* | 31.448* | 33.761* | 6.171* | 3.831* | 7.491* |
| Mymensingh | *r≤1(r=2)* | 2.313 | 2.313 | [0.013] | [0.050] | [0.006] |
| Khulna | *r=0(r=1)* | 28.680* | 30.247* | 8.138* | 3.187* | 10.228* |
| Kushtia | *r≤1(r=2)* | 1.567 | 1.567 | [0.004] | [0.074] | [0.001] |
| Rajshahi | *r=0(r=1)* | 32.156* | 33.943* | 0.901 | 2.343 | 12.384* |
| Naogaon | *r≤1(r=2)* | 1.786 | 1.786 | [0.342] | [0.132] | [0.000] |
| Sylhet | *r=0(r=1)* | 27.873* | 29.079* | 1.090 | 3.215* | 4.037* |
| Moulavi Bazar | *r≤1(r=2)* | 1.206 | 1.206 | [0.297] | [0.073] | [0.045] |
| **Dhaka** | ***r=0(r=1)*** | **18.181*** | **21.254*** | **10.979*** | **18.607*** | **4.521*** |
| **Kolkata** | ***r≤1(r=2)*** | **3.074** | **3.074** | **[0.001]** | **[0.000]** | **[0.034]** |

Note: Figures with asterisk are significant at 5 per cent probability level; those with brackets are p-values.

**Table 3.4: Normalized Vectors of Cointegrating and Adjustment Coefficients**

| Market Pairs | Intercept | $\beta_2$ | $\alpha_1$ | $\alpha_2$ |
|---|---|---|---|---|
| | | Brinjal | | |
| Barisal | 721.506 | -1.686 | 0.377 | 0.732 |
| Bhola | 151.716 | (0.136) | (0.085) | (0.105) |
| Chittagong | - | -0.709* | -0.373 | 0.123 |
| Comilla | - | (0.030) | (0.184) | (0.222) |
| Dhaka | - | -1.121* | 0.002 | 0.444 |
| Munshiganj | - | (0.043) | (0.168) | (0.111) |
| Khulna | -316.195 | -0.736* | -1.064 | -0.500 |
| Kushtia | (60.735) | (0.065) | (0.220) | (0.207) |
| Rajshahi | - | -1.012* | -0.481 | 0.125 |
| Bogra | - | (0.022) | (0.254) | (0.239) |
| Sylhet | - | -1.144* | -0.188 | 0.346 |
| Moulavi Bazar | - | (0.029) | (0.195) | (0.216) |
| | | Potato | | |
| Barisal | 23.129 | -0.999* | -0.129 | 0.563 |
| Bhola | (30.180) | (0.033) | (0.288) | (0.323) |
| Chittagong | 42.990 | -0.986* | 0.076 | 0.513 |
| Comilla | (52.741) | (0.058) | (0.162) | (0.176) |
| Dhaka | -35.810 | -0.976* | -0.711 | 0.449 |
| Munshiganj | (13.525) | (0.016) | (0.495) | (0.471) |
| Khulna | -52.778 | -0.962* | -0.461 | -0.045 |
| Kushtia | (31.036) | (0.037) | (0.261) | (0.281) |
| Rajshahi | -8.346 | -0.995* | -0.232 | 0.404 |

| Market Pairs | Intercept | $\beta_2$ | $\alpha_1$ | $\alpha_2$ |
|---|---|---|---|---|
| Bogra | (42.012) | (0.053) | (0.203) | (0.225) |
| Sylhet | -13.781 | -0.983* | -0.259 | 0.205 |
| Moulavi Bazar | (49.311) | (0.052) | (0.212) | (0.220) |
| | | Coarse Rice | | |
| Barisal | -97.336 | -0.956* | -0.602 | 0.062 |
| Patuakhali | (60.466) | (0.045) | (0.169) | (0.172) |
| Chittagong | -7.784 | -0.988* | -0.140 | 0.492 |
| Feni | (64.685) | (0.049) | (0.124) | (0.151) |
| Dhaka | 116.170 | -1.110* | -0.237 | 0.413 |
| Mymensingh | (62.457) | (0.048) | (0.161) | (0.155) |
| Khulna | -113.339 | -0.918* | -0.364 | 0.618 |
| Kushtia | (37.726) | (0.029) | (0.241) | (0.229) |
| Rajshahi | 29.647 | -1.035* | -0.277 | 0.613 |
| Naogaon | (44.707) | (0.035) | (0.155) | (0.178) |
| Sylhet | 107.207 | -1.045* | -0.252 | 0.326 |
| Moulavi Bazar | (52.913) | (0.039) | (0.145) | (0.148) |
| **Dhaka** | **236.713** | **-1.464*** | **-0.518** | **-0.179** |
| **Kolkata** | **(162.924)** | **(0.099)** | **(0.098)** | **(0.077)** |

Note: Figures in the parentheses are standard errors.

Second, we test the two nulls of non-causality, that is, that $\alpha_1=0$ and, that $\alpha_2=0$. For brinjal results show that except in three cases viz. Barisal-Bhola, Chittagong-Comilla, and Sylhet-Moulavi Bazar which show bi-directional causality, uni-directional causality is observed in the market pairs. For potato the Granger-causality seems to be uni-directional for all six pairs of markets. For coarse rice, as many as four markets show bi-directional causality. While uni-directional causality implies presence of dominant market, the bi-directional causality implies feedback relationship.

Table 3.4 shows the cointegrating vector for each relationship. It may be noted that slope coefficient is close to unity once again testifying that markets are integrated. However, the negative intercepts for several market pairs are difficult to justify. Also shown in Table 3.4 are the adjustment coefficients, $\alpha_1$and $\alpha_2$, which show the speeds at which $\Delta P_{1t}$ and $\Delta P_{2t}$ adjust towards each single long-run cointegrating relationship. There is a wide variation in the speed of adjustment for brinjal, potato and rice; for brinjal it ranges from as low as 0.002 to as high as 1.06; for potato it ranges between 0.04 and 0.7; and for rice it ranges between 0.06 and 0.6. Economic agents in brinjal, potato and rice markets remove these ranges of disequilibrium each period. For the bi-directional causality cases shock to either price is permanent.

*Divisional Prices of Brinjal, Potato and Rice*

For all price relationships of brinjal, potato and rice, one cointegrating vector (r=1) each was found and the results are reported in Table 3.5. Thus, the LOP holds among the divisional markets. As found earlier, LOP holds between the divisional and hinterland markets. Hence, it may be claimed that all divisional and hinterland markets are integrated together, i.e., the modified Ravallion models works for these commodities. Table 3.6 shows the coefficients of the cointegration vectors and the adjustment coefficients. While coarse rice and potato have intercepts in their respective long run relationships, brinjal has no such intercept. Most of the coefficient and adjustment vectors are significant implying long run stable relationships.

However, as Table 3.5 shows, some of the prices may be safely excluded from the long run relationship and hence these prices do not adjust to any long run disequilibrium.

**Table 3.5: Maximum Eigen Value Statistics and Trace Statistics of the Divisional Prices**

| $H_0(H_1)$ | $\lambda_{-Max}$ | Trace | $\lambda_{-Max}$ | Trace | $\lambda_{-Max}$ | Trace |
|---|---|---|---|---|---|---|
| | Brinjal | | Potato | | Coarse Rice | |
| *r=0(r=1)* | 57.760 | 122.240 | 60.557 | 151.501 | 48.027 | 155.108 |
| *r≤1(r=2)* | 26.242 | 64.480 | 33.893 | 90.944 | 36.426 | 107.081 |
| *r≤2(r=3)* | 17.450 | 38.238 | 24.907 | 57.051 | 29.419 | 70.655 |
| *r≤3(r=4)* | 11.660 | 20.788 | 17.553 | 32.144 | 25.346 | 41.236 |
| *r≤4(r=5)* | 9.103 | 9.128 | 13.015 | 14.591 | 14.498 | 15.890 |
| *r≤5(r=6)* | 0.025 | 0.025 | 1.576 | 1.576 | 1.391 | 1.391 |

*Dhaka and Kolkata Prices of Rice*

After the extent of spatial market integration of coarse rice is assessed in the domestic market, it was interesting to check whether Bangladesh rice wholesale market is integrated with international market. Since bulk of the rice imports originates in India we checked the nature of cointegration between Dhaka and Kolkata wholesale coarse rice markets[11]. As reported in Table 3.3, a unique cointegration vector is observed between Dhaka and Kolkata wholesale price of coarse rice. However, the null of $\beta_2 = -1$ is resoundingly rejected. Thus, integration in these two markets is less than perfect. Similar to some divisional markets, $\alpha_1=0$ and, that $\alpha_2=0$ are also rejected implying that neither of these markets dominates; instead there is a feedback relationship between Dhaka and Kolkata markets. This result is counter-intuitive as India hardly imports coarse rice from Bangladesh. The speed of adjustment towards equilibrium ranges from low 0.18 to as high as 0.52 implying that economic agents in coarse rice markets remove these ranges of disequilibrium each period. Since there is evidence of bi-directional causality, shocks to either the Dhaka or the Kolkata price takes time to decay or dissipate.

The finding that the two markets are less than perfectly integrated implies that each market takes the price signals of the other into account only partially. It is likely that there are other exporting countries besides India that influence price behaviour in Dhaka. Dhaka prices could also affect Kolkata prices if there is a substantial price differential, through informal trading over a long porous border.

**Table 3.6: Normalized Vectors of Cointegrating and Adjustment Coefficients**

| Markets | β′ | α′ | β′ | α′ | β′ | α′ |
|---|---|---|---|---|---|---|
| | Brinjal | | Potato | | Coarse Rice | |
| Constant | - | - | -33.417 | - | -331.175 | - |
| | - | - | (12.172 | - | (211.189) | - |
| Barisal | 1.000 | 0.018 | 1.000 | -1.471 | 1.000 | -0.067 |
| | - | (0.019) | - | (0.486) | - | (0.041) |
| Chittagong | -0.447 | 0.035 | -0.003 | -0.626 | 2.066 | -0.103 |
| | (1.139) | (0.021) | (0.081) | (0.479) | (0.608) | (0.032) |
| Dhaka | 3.542 | 0.039 | -0.347 | 0.173 | 2.839 | -0.073 |
| | (1.132) | (0.033) | (0.099) | (0.546) | (0.782) | (0.043) |

[11] The author is grateful to Dr. Ciro, FAO, Dhaka for providing monthly wholesale price of coarse rice in Kolkata, West Bengal, India for the period June 2005 to November, 2008.

| Markets | β′ | α′ | β′ | α′ | β′ | α′ |
|---|---|---|---|---|---|---|
| | Brinjal | | Potato | | Coarse Rice | |
| Khulna | 12.834 | -0.001 | -0.636 | -0.005 | -0.668 | -0.039 |
| | (2.021) | (0.016) | (0.086) | (0.548) | (0.826) | (0.040) |
| Rajshahi | -13.797 | 0.076 | 0.088 | -1.008 | -4.490 | 0.073 |
| | (2.163) | (0.018) | (0.074) | (0.581) | (0.720) | (0.034) |
| Sylhet | -3.473 | 0.054 | -0.105 | -1.052 | -0.632 | 0.016 |
| | (1.019) | (0.021) | (0.054) | (0.505) | (0.721) | (0.036) |

Note: Figures in the parentheses are standard errors.

**Table 3.7: Exclusion Restrictions and Weak Exogeneity Tests ($H_0$: βj=0, $H_0$: αi=0)**

| Markets | β′ | α′ | β′ | α′ | β′ | α′ |
|---|---|---|---|---|---|---|
| | Brinjal | | Potato | | Coarse Rice | |
| Barisal | 0.435 | 0.046 | 6.108* | 3.520* | 0.677 | 0.053 |
| | [0.510] | [0.830] | [0.013] | [0.061] | [0.411] | [0.818] |
| Chittagong | 0.423 | 0.505 | 0.024 | 1.320 | 0.684 | 1.058 |
| | [0.515] | [0.477] | [0.878] | [0.251] | [0.408] | [0.304] |
| Dhaka | 0.237 | 0.602 | 1.068 | 0.065 | 9.396* | 9.999* |
| | [0.626] | [0.438] | [0.302] | [0.799] | [0.002] | [0.002] |
| Khulna | 6.548* | 0.371 | 4.548* | 0.154 | 0.049 | 0.303 |
| | [0.010] | [0.542] | [0.033] | [0.695] | [0.825] | [0.582] |
| Rajshahi | 6.718* | 5.582* | 5.041* | 1.677 | 0.121 | 1.606 |
| | [0.010] | [0.018] | [0.025] | [0.195] | [0.728] | [0.205] |
| Sylhet | 2.607* | 1.088 | 5.489* | 0.055 | 10.860* | 4.331* |
| | [0.106] | [0.297] | [0.019] | [0.814] | [0.001] | [0.037] |

Note: Figures with brackets are p-values.

## 3.5 Conclusion

All the operators involved in the trading of brinjal, potato and coarse rice follow the open bargaining method for determining the price at the time of spot transactions. Marketing costs are higher for the beparis for both the types of vegetables ostensibly due to transport costs. The marketing margins for wholesalers and retailers are more than double of that earned by farias and beparis. For brinjal, the small volume offered by the farias and beparis weakens their bargaining strength. For potato, the marketing margins do not follow any systematic pattern. When looked at the margins of potato vis-à-vis brinjal one may conclude that potato market is more efficient than that of the brinjal. In contrast, the marketing margins are higher for coarse rice than potato or brinjal at almost all stages of transaction. Part of these higher margins may be attributed to the amount of capital necessary for doing business in paddy/rice vis-à-vis vegetables.

It may be noted that all of the operators in all three commodities earn gross monthly margins in the range of 4 to 35 per cent which is above the rate of return from alternative investment. However, when imputed interests on capital per unit of commodity are added, farias returns fall below the opportunity costs of capital. While growers share in the final consumer price is less than 50 per cent for brinjal, it is about 70 per cent for potato and rice. While the shares of market operators are evenly distributed for potato and rice, it is highly concentrated among wholesalers and retailers for brinjal.

Recent econometric approaches for measuring spatial market integration have focused on testing two important hypotheses: the existence of the LOP, and market dominance. The empirical framework for this analysis is the estimation of error correction models and cointegration using single-equation methods where a contemporaneous price in one market is related to its past values and to contemporaneous and past prices in another market.

In the approach used here, we test for long-run spatial market integration between two prices using a dynamic VAR model and Johanson's (1988) cointegration procedure. Given cointegration between divisional-hinterland prices and hence market integration, two hypotheses are of interest: first, the hypothesis of perfect market integration where a price increase in one market leads to an equivalent effect in another, and second the hypothesis of market dominance where causality is unidirectional. This approach integrates the testing of these hypotheses into a unified strategy.

Previous studies of rice market integration in Bangladesh (e.g. Ravallion (1986) conclude that there is limited integration.[12] In contrast, we conclude that since liberalization, the LOP holds between the prices in Dhaka and each regional market of three important commodities and this spatial market integration is perfect so that a price change in one market is mirrored elsewhere. Thus, markets across Bangladesh are efficient and function well. Finally, adjustment back towards their long-run equilibrium levels at varies both across markets and commodities.

Two types of policy implications follow from the above findings: for market pairs with dominant markets, any intervention should target the dominant one(s) while in the case of bi-directional causality, interventions would need to be carried out in both. In the case of perfect integration, the impact will be one-to-one while for imperfect integration, this will be partial, with some mismatch.

[12] Many previous studies estimated spatial integration with different techniques. While most found markets to be integrated, these were unable to spell out the extent of integration.

*CHAPTER 4*

# MARKET INSTITUTIONS AND EXCHANGE RELATIONS IN BANGLADESH AGRICULTURE (WITH PARTICULAR REFERENCE TO THE PADDY- RICE MARKET)

## 4.1 Introduction: Conceptualizing Markets

The discussion in chapter 3 centered essentially on market performance in terms of vertical and spatial integration, which meant looking at prices, costs and margins. The discussion however ignored the market participants themselves, namely producers, traders and millers as well as the institutional arrangements within which they confront each other, negotiate terms of exchange and enter into binding contracts. The ability of the market to generate binding contracts at low cost is crucial for market health. Market performance cannot be understood without reference to these dynamics, which among other things determine entry and exit, exchange obligations, the extent of tied-transactions practiced (and generally whether returns to trade are free or tied) and the ease with each complex forms of exchange are established. A better understanding of the underlying market dynamics is particularly important for policy.

The fundamental function of a market is to enable exchange. At the most basic level, this is simultaneous exchange, conducted face to face involving a direct transfer of goods or services, with or without the use of a medium of exchange (money, gold etc.). If money is used, payment must necessarily be in cash. Before the physical transfer of goods actually occurs, terms are negotiated, prices are fixed, and quality and weight are ascertained. It is easy to see that even in such a basic level of transaction, there may be significant problems that will need to be overcome. First, there is the problem of bargaining power of each party determined by class, caste, social position, hierarchy etc. which may favour the 'superior' party. Secondly, there is the problem of 'lemons' due to asymmetric information which may not be immediately apparent from physical verification of goods (e.g. adulterated food). Third, there may be inadequate market information on e.g. prices that would enable buyers to arrive at an equilibrium price.

If more complex or sophisticated exchange is to occur, additional problems have to be resolved. Thus, long-distance trade imposes additional risks since exchange will have to be conducted through agents or intermediaries (rather than being face to face), giving rise to the so-called "principal-agent" problem. Similarly, long-distance transactions and transactions involving credit (especially longer-term credit), involve significant risk elements that relate to potential default (in repayment, receipt of goods as per contract, e.g. in terms of quality, grade, timeliness of delivery and repayment), etc. Thus, for non-face to face exchange to occur, traders separated by space or time, must be able to engage in credible contracts at low cost. This is the central problem that a relatively more complex market has to resolve. In the case of even a basic market, the problem is to ensure that traders stick to their side of the bargain. It should be easy to guess that without repeat exchange, a market would soon cease to exist.

A well-functioning market requires 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 ideal is best thought to be approached by impersonal markets associated with those in advanced economies. Indeed some authors have gone so far as to argue that this is the central problem of development of underdeveloped countries. It is instructive here to refer to North who states: "…. The

dilemma posed by impersonal exchange, is central to the major issues of development", and again ".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).

It is argued by some that the rise and sustainability of impersonal markets in advanced economies is based on both internal and external institutions (rules, norms, values). Thus, the legal framework and a constant threat of enforcement are seen to be critical in providing the predictability and stability needed for markets to work well. In addition to legal rules, social and market values that are internally generated (honesty, fairness) play an even more crucial role, so much so that much of the time, the market remains self-regulated without needing legal (external) enforcement of contracts. In other words, values are "ubiquitous behavioural realities that play a critical role in facilitating the trustworthiness, fairness, and honesty that promote cooperation between individuals, firms, and institutions, and within society as a whole" (Goodenough and Cheney, 2008, p. xxiv). Values-based approaches, where they work, provide private, internal institutions that come at a much lower monetary cost compared to externally imposed institutions. Indeed, an over-reliance on external rules may crowd out internal (low cost) ones. Specific mechanisms and institutions are discussed in greater detail, below.

*The Role of Middlemen*

In more complex markets, the role of the middleman is to remove the risks associated with transactions between strangers, in effect acting as trust intermediaries. In addition, rating agencies, third-party experts or inspectors, and bonding and insurance agencies provide information and play a risk-bearing or risk-sharing role – all intended to encourage stranger-transactions. Numerous strategies are encouraged by businesses to make transactions easier, friendlier and less risky including discounts, advertisements, credit etc.

*Contract Law*

Contract law provides an external incentive that promotes a party's ability to trust that the other party will behave correctly. In other words, a contract law can provide additional assurance (at the margin) that the risks of trading will be small. This happens in three ways: (a) remedy for breach of promise is a distinct possibility (and can be of huge psychological benefit as well), (b) the flexibility of contract law allows parties to structure contractual provisions in a way that minimizes their concerns, and (c) the law can support existing norms, which will then be further strengthened (O'Hara 2008).

*Building Trust and Norms*

Trust enhancing institutions generally evolve through the efforts of participants in long-term, repeated market exchange environments. These allow traders an opportunity to establish a reputation as a dependable participant in exchange, making transactions less costly, more stable and more effective than otherwise would be the case. For example, in a game of Snatch, where traders face a choice between snatch and trade given a one-off exchange, results in snatch almost always, thus preventing a market from developing (Schwab and Ostrom 2008). Once some simple norms are introduced into this setting, private exchange is enabled. The Hobbesian world (of no trade) is described as follows: "….There is no place for industry; because the fruit thereof is uncertain; and consequently no culture of the earth; no navigation, nor use of the commodities that may be imported by sea; no commodious building; no instruments of moving or removing…" (Hobbes 1960, p.80). In this world there is no trust and no exchange. However, a number of scholars have differed with this view based on the common observation that even in very adverse situations, people trust one

another much more frequently than is theoretically predicted (Camerer, 2003; E. Ostrom and Walker, 2003).

Various modifications of the 'snatch' game have been demonstrated to show that different (more desirable) equilibrium are possible. One possibility is that players adopt norms that lead them to derive utility from self-consciously avoiding snatch. Thus, Crawford and Ostrom (2005) model this utility ("warm glow") as a delta (δ) parameter that is added to the utility of the player who follows such a norm. If delta is large enough to offset the utility from snatch, a new Nash equilibrium is generated that leads to exchange instead of snatch. This type of a game could be an appropriate way to model exchange in close-knit societies with repeated interactions amongst members belonging to the same community.

A second alternative is the establishment of law and order, by creating a new position in the community with the power of sanctioning opportunistic or undesirable behaviour. As long as the sanction involves a loss of utility that is larger than the expected gain from snatching, a Nash equilibrium favouring exchange is established (Ostrom 2005). However, passing and enforcing rules involves costs leading to a second-order, collective action problem: there is no incentive for players to monitor and sanction others, and in any case, this is never perfect – the guilty are not always caught and the innocent do not always escape punishment! A third possibility is that players develop a reputation for fair-play over time. There is enough evidence to show that reputation effects do play a critical role in decisions regarding with whom to trade (Colson, 1974; Sally, 2002). It is believed however, that for reputation to lead to trust, institutions are needed that are able to verify and disseminate reliable information in the market (Schwab and Ostrom, 2008). In other words, learning about reputation is likely to be costly in a context of imperfect information. Thus, trust enhancing institutions can help manage reputation information in a market by ensuring that this is available quickly, reliably and cheaply. Thus reputation, trust and reciprocity provide a strong inter-active brew that can sustain exchange and make snatching costly. If there are serious impediments to the flow of information (relating to reputation), it will not have the same deterrent effect, leading to a growing incidence of snatch.

*Institutional Design*

Institutions need to be context specific. Selling farm products is quite different from selling options or buying in futures markets. These differences emanate from the incidence and distribution of risks, and information flows relating to key variables. In other words, it is critical to identify the snatch potential, frequency, distribution, costs in order to design an appropriate institution for a specific commodity.

Secondly, poorly implemented institutional solutions can have the exact opposite effect than the one intended, i.e. it can crowd out trust rather than enhancing it (Schwab and Ostrom, 2008). Any functioning system has evolved its own rules and norms, its own mechanics which are not always well understood. Thus, ill-conceived attempts to tinker with these through externally designed institutions or rules can easily backfire.

*Methodological Note*

A case study approach was adopted to generate information on transactions and markets from a number of markets previously studied in 1989 in Dhaka, Bogra and Noakhali. While the main focus was on the paddy-rice market, the largest agricultural market in Bangladesh, two other commodities were also examined, namely potatoes and brinjal.

In depth interviews were conducted with a wide range of market participants as well as producers and millers in a variety of markets (Table 4.1). At the market level, the role of *samitis* in establishing market order was examined along with market norms that sustain

trade. At the level of transactions, the myriad forms of transaction-relationships were examined to understand how credible exchange was established and sustained.

The markets examined by Crow and Murshid (1989) were revisited to provide a sense of transformation of market structures and exchange relations over a period of 20 years. These markets were originally chosen as "advanced markets" (Bogra), backward markets (in Noakhali) and large, urban markets (Dhaka).

**Table 4.1: The Number of Traders and Growers Interviewed, by Location**

| **Products/** | **Paddy/Rice** | | | **Brinjal** | | | **Potato** | | | ***Total*** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Actors** | **Bogra** | **Noakhali** | **Dhaka** | **Bogra** | **Noakhali** | **Dhaka** | **Bogra** | **Noakhali** | **Dhaka** | |
| *Grower* | 3 | 3 | | 3 | 3 | | 3 | 3 | | *18* |
| *Fariya* | 6 | 5 | | 6 | 6 | | 6 | | | *29* |
| *Bepari* | 6 | 6 | | 6 | 6 | | 8 | 4 | | *30* |
| *Aratdar (Paddy)* | 5 | 5 | | | | | | | | *10* |
| *Miller* | 3 | 3 | | | | | | | | *6* |
| *Aratdar* | 5 | | | 3 | 3 | 1 | 5 | | 4 | *21* |
| *wholesaler* | | 6 | 17 | | | | | 6 | | *22* |
| *Retailer* | 3 | 3 | 5 | 3 | 3 | 3 | 3 | 10 | 2 | *35* |
| *Total* | *31* | *31* | *22* | *21* | *21* | *4* | *25* | *23* | *6* | |

Note: In addition 4 FGDs (2 before harvest and 2 after) were conducted in two villages of Bogra. Similarly 4 FGDs were conducted in Noakhali.

## 4.2 Generating Credible Contracts – A Focus on Transactions

Market exchange requires that potential trading partners are able to come together on the basis of good market information and enter into credible, binding contracts. As markets evolve, the nature and complexity of contracts increases to allow for additional risks, e.g. arising from long-distance trade. A distinction may be made between the terms of a contract that is negotiated and market-wide (formal or informal) mechanisms that are intended to facilitate smooth exchange. In this section, the main focus is on the transactions themselves, and especially on more complex types of transactions.

While individual traders are left to their own devices to devise credible transaction relationships, a crucial role is played by the institution of the *aratdari*. Several recurrent features may be observed in the manner in which traders try to minimize risk.

Establishment of trust amongst parties is generated through a long process of repeat transactions, although this can sometimes be by-passed if favourable references are obtained from a senior, well-established trader. Generally, initial transactions are small but are gradually scaled up over time as a history of successful transactions is built up:

a) Where parties do not know each other well enough, transactions are strictly on cash and face to face;

b) Complex transactions (involving credit financing or deferred payments) require a successful track record, and use of a third-party agency as guarantor: the key third-party agency role in the rice market, for example, is played by the rice *aratdar* and paddy *aratdar*, allowing unrelated parties to enter into exchange in relative safety and security;

c) However, this requires that aratdars need to invest time and effort in building a client-base of trusted trading partners, in the first place

d) Tied exchange where finance/credit is used to alter terms of trade in favour of the dominant party. Significant volume of trade in Bangladesh is of this type.

Third party agency is not always used or needed, e.g. when large millers are able to tie up directly with growers or wholesalers – but this introduces the principal-agent problem that takes time (and cost) to resolve, and has therefore met with limited success (e.g. smaller millers would find the cost of direct procurement through agents prohibitive).

***Tied Transactions Involving Farmers-Traders or Traders-Traders***

Larger farmers are able to obtain a "free" (untied) market price for their produce in open, face-to-face transactions but small and marginal farmers are often tied into credit-based relations requiring them to surrender a part of the produce at a significantly lower price than prevalent in the market. Poorer growers often accept cash advances from traders, millers or their agents which have to be repaid after harvest at a lower price (involving an implicit rate of interest). At the same time, surplus farmers are known to provide credit in kind (produce) to traders or millers which have to be repaid in cash at the end of the season, at the highest price of the season. The former is widespread in the backward (deficit) area, especially in the *chars* of Noakhali while the latter is well-known in the advanced (surplus) area in Bogra. It has also been reported that millers in Bogra lend rice to poor peasants (see below):

> *In Bogra, the miller lends rice to poor peasants (during April) (the major agricultural lean season) at a price of Tk. 800 to Tk. 900 higher than the market price per sack of rice (90 kg). This loan is repaid at harvest (in May-June) when prices are depressed. (Interview of a poor peasant)*

The various types of tied transactions have been well-documented in the literature on paddy-rice markets but are certainly not restricted to that market alone (Crow and Murshid,). The objective of tying loans is to improve the returns of one party (the dominant or lending party) at the expense of the other, or to transfer risk, in the context of a given transaction. The main forms of these tying loans are given below:

a. *Dhaner upore* where cash is advanced to peasants by trading intermediaries before harvest to be repaid partly in cash (usually the principal) and in kind (interest) at harvest at an agreed (higher than market) rate.

*b.* *Trader-dadon:* working capital advanced in cash by higher-order traders to a subordinate trader (typically by an *aratdar* to a *bepari*) on the condition that the sub-ordinate trader must trade exclusively with the higher-order trader until such time as the advance is repaid.

*c.* Credit in kind advanced by surplus peasants to traders, processors or other peasants to be repaid in cash at the highest price of the season.

*d.* Short-term *paikari baki* (sale credit) amongst traders that serves to promote client loyalty.

*e.* Loans in kind from shop-keepers, millers or rich peasants to poor peasants to be repaid in kind or cash.

With the exception of *paikari-baki*, a rate of interest is implicitly charged in all tying transactions (Table 4.2).

Tied exchanges allow the dominant party to by-pass the market and derive superior terms. However, tied exchanges are also risky as there is an incentive for borrowers (the weaker party) to renege if possible. This is essentially the principal-agent problem faced by the lender who is often located at some distance from the peasant. Contracts are verbal with no legal cover. Thus, for exchanges like *dhaner upore* to be credibly conducted, a local agent is essential. This agent takes on the risk of exchange on behalf of his principal (absentee landlord or big merchant) and in exchange, takes a cut from the profits. The local agent is well-informed about credit risks, and is someone with enough clout in the local community to ensure repayment.

**Table 4.2: Different Types of Financial Relations in the Backward Area Paddy Market**

| 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%). In recent years changed from repayment of cash (principal) and kind (interest) |
| 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 |

**Table 4.3: Changes in the *Dhaner Upore* Rate over Time**

| Year | Implicit DU price (Tk/md) | Market price (Tk./md) | % Loss to grower |
|---|---|---|---|
| 2008 | 417 | 600 | 30 |
| 2000 | 182 | 215 | 15 |
| 1989 | 143 | 200 | 29 |
| 1975 | 83 | 115 | 28 |
| 1972 | 20 | 67 | 70 |
| 1953 | 10 | 13 | 23 |

The question then is what binds the local agent to the higher-order trader or lender? This relationship, it may be noted is similar to *dadon* that binds superior traders with subordinate ones. The main glue is trust borne out of a history of successful repeat transactions bolstered by an element of threat: there is a clear market norm that *a subordinate must trade only with his principal as long as he remains indebted to him*. No other trader in a given market area will engage in any exchange with a tied trader. Clearly, the relevant information relating to different traders in a market and their tied subordinates or agents become public knowledge quite quickly. Under the circumstances, agents have little choice than to play by the rules, only able to break out of this norm through full repayment of loans or permanent relocation to a different market or occupation (which means that he will have to build up his relationships

with a new set of traders from scratch – not an easy job). The principal is thus able to bring to bear a lot of pressure on his agents through a set of well-established rules and norms that evolved endogenously in the market. Trust can also be thought of as crucial social capital which actually substitutes for cash working capital in the form of credit provided by the principal.

Thus, a majority of peasants in the backward area were found to be tied to money-lenders and traders twenty years ago. Over time, this has declined although it still persists, especially in the *chars* of Noakhali.[13] The hitherto subordinate traders and agents have now emerged as small, independent financiers at the local level. The ties with big traders and money-lenders have become weakened in the face of a much improved situation with respect to availability of credit (due to NGOs and remittances) and the demise of monopoly power of big traders-moneylenders twenty years ago (Crow and Murshid).[14]

In keeping with the general decline in tied exchange, trader *dadon* which used to be widespread in commodity markets across Bangladesh twenty years ago is no longer seen. Subordinate traders are no longer tied (e.g. to millers or *aratdars*) but engage in voluntary trade with their principals. This leads us to ask how the dominant forms of trade ('free exchange') is structured and sustained given the fact that *dadon* used to be a such a key mechanism adopted by major actors (millers, *aratdars*) to ensure supply at a low price.

***From Tied Exchange to Free Exchange***

The ideal market is generally thought of as an impersonal market, guided solely by market supply and demand, based on excellent information flows, low default, low risk and low transactions cost. Such a market system is upheld and sustained by norms, rules, and laws that require little or no enforcement, and is generally supported by a high level of generalized trust (Platteau, etc.). In such a market, tied contracts are absent; there is no need to invest in individual trust-building relationships; parties abide by the terms of the contract; one-off exchange is just as credible as repeated exchange; and there are remedies for default or opportunism that are easy to execute.

In most market contexts, especially in developing countries, such an ideal is distant, almost unreal. In practice, most markets in the developing world are situated somewhere in between the two polar extremes – namely markets dominated by tied transactions as seen in certain backward areas and the "impersonal" markets thought to exist in developed economies. Thus, agricultural markets in Bangladesh, like in most developing countries depend crucially on reputation, repeat transactions and reciprocity (e.g. see Schwab and Ostrom, 2008 and Ostrom and Walker, 2003). The key problem that new entrants to the market have to overcome is the problem of trust and credibility. This is not so relevant for petty, itinerant traders engaging in low volume, face-to-face cash transactions.

For higher order traders this is the central problem that must be overcome in order to succeed. Without a certain level of trust, trade must be conducted entirely on cash – this is difficult. In most cases, larger, more complex transactions, and transactions over longer distances or time, cannot be executed face-to-face. Further, there are additional risks arising from quality, weight and timeliness of delivery, which together make trading hazardous. These therefore require third party involvement in the market in the shape of e.g. the *aratdar* or commission

[13] Growers in Char WAPDA in Noakhali reported that 80 percent of peasants were indebted through tied arrangements, mainly *dhaner upore* loans at 1 *maund* (40 kg) per Tk.1000 plus principal to be paid in cash.

[14] Both small traders and poor peasants in Noakhali have reported access to micro credit from a well-known NGO – ASA.

agent, who can be relied upon to bridge the information, reputation and trust gap. Thus, for the *bepari* or miller or *paikar*, the problem becomes much more tractable: there is no longer the need to establish direct links with a myriad of trading partners spread across the country; all that now needs to be done is to find an "honest" *aratdar* to deal with. Complex transactions in Bangladesh agricultural markets cannot be conceived of without an active role of the *aratdar*. The aratdar, who is much maligned by the media, politicians and in popular lore, is in fact the central pillar of the market place.

It should be evident that entry into the *aratdari* trade is not easy. First, there is the capital constraint that needs to be overcome, including working capital needs (ranging from 2-6 *lac* taka). Secondly, the process of establishing a reputation for honesty and credibility is time consuming and difficult, and last of all, a network of trusted buyers and sellers will need to be created from scratch. Risks remain even in trusted relationships as the following quote reveals:

Sometimes *farias* get lower than the declared weight even from known persons with whom they trade regularly. Sometimes an *aratdar* or *bepari* takes an extra quantity of paddy by using tricks during the measurement. Though the *farias* understand what is going on, they remain quiet as these are known, respected people. Sometimes transactions take place on short term credit, and when dues are not paid on time, the *faria* who is unable to purchase paddy in the next *hat*.

Thus traders prefer to trade within a quasi-closed network of trusted clients and agents despite occasional breaches in verbal contract related to weight, standard, quality or timeliness of delivery, or disagreement on prices, as new relationships entail significant transactions costs. Exit is easy from the trade but entry is not automatic.

### 4.3 Morphology of Transactions in the Paddy-Rice Market

*Paddy Bepari*

The paddy bepari engages in transactions with *farias* or growers (to procure supplies) and with millers or paddy *aratdars* for selling the same. Transactions with farias/growers are in cash; sometimes, cash is paid in advance to ensure supply. In the latter case, the *bepari* acts as an agent of a miller who has made cash available for on lending to farias or growers. In the case of cash transactions, the basic problem is to ensure weight, quality and timely delivery – typically conducted directly, face to face. Once cash advances and on lending is introduced, the transactions become more complex, requiring mechanisms to ensure that default does not occur at any point in the chain that connects the miller or aratdar with the *bepari*, *faria* and grower. The riskiness of this arrangement has meant that the principal-agent problem implied (e.g. between miller-*bepari* and *bepari*-grower) is not so easily solved. Thus, the dominant paddy procurement mechanism has become dualistic, linking growers to millers through (a) independent beparis, and (b) paddy *aratdars,* rather than through tied agents.

*Paddy Aratdar*

The paddy aratdar reemerged in the late 1990s after a period of near extinction in the 1980s (Murshid and Rashid, 2001). Millers and processors moved away from direct procurement through beparis and hired agents initially, preferring increasingly to rely on paddy aratdars. As the scale of milling operations expanded, it became economically viable for large millers to set up an independent supply chain using hired agents to gain from economies of scale. Today, both chains co-exist for different segments of the market. The large millers procure directly (having invested in solving the agency problem) while smaller millers continue to

rely on paddy aratdars. For them, direct procurement remains too risky. Thus, Murshid and Rashid (2001 p.7) reports:

> *There has been massive investment in milling capacity over the last 10 years. In one of the markets examined (Dhupchachia in Bogra), 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 this 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 also acting as local buyers and sellers - 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. The number of cycle beparis has increased from around 100 to over 5000 while the number of paddy aratdars has increased from 5 to 35.*

*Rice Miller*

Millers buy paddy and sell rice both in cash and on credit. Most of the transaction is done on credit, especially when business agents live in distant areas. Cash transaction is 10%, transaction through cheques is 60% and on credit, 30%. If transactions are in cash, a discount of Tk.5-10 is given to the buyer per *maund* (40 kg). Transactions made on credit are settled within 7 days, a facility given to some aratdars who are regular clients. Problems of exchange that remain include supply of low quality paddy, delay in repayment, loss due to default by agents, etc. Rice (unlike paddy) is always sold through *rice aratdars.* As aratdars bear the risk of transaction between millers and distant wholesalers, millers prefer this option to direct sale.

Quality and weight are directly inspected by buyers but even then complaints persist. Poor quality and low weight is not due to lack of information but due to lack of bargaining power is the exchange.

Mosharraf is a faria who buys paddy for supply to a particular miller in Noakhali with whom he always trades. He thinks that there is an informal rule among the millers not to poach each others' agents. Moreover, millers don't trust people so readily. So, although he thinks that he is sometimes given a low price, he has to remain in good standing with his miller. The miller also stipulates a price, saying "I will not buy above this price". The faria will then try to negotiate with a paddy grower in such a way that he can retain a margin of 10-20 taka per *maund*.

*Rice aratdars*

Rice *aratdars* mainly deal with millers and wholesalers, local retailers and other (distant) *aratdars*. *Aratdars* make phone calls to millers or his agents and fixes the price through negotiation. In this way, rice *aratdars* confirm rice availability from different districts. Some of the buying traders of the *aratdar* are tied agents. Advance payments are also made by *aratdars* to millers for ensuring supply of rice. At least 50% of money transaction is conducted through banks. In case of transaction on credit, 2 to 7 days is required to settle dues. Commission is Tk 4 (for cash) and Tk 5 (for credit) per *maund (40 kg).*

The aratdar is mainly interested in turnover but to ensure this, he has to ensure that he is able to build up a trusted, loyal client base of suppliers and buyers. As part of his business strategy, trader-*dadon* used to be rampant 20 years ago but has now reduced to a trickle in all major markets in Bangladesh. Verbal contracts are now entered into with free (untied) traders who have the option of going elsewhere with his business if there is lack of trust. Thus, rice aratdars have to compete on the basis of the total quality of service provided to clients

(including short-term credit, quality and weight). In practice, trading partners are loyal, even is there are minor breaches in contract as it is difficult and time consuming to build new trade relationships.

*Rice Wholesalers*

Wholesalers procure rice supplies from different surplus areas of the country such as Dinajpur, Pabna, Mymensingh, Kushtia, Naogaon, and Bogra. Purchases are made from two sources: I) directly from millers and ii) from *aratdars*. There are no tied agents of wholesalers with the main strength of the business firmly resting on his reputation: suppliers of rice (in the distant rice surplus regions) look for wholesalers who have a good reputation of regular payment and who offers a good price. It was common 20 years ago to keep a representative permanently posted in the supply region to ensure that the verbal contract was honoured (in terms weight, quality, variety etc). This practice has disappeared because of the easing of the supply situation (thereby reducing the rush to garner supply 'at any cost') and the ability to maintain close contact over mobile phones with potential suppliers. Risks for wholesalers have reduced over time but still remain significant.

Initially he went himself to the procurement area to establish business links with an aratdar. Subsequently orders were placed through mobile phones after checking a sample sent and agreed, and payment made by bank t/t.

Another Noakhali rice wholesaler procures from rice mills through an *aratdar* situated in a major procurement area:

*"Most of our procurement is from a Bogra District, Dhupchachia. We have a talto bhai there who we phone when we need rice. He goes around different mills and checks the price and sends samples. Once we agree, the rice consignment is sent by truck. We make the payment through bank t/t only when we receive the consignment. The shipment is checked for quality as per sample sent and weight. In most cases rice is sold without weighing. Actual weighing takes place if suspicion is aroused."(Interview with a wholesaler from Noakhali*)

Most of the surveyed wholesalers in Dhaka have reported incurring losses due to default by trading partners (retailers). Retailers sometimes do not make payment on time; sometimes they leave the business without making repayment, and thus cannot be traced. Credit sale is common leading to some losses and default every year. In other words, risks are predominantly on the selling or retailer end.

Suppliers have the sole responsibility of ensuring weight (measurement) and quality. While selling to retailers, wholesalers weigh every sack of rice. If the weight is less than what was declared by the supplier, payment will be adjusted accordingly. This adjustment is possible because full payment is not made immediately upon delivery but is staggered.

*Rice Retailers*

There is no tying arrangements but generally each retailer purchases from a few fixed wholesalers, whom they trust and from whom they can purchase on credit. In Dhaka, business transaction is entirely on credit for purchase of rice from regular wholesalers living in or around the retail market. However when rice is purchased from distant wholesalers located at some distance from the retail shop, only 30-40% can be purchased on credit, underscoring the increased problem of monitoring and risk associated with long distance trading.

*Consumers*

The other side of exchange, i.e. with consumers introduces some new problems (for consumers). Here, the consumer is at a very clear disadvantage in Bangladesh markets. Consumer protection laws are virtually non-existent and where legal provisions exist, e.g. relating to adulteration of food, these are rarely enforced. The most crucial problem for consumers is the highly asymmetric nature of information between retailers and consumers, given lack of standards and information relating to quality and price. The consumer therefore attempts to wade through the problem of poor information through hard-bargaining, a mechanism generally welcome in traditional markets. Rarely however is the consumer a winner because the informational advantage of retailers is simply too great. In the case of perishable goods where there is an urgency to sell quickly, a clever consumer could come away with a good bargain.

The large retail margin (compared to the wholesale margin) in various kitchen markets in urban areas has recently come in for comment and consternation in the popular mind and a belief that prices were being manipulated by a coterie of powerful traders. However, the large differential is better explained by the information asymmetry between consumers and retailers, relative to asymmetry that is likely to exist between, e.g. retailers and wholesalers. In addition, retail markets generally see one-off transactions between unknown agents where "snatch" (opportunistic behaviour) is much more likely, as it is easier to cheat a consumer and get away with it. Where the consumer is able to establish trust relationships through repeated transactions, the terms of transaction/ quality of goods traded would be appreciably better. The retail trade is yet to develop into a large, modern operation where reputation-effects could come into play to reduce opportunism. A small beginning has been made in the capital city (Dhaka) where a few supermarkets have emerged on the scene. Until this trend becomes much larger, the retailer will continue to remain the weakest link in the chain presenting higher risks both to wholesalers as well as consumers, but particularly to the latter. Bangladesh agricultural markets, as illustrated by the paddy-rice market, have become freer over time, having discarded many of the most severe forms of trade tying that used to be rampant in the trading system. In other cases, while tying continues to exist, its use as a major trading strategy has declined considerably.

The market today has discarded the most exploitative forms of tied trade but remains embedded in a web of personal relationships that each trader has painstakingly generated and carefully nurtures. It is these relationships that are central to the success of a trader; this is even more important than finance and capital. Without this type of 'social-trade capital' exchange can only occur through cash and direct inspection and measurement of goods, obviating more complex and more sophisticated forms of transactions. Thus credible transactions are a direct product of social-trade capital with individual contracts carefully crafted to minimize risk and opportunism.

The most important problem that the market or traders have to resolve is therefore the problem of establishing appropriate social-trade networks. While all traders have to face this challenge to a greater or lesser extent, it is most important for the *aratdar*. The aratdar has to build links with buyers and sellers, establish a reputation for fairness and honesty, have sufficient market clout to provide credit and ensure repayment and generally, honour a myriad of contracts with a diverse clientele. This takes time. Many fail in the process and leave the trade typically because trading partners have defaulted. No cases have been observed where the aratdar has entered into the trade directly. Very often, there is a long history of trade in the market beginning from humble origins as a *faria* or *bepari*, slowly accumulating capital, knowledge, and more crucially, the all important social-trade capital,

before finally taking the plunge into the *aratdari* business, changing from an itinerant trader into the more respectable position of a senior trader operating from fixed premises.

## 4.4 Generating Social-Trade Capital

How difficult is it to establish trust between potential trading partners in a market? This is not a problem in the local village market where everyone knows everyone and at any rate, where transactions are face-to-face and direct. In larger markets or in long-distance trade, this is crucial. Here, for want of a better construct, we would like to invoke cultural norms in the market as playing a crucial role. Typical entry mechanisms are as follows:

Introduction: Those who are lucky will have the advantage of being introduced or referred to by a senior, more established trader. This serves as a good entry point, enabling the new entrant to gain a foothold on the lowest rung of the ladder;

"We are related": A host of quasi kinship relationships are sought to be established with potential (new) trading partners. Thus, the first task is to find common ground in terms of location of permanent residence (e.g. village, Thana, Upazila or even district). Then, depending on the socio-economic position of the traders, they will refer to each other as big brother, brother-in law (*dula bhai*), *dharmer bhai or talto bhai*, and *mamu* (uncle). In addition, often instant rapport can be built through the use of regional dialect (especially, Noakhali, Sylheti and Chittagong).

The moot point really is that the larger cultural-market context allows close pseudo-kinship relationships to emerge quite quickly, and from there, once initial transactions are successfully conducted, the stage is set for repeated transactions followed by more complex, sophisticated contracts.

## 4.5 Supporting Credible Exchange: Focus On Markets

Market-wide norms, rules and institutions support credible, low cost exchange. These relate to mechanisms for grievance resolution, safety and security of transactions, acting as a clearing house for key information, e.g. on prices, reputation and status of traders, dealing with the police and "authorities", provision of credit etc. In addition, credible exchange is facilitated by financial access and financing arrangements, insurance mechanisms, transport infrastructure, telecommunications and labour markets. Market associations and societies are thus, an important market institution that deserves to be examined carefully.

*Associations and Societies*

Market associations are legal bodies representing all traders operating in the market and paying a regular subscription. Association specific to a particular commodity or category of trader is not common.

Associations usually have an elected body of office bearers, including a President, Secretary and Treasurer. The association levies a subscription charge and in turn ensures cleanliness, safety and security in the market, and also helps to resolve disagreements and conflict between trading partners. A principal function is to attract long-distance *beparis* to the market and to ensure the safety of their persons and their money. Frequently, market associations build up a savings-credit fund from subscriptions which can be borrowed by members at favourable terms. In general the association will represent the collective and individual interest of its members – a function that larger, richer associations in the big, urban markets are better able to discharge, compared to e.g. small markets in rural areas. In this connection, they need to have a good working relationship with the Police, key government officials,

political party leaders and even local thugs and gangsters – i.e. with all potential agents that are known to impose unofficial fees and charges on traders. This is a sensitive and extremely difficult area of work for the association. It is well-known that most markets are captive to organized thugs frequently linked to ruling parties, who must be paid protection money regularly.

An example from the potato transport market shows how risks and fees are handled:

> *Each truck can carry 155 sacks, each sack carrying 85 to 90 kg potato. Any accidental cost is borne by the bepari. In case of theft of products or losses during transportation, truck owners (or the drivers) bear the loss. The truck owner bears all costs related to tolls or other costs incurred en route (e.g. bribes to the police,' contribution' to the labour association). The amount of toll is 1200 taka per truck and bribe is 100-200 taka (very rare during the emergency but now beginning to re-appear; contributions to the workers association is Tk. 50-100. (Field Report from Bogra)*

In some areas there are commodity-specific associations, especially for rice e.g. in Bogra. In addition to all the usual roles played by an association the rice traders association works closely with the government to meet official rice procurement targets of the Food Ministry.

***Informal Market Norms***

Certain practices and norms appear to be widely in use in agricultural markets, essentially designed to reduce default and lower risk. All contracts are verbal in nature and therefore are not legally binding. However, verbal contracts are generally respected in the trade although every attempt is made to pattern individual contracts in such a way as to ensure adherence, as has been noted earlier. For example, much of the reputation of a trader in a market is based on whether he honours verbal contracts. One should note that major religions, especially Islam considers a verbal contract to be as sacrosanct as a written one, so that when a religious person gives his "word" that is very unlikely to be broken. It is therefore no surprise that many large traders and aratdars adopt the garb of a pious man signaling loudly that he can be trusted.

An abiding market norm is that a (subordinate) trader who has taken a loan from a principal trader must route all his business through the latter. This information seems to become commonly known in the market so that all other traders will generally refuse to deal with the borrower till such time as he has paid off his loan and becomes an independent agent. The interesting point here is to note that (a) information becomes quickly available, spreading through word of mouth – suggesting close informal networking among traders, and (b) collective action is generated as a result to control "deviant behaviour".

A majority of transactions, especially larger ones, contain an element of short-term credit, with these being liquidated and fresh credit taken during the next, repeated round. Thus, at any given time, large traders and aratdars have a substantial amount of credit outstanding. The norm of *hal khata* (new book of accounts) has evolved to resolve this problem. Thus, during every Bengali New Year's Day (1 *Baisakh* or 14 April), big traders organize parties where all trading partners are expected to come and settle all accounts. Those who fail to do so after a couple of such opportunities are then considered defaulters, and their names are deleted from the *khata*. While this does not ensure 100 % repayment, it is an important loan recovery institution in the market.

Traders appear to have a fixed set of partners with whom they enter into contracts, with or without (tying) loans to act as an inducement. The use of such loans depends largely on the supply-demand situation. If supplies are scarce, an attempt will be made to corner supply

through various kinds of "encouragements". On the other hand, if demand is slow, there is an incentive to offer generous credit terms to buyers. The main pattern is that traders are loyal to each other. This seems to have become a norm in the market, based on experience that it takes time and patience to build new trade relationships, so that once established, people are reluctant to let it go, even if there are short-term problems faced once in a while (e.g. weight or quality problems in some transactions).

Some local norms have also been reported, e.g. from the potato trade in Bogra. *In some areas there is a tradition that any cheating in terms of weight needs to be settled by giving the affected party double of the amount cheated.* This was reported in transactions between growers and *faria* in Bogra.

Apart from market norms, exchange in agricultural markets requires support from a number of other facilitating markets, especially the financial market, the labour and transport market, technology and information services, and the legal system. These are briefly discussed below.

***Supporting Markets and Institutions***

*The Financial System*

Penetration of the formal financial system in agricultural markets is limited. Some *aratdars* and wholesalers are able to borrow from banks, as are millers and cold storage owners. In addition, micro credit availability has expanded enormously all over Bangladesh but is available only to poor traders and growers. The informal financial market continues to play a significant role in financial intermediation in rural areas. However, as far as the trading system is concerned, much of the financing is endogenous, emanating from large traders and aratdars providing credit to subordinate traders and clients. Over the last 20 years, credit availability and access has improved, leading to a sharp decline in tied credit. Further, there is wide variation of terms  Formal sector credit to finance trade remains confined to the big traders, and generally to those with fixed premises and able to provide collateral. Since the vast majority of traders involved are itinerant in nature, formal credit is denied to them.
Apart from credit, the financial system is used for payment, especially to long distance clients. The most common method is payment by TT (telegraphic transfer) and cheques which prevents abuse and possible theft. This has become possible because of the proliferation of bank branches across the country.

*The Labour and Transport Market*

The labour and truck transport market supporting agricultural commodity markets appear to be well-organized and controlled by a few operators (styled as *samitis*). It is difficult for non-*samiti* labour or transport operators to enter a given market. Traders usually have to deal with a *dalal* or broker, especially when hiring a truck, and have no option but to pay set rates. Similarly, labour rates are set by their *samitis*.

Damage, accident or theft during transport is the responsibility of the operator although in practice, this is often shared between the trader and operator on the basis of negotiations. Any charges, fees or bribes *en route* to the destination are the responsibility of the operator. Thus according a field report from Bogra:

*A single bepari or sometimes a group of beparis of the same locality hire one truck together to carry their products. Trucks are hired by contacting agents (dalal) of the local truck owner's samiti, who are paid 30 to 50 Taka commission per trip. Each truck can carry 100 maund brinjal.  Any accidental cost is borne by the bepari. In case of stealing of products or lost at the time of transportation, truck owner (or the driver) bears the losses. The truck*

*owner bears all costs related to tolls or other cost on the way (e.g. bribes to the police and contributions to the labour association).*

*Technology*

Twenty years ago there were few land-line telephones, few bank branches, few television sets and no cellular phones. Today, cellular phones have spread to the furthest nook and corner of Bangladesh, and television sets are no longer the monopoly of a rich few. Thus, access to information is now literally at one's finger tips. In particular, the rise of cellular phone access has revolutionized markets, as traders are able to talk to clients and suppliers readily, and able to place orders over the phone. Once the order is carried out payment is made through banks. It is no longer necessary for traders to physically travel, for example, to the supply regions to check goods physically and organize transport etc. All this has now been simplified and streamlined. This is a clear example of how technology has led to lower transactions costs.

## 4.6 Conclusion

Agricultural markets are apparently complex but basic exchange mechanisms are simple. The key institution in the market is the *aratdari* system, especially for (non face-to-face) stranger-transactions. All the three markets examined (rice, potato and brinjal) exhibit a local circuit and a long-distance circuit. In the case of paddy-rice, the local circuit is dominated by traditional micro-processors responding to local demand and tastes, and surviving through product differentiation. The longer circuit is dominated by modern rice millers catering to deficit areas and large, urban centres. The exchange modalities are similar but the scale and terms of exchange differ depending on nature of risks faced.

Trust-building and personalized transactions are keys to successful exchange relations but this is essentially endogenous to the transaction, requiring little or no external mechanisms. Once trust is built, repeated transactions dominate exchange – new partners are introduced slowly and gradually. There are some supportive norms and institutions like *samitis* along with loyalty inducing values including a reliance on contracts. The market culture is conducive to building trade rapport quite quickly and for quick, verbal dissemination of information, e.g. on reputation.

Formal legal institutions to enforce contract are non-existent; judicial recourse is not commonly available as contracts are verbal. In terms of information, the weakest link is between consumers and retailers, as transactions are one-off, especially in urban centres, thus encouraging snatch (i.e. supply of sub-standard goods at a higher price). Only larger, institutional consumers (like restaurants) dealing with the same set of suppliers, can avoid this problem.

The market has become less tied and therefore more equitable. Bargaining power however, remains an important price-fixing element in exchange that gives advantage to the superior party.

*Policy*

A major problem in the market is payment default and constitutes the single biggest threat to trading. This is handled endogenously by traders themselves or through informal interventions by the *samiti*. Traders who are able to develop appropriate strategies to keep this under control are able to survive. Usually payments are deferred (fully or partly) until a shipment is received. If the goods are considered sub-standard, further negotiations will be held (often over the phone) and some price discount will be agreed. Payment is then made through banks. ***The weaker parties are often unable to enforce a contract, so that some***

***external mechanisms for conflict resolution would be useful in reducing risks. With the existence of national identity cards, this is now a real possibility.***

Quality and weight issues are endemic problems in the trade arising from lack of grades and standards. This leads to a chaotic situation of local grading and sorting practices that can vary widely from place to place, and which are difficult to assess. Traders will frequently mix a number of varieties (especially for rice) and try to pass it off as a superior quality. These problems are especially severe for unsuspecting consumers who have the least information available. ***Use of modern grading and sorting techniques and introduction of international standards should be closely examined.***

The *aratdari* system is the central pillar for market exchange. ***Policy attention needs to be focused closely on the aratdari system to improve it through modern management practices, use of ICT, quality management and product standardization, access to bank credit – generally, trying to transform an institution that remains "traditional" in its mode of operations to that of a modern, corporate entity, even if a relatively small one***. In order for this transformation to be successful, the scale of operations will need to be expanded so that unit costs can be kept to a minimum. Unless this transformation occurs from within, it may occur from without, with the intrusion of multinational and large national companies carefully eyeing the wholesale-retail sector.

The food trade sector is mired in problems of quality and standards, and concern for bio-security. ***Once again, the traditional trading sector must quickly address itself to these concerns if they are to remain competitive with the emerging modern sector***. While this competition is not yet evident, it is only a matter of time before it comes to ahead. While it may benefit some consumers, such a transformation will have serious repercussions on the poor, both traders and consumers. Thus, the transformation needs to occur quickly in the informal sector, with the *aratdars best placed to lead this challenge.* In its absence, a dual-track trading system will emerge, one for the well-to-do, middle-class consumers led by large companies, and the other, much emaciated informal sector, catering to the poor.

*CHAPTER 5*

# CONSUMPTION IMPACT AND ADJUSTMENTS AT THE MICRO LEVEL

## 5.1 Introduction

The impact of food price volatility on consumption, especially of the poor, is likely to be acute with survival often depending on complex adjustment processes. In general, the worst time for the poor is the pre-*boro* harvest period of March-April, which is usually associated with a seasonal food price peak. The pre-*boro* period of 2008 was particularly volatile, with rice prices rising to Tk.32-35 per kg (coarse variety) – an increase of 45 percent over the same period in 2007, leading to fears of deepening poverty and malnutrition. However, the bumper *boro* harvest of 2008 served to stabilize the situation. This chapter examines the adjustment process in the light of sharp food price volatility experienced in 2007-08.

A series of FGD exercises were conducted before and after *boro* 2008 to gather information on prices, wages, earnings, employment etc. Comparisons were made between (a) the situation before *boro* 2008 and the same period in 2007, and (b) before and after *boro* 2008. In addition, a small household survey was conducted in two areas of Bangladesh – an agriculturally developed area (Bogra) and a backward area (Noakhali *Chars*)

***Details of the FGDs***

- Two villages were chosen within 2-5 km of a village (primary) market, in each area
- A key person was chosen to facilitate FGDs (e.g. member, chairman, school teacher etc.)
- Data collected - overall village situation: number of households, infrastructure, schools, literacy rate, NGO presence, poverty rate, landless, migrants, seasonality, natural resources etc.
    - How rice prices, food prices behaved
    - How wages, earnings behaved
    - Employment situation (trade, transport, services –compare with this time last year)
    - How crop production behaved
    - How non-crop sector behaved
    - Who have been most affected: children, girls, boys, female headed households; and which social groups, and who within each social group
    - How people responded to price change, food availability changes (eat potatoes, eat less? migrate?)
    - How poor managed to survive: safety nets, credit, advance labour sale or pledges, crop pledge in advance, amount of such pledges etc.
    - Any asset sale, distress sale, distress borrowing?
    - Health and nutrition status; meals, food security

***Details of the Household Survey***

A survey was conducted on 200 households in two FGD villages each in Bogra and Noakhali during October 2008. The survey covered rich, poor and very poor households. To understand economic status of various households in the selected villages, prior visits were

made and assistance from local government members sought. Rich and poor households were identified on the basis of perception of the respective households regarding their economic status. Then sample households were chosen randomly from these rich and poor households. Data was collected on socio-economic characteristics along with wages, incomes, earnings, asset disposition and coping mechanisms.

## 5.2 Adjustments to Instability

The extent of food price instability experienced in 2007-08 is indicated in table 5.1 below. Rice prices increased between the pre-*boro* lean season of 2008 over the same period in 2007, 30-45 percent, depending on the variety. Prices, however, fell back after the boro harvest in 2008, especially in the major rice producing areas. Thus, in Bogra the rice price declined by around 12-15 percent, serving to arrest what had appeared to be a situation of unbridled price escalation, which in turn dampened speculative behaviour. This decline, while welcomed at the time, seemed relatively small, given that a bumper harvest was reaped, and may be compared to the situation in 2009 when another bumper harvest of boro led to a sharp slump in rice prices, by over 30 percent compared to the same period in 2008.[15] Unlike in post-boro 2008 when the concern was with high prices, post-boro 2009 is faced with the spectre of very low farm gate prices that are barely able to cover farm production costs.

**Table 5.1 Wage-Price Adjustments to Unstable Prices in Bogra**

| | **Pre-*boro* lean 2007** | **Pre-*boro* lean 2008** | **Post-*boro* 2008** |
|---|---|---|---|
| Rice coarse | 22 | 32 | 28 |
| Rice fine | 32 | 42 | 36 |
| WageRate/day,male | 62 | 80 | 110 |
| Wage, kg equiv/day | 2.8 | 2.5 | 3.9 |

Note: No *boro* is cultivated in the Noakhali survey village

The concern with high-low prices stems from the twin policy goals of protecting the real incomes or consumption of the poor as well as the farming community. In the case of high prices, poor consumers have to adjust in order to be able to stabilize their already low food consumption levels. While it is generally noted that wages, especially rural wages respond to food price rises, the moot question is how quickly this occurs and whether the response is sufficiently compensatory. It may be noted from table above that real wages (in terms of rice) certainly adjust, and may even overcompensate for the initial real income loss, within a period of one year. Since wage adjustments are not instantaneous, poor rural consumers need to find ways of coping in the short run.

The evidence from the Bogra FGDs point to a number of coping mechanisms displayed by the poor:

[15] It is highly likely that important influences are exerted by world market conditions even though Bangladesh is not heavily dependent on food imports.

- Significant cut back in food consumption especially rice consumption, and an attempt to substitute rice with cheaper foods[16]
- High levels of indebtedness to *mahajan* and NGOs, as well as traders-shopkeepers
- Seasonal migration to urban areas for work
- Sale of non-land assets – especially poultry, animals and trees
- Forced into less desirable work for longer periods (especially for women)

Both in Dhaka slums and in rural areas, poor people were affected by rising food prices, with the direct impact falling on food consumption (as an example see box 1).

Box 1: Abdus Salam Mia, age-68, Dhaka

In a 5 member family 2 are earning. He is dependent on the income of his two sons. As a result of heavy increase in price of food items, less rice is bought in his family. He cannot afford a little luxury of taking rice with milk and sugar, which he could afford before. His family cannot afford to buy fish and meat.

Poor were also found to be taking loans from different NGOs and cooperative societies to meet daily needs. In rural areas poor people also sold livestock, household furniture, trees etc. A few families in Noakhali even sold land to meet daily needs. Both in Dhaka and Noakhali, women and children suffered the most as a result of the price hike, because women were eating less and children were not fed nutritious food. Though urban wage rate was reported to remain unchanged even after price hike, some garment factory workers and security guards said their salaries were raised. Families with members working abroad fared relatively better, depending on increased remittances to tide over the bad times. However, family expenditures rose by at least 25 percent. Urban house rents were also raised, inflicting greater hardships on the poor.

The household survey data provide additional evidence of adjustment processes. Some differences between the Bogra and Noakhali sample may be noted. The incidence of people described as very poor in Bogra was 14 percent and in Noakhali 28 percent, i.e. the Noakhali sample is poorer. It is interesting to note that the subjective categorization of sample households into Rich, Poor, Very Poor in the two areas corresponds well in terms of income levels by category.

**Table 5.2(a) Income of households**

| **Economic Status**** | **Number of sample households in different regions** | | | **Average annual income of the household group (in thousand Taka)** | | |
|---|---|---|---|---|---|---|
| | Bogra | Noakhali | Total | Bogra | Noakhali | Total |
| Rich | 52 | 53 | 105 | 189.55 | 123.44 | 156.18 |
| Poor | 34 | 19 | 53 | 48.49 | 50.22 | 49.11 |
| Very poor | 14 | 28 | 42 | 43.65 | 37.68 | 39.67 |
| Total | 100 | 100 | 200 | | - | - |

** Economic status of the household is based on the perception of each household regarding their respective economic status.

[16] Seasonal production of potatoes and leafy vegetables (*shak*) was in abundant supply during this period. It was widely observed during the fieldwork that poor peasants were heavily substituting rice with these foods.

**Table 5.2(b) Average land holdings of households**

| Economic Status** | Average total landholding by household group (in Decimal) | | | Average agricultural landholding by household group (in Decimal) | | |
|---|---|---|---|---|---|---|
| | Bogra | Noakhali | Total | Bogra | Noakhali | Total |
| Rich | 298.3 | 211 | 254.27 | 254.8 | 147.1 | 200.5 |
| Poor | 39.0 | 51.8 | 43.59 | 27.1 | 31.1 | 28.6 |
| Very poor | 6.8 | 29.7 | 22.05 | 2.0 | 15.1 | 10.8 |
| Total | 169.3 | 130 | 149.67 | 142.0 | 88.1 | 115.1 |

In terms of landholding size, average holdings are larger in Bogra but interestingly, the Poor and the Very Poor in Noakhali have significantly more land than the corresponding groups in Bogra. It may be noted however, that land in Noakhali is single cropped and of low yield.

*Borrowing by households*

It will be observed from table 5.3 that indebtedness increased sharply in the face of rice price hike. In particular, borrowings from informal sources accelerated at a much faster pace. In particular, this tendency was seen to be heightened in the case of the poor and very poor households in Noakhali, in particular.

*Decline in food consumption*

Increase in food price increased household vulnerability by lowering consumption (table 5.5). Overall, 88% of 'very poor' households were compelled to take less food than the amount usually demanded. Many households substituted cheaper food items; 38% of very poor households and 28% of poor households even faced near-starvation conditions, faced with no money and no food. Children of poor and very poor families reported missing meals.

**Table 5.3: Number of households taking loan**

| Economic status of household | Number of household taking loan | | | | % change between pre and price-hike periods | |
|---|---|---|---|---|---|---|
| | Price hike period | | Pre- price hike period | | | |
| | Bogra | Noakhali | Bogra | Noakhali | Bogra | Noakhali |
| Rich | 27 | 44 | 18 | 27 | 50.00 | 62.96 |
| Poor | 29 | 17 | 14 | 9 | 107.14 | 88.89 |
| Very poor | 11 | 23 | 11 | 10 | 0.00 | 130.00 |
| Total | 67 | 84 | 43 | 46 | 55.81 | 82.61 |

**Table 5.4: Borrowing from different sources**

| Survey Region | Source of loan | % household taking loan during high price period | | | % household taking loan pre-high-price period (1 year before) | | | % change between the two periods | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Rich | Poor | Very Poor | Rich | Poor | Very Poor | Rich | Poor | Very Poor |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Bogra | Government | 42.30 | 14.70 | 28.60 | 33.30 | 9.70 | 19.00 | 9 | 5 | 9.6 |
| | NGO | 13.50 | 61.80 | 71.40 | 8.30 | 29.00 | 66.70 | 5.2 | 32.8 | 4.7 |
| | Informal | 9.60 | 29.40 | 7.10 | 2.10 | 6.50 | 4.80 | 7.5 | 22.9 | 2.3 |
| Noakhali | Government | 31.00 | 41.50 | 26.30 | 23.00 | 26.10 | 13.60 | 8 | 15.4 | 12.7 |
| | NGO | 38.00 | 39.60 | 57.90 | 27.00 | 26.10 | 31.80 | 11 | 13.5 | 26.1 |
| | Informal | 16.00 | 54.70 | 78.90 | 4.00 | 4.30 | 4.50 | 12 | 50.4 | 74.4 |
| Total | Government | 14.30 | 31.00 | 31.00 | 6.30 | 17.00 | 20.00 | 8 | 14 | 11 |
| | NGO | 32.10 | 41.00 | 39.50 | 25.00 | 27.00 | 27.00 | 7.1 | 14 | 12.5 |
| | Informal | 60.70 | 61.00 | 38.50 | 6.30 | 5.00 | 4.50 | 54.4 | 56 | 34 |

*Decreased rice consumption and non-food expenses*

An important indicator of the impact of food prices is the status of rice consumption by different households. As this is the staple food, households decrease its consumption only when all other options have been exhausted. While a sharp decline in rice consumption is observed among slightly larger percentage of people in Bogra than in Noakhali, a small decrease is rice consumption is much higher in Noakhali than in Bogra (table 5.6).[17] Rich households in Bogra were found to be almost free from such adverse effects, but the situation is different for the rich in Nokhali, where 45% of them marginally decreased their rice consumption. This indicates that scarce economic opportunities for generating additional income compel even those that are better off to adjust their rice consumption as food prices rise. Expenses on non-food consumption also decreased both in Bogra and Noakhali. One-third of the very poor households heavily decreased expenses for non food items (table 5.7).

The sharp decline in non-rice food consumption has serious implications for nutritional status of the population.

**Table 5.5: Food availability (as percent of surveyed households)**

| Economic status of household | Household taken low cost food (%) | Household taken less food than demand (%) | Household facing a situation with no food and no money (%) | % household where children starved** | |
|---|---|---|---|---|---|
| | | | | part of a day | whole day |
| Rich | 1.00 | 15.20 | 2.90 | none | none |
| Poor | 9.40 | 67.90 | 28.30 | 2.40 | 2.40 |
| Very poor | 26.20 | 88.10 | 38.10 | 13.80 | 10.30 |
| All | 8.50 | 44.50 | 17.00 | 3.60 | 2.90 |

Note: ** Based on only those households which have children of 12 years and below.

[17] It was seen in the FGD that availability of rice substitutes in Bogra (potatoes and vegetable) was much higher compared to Noakhali.

*Additional work by households*

During higher price of essentials people tend to work harder/longer in an attempt to stabilize real incomes. It was observed that additional work substantially increased among 38 percent of very poor households (table 5.8). Compared to Noakhali, more people of Bogra were found to be involved in additional work, reflecting the wider availability of employment opportunities here than in Noakhali. It was also seen that additional work was undertaken by even poor women and children (table 5.8).

**Table 5.6: Rice consumption in different households during high food prices**

| Region | Economic Status of households | Heavily decreased (%) | Marginally decreased (%) | Not affected (%) | Not responded (%) | Total households in a particular group |
|---|---|---|---|---|---|---|
| Bogra | Rich | 0.00 | 1.90 | 98.1 | 0.00 | 52 |
| | Poor | 5.90 | 67.60 | 26.50 | 0.00 | 34 |
| | Very Poor | 28.60 | 71.40 | 0.00 | 0.00 | 14 |
| | Total | 6.00 | 34.00 | 60.00 | 0.00 | 100 |
| Noakhali | Rich | 0.00 | 45.30 | 52.80 | 1.90 | 53 |
| | Poor | 0.00 | 63.20 | 36.80 | 0.00 | 19 |
| | Very Poor | 14.30 | 75.00 | 10.70 | 0.00 | 28 |
| | Total | 4.00 | 57.00 | 38.00 | 1.00 | 100 |
| Total | Rich | 0.00 | 23.8 | 75.2 | 1.00 | 105 |
| | Poor | 3.80 | 66.00 | 30.2 | 0.00 | 53 |
| | Very Poor | 19.00 | 73.8 | 7.1 | 0.00 | 42 |
| | Total | 5.00 | 45.50 | 49.00 | 0.50 | 200 |

**Table 5.7: Expenses for commodities other than food**

| Survey Region | Economic Status of households | Heavily decreased (%) | Marginally decreased (%) | Not affected (%) | Not responded (%) | Total households in a particular group |
|---|---|---|---|---|---|---|
| Bogra | Rich | 1.90 | 38.50 | 59.60 | 0.00 | 52 |
| | Poor | 11.80 | 67.60 | 20.60 | 0.00 | 34 |
| | Very Poor | 35.70 | 64.30 | 0.00 | 0.00 | 14 |
| | Total | 10.00 | 52.00 | 38.00 | 0.00 | 100 |
| Noakhali | Rich | 7.50 | 49.10 | 41.50 | 1.90 | 53 |
| | Poor | 10.50 | 42.10 | 47.40 | 0.00 | 19 |
| | Very Poor | 32.10 | 60.70 | 7.10 | 0.00 | 28 |
| | Total | 15.00 | 51.00 | 33.00 | 1.00 | 100 |
| Total | Rich | 4.80 | 43.80 | 50.50 | 1.00 | 105 |
| | Poor | 11.30 | 58.50 | 30.20 | 0.00 | 53 |
| | Very Poor | 33.30 | 61.90 | 4.80 | 0.00 | 42 |
| | Total | 12.50 | 51.50 | 35.50 | 0.50 | 200 |

**Table 5.8: Household involvement in additional works**

| Survey Region | Economic Status of households | Heavily Increased (%) | Marginally Increased (%) | Not affected (%) | Not responded (%) | Total households in a particular group |
|---|---|---|---|---|---|---|
| Bogra | Rich | 1.90 | 32.70 | 61.50 | 3.80 | 52 |
| | Poor | 26.50 | 35.30 | 32.40 | 5.90 | 34 |
| | Very Poor | 35.70 | 50.00 | 7.10 | 7.10 | 14 |
| | Total | 15.00 | 36.00 | 44.00 | 5.00 | 100 |
| Noakhali | Rich | 7.50 | 30.20 | 43.40 | 18.90 | 53 |
| | Poor | 10.50 | 10.50 | 63.20 | 15.80 | 19 |
| | Very Poor | 39.30 | 28.60 | 17.90 | 14.30 | 28 |
| | Total | 17.00 | 26.00 | 40.00 | 17.00 | 100 |
| Total | Rich | 4.80 | 31.40 | 52.40 | 11.40 | 105 |
| | Poor | 20.80 | 26.40 | 43.40 | 9.40 | 53 |
| | Very Poor | 38.10 | 35.70 | 14.30 | 11.90 | 42 |
| | Total | 16.00 | 31.00 | 42.00 | 11.00 | 200 |

**Table 5.9: Additional work by women and children**

| Survey Region | Economic Status of households | Heavily Increased (%) | Marginally Increased (%) | Not affected (%) | Not responded (%) | Total households in a particular group |
|---|---|---|---|---|---|---|
| Bogra | Rich | 0.00 | 3.80 | 55.80 | 40.40 | 52 |
| | Poor | 2.90 | 2.90 | 55.90 | 38.20 | 34 |
| | Very Poor | 7.10 | 14.30 | 28.60 | 50.00 | 14 |
| Noakhali | Rich | 0.00 | 0.00 | 54.70 | 45.30 | 53 |
| | Poor | 5.30 | 0.00 | 63.20 | 31.60 | 19 |
| | Very Poor | 0.00 | 17.90 | 39.30 | 42.90 | 28 |
| Total | Rich | 0.00 | 1.90 | 55.20 | 42.90 | 105 |
| | Poor | 3.80 | 1.90 | 58.50 | 35.80 | 53 |
| | Very Poor | 2.40 | 16.70 | 35.70 | 45.20 | 42 |
| | Total | 1.50 | 5.00 | 52.00 | 41.50 | 200 |

**Table 5.10: Change in overall economic condition of households**

| Survey Region | Economic Status of households | Worsen (%) | Remain same (%) | Improved (%) | Total households in a particular group |
|---|---|---|---|---|---|
| Bogra | Rich | 3.85 | 23.08 | 73.08 | 52 |
| | Poor | 44.12 | 26.47 | 29.41 | 34 |
| | Very Poor | 85.71 | 14.29 | 0.00 | 14 |
| | **Total** | **29.00** | **23.00** | **48.00** | **100** |
| Noakhali | Rich | 24.53 | 28.30 | 47.17 | 53 |
| | Poor | 31.58 | 36.84 | 31.58 | 19 |
| | Very Poor | 57.14 | 32.14 | 10.71 | 28 |
| | **Total** | **35.00** | **31.00** | **34.00** | **100** |
| Total | Rich | 14.29 | 25.71 | 60.00 | 105 |
| | Poor | 39.62 | 30.19 | 30.19 | 53 |
| | Very Poor | 66.67 | 26.19 | 7.14 | 42 |
| | Total | 32.00 | 27.00 | 41.00 | 200 |

***Post-Harvest Price Changes and Adjustments***

The bumper rice harvest during *boro* 2008 had ushered in hopes that rice prices would fall quickly. Prices did decline, especially in the major production areas but it was much less than was popularly expected. In fact the farm gate price of rice remained largely unchanged between May-June 2008 while wages increased. The higher output increase per acre (by at least 20 percent) generated a lot of demand for ancillary activities, creating employment, raising earnings and consumption. In other words, rice producing areas coped well with the highly unstable food/rice regime, as wages, employment and earnings adjusted to price volatility in Bogra.

This picture contrasts sharply with the deficit, mono-cropped areas of Noakhali. In the absence of a boro crop here, little change was seen in prices, employment and consumption although it could be argued that without a bumper harvest of boro nationally, the situation in Noakhali would have been even worse. The poor and even non-poor people were forced to adopt different adjustment measures:

- Seasonal migration: Migration increased sharply, with 1-2 members leaving the village from each household
- Credit: loans from usurious informal sources at adverse terms as well as from NGOs expanded rapidly (80 percent of households have NGO loans, usually 2-3 loans per household)
- Advance crop sales were rampant along with traditional paddy-based credit like *dhaner upore* which involves credit in cash paid in paddy at harvest at a sharply reduced price
- Sale of poultry almost universal
- Deepened the hardships further as the September-October period (*kartik*) approached as no employment was available even outside the village
- Ten percent of households sold land and went off to settle in the high-risk environment of newly emerging *chars*
- Sweet potatoes were widely consumed as a cheaper rice substitute: most poor people ate one meal consisting of sweet potatoes. Many also mixed two kg of spinach with 1 kg of *shak*
- Agricultural wages did not respond to higher prices as in Bogra
- Demand for labour declined sharply; same with demand for consumer items, transport etc (no one wanted to ride rickshaws to save money!).
- The *aus* crop harvested in July-August provides some respite in terms of creating some employment and stabilizing local prices.

## 5.3 Conclusion

The main finding of this chapter is that price instability has a cost, and that poor households try to adjust through complex mechanisms. In surplus rice producing areas with a good *boro* harvest, these adjustments were easier as wages responded to high prices, the harvest itself stabilized rice prices while at the same time, generating broad-based demand in the economy for a variety of trade, services and other employment. In non-green revolution, single crop areas like Noakhali (especially *chars*) the adjustment process was found to be much harder with the poor having to devise complex responses to stave off hunger. The main point is that for large parts of the country (i.e. where rice production is good), the problem of high prices is transitory with adjustments in the labour market and the overall economy occurring quite rapidly. The concern is with backward areas where micro-level adjustments are indeed costly, and where the local economy is unable to adjust so well. The policy implication is clear: it is important to design safety net programs and development interventions especially for backward areas like *chars*, *haors*, and lowland zones where the impact of high prices is severe.

## *CHAPTER 6*

## SOME KEY FINDINGS AND CONCLUDING REMARKS

### Key-Findings and Policy Implications

*Production and Price Patterns*

- Price and production fluctuations have increased in more recent years, and for rice, appears to be associated with large random and non-random shocks. The pattern of seasonality has remained unchanged with a twin-peak pattern in May and October. The October peak remains higher than the May peak. These findings point to the need for an active PFDS.[18]
- Potato price seasonality off-sets rice price seasonality while brinjal price seasonality accentuates it. This suggests that a policy of careful crop diversification can dampen food prices and help to smooth food consumption.
- Domestic price-production relationship for rice seem weak pointing to the likelihood that rice price is being increasingly influenced by external developments, e.g. in Indian and world food markets. This preliminary finding should be treated with caution as it requires further research to validate it, and suggests the need to systematically monitor and analyze Indian and world food markets in addition to monitoring of domestic production and price movements. A dedicated agency along the lines of an agricultural or food prices commission could be set up to address these objectives..

*Market Integration*

- Overall markets, especially for potato and rice are well integrated (LOP holds) although specific rice markets fared poorly while brinjal markets in general, performed much less well. Thus for some crops and areas, there is a need to improve market performance. In particular, perishable crops are likely to provide poor returns to growers as well as to small traders while the bigger traders and retailers appear to do much better. A positive impact could be had if it is possible to stagger output/harvests or to allow storage or processing of these goods. This would require appropriate public investments as well as agricultural research and extension.
- Causality direction was found to be mixed. It was interesting to find bi-directional causality with Indian rice prices – this is difficult to explain given that Bangladesh imports from but does not export to India. It is possible however that there is significant informal flows of rice in both directions, especially from the border zones, that could explain this pattern. If price differentials are large, as may well happen during certain periods, such informal flows cannot be ruled out. This provides additional impetus to the need to carefully monitor food market trends in India at the disaggregated level.
- Vertical integration: The paddy growers appear to receive about *70 per cent* of the retail value of rice. Both the paddy *farias* and *beparis* get about 8 per cent of the retail value. The paddy aratdars/wholesalers get about 4 per cent of the retail value. The low

[18] The findings in Chapter 3 found no role of PFDS in determining prices. The objective of PFDS operations is usually to stabilize prices, and in particular to regulate seasonal price hikes. This was not explicitly tested in the econometrics used in this chapter. Historically, OMS employed by the PFDS has played an important role in price stabilization.

margins for the *aratdars*/wholesalers can be explained by the fact that they are really commission agents. In the rice segment of the supply chain millers get around 7 per cent, and the rice aratdars/wholesalers get another 3 per cent of the retail value. The highest individual margins go to the rice retailers accruing about 9 per cent of the value.

- For perishable items such as brinjal the marketing margins are higher at the latter stages of the transaction. For instance, the marketing margins for wholesalers and retailers are more than double of that earned by *farias* and *beparis*. For this commodity, small volume offered by the *farias* and *beparis* makes their bargaining strength weak. For potato, the marketing margins do not follow any systematic pattern. When looked at the margins of potato vis-à-vis brinjal one may conclude that potato market is more efficient than that of the brinjal. In contrast, the marketing margins are higher for rice than potato or brinjal at almost all stages of transaction. While growers share in the final consumer price is less than 50 per cent for brinjal, it is about 70 per cent for potato and rice. While the shares of market operators are evenly distributed for potato and rice, it is highly concentrated among wholesalers and retailers for brinjal.

*Market Institutions*

- Weaker parties are unable to enforce contracts – strong need for external enforcement mechanisms. However, great care will be required as often formal mechanisms can end up having the exactly opposite effect than intended.
- Use of modern grading and sorting techniques and introduction of international standards: This has been discussed often but no steps have yet been taken. This should be urgently addressed, especially if our target is to move towards agro-exports.
- The *aratdari* system is the central pillar for market exchange. Policy attention needs to be focused closely on the *aratdari* system to improve it through modern management practices.
- The food market is mired in problems of quality, standards, and concern for bio-security. This is a crucial challenge for the traditional trading sector, which if left unaddressed, could mark the beginning of its end.

*Consumption*

- For large parts of the country (i.e. advanced areas), the problem of high prices is transitory with adjustments in the labour market and the overall economy occurring quite rapidly.
- This is not the case for backward areas where micro-level adjustments are costly, and where safety net programmes are urgently required.

**Areas for Further Research**

- The price-production relationship for rice needs to be validated through more rigorous estimates.
- There is a presumption that seasonality in food prices declined in the 80s but may have become aggravated in more recent years. This needs to be verified as it has implications for PFDS operations.

- The finding of bidirectional causality of Bangladeshi and Indian rice prices requires further investigation.
- For rice, some areas appear not to be well integrated – these need to be identified and characterized. It is likely that these are the more backward, single-cropped areas.
- The modern food retailing sector is in its infancy. The trade off between this sector and the traditional sector needs to be understood.
- The single biggest threat to trading is default – its nature, extent, and redressal mechanisms need to be examined in depth to identify remedies.
- The *aratdari* system has been identified as the central pillar of the market. The task now is to promote this as a modern corporate entity. How can this be done?
- How to generate low cost consumer information that will reduce information asymmetry, especially at the interface with the retailer?
- Need to examine alternative shock-scenarios, the need for domestic stocks and costs compared to a strategy that depends more on a combination of stocks and imports to address food crises.

**Some Final remarks**

We began with the question whether food insecurity has now re-emerged in Bangladesh, after a period of respite from late 1990s to the mid 2000s. It was observed that over a thirty year period, supply and price fluctuations in rice, first declined in the 1990s but increased thereafter. We also found seasonality in rice prices to be high with the major one occurring in September-October and a slightly smaller peak in March-April, suggesting that seasonal patterns have largely remained unchanged over the last two decades. At the same time, the world cereal, especially rice market, was found to exhibit sharp price movements, not entirely explained by the usual supply-demand movements. Indeed, a major price shock was experienced in 2007-08 in world food and energy prices, which in turn fuelled an intense period of high prices across the board. This was soon followed by the recession in the wake of a slump in demand, bringing prices down to historical lows.

It is difficult to predict whether this combination of domestic and world market instability seen in recent years is a temporary phenomenon or here to stay with us for a while. The dominant thinking on the subject seems to be that the world market will become increasingly unreliable as a source of imports of food, and that countries that depend on food imports need to carefully re-examine their options. Domestic markets are also widely viewed as being highly imperfect, leading to aberrant (high) prices and monopolistic control. The new reality seems to be that volatility has increased in both domestic and international markets, leading to a greater probability that this will heighten shocks – both positive and negative, more frequently than before. Thus, the problem of food management which is already complex, is set to become even more difficult in the years ahead.

For a food-importing country like Bangladesh, the world market is given. Bangladesh can choose whether to participate but cannot dictate the terms of participation. There is understandably, a huge pressure on the government to adopt autarkic policies for food. Indeed, the Awami League Manifesto explicitly states "Our main aim is to ensure 'food for all' by taking all possible measures and to make Bangladesh self-sufficient in food by 2013" (Election Manifesto of Bangladesh Awami League, 2008, p.9). These twin concerns regarding availability and access require that domestic production be scaled up and that access to food is ensured, not only on average, but in each and every time period. Given the

greater probability of fluctuations and shocks in both the domestic and world markets, as well as the heightened risk of a combined world-domestic market shock, the task of food market stabilization assumes a greater challenge. This implies that the public food system hold huge stocks, undertake extensive procurement after harvest while also pursuing a policy of subsidized inputs to farmers to encourage production. In other words, we are staring at a set of policies that was thought to have become extinct in the 1980s and 1990s. Is this justified in the light of the emerging changes in the food price regime or is it a hasty reaction to traumatic food price movements seen in recent years?. Much depends on whether this type of volatility is seen as a temporary, one-off event or whether it is likely to be a permanent feature of the Bangladesh food regime.

Unfortunately, a reliable answer to this basic question is not easy to find. This is especially true for the world food market which is under pressure from a number of directions. Rapid growth in China and India has dramatically altered food consumption patterns with more calorie-dense foods like meat and poultry in demand. This has in turn intensified demand for feed grains. In addition, subsidies given to advanced country agriculture has made bio-fuels profitable which compete directly with human food. As far as developing countries like Bangladesh are concerned, volatility has increased, possibly as a result of pushing cultivation to the more marginal areas, high and erratic behaviour in the availability of agricultural inputs including energy inputs, and diminishing returns to past investments in the now, not so new, agricultural technology. The probability of a joint external-internal shock to the food regime is therefore more likely today than ever before. **As such, the government reaction seems apparently justified. However, further research is required to examine alternative shock-scenarios, the need for domestic stocks and costs compared to a strategy that depends more on a combination of stocks and imports to address food crises**. At the end however, this will have to be based on the subjective judgement of policy makers.

Market performance was closely examined and in general found to be performing well. There was some evidence that the market for perishable items (in this case brinjal) was poorly integrated. It was also found that even in the case of rice markets, there were areas were markets were not well-integrated. Cross border rice markets were found to be well-integrated. Vertical integration was assessed through analysis of trading costs and margins for dominant types of transactions, and were generally found to be reasonable, although again, in the case of brinjal the return to growers was relatively low. In other words, the study finds some evidence that for some markets and commodities, and in some areas, market performance is poor requiring appropriate policy action to be brought to bear.

Much of the domestic attention to a food crisis is on markets and traders who are frequently accused of collusion and price-fixing. This study finds no evidence for these concerns but does note that there is plenty of **scope for improving market performance through reduction of certain types of risks and transactions costs**. The central role of the *aratdar* working through a network of traders (who are increasingly free, not tied agents) was observed. Establishing trading networks is not cheap, taking time and credit arrangements to build. Such networks are crucial in resolving the problem of trust in an effort to lower risk ensure turnover. Thus, the single most critical issue in trade is building reputation, trust and loyalty, generally through repeat transactions. These networks also enable small traders to achieve a superior bargaining position against other larger entities than would have been possible if they were to trade directly, by-passing the *aratdar*.

The food security regime facing the country has changed, possibly permanently. The outlook for the future is not good especially in the face of world market changes and the likely impact of global warming on Bangladesh agriculture. The attention of the government therefore

needs to be on supply side factors, including provision of incentives for domestic producers. In this context, the cheap-food policy of the government needs a thorough examination. It would be important to have a longer term plan of allowing real food prices to rise gradually to ensure farm incentives, raising rural incomes and purchasing power, and creating well-tuned safety nets for the ultra-poor. The supply side constraint also needs to be addressed by basic research.

The other side of the problem of food security is reflected in widespread malnutrition, especially child malnutrition, arising from a preponderance of rice in the national diet. Roughly between 75-80 percent of calorie needs are fulfilled by rice or cereals causing a serious shortage in the intake of fat, fruits and vegetables. Ideally, not more than 55 percent of calories should come from cereals suggesting that longer term food policy needs to encourage consumption of non-rice foods. A medium term strategy of reducing cereal based calorie share to 60-65 percent would be a reasonable goal, which if achieved, will automatically ensure rice self-sufficiency (due to reduction in rice demand), see Murshid et al, (2008). The thrust therefore must be on promoting the production and demand for fruits, vegetable and oil/fat in the national diet. The question is how best can we move away from a rice-centered food policy to a more broad-based, nutritional approach? A possible way forward is to borrow a leaf from the experience of the green revolution which was driven by technology, and initially, by heavily subsidized inputs. Unlike rice or other cereals, however, these other crops are likely to be much more perishable, requiring large-scale investments in appropriate infrastructure distribution and storage facilities. A pro-active public sector role in this context would be highly desirable.

Government of Bangladesh now seems to be going through a phase of drastic policy reversal. Even if one agrees with the rationale for increased state intervention in food and agriculture, the institutions and governance arrangements that are crucial in this context needs to be strengthened. Many of these institutions have over time, become emasculated (e.g. the public food distribution system) requiring capacity development, incentives as well as infrastructural improvements. A dramatic shift towards public interventions across the board could backfire with calamitous results if the underlying institutions are not corrected.

APPENDIX TO CHAPTER 3

**Table A1: Unit Root Tests for Wholesale Prices of Brinjal across Some Districts**

| **Tests→** | **ADF Test** | | **PP Test** | | **KPSS Test** | |
|---|---|---|---|---|---|---|
| **Districts↓** | **Drift** | **Trend** | **Drift** | **Trend** | **Drift** | **Trend** |
| Series in Level | | | | | | |
| Barisal | 0.440 | -0.754 | -4.595 | -5.281 | 1.172 | 0.118 |
| Bhola | 0.728 | -0.049 | -5.441 | -5.779 | 0.554 | 0.102 |
| Chittagong | 3.025 | 0.818 | -4.436 | -5.165 | 0.940 | 0.246 |
| Comilla | 1.365 | -0.830 | -4.556 | -5.274 | 1.378 | 0.135 |
| Dhaka | -5.926 | -6.646 | -5.954 | -6.717 | 0.940 | 0.175 |
| Jossore | 1.406 | -0.592 | -5.070 | -5.452 | 1.039 | 0.130 |
| Khulna | 0.949 | -0.845 | -4.573 | -5.775 | 1.317 | 0.142 |
| Manikganj | -0.352 | -2.546 | -5.237 | -5.859 | 1.215 | 0.052 |
| Moulavi Bazar | 0.837 | -1.634 | -5.518 | -6.528 | 1.253 | 0.136 |
| Natore | 2.684 | 1.017 | -4.774 | -5.787 | 1.021 | 0.213 |
| Rajshahi | 1.039 | -0.680 | -4.590 | -4.725 | 1.199 | 0.162 |
| Sylhet | -6.255 | -8.139 | -4.864 | -5.135 | 1.139 | 0.069 |
| Series in First Difference | | | | | | |
| Barisal | -5.956 | -6.062 | -24.197 | -22.918 | 0.101 | 0.084 |
| Bhola | -11.703 | -11.834 | -18.772 | -18.747 | 0.068 | 0.060 |
| Chittagong | -10.541 | -10.029 | -15.719 | -15.783 | 0.060 | 0.046 |
| Comilla | -10.222 | -10.501 | -25.483 | -24.208 | 0.124 | 0.100 |
| Dhaka | -9.554 | -9.854 | -26.675 | -26.774 | 0.065 | 0.065 |
| Jossore | -6.139 | -6.323 | -20.152 | -19.922 | 0.123 | 0.143 |
| Khulna | -5.553 | -5.783 | -22.200 | -22.209 | 0.167 | 0.135 |
| Manikganj | -5.691 | -5.776 | -21.845 | -24.649 | 0.073 | 0.070 |
| Moulavi Bazar | -10.907 | -11.151 | -24.213 | -21.862 | 0.065 | 0.049 |
| Natore | -6.097 | -10.942 | -19.540 | -19.487 | 0.052 | 0.051 |
| Rajshahi | -6.150 | -6.453 | -15.674 | -15.475 | 0.061 | 0.049 |
| Sylhet | -9.575 | -9.675 | -15.445 | -15.418 | 0.078 | 0.074 |

**Table A2: Unit Root Tests for Wholesale Prices of Potato across Some Districts**

| Tests→ | ADF Test | | PP Test | | KPSS Test | |
|---|---|---|---|---|---|---|
| Districts↓ | Drift | Trend | Drift | Trend | Drift | Trend |
| Series in Level | | | | | | |
| Barisal | -1.711 | -2.805 | -1.424 | -2.724 | 0.865 | 0.196 |
| Bhola | -1.426 | -3.992 | -2.000 | -3.090 | 0.793 | 0.205 |
| Bogra | -2.665 | -3.646 | -2.177 | -3.394 | 0.845 | 0.214 |
| Chittagong | -1.595 | -2.630 | -1.212 | -2.335 | 0.830 | 0.193 |
| Comilla | -1.325 | -2.421 | -1.973 | -3.228 | 0.933 | 0.175 |
| Dhaka | -2.036 | -3.212 | -2.119 | -3.223 | 0.951 | 0.207 |
| Khulna | -3.139 | -4.304 | -1.819 | -2.959 | 0.849 | 0.183 |
| Kushtia | -1.355 | -4.313 | -1.893 | -3.083 | 0.886 | 0.224 |
| Moulavi Bazar | -1.408 | -2.299 | -2.364 | -3.239 | 0.761 | 0.166 |
| Munshiganj | -2.306 | -3.496 | -2.243 | -3.418 | 0.936 | 0.209 |
| Rajshahi | -2.454 | -3.592 | -2.063 | -3.541 | 0.901 | 0.220 |
| Sylhet | -3.081 | -4.285 | -1.887 | -2.952 | 0.861 | 0.183 |
| Series in First Difference | | | | | | |
| Barisal | -9.709 | -9.743 | -9.621 | -10.586 | 0.300 | 0.185 |
| Bhola | -10.051 | -10.074 | -12.409 | -13.542 | 0.500 | 0.500 |
| Bogra | -11.915 | -11.894 | -16.168 | -17.703 | 0.281 | 0.162 |
| Chittagong | -10.271 | -10.296 | -10.786 | -11.789 | 0.302 | 0.124 |
| Comilla | -10.406 | -10.420 | -14.778 | -19.228 | 0.335 | 0.198 |
| Dhaka | -11.072 | -11.062 | -14.894 | -17.141 | 0.334 | 0.160 |
| Khulna | -9.404 | -4.687 | -11.356 | -12.039 | 0.257 | 0.185 |
| Kushtia | -9.857 | -9.877 | -12.956 | -15.289 | 0.324 | 0.323 |
| Moulavi Bazar | -10.405 | -10.426 | -10.826 | -11.872 | 0.368 | 0.230 |
| Munshiganj | -10.106 | -10.128 | -17.657 | -20.490 | 0.500 | 0.468 |
| Rajshahi | -12.678 | -12.660 | -15.003 | -15.908 | 0.220 | 0.098 |
| Sylhet | -9.553 | -9.565 | -13.387 | -18.816 | 0.328 | 0.159 |

**Table A3: Unit Root Tests for Wholesale Prices of Coarse Rice across Some Districts**

| Tests→ | ADF Test | | PP Test | | KPSS Test | |
|---|---|---|---|---|---|---|
| **Districts↓** | **Drift** | **Trend** | **Drift** | **Trend** | **Drift** | **Trend** |
| Series in Level | | | | | | |
| Barisal | -1.453 | -2.890 | -1.068 | -2.808 | 1.075 | 0.248 |
| Chittagong | -0.376 | -2.272 | -0.172 | -2.272 | 1.071 | 0.248 |
| Dhaka | -1.185 | -2.756 | -0.392 | -2.257 | 1.046 | 0.235 |
| Feni | -1.217 | -2.914 | -0.453 | -2.652 | 1.098 | 0.199 |
| Khulna | -0.471 | -3.176 | -0.751 | -2.705 | 0.982 | 0.242 |
| **Kolkata** | **-1.108** | **-2.608** | **-1.118** | **-0.945** | **0.664** | **0.100** |
| Kushtia | -0.702 | -2.509 | -0.142 | -2.509 | 1.019 | 0.227 |
| Moulavi Bazar | -0.801 | -2.357 | -0.556 | -2.429 | 1.091 | 0.196 |
| Mymensingh | -0.920 | -2.374 | -0.177 | -2.030 | 1.005 | 0.214 |
| Naogaon | -0.501 | -2.167 | -0.539 | -2.697 | 1.069 | 0.194 |
| Patuakhali | -1.404 | -3.060 | -0.806 | -2.649 | 1.090 | 0.220 |
| Rajshahi | -0.595 | -2.451 | -0.125 | -2.291 | 1.083 | 0.210 |
| Sylhet | -0.509 | -2.002 | -0.109 | -1.898 | 1.034 | 0.221 |
| Series in First Difference | | | | | | |
| Barisal | -12.468 | -12.510 | -13.274 | -13.922 | 0.249 | 0.065 |
| Chittagong | -12.330 | -12.483 | -12.348 | -12.822 | 0.288 | 0.052 |
| Dhaka | -14.906 | -15.017 | -15.707 | -16.636 | 0.312 | 0.093 |
| Feni | -14.281 | -14.388 | -15.078 | -15.709 | 0.283 | 0.067 |
| Khulna | -15.895 | -16.059 | -17.325 | -18.279 | 0.436 | 0.067 |
| **Kolkata** | **-5.574** | **-5.587** | **-5.574** | **-5.587** | **0.213** | **0.182** |
| Kushtia | -14.629 | -14.851 | -15.125 | -15.694 | 0.460 | 0.072 |
| Moulavi Bazar | -11.393 | -11.450 | -11.543 | -11.838 | 0.225 | 0.054 |
| Mymensingh | -13.726 | -13.870 | -14.302 | -14.782 | 0.326 | 0.081 |
| Naogaon | -15.644 | -15.758 | -16.466 | -16.989 | 0.296 | 0.062 |
| Patuakhali | -14.641 | -14.756 | -15.688 | -17.867 | 0.345 | 0.116 |
| Rajshahi | -13.671 | -13.803 | -13.900 | -14.558 | 0.313 | 0.066 |
| Sylhet | -12.421 | -12.532 | -12.599 | -13.023 | 0.281 | 0.062 |

# *REFERENCES*


Ahmed, N. et al (2007): Distortions to Agricultural Incentives in Bangladesh, Working Paper 32, World Bank

Ahmed, R. and A. Bernard. 1989. Rice Price Fluctuation and an Approach to Price Stabilization in Bangladesh. *Research Report 72,* International Food Policy Research Institute: Washington D.C.

Ahmed, R. et al (2000): Out of the Shadow of Famine: Evolving Food Markets and Food policy in Bangladesh, Baltimore, Md: The Johns Hopkins University Press, 2000

Alauddin, M. and Tisdell, C. (1991): The Green Revolution and Economic Development, London: Macmillan

Baulch, Bob (1997): Transfer Costs, Spatial Arbitrage and Testing for Food Market Integration, AJAE, 79

Camerer, C. (2003) Behavioral Game Theory: Experiments in Strategic Interaction. Princeton, N.J. Princeton University Press.

Chowdhury, N. 1992. Rice Markets in Bangladesh: A Study in Structure, Conduct and Performance. *Bangladesh Food Policy Project Manuscript 40*, International Food Policy Research Institute: Washington D.C.

Chowdhury, N. et al (2006): Food policy Liberalization in Bangladesh: How the Government and the markets delivered, MTID discussion paper no.92, IFPRI

Chowdhury, Omar, H. et all: Credit programs for the poor and the Health Status of Children in Rural Bangladesh, International Economic Review, Brown University, vol.44, no.1

Clay, Ed. (1990): Preventing Famine: Policies and Prospects for Africa, Journal of Development Economics, 32 (1990)

Colson, Elizabeth. (1974) Tradition and Contract: The Problem of Order. London: Heinemann.

CPD. 2007. *Price of Daily Essentials: A Diagnostic Study of Recent Trends*, Centre for Policy Dialogue, Bangladesh, mimeo.

Crawford, Sue. and Elinor Ostrom. (2005) "A Grammar of Institutions." In Understanding Institutional Diversity, ed. Elinor Ostrom, 137-174. Princeton, N.J. Princeton University Press. Originally published in American Political Science Review 89 (3) (1995):582-600.

Crow, B. and K.A.S. Murshid (1989): The Finance of Forced and Free Markets – Merchants' Capital in Bangladesh Grain Trade, DPP Working Paper, Open University, UK

Crow, B. sand K.A.S. Murshid (1994): Economic Returns to Social Power: Merchants' Finance and Interlinkage in the Grain Markets of Bangladesh", World Development, 22, 7, July 1994

Das, J., S. Zohir and R. Baulch. 1997. *Spatial Integration of Foodgrain Markets in Bangladesh: Pricing Analysis*. Bangladesh Institute of Development Studies, mimeo.

Dawson, P. J. and P.K. Dey. 2003. Testing for the Law of One Price: Rice Market Integration in Bangladesh. *Journal of International Development,* 14, pp. 473-484.

Del Ninno, C. et al (2003): Public Policy, Food Markets, and Household Coping Strategies in Bangladesh, FMRSP-IFPRI

Dickey, D.A. and W.A. Fuller. 1979. Distributions of the Estimators for Autoregressive Time Series With a Unit Root. In: Journal of the American Statistical Association, 75: 427- 431.

Dorosh, P. and K.A.S. Murshid (2000): Trade liberalization, Private Sector Imports and National Food Security in Bangladesh, FMRSP Synthesis Paper 2, IFPRI

Dorosh et al (2004): The 1998 Floods and Beyond: Towards Comprehensive Food Security in Bangladesh, UPL/IFPRI

Goletti, F. and N. Farid. 1995. Structural Determinants of Rice Market Integration: The Case of Rice Markets in Bangladesh. *Developing Economies,* 33(X), pp. 185-202.

Goodenough, Oliver and Monika Gruter Cheney. (2008) "Is Free Enterprise Values in Action" In Moral Markets: The Crucial Role of Values in the Economy, ed. Paul J. Zak, Princeton University Press, Princeton and Oxford.

Hobbes, Thomas. [1651] 1960. Leviathan, or the Matter, From the Power of a Commonwealth Ecclesiastical and Civil. Oxford: Basil Blackwell.

Hossain, M. (1988): Nature and Impact of the Green Revolution in Bangladesh, IFPRI

Hossain, M., Nahar, F. and Quazi Shahabuddin (2005): Food Security and Nutrition in Bangladesh: Progress and Determinants, vol.2, FAO, Rome

Johansen S. 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control* 12: 231–254.

Johansen S. 1992. Determination of cointegration rank in the presence of a linear trend. *Oxford Bulletin of Economics and Statistics* 54: 383–397.

Kwiatowski, D. P.C.B. Phillips, P. Schmidt, and Y. Shin. 1992. Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How Sure are We that Economic Time Series have a Unit Root? *Journal of Econometrics*, 54, 159-178.

Moazzem and Fujita (2004): The potato marketing System and its Changes in Bangladesh: From the perspective of a Village Study in Comilla, Bangladesh, Institute of Developing Economies, vol 42, no. 1

Mosconi R, and C. Giannini. 1992. Non-causality in Cointegrated Systems: Representation, Estimation and Testing. *Oxford Bulletin of Economics and Statistics* 54: 399–417.

Murshid, K.A.S. (1986); Nature, Levels and Trend in Instability in Foodgrain Production in Bangladesh, Bangladesh Development Studies, XV no. 1, 1987

Murshid, K.A.S. (1987): Weather, Technology and Instability in Cereal Production in Bangladesh, Bangladesh development studies, XV, no.1

Murshid, K.A.S. (1999): Trade Liberalization and Food Security – the Evolution and Conduct of the Cross Border Trade in Rice (A Bangladesh Perspective), Working paper, BIDS-IFPRI/FMRSP,

Murshid, K.A.S. (1997): "Generalised Morality and the Problem of Transition to an Impersonal Exchange Regime - A Response to Platteau with Insights from the Bangladesh Rice Market, Journal of Development Studies, June, 1997, London

Murshid, K.A.S. and Shahidur Rashid (2001): Market Transition and Price-Wage Dynamics: The Case of if the Bangladesh Rice Market, FMRSP Synthesis paper 5, BIDS-IFPRI

North, Douglass C. (1990) Institutions, Institutional Change and Economic Performance, Cambridge University Press, UK

O'Hara, E. Ann (2008) "Trustworthiness and Contract" In Moral Markets: The Crucial Role of Values in the Economy, ed. Paul J. Zak, Princeton University Press, Princeton and Oxford.

Ostrom, Elinor, and James Walker. 2003. Trust and Reciprocity: Interdisciplinary Lessons from Experimental Research. New York, Russell Sage Foundation.

Ostrom, Elinor. 2005. Understanding Institutional Diversity. Princeton, N.J. :Princeton University Press.

Osmani, S.R. and A. Quasem (1990): Pricing and Subsidy policies for Bangladesh Agriculture, mimeo, BIDS

Phillips and Perron, "Testing for a Unit Root in Time Series Regressions", Biometrika, 1988.

Pressman, Steven and Gale Summerfield (2000): The Economic Contributions of Amartya Sen, Review of political Economy, 1, 12

Rahman, S.H. 1993. *Analysis of Agricultural Commodity Markets and Prices in Bangladesh*, Bangladesh Institute of Development Studies, mimeo.

Ravallion, M. 1986. Testing Market Integration. *American Journal of Agricultural Economics,* 68(XX), pp. 102-109.s

Ravallion, M. (1987): Markets and Famines, Clarendon Press: Oxford

Razzaque, A., Khondker,B. and Selim Raihan (2007): Intrahousehold Distribution and Poverty Dynamics: Empirical Analysis on Bangladesh Data, BER, Dhaka University

Reutlinger, A. (1986): Securing Food Supply for All: Poverty and Hunger, Issues and Options for Food security in Developing Countries, World Bank Policy Study, Washington, DC, USA

Sally, David. 2002. "Two Economic Applications of Sympathy." Journal of Law, Economics and Organization 18 (2): 455-487.

Schwab, David and Elinor Ostrom. (2008) "The Vital Role of Norms and Rules in Maintaining Open Public and Private Economics" In Moral Markets: The Crucial Role of Values in the Economy, ed. Paul J. Zak, Princeton University Press, Princeton and Oxford.

Sen, Binayak and D. Hulme (ed) 2006: Chronic Poverty in Bangladesh, Tales of Ascent, Descent, Marginality and Persistence, BIDS-CPRC

Shahabuddin, Q. et al (1986): Peasant behaviour Towards Risk and Socio-Economic and Structural Characteristics of Farm Households in Bangladesh, Oxford Economic P, 1, 38

Shahabuddin and Butterfield (1986): The Impact of Risk in Agricultural Decisions: Tests of a Safety First Model in Bangladesh, BDS, vol XV, no.3

Shahabuddin, Q. and Paul Dorosh (2002): Comparative Advantage in Bangladesh Crop Production, MTID discussion paper 47, IFPRI

Timmer, C.P., W.R. Falcon, and S. R. Pearson. 1983. *Food Policy Analysis*—A World Bank Publication, Johns Hopkins University Press, Baltimore and London.

Tomek, W.G. and K. Robinson. 2003. *Agricultural Product Prices*, Cornell University Press, Ithaca and London.