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RICE PRICE STABILIZATION IN BANGLADESH: AN ANALYSIS OF POLICY OPTIONS

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ABSTRACT

To meet its overall objective of ensuring food security for all households, the Government of Bangladesh undertakes several activities: it intervenes in markets to stabilize prices, targets food distribution to poor households and provides emergency relief after natural disasters. This paper provides measures of the variability of domestic and international rice prices, and examines the mix of government intervention and private sector participation in rice markets. The analysis shows that the relatively high degree of price stability achieved in the 1990s was due in large part to private sector imports that stabilized markets following major production shortfalls. Domestic rice procurement contributed relatively little to raising domestic producer prices at harvest time, involved only a small percentage of farmers, and incurred excessive costs following successful harvests because of procurement prices set far in excess of market prices.

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RICE PRICE STABILIZATION IN BANGLADESH: AN ANALYSIS OF POLICY OPTIONS

Paul Dorosh[1] and Quazi Shahabuddin[2]

1. INTRODUCTION

Ironically, less than one year from the massive floods of 1998 and the concerns of imminent food shortages, excessively low prices, rather than high prices dominated the short-term food policy debate. Bumper crops of wheat and boro rice in the first half of 1999 suddenly brought large surpluses to markets, leading the Ministry of Food to increase procurement targets, and which resulted in a large build-up of government stocks. This rapid turnabout in market conditions and public perceptions illustrates both the natural instability of foodgrain production and markets in Bangladesh and a major reason why the Government of Bangladesh intervenes heavily in rice and wheat markets.

Food policy in Bangladesh has several objectives, though basically the major objective is ensuring food security for all households. In attempting to meet this objective, the Government of Bangladesh undertakes several activities, including open market sales of foodgrain to limit foodgrain price increases, targeting food distribution to poor households, providing emergency relief after natural disasters, and procuring foodgrain to support producer prices and incomes.

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Government food policy has both price and quantity aspects, and given fiscal, as well as stock constraints, it is not always possible to meet all objectives. For example, no specific floor and ceiling prices are set. Rather, the government attempts to influence domestic market prices through limited purchases (domestic procurement), sales or distribution of specified quantities of foodgrains. Likewise, programs designed to alleviate poverty and household food insecurity such as Food For Work (FFW) and Vulnerable Group Development (VGD) are limited by the extent of resources available, particularly in the form of food aid.

This paper examines the mix of government intervention and private sector participation in food markets in recent years, and analyzes policy options related to price stabilization. In particular, the focus of the paper is on the role of trade liberalization, and impacts of domestic procurement on rice prices.

Chapter two examines data on price stability in Bangladesh in comparison to international market prices. Long-term trends in real prices are also examined, particularly in reference to import and export parity. Chapter three reviews recent stock modeling exercises for Bangladesh and discusses the role of international trade in stabilizing domestic rice and wheat markets in the 1990s. Chapter four analyzes domestic procurement, summarizing the experience of fixed price domestic procurement in recent years, and estimating the impact of domestic procurement on market prices and potential cost-savings of procurement by tenders versus fixed price procurement. Conclusions are presented in chapter five.

2. TRENDS AND VARIABILITY OF RICE PRICES IN BANGLADESH AND WORLD MARKETS

Since Independence, the Government of Bangladesh has attempted to reduce variability of rice prices, and especially to prevent sharp increases in price. This chapter analyzes historical price trends and variability in Bangladesh, and compares them to price trends and variability in India and Thailand (the world's leading rice exporter). First, inter-year (annual) and intra-year (seasonal) prices in Bangladesh are analyzed. In order to separate out price trends from seasonal or random elements, price fluctuations are measured as deviations from the moving average of prices and from a linear trend. Price changes relative to the price in the preceding period are also discussed.

RICE PRICES IN BANGLADESH: ANNUAL AND SEASONAL PATTERNS[3]

Annual price fluctuations in Bangladesh arise mostly from fluctuation in production, which again can be attributed to the random effect of floods and drought. Prior to 1994, public imports, and to a lesser extent drawdown of stocks, were the main policy instruments to achieve year-to-year stability in prices. As will be discussed below, since the trade liberalization of 1994, the private sector import trade has been the dominant factor in keeping price rises within acceptable limits in case of a domestic production shortfall. Seasonal price variations are generated by seasonality in production. The policy instruments that are used to keep seasonal price spreads within acceptable limits are domestic procurement, which attempts to raise average prices (and farmer incomes), and Open Market Sales (OMS) and other sales channels, designed to

[3] This section draws heavily from Shahabuddin (1998), estending the analysis to 2001.

moderate prices to consumers when there are severe upward pressure on prices.

Fluctuations in Annual Rice Prices in Bangladesh

Year-to-year fluctuations in nominal prices of rice in Bangladesh were very high during the seventies, ranging from 9.1 to 108.6 percent, (Table 2.1). Prices were especially unstable during the early seventies (1973/74 - 1975/76) due to severe rice shortages caused by drought-related production shortfalls and shortage of foreign exchange for government rice imports. During the 1980s and 1990s, the range of price fluctuations diminished (3.0 percent to 30.9 percent in the 1980s and 1.6 percent to 27.3 percent in the 1990s). Year-to-year fluctuations greater than 10 percent occurred in 5 out of 7 years during the 1970s as compared with 4 out of 10 years during the 1980s and 7 out of 10 years during the 1990s. By this measure, the decade of the 1980s enjoyed a greater degree of price stability than the 1990s.

In order to distinguish between trend and random elements of fluctuation in prices, trends are calculated using a three-year centered moving average, (which provided a better fit to the data than did a simple linear trend, Figures 3.1 and 3.2). Deviations from the moving average were quite large (between 2.8 and 44.7 percent) during the 1970s and became much smaller during the 1980s (between 0.1 and 14.4 percent) and the 1990s (between 1.7 and 11.7 percent).

Moreover, the deviations of actual prices from the moving average greater than 5 percent occurred 6 out of 7 years during the 1970s, only 5 out of 10 years during the 1980s, and 7 out of 10 years during the 1990s. The patterns remain the same if we consider the deviation of actual prices from the linear trend. Thus, by several measures,

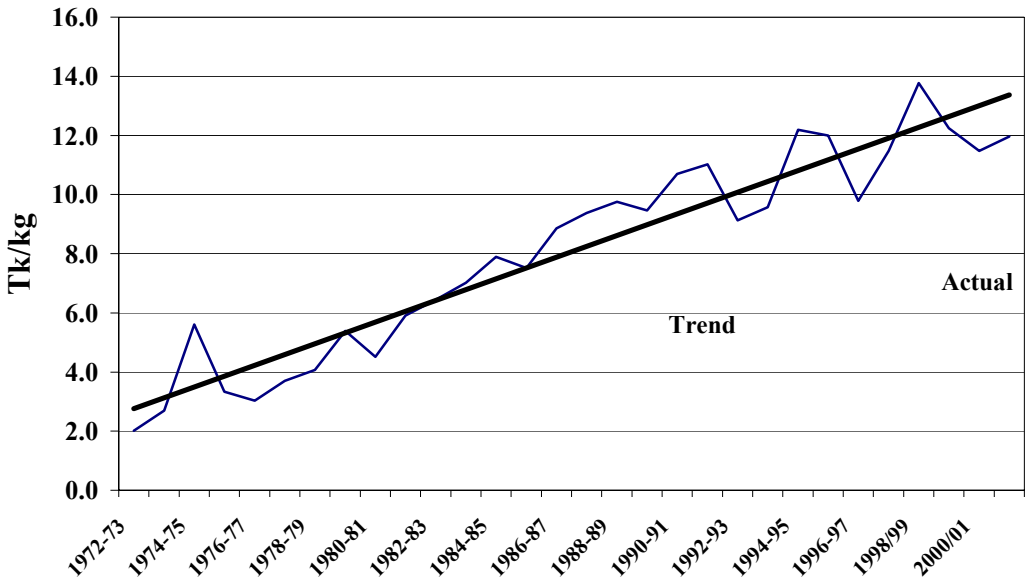
annual rice prices displayed a greater degree of stability during the 1980s than in the 1970s, but fluctuations in rice prices again increased in the 1990s.

Table 2.1—Fluctuations in Annual Rice Prices, 1973/73 to 2001/02

Year	Actual Price (Tk/kg)	Changes from Previous Year (%)	3 years Moving Average	Deviation of actual price from Moving Average (%)	Deviation of actual price from Linear trend (%)
1972-73	2.01	-	--	-	-27.0
1973-74	2.69	33.6	3.44	-21.8	-13.9
1974-75	5.61	108.6	3.88	44.7	60.8
1975-76	3.34	-40.6	3.99	-16.5	-13.5
1976-77	3.03	-9.1	3.36	-9.7	-28.2
1977-78	3.71	22.2	3.60	2.8	-19.2
1978-79	4.07	9.9	4.39	-7.2	-17.7
1979-80	5.39	32.3	4.66	15.7	1.4
1980-81	4.51	-16.3	5.27	-14.4	-20.6
1981-82	5.91	30.9	5.62	5.1	-2.4
1982-83	6.44	9.1	6.45	-0.1	0.4
1983-84	7.01	8.8	7.11	-1.5	3.4
1984-85	7.89	12.5	7.47	5.6	10.4
1985-86	7.51	-4.8	8.08	-7.1	-0.1
1986-87	8.85	17.9	8.58	3.2	12.3
1987-88	9.37	5.9	9.33	0.5	13.7
1988-89	9.76	4.1	9.53	2.4	13.3
1989-90	9.47	-3.0	9.97	-5.1	5.5
1990-91	10.69	12.9	10.39	2.9	14.4
1991-92	11.03	3.1	10.28	7.3	13.6
1992-93	9.12	-17.3	9.91	-7.9	-9.5
1993-94	9.57	5.0	10.29	-7.0	-8.3
1994-95	12.19	27.3	11.25	8.3	12.8
1995-96	11.99	-1.6	11.32	5.9	7.3
1996-97	9.79	-18.4	11.08	-11.7	-15.2
1997/98	11.48	17.3	11.68	-1.7	-3.6
1998/99	13.77	19.9	12.50	10.2	12.2
1999/00	12.24	-11.0	12.50	-2.0	-3.1
2000/01	11.48	-6.2	11.89	-3.5	-11.7
2001/02	11.96	4.2	--	--	-10.5

Source: DAM, MOA and author's calculation.

Figure 2.1—Fluctuations in Annual Wholesale Prices of Coarse Rice, 1972/73 to 2001/02



Fluctuations in Monthly Prices in Bangladesh

Table 2.2 shows the extent of fluctuations in monthly prices for the 1970s, 1980s and 1990s. Two indicators are presented. The first indicator is the simple range - the difference between the lowest and the highest monthly price indices. For each year, the January price is chosen as the base, and is set equal to 100. The second indicator is the coefficient of variation, defined as the standard deviation of the monthly prices in a year, divided by the average price.

As indicated by the first indicator, monthly price fluctuations exceeded 30 percent in 6 out of 8 years during the 1970s, the period characterized by years of post-liberation turmoil and famine in Bangladesh. Monthly price fluctuations exceeding 30 percent,

however, occurred in only 2 out of 10 years during the 1980s, and 3 out of 10 years during the 1990s.

Judged by the second indicator also, rice price fluctuations were quite pronounced during the 1970s. The coefficient of variation of monthly rice prices exceeded 10 percent in 6 out of 8 years in the 1970s, compared with only 2 out of 10 years in the 1980s and 3 out of 10 years in the 1990s.

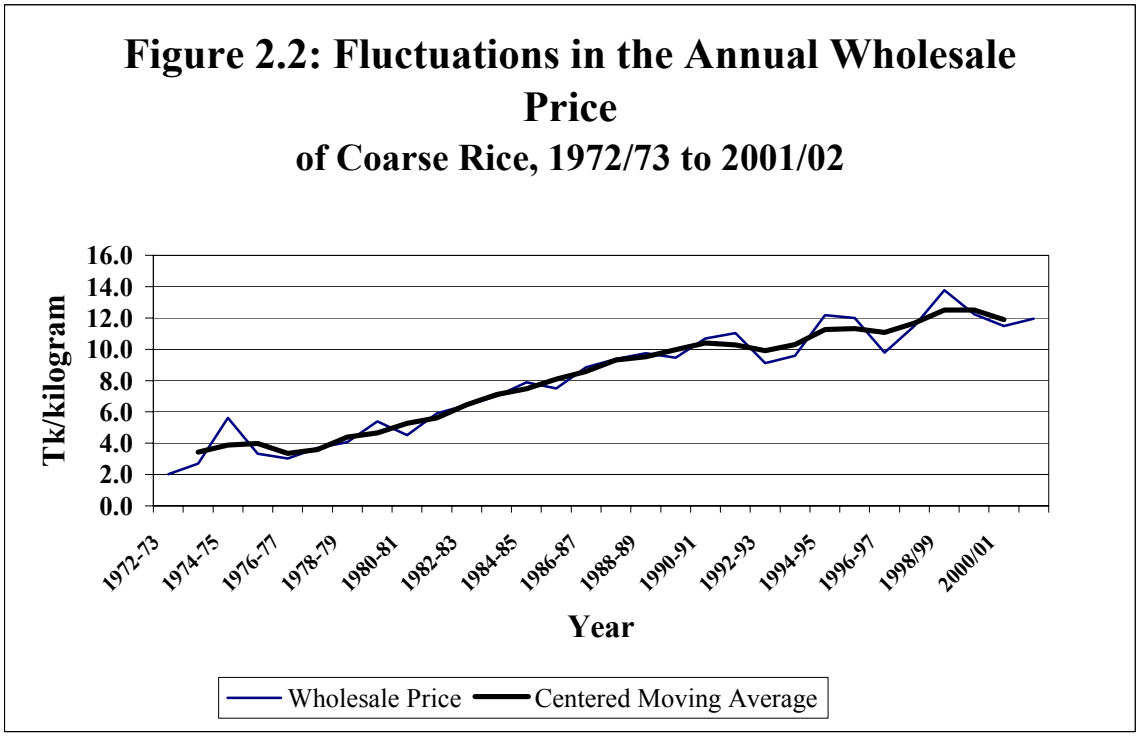
Thus both annual and monthly rice prices displayed a greater degree of stability during the 1980s compared with the 1970s. Two major factors likely account for this change. First, the phenomenal growth of irrigated rice in the boro season (which raised the share of boro rice in total production from about 15 percent in the mid-1970s to about 30 percent in the late 1980s) increased stability of production and resulted in a more even distribution of market arrivals of rice due to multiplicity of harvests in each year. Second, improved infrastructure and enhanced capacity of the government and farmers to undertake effective rehabilitation activities may have reduced the magnitude of production shortfalls caused by natural disasters, thus contributing to improved supply stability.

Nonetheless, the frequency of large year-to-year fluctuations in the average annual rice price again increased during the 1990s, though as discussed above, the range of these annual price fluctuations (measured against the moving average) was slightly smaller than both the 1970s and 1980s.

Table 2.2—Fluctuations in Monthly Nominal Prices of Coarse in Bangladesh

Year	Fluctuation	Coefficient of Variation	Month of Lowest price	Month of Highest price
				May
1972-73	43.5	0.137	July	
1973-74	59.1	0.206	December	June
1974-75	58.0	0.170	July	March
1975-76	85.0	0.242	June	July
1976-77	40.6	0.115	December	June
1977-78	18.8	0.058	December	July
1978-79	63.3	0.177	August	June
1979-80	28.4	0.084	June	July
1980-81	21.1	0.061	December	April
1981-82	54.3	0.172	August	April
1982-83	19.7	0.059	December	October
1983-84	20.4	0.075	August	April
1984-85	19.7	0.055	June	September
1985-86	21.5	0.067	August	April
1986-87	46.9	0.121	November	April
1987-88	16.1	0.053	May	March
1988-89	16.0	0.052	July	April
1989-90	19.1	0.048	December	April
1990-91	29.6	0.096	November	October
1991-92	17.3	0.050	November	April
1992-93	34.1	0.109	November	July
1993-94	41.8	0.143	July	June
1994-95	25.3	0.076	July	February
1995-96	16.8	0.056	May	July
1996-97	20.7	0.063	January	May
				April
1997-98	38.9	0.157	August	
1998-99	15.5	0.061	June	February
1999-00	11.1	0.031	January	May
2000-01	16.7	0.047	August	October
2001-02	13.4	0.058	July	March
Average: 1972/73 - 1979/80	49.6	0.149		
Average: 1980/81 - 1989/90	25.5	0.076		
Average: 1990/91 - 2001/02	23.4	0.079		

Notes : (a) Price fluctuation is measured as the difference between the highest and lowest index numbers; the index number is based on the January price as 100 and constructed separately for months in a year. (b) The coefficient of variation is the standard deviation divided by the mean. Source: Authors' calculations.



Seasonality of Rice Prices in Bangladesh

The seasonal component is defined as the intra-year pattern of variation that is repeated from year to year. The seasonal index is calculated by taking the averages for each month, of the ratio of the price to a 12 month moving average.

Table 2.3 and Figure 2.3 show the seasonality index for the late 1970s, the 1980s and the 1990s. Three major changes in the seasonality index can be observed. First, the ratio of the peak price to trough price gradually declined over time, from 1.236 in the late 1970s to 1.161 in the 1980s to 1.103 in the 1990s.[4] The seasonal price spread thus has declined significantly (almost cut down by half) during the 1980s and the 1990s as

[4] The 1990s figure covers 1990/91 – 2001/02.

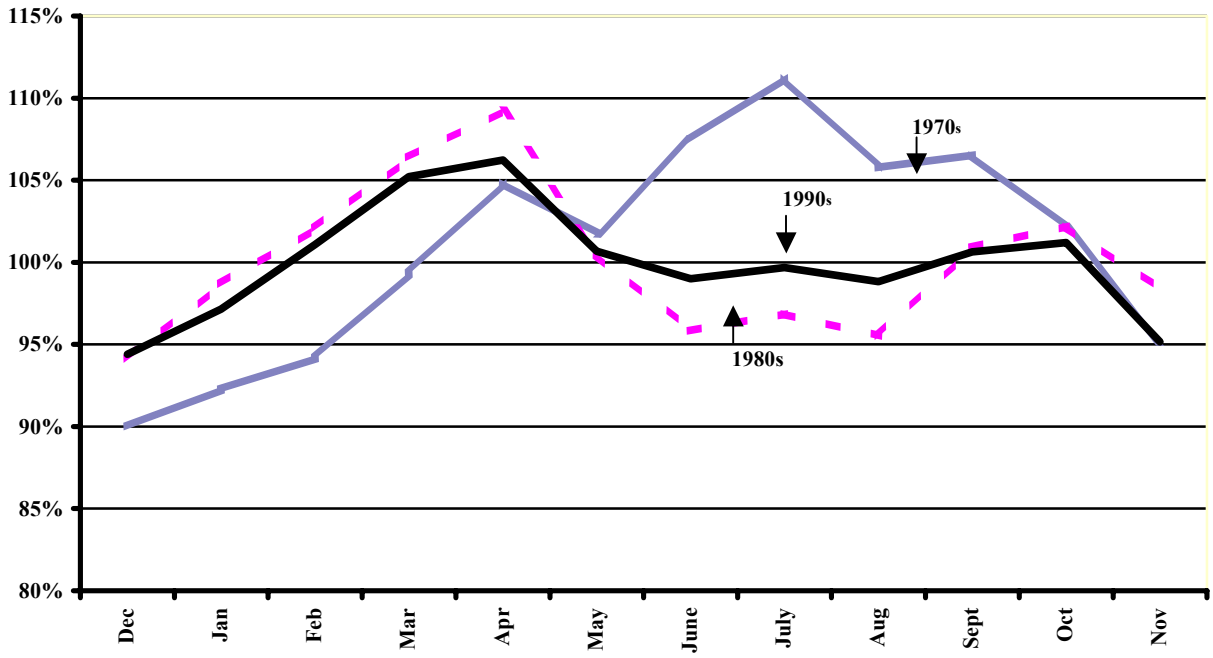
compared to the earlier decade. Second, the month of peak price changed from July in the late 1970s to April in both the 1980s and the 1990s. Third, the pattern of prices from April to October changed markedly. In the late 1970s, prices continued to rise after a small drop from April to May. In the 1980s, there was a drop in prices from April to June and stable prices from June to August. In the 1990s, prices have on average remained at the same level from May to October.

Table 2.3—Seasonal Price Indices of Coarse Rice (National Average)

	1977/78 - 1979/80	1980/81 - 1989/90	1990/91 - 2001/02	1983/84- 1992/93	1993/94 - 2001/02
January	0.923	0.987	1.002	0.997	1.024
February	0.942	1.021	1.040	1.020	1.063
March	0.993	1.064	1.065	1.059	1.087
April	1.049	1.092	1.072	1.082	1.085
May	1.018	1.005	1.015	1.005	1.033
June	1.075	0.958	0.984	0.977	0.993
July	1.112	0.969	0.985	0.999	0.986
August	1.058	0.955	0.985	0.992	0.983
September	1.065	1.009	1.002	1.033	0.993
October	1.021	1.022	1.018	1.044	1.005
November	0.952	0.983	0.973	0.988	0.985
December	0.900	0.941	0.987	0.958	1.006
Peak	1.112	1.092	1.072	1.082	1.087
Trough	0.900	0.941	0.973	0.958	0.983
Ratio	1.236	1.161	1.103	1.129	1.106

Source: Authors' calculations from DAM data.

Figure 2.3—Seasonality in Coarse Rice Prices in Bangladesh



Notes: This graph uses a 12 month lagged moving average.
1970s data are for 1976/77 – 1978/79.
1990s data are for 1989/90 – 2001/02.

The increase in the size of the boro harvest relative to aman and aus is the major factor behind these observed changes in seasonality. The increase in the share of boro (and aus) in total production have eliminated the steep seasonal rise in prices in June and July observed in the late seventies and resulted in relatively stable prices from May to October. As a result, the ratio of peak to trough has been reduced.

Note that the decline in the magnitude of seasonal price fluctuations is not as steep when comparing the post- rice import trade liberalization period: 1.106 in 1993/94-2001/02 compared with 1.129 in the preceding decade, (1983/84 – 1992/93). The major reason for this smaller decline is that the magnitude of seasonal price fluctuations was especially high in the early 1980s (the ratio of the peak to trough for 1983/84-92/93 is

only 1.129 compared to 1.161 for 1980/81-89/90). Thus, these figures suggest that the magnitude of seasonal price fluctuations did not change significantly following the trade liberalization.

Fluctuations in Annual Rice Prices in International Markets

An in the case with domestic rice prices, the fluctuations in annual world prices of rice (ex-Bangkok, C & F Chittagong, 15% broken) have been measured both in reference to the previous year's price (nominal fluctuations) as well as a moving average (Table 2.4 and Figure 2.4). The fluctuation in nominal prices ranged between 10.0 to 34.7 percent during the 1970s, between 0.0 to 39.1 percent during the 1980s and between 0.7 to 27.1 percent during the 1990s. The extent of fluctuations in nominal prices thus seemed to have increased during the 1980s compared to the 1970s, but the range of price fluctuations declined in the 1990s to almost the same range as obtained during the 1970s. Another way of looking at this is that year-to-year fluctuations greater than 10 percent occurred in 5 out of 6 years during the 1970s, 5 out of 10 years during the 1980s and only 4 out of 10 years during the 1990s.

Deviations from the moving average indicate that the range of fluctuations in prices which was rather small (4.3 and 13.5 percent) during the 1970s became larger during the 1980s (0.5 and 18.5 percent) but became smaller again during the 1990s (0.0 and 11.0 percent). Moreover, the deviations of actual prices from the moving average greater than 10 percent occurred in 3 out of 6 years during the 1970s, 3 out of 10 years

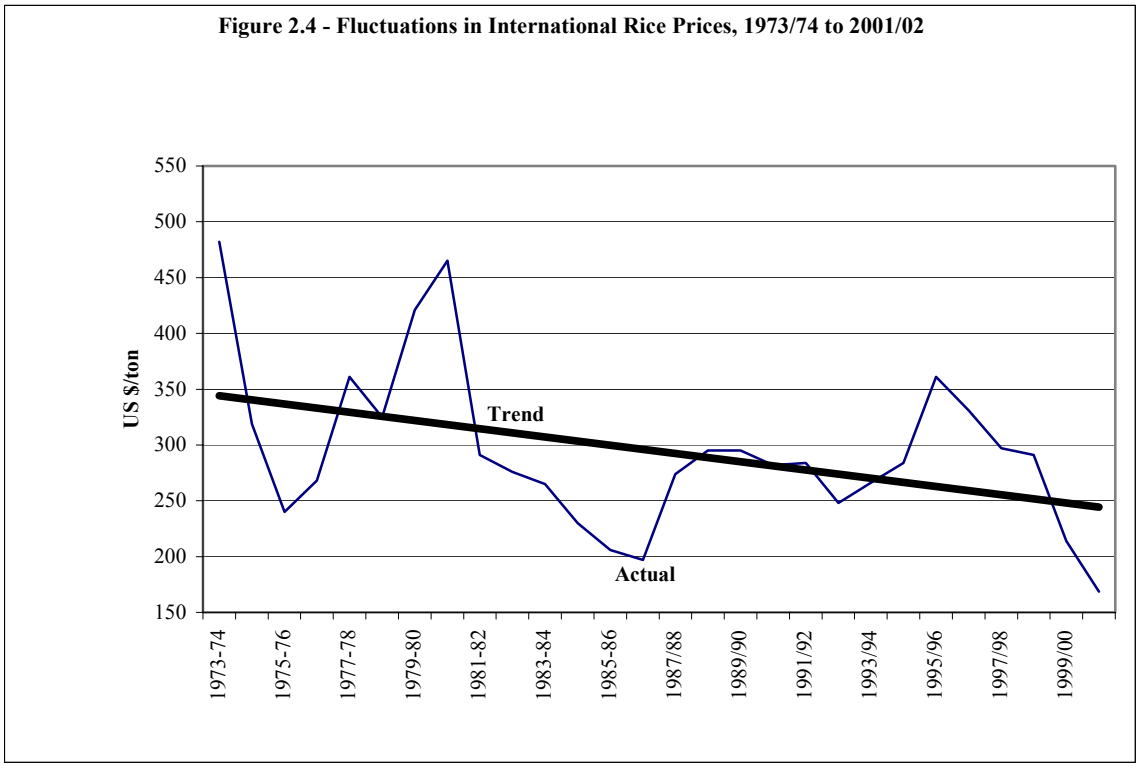
Table 2.4—Fluctuations in International Rice Prices, 1973/74 to 2000/01

Year	Nominal Price C & F (Thai 15 % Broken) (US $ / Mt)	Changes from Previous Year (%)	3 year Centered Moving Average	Deviation of Actual price from Moving Average (%)	Deviation of Actual price from Linear Trend(%)
1973-74	482	-	-	-	40.1
1974-75	319	-33.82	347	-8.1	-6.3
1975-76	240	-24.76	276	-12.9	-28.7
1976-77	268	11.67	290	-7.5	-19.5
1977-78	361	34.70	318	13.5	9.6
1978-79	325	-9.97	369	-11.9	-0.2
1979-80	421	29.54	404	4.3	30.8
1980-81	465	10.45	392	18.5	46.1
1981-82	291	-37.42	344	-15.4	-7.5
1982-83	276	-5.15	277	-0.5	-11.2
1983-84	265	-3.99	257	3.1	-13.7
1984-85	230	-13.21	234	-1.6	-24.2
1985-86	206	-10.43	211	-2.4	-31.3
1986/87	197	-4.37	226	-12.7	-33.4
1987/88	274	39.09	255	7.3	-6.3
1988/89	295	7.66	288	2.4	2.2
1989/90	295	0.00	291	1.5	3.5
1990/91	282	-4.41	287	-1.7	0.3
1991/92	284	0.71	271	4.7	2.3
1992/93	248	-12.68	266	-6.8	-9.4
1993/94	266	7.26	266	0.0	-1.5
1994/95	284	6.77	304	-6.5	6.6
1995/96	361	27.11	325	11.0	37.4
1996/97	331	-8.31	330	0.4	27.8
1997/98	297	-10.27	306	-3.0	16.3
1998/99	291	-2.02	267	8.9	15.6
1999/00	214	-26.46	225	-4.7	-13.7
2000/01	169	-21.18	-	-	-30.9
Average: 1973/74 - 1979/80	345	1.23	334	9.70	15.85
Average: 1980/81 - 1989/90	279	-1.74	278	6.54	17.94
Average: 1990/91 - 2000/01	275	-3.95	285	4.76	14.72

Sources: Authors' calculations from FAO and USDA data.

during the eighties and only 1 out of 10 years during the nineties. Thus in terms of number of years with large deviations, (for both year-to-year fluctuations and deviations from the moving average trend), annual world prices of rice displayed a progressively greater degree of stability over the last three decades.[5]

Figure 2.4—Fluctuations in International Rice Prices, 1973/74 to 2001/02



[5] It may be noted here that this conclusion also remains valid when Thai 5% broken parboiled rice prices are used.

Table 2.5 presents a comparison of price variability of Bangladesh wholesale prices, Indian prices and Thai prices for the late 1970s, the 1980s and the 1990s. Variation in annual prices is measured using the coefficient of variation in each period, i.e. the standard deviation of prices divided by the mean price level. The prices of Indian and Thai rice are converted to import parity Dhaka using a constant percentage marketing margin of 30 percent for Indian rice and 10 percent for Thai rice.[6]

Table 2.5—Fluctuations in Annual Nominal Rice Prices

		1975-76 - 1979/80	1980-81 - 1989/90	1990-91 - 1999/00	1984/85 - 1993/94	1994-95 - 2000/01
Bangladesh National Average Coarse Rice (Tk/Kg)	Average	3.91	7.71	11.14	9.32	11.85
	Coef of variation	0.210	0.218	0.126	0.106	0.093
India Perimal Rice Import Parity Bangladesh (Rs/kg)	Average	n.a.	4.29	9.01	5.45	10.10
	Coef of variation	n.a.	0.124	0.209	0.289	0.123
Thai 5% Brokens Parboiled Rice C&F Chittagong ($/ton)	Average	353	316	305	276	298
	Coef of variation	0.135	0.284	0.135	0.131	0.201
Thai 15% Brokens White Rice C&F Chittagong ($/ton)	Average	323	279	288	257	281
	Coef of variation	0.200	0.257	0.143	0.141	0.227

Notes : For India, data for the 1980s are from 1984/85 to 1989/90.
Source: Authors' calculations

[6] Multiplying prices by a constant percent marketing margin makes no difference to the coefficient of variation since it increases the standard deviation and the mean by the same factor.

As shown, the coefficient of variation of Bangladesh coarse rice prices fell sharply in the 1990s, from 0.218 in the 1980s to 0.126 in the 1990s. The variability of Thai prices was also reduced in the 1990s, with the coefficient of variation of the price of 15 percent broken rice falling from 0.257 in the 1980s to 0.143 in the 1990s. Indian prices, measured in rupees, actually became more variable in the 1990s, with the coefficient variation increasing from 0.124 (for 1984/85 to 1989/90) to 0.209 in the 1990s.

Expressing the prices of Indian rice in Taka, the variability of Indian rice prices changes little from the mid-1980s to the 1990s, however (Table 2.6). The coefficient of variation increases from 0.095 to only 0.118, because the depreciation of the Indian rupee relative to the Taka offsets much of the changes (increases) in the rupee price of Indian rice. Thai prices expressed in Taka are also generally more stable than in dollar terms, particularly for the 1980s. Bangladesh coarse rice prices had higher coefficients of variability than either Indian or Thai rice prices (expressed in Taka) in the 1980s. In the 1990s, however, Bangladesh prices were on average lower than import parity prices for Indian and Thai rice, and less variable than Thai import parity prices.

Even though Bangladesh was, on average, a rice importer throughout the entire period considered here, domestic rice prices were not consistently determined by import parity. Up until the liberalization of the private sector rice trade in 1994, government imports and stock policy were the major determinants of rice prices and the Bangladesh market was to some extent insulated from world market fluctuations. Even after the liberalization, however, domestic rice prices were significantly below import parity levels in the mid-1990s during a period of consecutive good rice harvests.

Table 2.6—Fluctuations in Annual Nominal Rice Prices in Bangladesh Taka

		1975-76 - 1979/80	1980-81 - 1989/90	1990-91 - 1999/00	1984/85 - 1993/94	1994-95 - 2000/01
Bangladesh National Average	Average	3.91	7.71	11.14	9.32	11.85
Coarse Rice (Tk/Kg)	Coef of Variation	0.210	0.218	0.126	0.106	0.093
India Perimal Rice Import Parity	Average	n.a.	9.50	11.89	9.99	12.87
Bangladesh (Tk/kg)	Coef of Variation	n.a.	0.095	0.118	0.097	0.099
Thai 5% Brokens Parboiled Rice	Average	5.38	8.10	12.90	9.32	13.77
C&F Chittagong (Tk/kg)	Coef of Variation	0.145	0.168	0.146	0.202	0.113
Thai 15% Brokens White Rice	Average	4.93	7.25	12.17	8.71	12.93
C&F Chittagong (Tk/kg)	Coef of Variation	0.212	0.202	0.152	0.217	0.131

Notes: For India, data for the 1980s are from 1984/85 to 1989/90.
Source: Authors' calculations

These periods of low prices both increased the variability of prices for the decade as well as reduced the average price level in comparison with import parity.

Table 2.7 shows average prices and coefficients of variation for rice prices expressed in real terms, i.e. adjusted for overall price inflation.[7] Bangladesh rice prices are deflated by the non-food consumer price index, Indian prices are deflated by the Indian wholesale price index and Thai prices (expressed in dollars) are deflated by the

[7] Although policy-makers generally focus on short-term variations in nominal price, measuring prices in real terms offers a better comparison of price fluctuations over long periods.

U.S. wholesale price index. In real terms, all coefficients of variation are lower, except for Thai rice in the 1980s. Bangladesh real rice prices were slightly more variable in the 1990s than in the 1980s; Thai real rice prices were much more stable in the 1990s than in the 1980s, though only slightly less stable than Bangladesh real rice prices in the 1990s. Indian real rice prices were extremely stable in the late 1980s and only slight less stable in the 1990s.

Table 2.7—Fluctuations in Annual Real Rice Prices

		1975-76 - 1979/80	1980-81 - 1989/90	1990-91 - 1999/00	1984/85 - 1993/94	1994-95 - 2000/01
Bangladesh National Average Coarse Rice (Tk/Kg)	Average	19.01	17.41	12.29	15.02	12.16
	Coef of Variation	0.160	0.091	0.103	0.190	0.100
India Perimal Rice Import Parity Bangladesh (Rs/kg)	Average	n.a.	9.86	11.29	10.37	11.34
	Coef of Variation	n.a.	0.097	0.039	0.094	0.045
Thai 5% Brokens Parboiled Rice C&F Chittagong ($/ton)	Average	636	386	312	312	300
	Coef of Variation	0.071	0.326	0.106	0.108	0.180
Thai 15% Brokens White Rice C&F Chittagong ($/ton)	Average	577	340	295	290	283
	Coef of Variation	0.110	0.295	0.118	0.114	0.206

Notes : (a) For India, data for the 1980s are from 1984/85 to 1989/90.
(b) Bangladesh prices are deflated by the non-food CPI.
(c) Indian prices are deflated by the Indian wholesale price index.
(d) Thai prices are deflated by the U.S. wholesale price index.
Source: Authors' calculations

Finally, Table 2.8 shows average real prices and coefficients of variation for rice prices expressed in real Taka.[8] In real Taka terms, both Indian and Thai rice prices became more stable in the 1990s. Bangladesh real rice prices were slightly more stable than Thai import parity prices, but less stable than Indian import parity rice prices during the 1990s.

A comparison of the coefficients of variation of the period since rice import trade liberalization (1994/95-2001/2002) and the previous decade (1984/85 – 1993/94) shows than Bangladesh prices became slightly more stable in nominal terms (Table 2.6) and much more stable in real terms, with the coefficient of variation in the latter period about half the magnitude of the coefficient of variation in the former period (0.100 and 0.190, respectively, Table 2.8). As discussed in the next chapter, the stabilizing influence of private sector imports from India at moderate and very stable prices during times of domestic production shortages in Bangladesh limited price increases. In contrast, Thai rice prices were more variable in real terms (in both dollars and Taka) in the late 1990s as compared to the earlier period. India's domestic price stabilization efforts thus had positive spillover effects on Bangladesh rice markets.

[8] Prices in real Taka are calculated by converting international prices to nominal prices in Taka using the relevant exchange rates, and then deflating by the Bangladesh non-food consumer price index.

Table 2.8—Fluctuations in Annual Real Rice Prices in Bangladesh Taka

		1975-76 - 1979/80	1980-81 - 1989/90	1990-91 - 1999/00	1984/85 - 1993/94	1994-95 - 2000/01
Bangladesh National Average Coarse Rice (Tk/Kg)	Average	19.01	17.41	12.29	15.02	12.16
	Coef of Variation	0.160	0.091	0.103	0.190	0.100
India Perimal Rice Import Parity Bangladesh (Tk/kg)	Average	n.a.	17.35	13.09	15.62	13.15
	Coef of Variation	n.a.	0.148	0.065	0.191	0.050
Thai 5% Brokens Parboiled Rice C&F Chittagong (Tk/kg)	Average	26.28	19.13	14.20	14.58	14.18
	Coef of Variation	0.129	0.290	0.110	0.109	0.145
Thai 15% Brokens White Rice C&F Chittagong (Tk/kg)	Average	24.03	16.85	13.40	13.55	13.34
	Coef of Variation	0.191	0.252	0.120	0.103	0.170

Notes : (a) For India, data for the 1980s are from 1984/85 to 1989/90.
(b) Bangladesh prices are deflated by the non-food CPI.
(c) Indian prices are deflated by the Indian wholesale price index.
(d) Thai prices are deflated by the U.S. wholesale price index.
Source: Authors' calculations.

Summary

The above discussion has presented a number of different indicators to measure variability of prices: the range of period-to-period fluctuations of nominal prices, range of variations from trend, number of times prices deviate by more than a given percentage from trend, and coefficients of variation. Moreover, for each of these measures, several options are available including the choice of trend (e.g. linear or moving average), the percentage cutoff for defining a "large" variation, and the frequency of observations (e.g. monthly or annual data). The period chosen for comparison can also potentially affect the results, (e.g. comparing prices by decade or by shift in policy regime). Finally, in comparing prices across countries, a conversion of data to a common currency (which captures the combined effects of price changes expressed in domestic currency and exchange rate changes) is needed to compare domestic prices with import or export parity prices.

No single measure completely quantifies price variability. Measures involving the number of years that price fluctuations are "large" relative to recent prices or a price trend may be most relevant to policy –makers and politicians who are concerned with the public's perceptions of annual price fluctuations, but involve somewhat arbitrary definitions of a "large" variation. Measures involving average variations (e.g. coefficients of variation) give a better quantitative estimate of the distribution of prices, but obscure the difference between several years of moderate price variations and a few years of large price variations. Fortunately, the different measures give similar results, suggesting that some general conclusions are robust.

First, since the 1970s, Bangladesh rice prices have become more stable, both annually and seasonally. Comparisons between the 1980s and 1990s, trends in price instability are mixed, varying by the measure used. Year-to-year fluctuations greater than 10 percent occurred more frequently in the 1990s (7 out of 10 years) compared to the 1980s (4 out of 10 years), as did deviations from the moving average of more than 5 percent (7 out of 10 years in the 1990s compared with 5 out of 10 years in the 1980s). Coefficients of variation of nominal prices fell sharply, though coefficients of variation of real prices increased slightly. Seasonality of monthly prices was reduced in the 1990s, however. In short, prices were approximately as stable in the 1990s as in the 1980s, and in any case, there is no evidence of a sharp increase in variability in the 1990s.

World prices of rice, for example Bangkok prices, however have clearly become more stable over time, as the volume of world trade has grown. In the 1990s, Bangladesh domestic prices expressed in Taka were approximately as stable as world prices expressed in dollars. In the 1990s, though, Indian prices in real terms were most stable (all measured in terms of coefficients of variation). Expressed in Taka, import parity prices of Indian rice were only slightly more stable than Bangladesh domestic prices as measured by the coefficients of variation, though in real terms the difference is somewhat larger. Import parity prices of Thai rice were slightly more variable than Bangladesh prices in both nominal and real terms. In short, Bangladesh annual prices were slightly more stable in the 1990s than international (Thai) prices, though Indian prices, heavily influenced by Indian government market interventions, were the most stable of the rice prices examined here.

3. STOCK POLICIES, PRICE STABILIZATION AND THE ROLE OF INTERNATIONAL TRADE

Stabilization policies and stock management are closely linked to international trade. Although one argument for building up a national security stock is to avoid the risks of large price increases in international markets, in practice, operation of a national food security stock almost inevitably involves imports in some years, perhaps later sold in the domestic market at subsidized prices. Up until 1993, the Government of Bangladesh relied exclusively on maintenance of public foodgrain stocks, supplemented in emergencies with additional food aid and government commercial imports, to achieve its price stabilization objectives. With the liberalization of the private sector trade in wheat in 1993 and rice in 1994, private sector imports, especially of rice, successfully stabilized prices and augmented domestic foodgrain supplies following major production shortfalls in 1997/98 and 1998/99.

This section begins with a review of the major lessons from several stock modeling exercises in recent years, based on Goletti and Rich (1998). The extent to which import parity has provided a ceiling for rice prices in recent years is then examined. The section concludes with a discussion of why export parity has failed to provide a floor for rice prices.

LESSONS FROM MODELING OF STABILIZATION AND STOCK MANAGEMENT IN BANGLADESH[9]

Stock and price stabilization analyses are often characterized by complex models involving dozens of equations. The major lessons from these models, however, are not

[9] This section is based on Goletti and Rich (1998).

complicated. In fact, many of the insights gained derive essentially from the necessity to clearly specify policy objectives, instruments and constraints in setting up a model.

Policy-makers in the real world face difficult decisions involving tradeoffs between objectives, given constraints on financial resources, and in the short-run (of several months), stock levels. For example, though the basic objectives are clear, such as supporting producer prices and farmer incomes through domestic procurement, in practice the government may lack the financial resources or the storage capacity to procure all the grains required to actually raise market prices for producers significantly.

In essence, the Ministry of Food has two major objectives, price stabilization (especially for rice) and food distribution (largely in wheat, mostly funded by food aid). Given financial resource constraints, it is often not possible to meet fully both these objectives. Stock modeling exercises have typically attempted to determine which policies can achieve the objectives of price stabilization (especially for rice) and public distribution targets to poor households at lowest cost. These exercises, though lacking in the details of specific policy situations, nevertheless do shed light on policy tradeoffs.

Perhaps the most important lesson of stock modeling is that the composition of foodgrain stocks affects the capacity of achieving alternative objectives. While rice price stabilization can be achieved primarily with rice stocks, food security objectives can be achieved at a lower cost primarily with wheat stocks.

Goletti, Ahmed and Chowdhury (1991) and Brennan (1995) show that the composition of the stocks is related to the effectiveness of stock management. If the primary objective is food security for the poor, as in the case of several program distribution channels (VGD, VGF, FFW, FFE, GR), then wheat should be the main grain

used. If, on the other hand, rice price stabilization is the primary objective, then market interventions should be conducted with rice. This is due to three main reasons. First, the cross-price elasticity of rice demand with respect to wheat price is very low, implying that movements in wheat prices have little influence on rice demand and prices. As shown by Goletti, Ahmed and Chowdhury (1991) and Ahmed-Shams (1994), the cross price elasticity of demand between wheat and rice is close to zero. That is to say that to affect market prices of rice through wheat interventions would require huge amounts of wheat. On the other hand, the own price elasticity of rice is relatively high (most estimates in the literature range between -0.3 and -0.5). Therefore, a much lower quantity of rice would be needed to affect rice prices. Even though rice is more expensive than wheat (typically about 20 percent higher in Bangladesh), the savings in quantity would amply compensate the price differential. The second reason is that in spite of rice being more expensive than wheat, its nutritional value is similar to that of wheat (approximately 345 kilocalories per kg). Therefore, the same quantity of wheat would provide similar nutritional value than rice but cost much less.

The third reason is that the target groups for food programs in Bangladesh are usually at such a low poverty level, that market interventions to stabilize rice prices would not have any effect on their effective demand. Brennan (1995) has shown that rice price stabilization would have the greatest impact on the middle income group and has little impact on the average degree of poverty experienced by the lowest income quartile in Bangladesh, confirming similar results by Goletti 1994. Wheat stocks would be largely determined by planned distribution and the key issue becomes that of targeting effectively (that is identifying the beneficiaries) and efficiently (that is avoiding leakages

and storage losses. The objective of increasing household food security is unquestionable, and given the availability of food aid as a resource, the role of government is essential. Whether meeting the price stabilization objective is worth the costs is less clear.

In spite of a large public support for rice price stabilization, the economic case for stabilization is not very strong.[10] The analysis by Goletti (1994) and Brennan (1995) leaves doubts about the advisability of pursuing price stabilization. If economic benefits exist at all, these are likely to be rather small, unless households are extremely risk averse (i.e. unless they place a very high value on price stability). Even as a mechanism to reduce poverty in the short term, price stabilization is not very effective. Targeted programs conducted with wheat would seem to be more appropriate.

The case made by Ravallion (1987) for price stabilization during times of famine was based on the experience of the 1974 famine. Ravallion suggested that price stabilization would have reduced the number of victims of the famine. The case of 1974, however, does not seem to be a good guide for policy making in the 1990s given that domestic and international conditions are rather different. Even in the "crises" of 1994-95 and 1998, price hikes were much lower than in the case of 1974. One reason for this is that improvements in informational efficiency, infrastructure, and market integration facilitated market flows that kept prices in any one region from rising above prices in neighboring regions by more than normal marketing and transport margins would justify (Goletti, 1993 and 1994, and del Ninno, Dorosh, Smith and Roy, 2001). Moreover, as

[10] Newbery and Stiglitz (1981), Islam and Thomas (1996) and Goletti (1994) review the analytics of price stabilization, in which benefits are usually characterized in terms of changes in consumer and producer surplus.

described below, private sector imports, made possible by trade liberalization in the early 1990s, have helped stabilize prices and foodgrain availability in periods of domestic production shortfalls.

Nonetheless, price stabilization is important politically. In spite of a quite different domestic and international environment, the memory of the famine of 1974 is still present. High rice prices in Bangladesh are treated as a crisis situation, and are often interpreted by critics as a failure of the government to ensure food security. As such, high rice prices point to the need of the government to intervene, even though this intervention can be very costly and ineffective. Typically, in Bangladesh high rice prices set in motion a pressure for high public rice stocks, without attention to the fact that high stocks are not a guarantee that food security of the poor is properly addressed.

Finally, the debate on stock policy has often been dominated by a misunderstanding of what is meant by "Optimal Stock". Optimization requires a well-specified set of objectives, constraints, and policy instruments. In a dynamic context such as foodgrain stock policy, the optimal stock is not a single magic number. It implies a sequence of numbers over a well-defined time horizon. Over such a time horizon, the amount of stock will vary depending on conditions related to production, world prices and policy regimes. The "optimal stock" has often been identified with the average amount of stock over this path of numbers. The average is misleading because the same average number could arise from very different paths. Moreover, the path for the optimal stock depends on the policy regime (e.g. government monopoly versus liberalized private sector imports) as well as policy objectives (e.g. the relative weight put on price stability versus number of poor household reached by targeted distribution programs). Thus, for

example, the liberalization of private sector trade after 1992 changes the path for optimal stock by allowing private sector imports to provide additional stability to markets in times of domestic shortfalls.

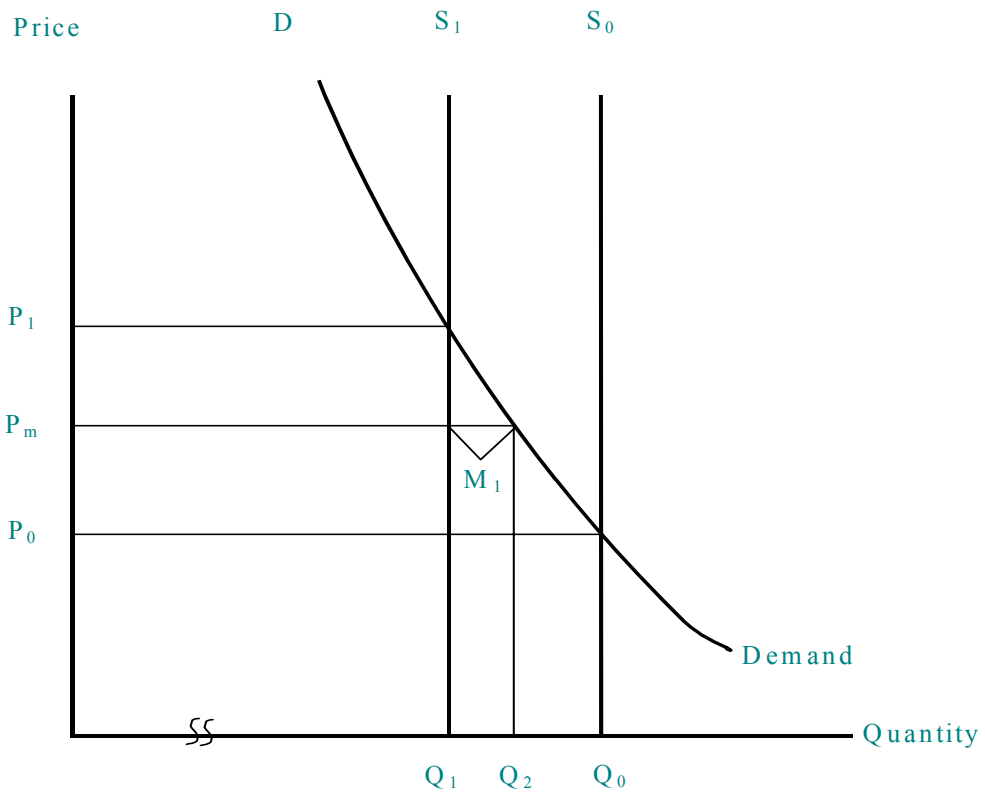
PRICE STABILIZATION THROUGH INTERNATIONAL TRADE

Stock modeling exercises have shown that using private sector trade and setting bands close to import and export parity is most efficient in terms of fiscal costs relative to degree of stabilization achieved. With trade liberalization, import parity provides a ceiling, though in years of high world prices, this ceiling may be unacceptably high, requiring the government to subsidize imports and draw down its stocks.

Figure 3.1 illustrates how openness to import trade adds to price stability in the case of a production shortfall. With a normal harvest, short-run supply in the months just after the harvest is indicated by S0. With this level of production, the market price is P0, determined by the intersection of the supply and demand curves. A production shortfall shifts the short-run supply curve back to S1. In the absence of international trade, the market price would rise to P1. However, with free trade and an import parity price of Pm below P1, domestic demand is Q2 and the difference between Q2 and Q1 is the sum of private imports, changes in private stocks and net market injections by the government. Note that in this case, if there is no change in private stocks,[11] net market injections less than or equal to M1 have no effect on the price, but only reduce the quantity of imports.

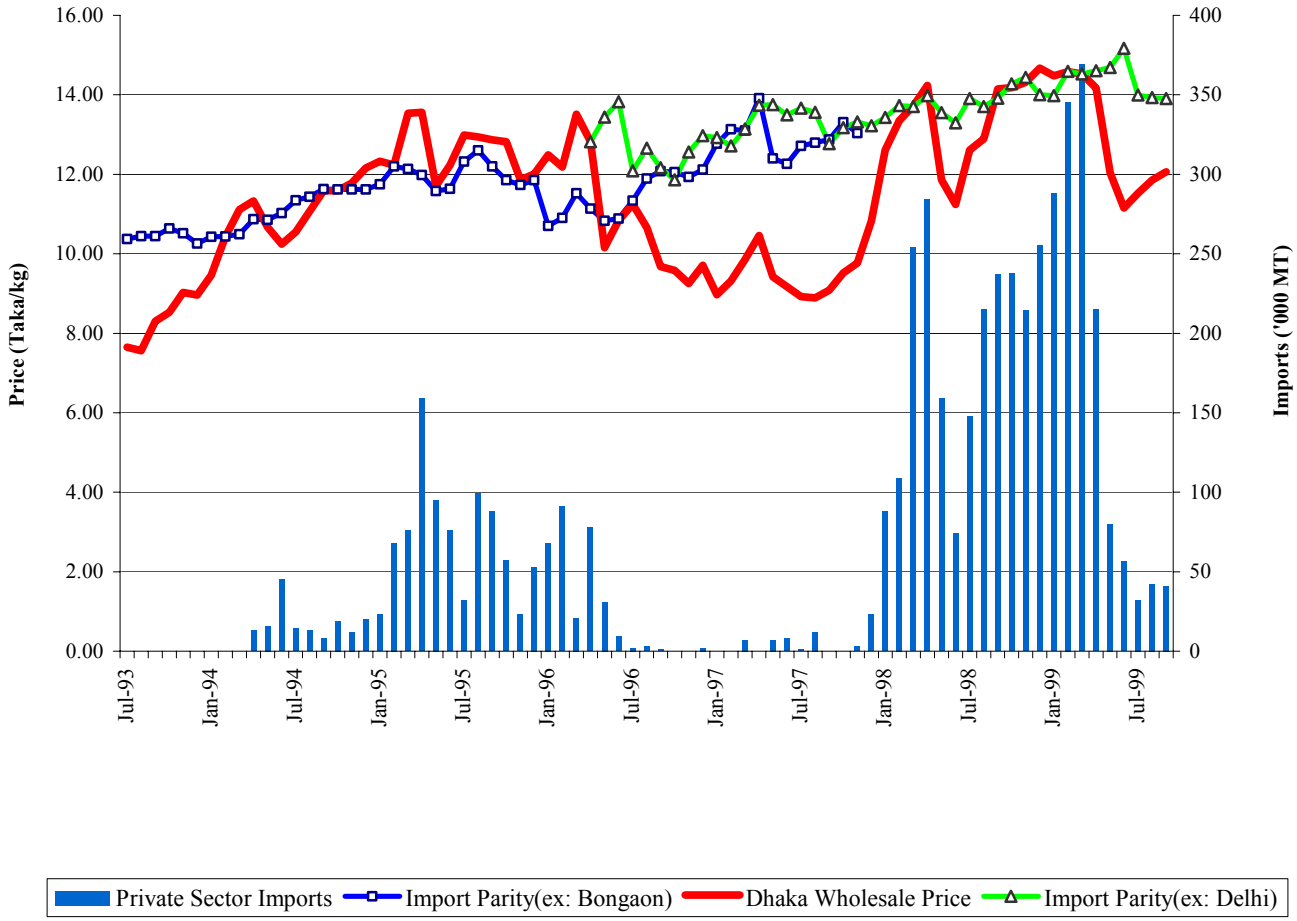
[11] A decrease (increase) in private stocks will reduce (increase) the amount of imports, holding net government sales constant.

Figure 3.1—Effects of a Production Shortfall



Source : Author

Figure 3.2—Rice Prices and Quantity of Private Imports in Bangladesh, 1993-99



Source: Dorosh (1999), calculated using data from FPMU, CMIE (1998, 1999) and Baulch, Das et. al. (1998).

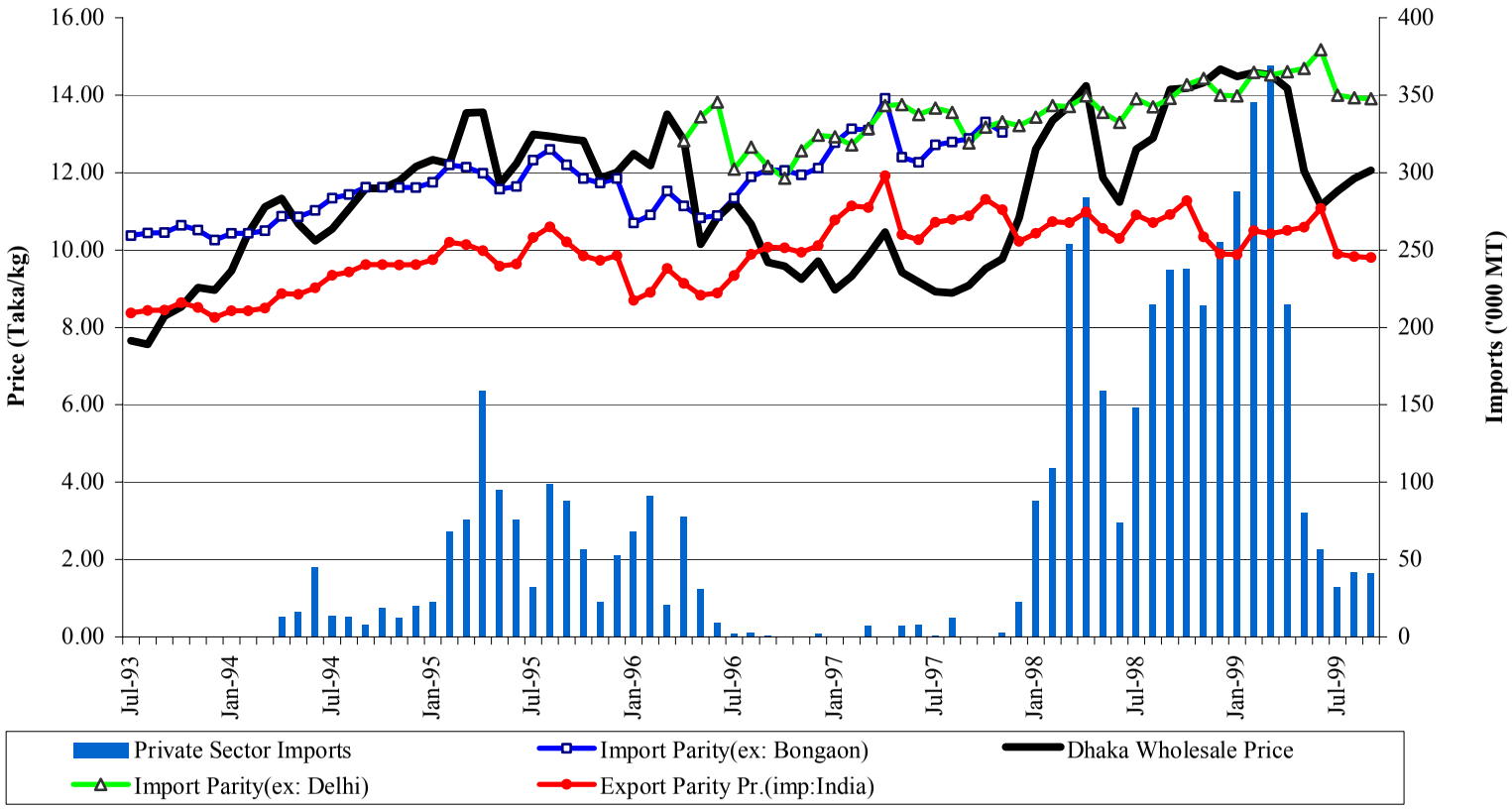
As shown in Dorosh (1999), private sector imports did effectively stabilize rice prices in 1997/98 and 1998/99 following major rice production shortfalls (Figure 3.2). Following a poor aman harvest in November 1997, domestic prices rose rapidly to import parity. Prices did not rise further because a competitive private sector import trade was able to bring in all the grains required to meet excess demand at that price. Similarly,

following the massive floods of 1998, private sector imports again increased significantly and kept prices from rising above import parity.

This positive experience with private sector imports does not completely eliminate the need for rice stocks, however. Import parity prices in years of tight world markets may be unacceptably high. In this case, subsidized sales of government imports (and rice stocks) may be needed. Thus, some security rice stocks are needed, equal to at least about three months of planned distribution, because of delays in import arrivals.

As shown in Figure 3.3, however, export parity, (the price at which rice could be profitably exported from Bangladesh) does not provide a floor for Bangladesh prices. Three successive good rice harvests in Bangladesh (boro 1996, aman 1996/97 and boro 1997) brought rice prices to export parity. Exports did not occur in part because market links were not established. Also, because of the lack of uniform grades and standards for Bangladesh, rice would greatly reduce the price received by exporters, in effect lowering the export parity price below that shown in the figure (See Rahman, 1998). Investments in mechanical graders and the establishment of grades and standards consistent with current international trade could thus help avoid large price declines by making exports possible following bumper harvests. If large scale exports of rice become feasible, however, government negotiations with food aid donors would be necessary to ensure that food aid flows (almost exclusively in wheat and targeted to poor households) would not be reduced.

Figure 3.3—Export and Import Parity Rice Prices and Private Rice Imports in Bangladesh, 1993-99



Note: Export parity price based on Bongaon price from July 1993 to Nov 1997; and Delhi wholesale price thereafter.
Source: Dorosh (1999), calculated using data from FPMU, CMIE (1998, 1999) and Baulch, Das et. al. (1998).

4. IMPACTS OF GOVERNMENT INTERVENTIONS IN RICE MARKETS

The alternative to making the investments required and permitting private sector exports to boost producer prices following bumper harvests is, of course, government procurement. This chapter first presents data on the structure of rice production and sales by household and farm size, to provide insights on who benefits from increases in producer prices. It then reviews the government's recent experience with domestic procurement and open market sales of rice, comparing government sales and purchases with market prices in recent years. A simple modeling framework is also used to assess the extent to which domestic procurement affects market prices. Finally, costs of fixed price procurement in recent years are compared to the alternative of procuring rice at the wholesale market level.

STRUCTURE OF FOODGRAIN PRODUCTION AND SALES

Table 4.1 presents estimates of rice and wheat production cultivated by farm size based on data from the 1996/97 Agricultural Census. Production by farm size is estimated using the area cultivated data from the Agricultural Census and average yield data by season and type of rice cultivation from the Bangladesh Bureau of Statistics. As indicated, an estimated 42.2 percent of rice and 48.4 percent of wheat is produced on farms less than 2.50 acres in size. These shares vary little by season: small farms account for an estimated 45.4 percent of aus, 40.0 percent of aman and 40.1 percent of boro rice produced.

Data from the 1995/96 Household Expenditure Survey give an indication of rice sales by farm size (Table 4.2). Out of a total of 18.50 million farm households with a total population of 97.05 million people, 85.9 percent owned less than 2.50 acres.

Table 4.1—Estimated Cereal Production of Farm Holdings by Type, Classified by Size of Holdings

Items	NUMBER OF FARM HOLDINGS							Total	Total Area (thousand acres)	Per acre Yield (Kg)	Production thousand m. tons
	Small					Medium	Large				
	0.05-0.49 acres	0.50-0.99 acres	1.00-1.49 acres	1.50-2.49 acres	Sub-total	2.50-7.49 acres	>7.49 acres				
Rice-Local broadcast Aus	18.7	53.1	72.2	132.9	276.9	299.7	95.8	672.4	2657[a]	378[a]	1003
Rice Local transplanted Aus	10.9	29.6	37.2	65.6	143.3	141.0	46.3	330.6			
Rice HYV Aus	39.7	98.9	114.3	175.7	428.6	337.0	101.4	867.0	1205	720	867
Rice-Pajam Aus	0.1	0.4	0.5	1.0	2.1	2.1	0.8	5.0	6	750	5
Total Aus	69.5	182.1	224.2	375.2	850.9	779.7	244.4	1875.0	1211	484	1875
Rice-Local broadcast Aman	18.9	58.5	79.2	151.7	308.3	347.6	124.1	780.0	2010	388	780
Rice Local transplanted Aman	70.2	196.0	264.2	498.3	1028.7	1260.8	574.5	2864.0	6049	473	2864
Rice HYV transplanted Aman	159.1	400.6	488.8	802.5	1851.0	1829.0	678.4	4358.4	5480[a]	843[a]	4623
Rice HYV broadcast Aman	9.2	25.2	30.6	50.0	115.1	107.1	42.4	264.6			
Rice-Pajam Aman	16.5	46.9	63.7	114.3	241.3	249.8	91.9	583.0	815	715	583
Total Aman	273.9	727.2	926.4	1616.9	3544.4	3794.3	1511.3	8850.0	8874	617	8850
Rice-Local Boro	8.1	24.6	32.8	59.2	124.8	141.6	74.6	341.0	539	634	341
Rice-HYV Boro	277.1	741.0	908.1	1455.2	3381.4	3068.8	1208.9	7659.0	6466	1184	7659
Rice-Pajam Boro	3.7	11.3	15.2	26.2	56.4	56.5	24.1	137.0	133	1023	137
Total Boro	288.9	776.9	956.1	1540.6	3562.5	3266.8	1307.6	8137.0	7138	1140	8137
Total Rice	632.3	1686.2	2106.7	3532.7	7957.9	7840.8	3063.3	18862.0	17223.0	2241.0	18862.0
Share of Total Rice (percent)	3.4%	8.9%	11.2%	18.7%	42.2%	41.6%	16.2%	100.0%			
Wheat-Local	27.0	68.5	81.2	127.5	304.2	230.0	67.6	601.8	1988[b]	906[b]	1803
Wheat-HYV	52.9	125.3	150.6	240.0	568.9	479.8	152.5	1201.2			
Total Wheat	79.9	193.9	231.8	367.5	873.1	709.8	220.1	1803.0	1988	906	1803
Share of Total Wheat (percent)	4.4%	10.8%	12.9%	20.4%	48.4%	39.4%	12.2%	100.0%			

Notes: Production by crop and farm size is calculated as the area by crop and farm size divided by the total crop area (both figures from the 1996/97 Agricultural Census) the calculations thus assume same yields across farm size by type of crop. The calculation thus assumes same yields for transplanted and local aus, for broadcast and transplanted HYV aman, and for local and HYV wheat. Note that according to CIMMYT-IFPRI wheat producer survey, 1993 (cited in Morris, Chowdhury and Meisner, 1997, p.26), 99.6 percent of wheat farms planted modern varieties of wheat.

[a] Includes both broadcast and transplanted rice.

[b] Includes both local and HYV wheat.

Source: BBS, Census of Agriculture-1996.

Table 4.2—Rice Production, Consumption and Sales by Household, 1995/96

	Households by Land Area Owned (acres)				
	0-0.04	**0.05-0.49**	**0.50-2.49**	**2.50+**	**Total**
Number of Households (millions)	3.32	6.87	5.70	2.61	18.50
Population (millions)	14.30	33.65	30.87	18.24	97.05
Average Population/Household	4.30	4.90	5.42	6.99	5.25
Monthly Expenditure/Capita (Tk)	458.76	507.63	628.06	843.67	601.88
Share of Rice Expenditures (percent)	36.2%	34.4%	29.1%	22.8%	29.9%
Annual Rice Consumption ('000 tons)	2182	5473	5635	3598	16,889
Consumption per Capita (kgs)	152.6	162.7	182.6	197.3	174.0
From Own Production ('000 tons)	195	967	2771	2728	6,661
From Own Production (percent)	9.0%	17.7%	49.2%	75.8%	39.4%
Rice Purchases ('000 tons)	1986	4507	2864	871	10,228
Rice Purchases (percent)	91.0%	82.3%	50.8%	24.2%	60.6%
Annual Rice Production ('000 tons)	440	2,102	5,940	8,152	16,633
Rice Sales ('000 tons) (a)	119	547	1,817	3,632	6,115
Percentage Sold (a)	27.1%	26.1%	30.6%	44.5%	36.8%
Rice Sales ('000 tons) (b)	244	1135	3169	5424	9,972
Percentage Sold (b)	55.6%	54.0%	53.3%	66.5%	60.0%
Net Rice Sales ('000 tons) (a)	-1867	-3960	-1047	2761	-4113
Net Rice Sales / Person (kgs) (a)	-130.6	-117.7	-33.9	151.4	-42.4
Net Sales / Consumption (percent) (a)	-85.6%	-72.3%	-18.6%	76.7%	-24.4%
Net Rice Sales ('000 tons) (b)	-1742	-3372	305	4553	-256
Net Rice Sales / Person (kgs) (b)	-121.9	-100.2	9.9	249.7	-2.6
Net Sales / Consumption (percent) (b)	-79.8%	-61.6%	5.4%	126.5%	-1.5%

Notes: (a) Using rice sales as reported in survey.
(b) Using net rice sales computed as production less own consumption.
Source: BBS, 1995-96 Household Expenditure Survey and authors' calculations.

These small farm households accounted for 51.0 percent of rice production, (compared to the estimated 42.2 percent for 1996/97 in Table 4.1). Rice sales appear to be under-reported in the survey as the total net rice sales are negative, indicating a deficit in the rural areas of 4.113 million tons in a year in which net public foodgrain distribution and private imports were small (240 thousand and 583 thousand tons, respectively). Using rice sales computed as reported production less reported own consumption, total rice sales are 9.972 million tons, (60.0 percent of production), and net sales are –256 thousand tons, indicating a net deficit of 1.5 percent of consumption. Large farm households, owning more than 2.5 acres of land, have a significant positive net sales (4.553 million tons), equal to 55.9 percent of their production.

Calculating rice sales as production less own consumption, average rice sales exceed 50 percent of production for all categories of land ownership, suggesting that market prices at harvest time are an important determinant of incomes for all groups of farmers.[12] Nonetheless, low consumer prices provide a direct benefit to rural households owning less than 0.49 acres of land (49.4 percent of the rural population) since these households purchase on average 61.6 to 79.8 percent of the rice they consume.

DOMESTIC PROCUREMENT, OPEN MARKET SALES AND MARKET PRICES IN RECENT YEARS

Table 4.3 summarizes the performance of domestic procurement from 1987/88 to 1998/99. Boro procurement has been much more reliable than aman procurement. Boro procurement exceeded 80 percent of the target in 9 out of 13 years, and failed to reach at

[12] Shahabuddin and Islam (1999) show that few farmers actually participate in government procurement, however.

least 60 percent of the target in only one year (1993).[13] Aman procurement, in contrast, exceeded 80 percent of the target in only 2 out of 12 years, (1989/90 and 1996/97), and failed to reach 60 percent of the target 8 out of 12 years. In these eight years, aman procurement averaged only 18.5 percent of the target.

This difference in procurement performance reflects the difficulty in forecasting the aman harvest and future aman rice market prices, key factors in determining an appropriate procurement price for aman. In the last six years, from 1993/94 through 1998/99, aman procurement exceeded 30 percent of the target only in 1996/97. In that year, the average price in the major procurement zone (calculated as the average price in Rangpur, Dinajpur and Bogra districts) was 1.65 Tk/kg below the procurement price. In the other five years, the average price in the major procurement zone was an average of 1.35 Tk/kg above the procurement price, and procurement averaged only 8.9 percent of the target (Figure 4.1).

Open Market Sales (OMS) of rice face a similar problem, in that no sales are possible when the OMS price is set above the market price. However, since the OMS price can easily be changed, the government is able to increase sales when needed for stock rotation purposes simply by reducing the price.[14] Note that the OMS price has often been below the market price (Figure 4.2) indicating that the OMS price has not served as a ceiling price, since the quantity of OMS sales in these periods has not been sufficient to reduce market prices to the OMS price level.

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[13] In 1993, government rice stocks were being drawn down as major rationing channels (Statutory Rationing and Rural Rationing) were being eliminated. Thus, there was little need for additional rice procurement.

[14] If the market price was already lower than the established OMS price, the purpose of OMS sales would not be to stabilize rice prices.

IMPACT OF DOMESTIC PROCUREMENT AND DISTRIBUTION ON MARKET PRICES

Table 4.4 presents estimates of the effect of domestic net procurement on market prices. Defining the boro/aus season as the seven month period from May through November, the table shows total availability in the period assuming no change in private stocks. The implications of private stock changes and private sector imports are discussed below. Procurement as a share of total boro plus aus production ranged from 2.6 to 5.1 percent from 1996 to 1999. However, net procurement, equal to procurement less offtake from government stocks, was much smaller. Net procurement as a share of total supply ranged from –0.8 to 1.9 percent.

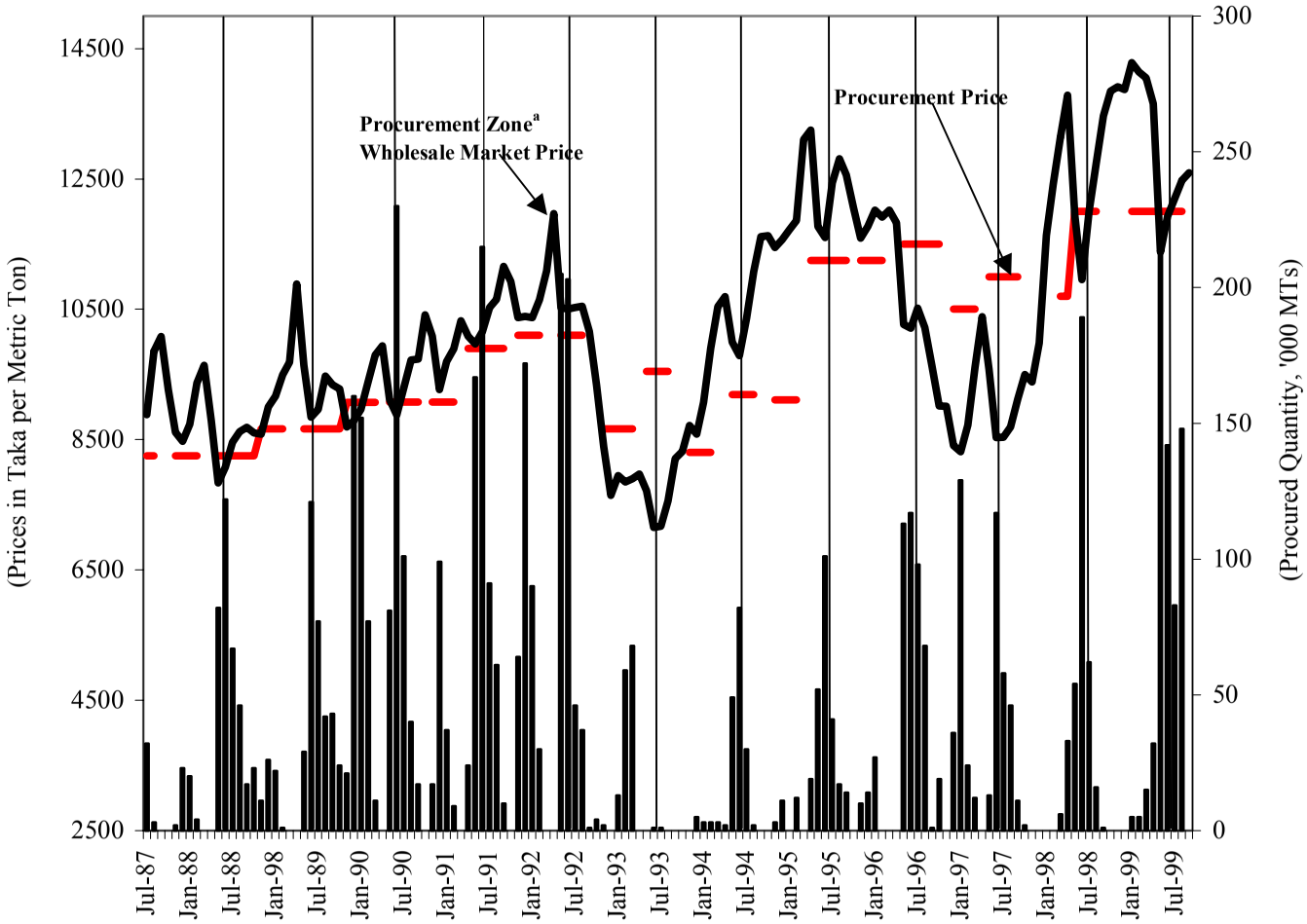
The impact of net procurement on domestic prices can be calculated by considering net procurement as a reduction in net market supply, and then using an assumed own-price elasticity of demand for rice. Thus, for example, in 1996, if the net procurement of 150 thousand tons did not take place, net supply would have been 1.9 percent greater. Assuming an elasticity of demand of –0.2, then the market price would be 9.5 percent lower (=1.9 percent / -0.2) in the absence of procurement. Or, using the simulated no-procurement price as a base, procurement raised market prices by an estimated 10.5 percent (=1/(1-.095) – 1).

Table 4.3—Domestic Procurement of Rice and Procurement Prices, 1987/88 - 1998/99

Season	Category of Procured Rice	Procurement Target ('000 tons)	Actual Procurement ('000 tons)	% of Actual to Targeted Procurement	Procurement Quantity of Procurement Zone[a]	Procurement Price (Tk/kg)	Procurement Zone[a] Wholesale Price (Tk/kg)
Apr 87 - Oct 87	Boro	200	141	70.5	n.a.	8.25	9.67
Nov 87 - Mar 88	Aman	120	49	40.8	n.a.	8.25	8.83
Apr 88 - Oct 88	Boro	200	357	178.5	n.a.	8.25	8.80
Nov 88 - Mar 89	Aman	250	61	24.4	n.a.	8.66	9.27
Apr 89 - Oct 89	Boro	525	336	64.0	n.a.	8.66	9.22
Nov 89 - Mar 90	Aman	250	421	168.4	n.a.	9.07	9.12
Apr 90 - Oct 90	Boro	400	470	117.5	n.a.	9.71	9.54
Nov 90 - Mar 91	Aman	425	162	38.1	n.a.	9.71	9.91
Apr 91 - Oct 91	Boro	500	568	113.6	399	9.90	10.49
Nov 91 - Mar 92	Aman	550	363	66.0	278	10.10	10.51
Apr 92 - Oct 92	Boro	500	503	100.6	0	10.10	10.48
Nov 92 - Mar 93	Aman	200	142	71.0	111	8.66	7.89
Apr 93 - Oct 93	Boro	133	2	1.5	138	9.55	7.59
Nov 93 - Mar 94	Aman	200	14	7.0	9	8.51	9.23
Apr 94 - Oct 94	Boro	250	165	66.0	141	9.19	10.66
Nov 94 - Mar 95	Aman	-	42	-	0	9.11	11.86
Apr 95 - Oct 95	Boro	300	244	81.3	202	11.25	12.14
Nov 95 - Mar 96	Aman	200	51	25.5	32	11.00	11.60
Apr 96 - Oct 96	Boro	420	416	99.0	168	11.00	10.07
Nov 96 - Mar 97	Aman	250	201	80.4	128	10.50	8.85
Apr 97 - Oct 97	Boro	250	243	97.2	184	11.00	9.19
Nov 97 - Mar 98	Aman	300	6	2.0	n.a.	10.70	11.31
Apr 98 - Oct 98	Boro	400	355	88.8	n.a.	12.00	12.68
Nov 98 - Mar 99	Aman	250	25	10.0	n.a.	12.00	14.05
Apr 99 - Oct 99	Boro	400	621	155.3	n.a.	12.00	12.37

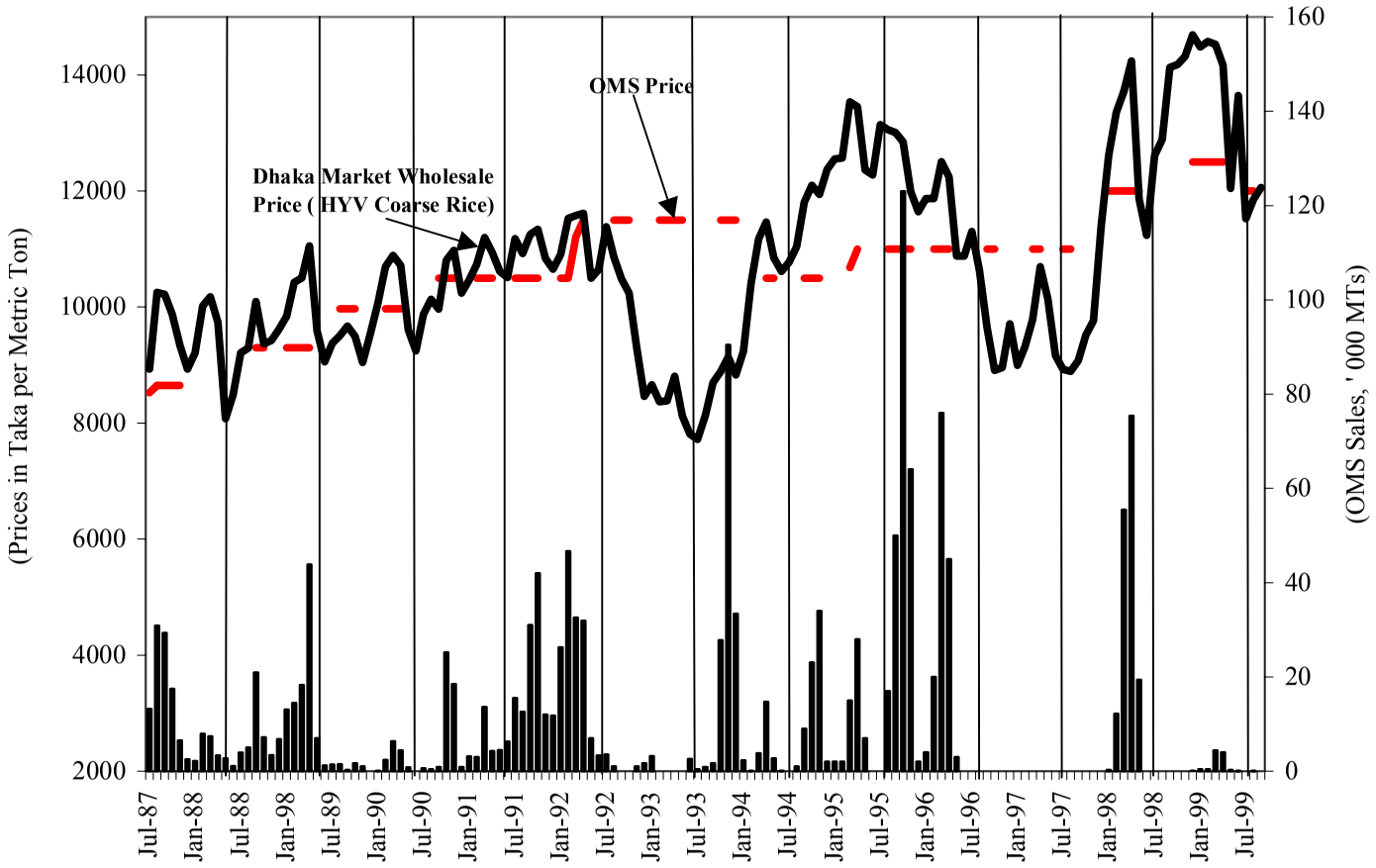
Notes: [a] includes Rangpur, Dinajpur and Bogra districts.
n.a. means not available.
Source: DAM; FPMU and DG Food.

Figure 4.1—Prices of Rice – Wholesale Market and Producer, 1987/88 –1999/2000



Note : [a] includes Ranngpur, Dinajpur and Bogra.
Source : DAM; DG Food and FPMU.

Figure 4.2—Wholesale Market and OMS Prices of Rice, 1987/88 - 1999/2000



Source : DAM; FPMU and DG Food.

Table 4.4—Impact of Domestic Net Boro Season Procurement, 1996 – 1999

	1996	1997	1998	1999
Boro	7.221	7.46	7.979	10.000
Aus	1.676	1.874	1.616	1.800
Total Production	8.897	9.334	9.595	11.800
Losses, seed, etc. (10 percent)	0.890	0.933	0.960	1.180
Net Production	8.007	8.401	8.636	10.620
Domestic Procurement (May-Nov)	0.416	0.243	0.322	0.602
Offtake from Government Stocks (May-Nov)	0.266	0.307	0.289	0.538
Net Domestic Procurement (May-Nov)	0.150	-0.064	0.033	0.064
Private imports	0.046	0.031		
Private stock change	0	0	0	0
Supply / Demand	7.903	8.496	8.603	10.556
Actual Price (May-Nov)	10.19	9.75	13.24	12.50
Procurement / Total Production (percent)	4.7%	2.6%	3.4%	5.1%
Net Procurement / Total Supply (percent)	1.9%	-0.8%	0.4%	0.6%
Effect of Net Procurement on Market Prices				
Simulated Change in Price (percent)				
elasticity = -0.2	10.5%	-3.6%		3.1%
elasticity = -0.3	6.8%	-2.4%		2.1%
elasticity = -0.5	3.9%	-1.5%		1.2%

Source: Authors' calculations.

The calculations described above involve important assumptions regarding spatial market integration and private stock behavior. In this simple calculation, it is assumed that markets are integrated for the entire period of analysis and that there are no reverse flows in rice from urban to rural areas. This assumption implies that prices throughout the country move together, with a constant margin between rural and urban prices. Baulch, et. al. (1998) provide econometric evidence suggesting that wholesale markets for rice are in fact well integrated, and except for periods of major shortages in domestic production (such as those just after the 1997/98 and 1998/99 aman harvests), the assumption that rural and urban markets are linked throughout the year seems reasonable.

Private stock behavior, however, is much more difficult to take into account. The calculations assume that the private sector has a desired level of stocks just before the start of the aman harvest, (for example, stocks equal to six weeks of average consumption). Thus, increased net procurement of the government has a large impact on prices since the private sector does not respond to government purchases (and higher market prices) by selling some of its stocks. In this case, total stocks (public and private) rise by the amount of procurement. An extreme alternative assumption would be simply that the private sector, assuming that net government procurement for the period will be zero, may simply immediately reduce its stock levels by the amount of government procurement, so that total stock levels (public and private) are unchanged.

A full model of private stock behavior would require specification of price expectations and storage costs of the private sector. Simple price expectations are often used in dynamic programming models, but a complete specification would take the

expected actions of the government into consideration (Williams and Wright, 1991; Goletti, Ahmed and Chowdhury, 1991; Goletti, 1994; Brennan, 1995). As a simple alternative, the model of the Bangladesh food sector by Dorosh and Haggblade (1997) allowed price responsiveness of private stock behavior through an own-price elasticity of stock-holding. In this way, the effect of government procurement on prices would be mitigated somewhat as the private sector reduced its stocks as prices rose, thus offsetting part of the impact on market supplies.

No estimate of the impact of boro procurement on average prices in 1998 is shown in the table since the Bangladesh price was near the import parity price with India throughout the May-November period. Prices were below import parity calculated ex: Delhi in May and June, but were probably close to import parity for rice from West Bengal. West Bengal prices are typically below those in Delhi during these months because of the boro (rabi) rice harvest in West Bengal (and the lack of a major boro harvest in most other states with the exception of Andhra Pradesh). On average, rice prices in May through June in 1996 and 1997 were 9.7 percent lower in West Bengal than in Delhi.

Thus, with prices at import parity, government procurement would have no effect on market prices, but instead would only increase the volume of private sector rice imports. Private imports were also substantial in mid-1999, but Table 4.4 nonetheless calculates a price effect of net procurement given that domestic prices were far below even estimated import parity ex: West Bengal. Moreover, no import volumes are entered into the calculation of domestic supply because of substantial evidence that official figures for rice imports during this period might be significantly overstated (Dorosh,

1999). Note, however, that adding the 272 thousand tons of imports would increase availability (net of government procurement and sales) by only 2.6 percent, and would thus have little impact on the calculated price effect.

EXCESS COSTS OF PROCUREMENT

Table 4.5 compares the procurement price to the market price in the major boro procurement zone (Rajshahi) to assess whether it would have been possible to procure rice at a lower cost in these years. As shown, the procurement price ranged from 0.27 to 1.88 Tk/kg above the May-July average Rajshahi wholesale price of coarse rice from 1996 through 1999. Adjustments need to be made both for rice quality and location, however. Since government procurement standards are higher than the average quality of coarse rice, a quality adjustment of perhaps 0.5 to 1.5 Tk/kg should be added to the market price of rice. On the other hand, procurement generally takes place at Local Supply Depots (LSDs) in rural areas and so the costs of handling and transport from the LSD's to urban wholesale markets must be added, in the range of 0.5 to 1.0 Tk/kg. The net adjustment may be rather small and depends on the location of the LSD and the wholesale market.

Thus, for example, though the difference between the wholesale market price and the procurement price was only 0.27 Tk/kg in 1999, the government procured 602 thousand tons following the boro harvest. If we use this margin of 0.27 Tk/kg as the quality and transport factor needed to make wholesale market prices in Rajshahi division comparable to the government procurement price, then the prices paid to farmers in 1996, 1997 and 1998 were excessive by 0.54, 1.61, and 0.08 Tk/kg, respectively (Estimate II of the excess procurement price). Multiplying by the procurement quantities in these years,

the estimated excess cost of procurement was 226 million Taka in 1996, 391 million Taka in 1997, and 25 million Taka in 1999. Thus, in principle, the government could have met its objective of procuring rice for security stocks and public distribution at far lower costs. And given that few farmers actually participate in procurement, the vast majority of farmers would have had the same benefits as under fixed-price procurement.

Table 4.5—Costs of Domestic Boro Season Procurement, 1996 –1999

	1996	1997	1998	1999
Domestic Procurement (May-Nov)	0.416	0.243	0.322	0.602
Procurement Price (Tk/kg)	11.00	11.00	12.00	12.00
Market Prices (Average May-July)				
National Average HYV Coarse (Tk/kg)	10.84	9.83	12.37	12.50
Rajshahi HYV Coarse (Tk/kg)	10.19	9.12	11.66	11.73
"Excess" Procurement Price (Tk/kg)				
Estimate I (Procurement Price less Rajshahi Price)	0.81	1.88	0.34	0.27
Estimate II (Estimate I less 1999 Value of Estimate I)	0.54	1.61	0.08	0.00
"Excess" Cost of Procurement (mn Taka)				
Estimate I	337	456	111	161
Estimate II	226	391	25	0

Notes: Private imports are not included in total supply for calculations in 1998 and 1999. The Rajshahi Division price is the average of prices in Bogra, Dinajpur, Naogaon, Rangpur and Rajshahi districts. Excess cost of procurement is calculated as the excess procurement price times the quantity of procurement.
Source: Authors' calculations.

5. CONCLUSIONS

Price stabilization is an important, though somewhat ambiguous policy objective of the Government of Bangladesh. Procurement prices (and OMS prices) are not true floor (and ceiling prices), since there is no attempt to buy all the foodgrains offered at the procurement price nor sell unlimited quantities of foodgrains at the OMS price.[15] Operationally, the overriding policy objective has been ensuring smooth operation of the Public Foodgrain Distribution System, which has been increasingly targeted to the poor, particularly since the elimination of Statutory Rationing and Rural Rationing channels in the early 1990s.

The reduction in the size of the PFDS in the early 1990s diminished the government's share of total foodgrain sales and consumption and to some extent its influence on domestic market prices. The trade liberalization of the early 1990s also reduced government control on the supply of foodgrain through imports, though it opened up the possibility that private sector imports could stabilize markets in times of domestic production shortfalls, perhaps in a more cost-effective way.

Examination of rice price variability in Bangladesh shows no clear increase in price instability in the 1990s compared with the 1980s or the second half of the 1970s. Year-to-year fluctuations greater than 10 percent and deviations from the moving average of more than 5 percent occurred more frequently in the 1990s than in the 1980s. However, seasonality of monthly prices was reduced in the 1990s, and coefficients of

[15] Procurement of sufficient quantities to maintain an effective floor price in the market would require large fiscal outlays in years of good harvests and possibly substantial increases in storage capacity.

variation of annual prices fell sharply. Real prices of rice were slightly more unstable in the 1990s, (as measured by the coefficients of variation).

World prices of rice, (Bangkok prices for example), in contrast, have clearly become more stable over time, as the volume of world trade has grown. In the 1990s, Bangladesh domestic prices expressed in Taka were approximately as stable as Bangkok prices expressed in dollars (as measured in terms of deviations from a moving average trend.) Overall, the evidence indicates that Bangladesh annual prices were slightly more stable in the 1990s than international (Thai) prices, though Indian prices, heavily influenced by Indian government market interventions, were even more stable.

Earlier stock modeling exercises suggest the importance of clarifying policy objectives and the limited influence and benefits of government market operations on domestic rice prices in the 1980s. Given the lower price of wheat compared with rice, costs can be reduced or the number of people reached can be increased if wheat is used instead of rice in targeted distribution to the poor. Moreover, with trade liberalization, private sector imports have added to price stability by effectively providing a price ceiling at import parity levels following poor rice harvests in 1994/95, 1997/98 and 1998/99. Nonetheless, rice price stability remains a concern, especially since export parity does not provide an effective floor because Bangladeshi traders have not established export contacts.

Domestic procurement thus retains its importance. Production instability in the aman season makes price forecasting difficult, though. In five of the last six years, the eventual average wholesale market price at harvest was above the procurement price, resulting in an average of only 8.9 percent of the procurement target actually being

achieved. Moreover, the procurement price set in boro season has been excessively high in 3 out of 4 recent years, resulting in extra costs to the government and windfall profits to those who are fortunate enough to sell at the procurement centers. In addition, procurement prices substantially above market prices increase the potential for rent-seeking behavior and corruption of public officials connected with procurement. Open tendering has succeeded in enabling some domestic procurement following unexpected domestic production shortfalls in 1998 and 1999. Technical problems remain, but if these are overcome, costs could be reduced and reliability of procurement could be increased.

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