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PRICE STABILIZATION AND PUBLIC FOODGRAIN DISTRIBUTION:

POLICY OPTIONS TO ENHANCE NATIONAL FOOD SECURITY

PAUL A. DOROSH

QUAZI SHAHABUDDIN

NOVEMBER 1999

FMRSP Working Paper No. 12

FMRSP Bangladesh

Food Management & Research Support Project

Ministry of Food, Government of the People's Republic of Bangladesh

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

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EXECUTIVE SUMMARY

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, dominate 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 resulting 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 is a major reason why the Government of Bangladesh intervenes heavily in rice and wheat markets.

The major objective of food policy in Bangladesh is ensuring food security for all households. To meet this overall objective, the government undertakes several activities: it intervenes in markets to stabilize prices, targets food distribution to poor households and provides emergency relief after natural disasters. Thus, government food policy has both price (stabilization) and quantity (public foodgrain distribution) 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 and targeted distribution. In particular, the focus of the paper is on the role of trade liberalization, impacts of domestic procurement on rice prices, and food aid.

RICE PRICE STABILITY IN BANGLADESH AND WORLD MARKETS

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

In contrast, world prices of rice, ex: Bangkok, 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.

STOCK POLICIES, PRICE STABILIZATION AND THE ROLE OF INTERNATIONAL TRADE

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.

IMPACTS OF GOVERNMENT INTERVENTIONS ON DOMESTIC RICE MARKETS

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 the *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 the sell at the procurement centers. In addition, procurement prices substantially above market prices encourages rent-seeking behavior and adds to the potential for 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.

TARGETED DISTRIBUTION, FOOD AID AND HOUSEHOLD FOOD SECURITY

The Bangladesh food economy has undergone major changes in the last two decades: foodgrain production has increased, real rice prices have fallen, major rationing channels (palli rationing and statutory rationing) were eliminated in the early 1990s, and private sector foodgrain imports were liberalized in 1992/93. In the 1990s, with less food aid available, total PFDS distribution is lower (by 0.68 ounces/person/day compared to the 1980s), but over 80 percent of this foodgrain is targeted to the poor.

In the medium-term, if Bangladesh increases production and prices fall towards export parity levels, price stabilization, in the absence of some exports, will become more difficult. Moreover, increased foodgrain production reduces the estimated food gap, generally used in the determination of food aid flows.

The concept of the food gap is deficient on two counts, however. First, it fails to take into account private sector imports, which depend not only on domestic production, (and more broadly domestic supply and demand), but on international prices as well. Second, the food gap is essentially a measure of food availability, but food security depends not only on availability, but on access and utilization as well. There is a very high likelihood that food aid to Bangladesh will decline in the future because of increased domestic production and, perhaps, more exact estimations of private sector imports in the food availability calculations. Moreover, food aid worldwide may fall due to reductions in producer subsidies in donor countries following the Uruguay Round agreements. Reductions in food aid are likely to result in overall reductions in resources for ensuring household access to food, as well.

Thus, a firm commitment on the part of donors and the Government of Bangladesh regarding resources for access is needed, particularly for programs that combine access with increased skills or infrastructure development to enhance long-term growth in incomes. As domestic production increases and Bangladesh becomes more integrated with world markets, foodgrain price instability may become less important. Tackling the problems of poverty and household food insecurity will require more resources, not less, than those devoted in the past to price stabilization and direct food distribution through the Public Foodgrain Distribution System.

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 dominate 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 resulting 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 increase, targeting food distribution to poor households, providing emergency relief after natural disasters, and procuring foodgrain to support producer prices and incomes.

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 and targeted distribution. In particular, the focus of the paper is on the role of trade liberalization, impacts of domestic procurement on rice prices, and food aid.

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 and discusses their implications regarding private sector trade and price stabilization. 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. Chapter Five examines medium-term implications of current production and price trends, particularly in regard to food aid and household food security. Conclusions are presented in Chapter Six.

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 reported.

RICE PRICES IN BANGLADESH: ANNUAL AND SEASONAL PATTERNS[1]

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

[1] This section draws heavily from Shahabuddin (1998).

Table 2.1 — Fluctuations in Annual Rice Prices, 1972/73 to 1998/99

Year	Actual Price (Tk/maund)	Changes from Previous Year (%)	3 years Moving Average	Deviation of actual price from Moving Average (%)	Deviation of actual price from Linear trend (%)
1972-73	75.17	-	-	-	-18.2
1973-74	100.42	33.6	128.36	-21.8	-5.9
1974-75	209.50	108.6	144.81	44.7	72.2
1975-76	124.50	-40.6	149.06	-16.5	-8.8
1976-77	113.17	-9.1	125.33	-9.7	-25.3
1977-78	138.33	22.2	134.53	2.8	-16.8
1978-79	152.08	9.9	163.89	-7.2	-16.1
1979-80	201.25	32.3	173.92	15.7	2.6
1980-81	168.42	-16.3	196.69	-14.4	-20.2
1981-82	220.42	30.9	209.78	5.1	-2.4
1982-83	240.50	9.1	240.86	-0.1	-0.1
1983-84	261.67	8.8	265.53	-1.5	2.3
1984-85	294.42	12.5	278.78	5.6	8.8
1985-86	280.25	-4.8	301.67	-7.1	-1.8
1986-87	330.33	17.9	320.14	3.2	10.0
1987-88	349.83	5.9	348.11	0.5	10.9
1988-89	364.17	4.1	355.78	2.4	10.3
1989-90	353.33	-3.0	372.19	-5.1	2.4
1990-91	399.08	12.9	387.97	2.9	10.9
1991-92	411.50	3.1	383.67	7.3	9.8
1992-93	340.42	-17.3	369.75	-7.9	-12.7
1993-94	357.33	5.0	384.19	-7.0	-11.7
1994-95	454.83	27.3	419.89	8.3	8.4
1995-96	447.50	-1.6	422.53	5.9	3.0
1996-97	365.25	-18.4	416.27	-12.3	-18.7
1997/98	436.06	19.4	439.45	-0.8	-6.1
1998/99	517.05	18.6	-		7.9

Source: DAM, MOA and author's calculations.

Figure 2.1 — Fluctuations in Annual Wholesale Prices Coarse Rice, 1972/73 to 1998/99 (Using a Centered Moving Average)

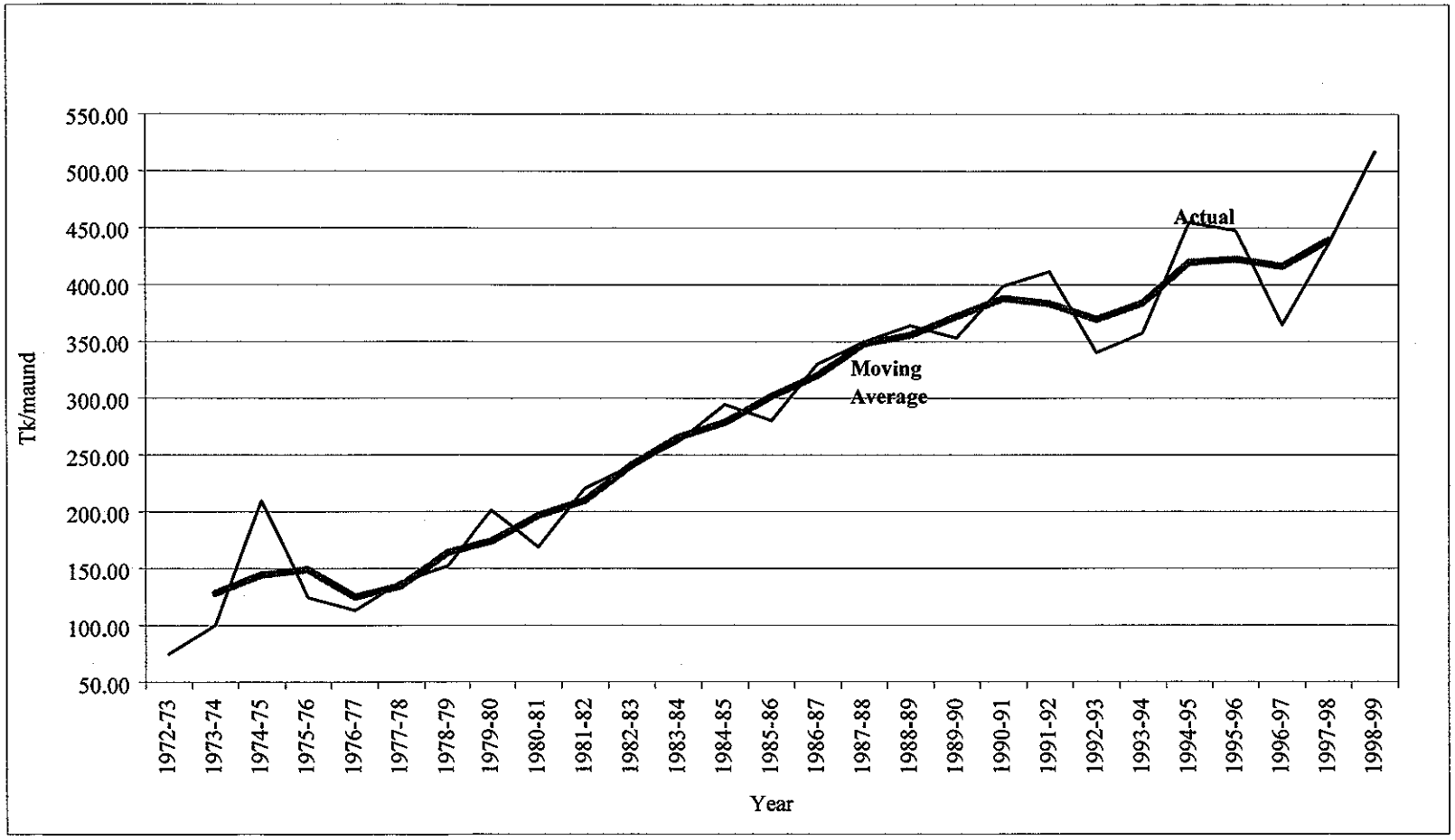
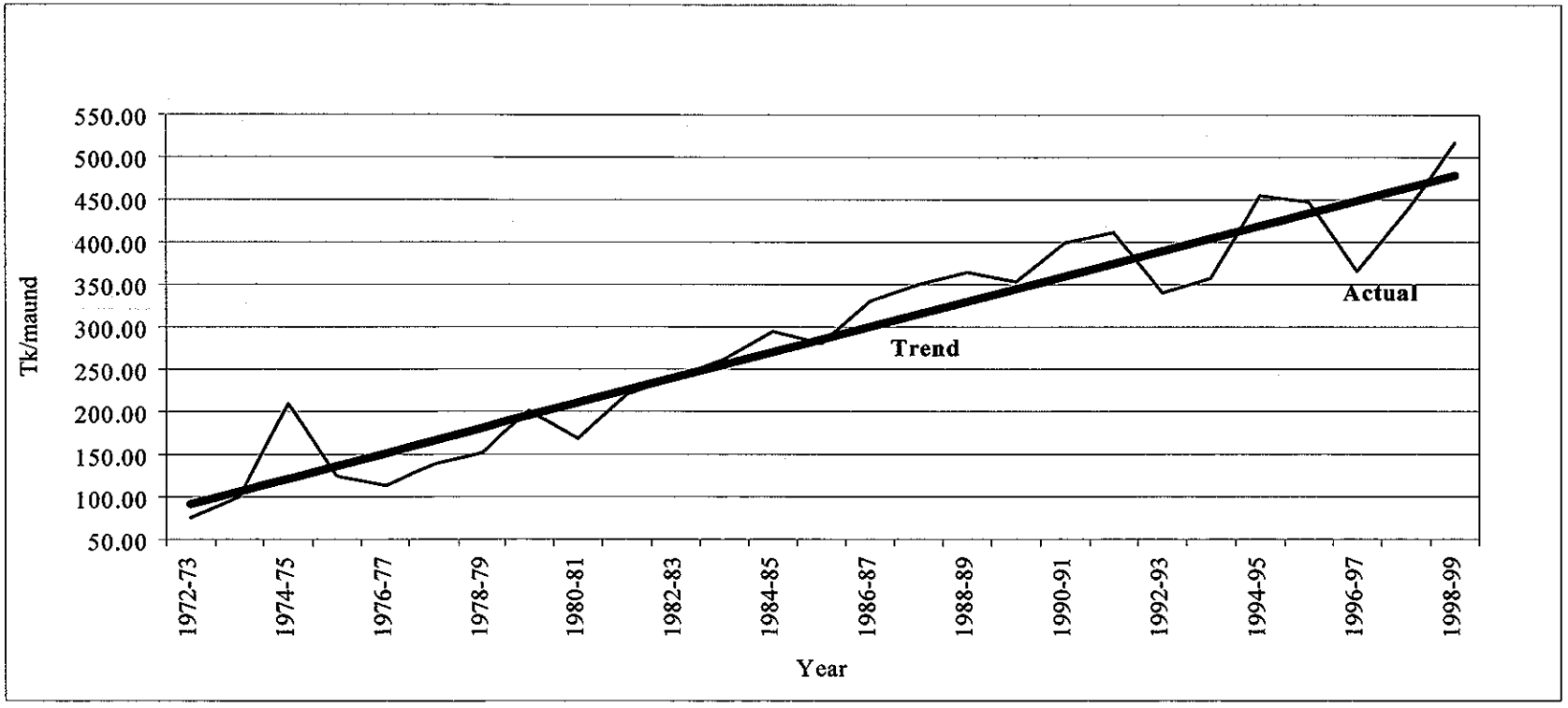


Figure 2.2 — Fluctuations in Annual Wholesale Prices Coarse Rice, 1972/73 to 1998/99 (Using a Linear Trend)



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 6 out of 9 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 moving average, (which provided a better fit to the data than did a simple linear trend, Figures 2.1 and 2.2). 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 0.8 and 12.3 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 6 out of 8 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 2.2 — Fluctuations in Monthly Nominal Prices of Coarse Rice in Bangladesh, 1972/73 to 1996/97

Year	Fluctuation	Coefficient of Variation	Month of Lowest price	Month of Highest price
1972-73	43.48	0.139	July	May
1973-74	55.68	0.213	December	June
1974-75	58.02	0.169	July	March
1975-76	84.96	0.238	June	July
1976-77	31.68	0.117	December	June
1977-78	18.80	0.058	December	July
1978-79	38.85	0.185	August	June
1979-80	28.35	0.083	June	July
1980-81	21.12	0.062	December	April
1981-82	54.34	0.172	August	April
1982-83	19.75	0.059	December	October
1983-84	20.38	0.075	August	April
1984-85	19.67	0.055	June	September
1985-86	21.51	0.067	August	April
1986-87	46.89	0.122	November	April
1987-88	16.14	0.053	May	March
1988-89	16.01	0.052	July	April
1989-90	19.10	0.048	December	April
1990-91	29.61	0.096	November	October
1991-92	17.33	0.049	November	April
1992-93	34.08	0.108	November	July
1993-94	39.19	0.146	July	June
1994-95	25.33	0.076	July	February
1995-96	16.82	0.056	May	July
1996-97	20.66	0.062	January	May

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' calculation

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 2 out of 7 years during the 1990s (1990/91 - 1996/97 period).

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 2 out of 7 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.

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 shows that seasonal price fluctuation was quite high during the 1970s (with the annual range exceeding 20 percent in 5 out of 7 years) but was considerably reduced during the 1980s (in only 2 out of 10 years) and the 1990s (in 2 out of 6 years). The amplitude of seasonal factors (seasonal price spread) thus has declined significantly (almost cut down by half) during the 1980s and the 1990s as compared to the earlier decade.

Table 2.4 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 1.125 in the 1990s. 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.

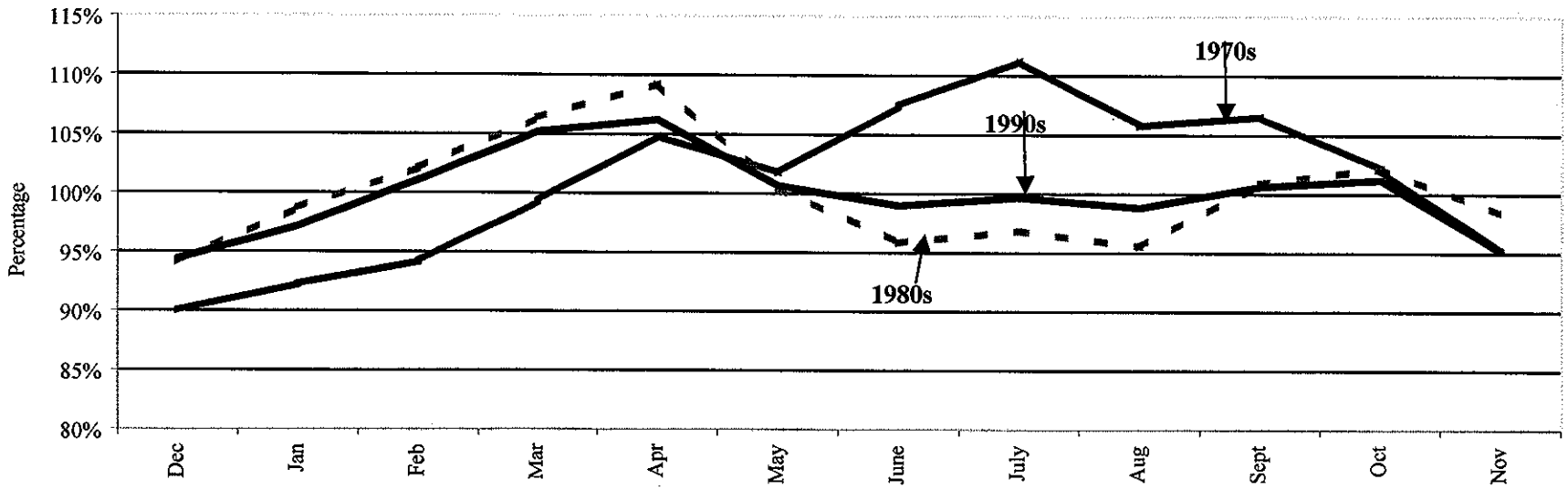
The increase in the size of the *boro* harvest relative to *aman* and *aus* is the major factor behind these observed changes in seasonality. The increase in the share of *boro* (and *aus*) in total production have eliminated the steep seasonal rise in prices in June and

Table 2.3 — Dispersion of the Index of Pure Seasonality in Rice Prices with Low and High Price Months, 1973/74 to 1995/96

Year	Range	Maximum	Minimum	Low Month	High Month
1973-74	18.07	101.35	83.28	December	April
1974-75	45.90	131.79	85.89	July	October
1975-76	33.20	110.29	77.09	November	July
1976-77	19.78	107.58	87.79	December	Jun
1977-78	23.78	113.92	90.14	December	July
1978-79	27.68	115.73	88.06	February	Jun
1979-80	31.72	121.43	89.71	December	July
1980-81	16.94	109.43	92.49	December	April
1981-82	32.52	122.65	90.12	August	April
1982-83	19.51	110.34	90.83	December	October
1983-84	9.11	103.27	94.16	August	September
1984-85	16.61	107.14	90.53	June	April
1985-86	13.52	107.18	93.66	December	April
1986-87	41.03	116.67	75.64	November	April
1987-88	15.58	108.19	92.60	May	March
1988-89	13.43	108.99	95.56	August	April
1989-90	15.37	107.01	91.64	December	April
1990-91	30.45	122.51	92.06	November	October
1991-92	19.39	111.79	92.40	November	April
1992-93	20.38	107.42	87.03	November	December
1993-94	17.69	108.67	90.98	July	March
1994-95	15.74	110.50	94.76	July	February
1995-96	13.06	109.54	96.48	December	March

Source: Shahabuddin (1998)

Figure 2.3 — Seasonality in Coarse Rice Prices in Bangladesh



Note : This figure uses a lagged moving average ; the line for the 1970's is based on 1977-79 only

Table 2.4 — Seasonality in Coarse Rice Prices in Bangladesh

Month	1970's	1980's	1990's
January	0.923	0.987	0.972
February	0.942	1.021	1.011
March	0.993	1.064	1.052
April	1.049	1.092	1.062
May	1.018	1.005	1.007
June	1.075	0.958	0.990
July	1.112	0.969	0.997
August	1.058	0.955	0.988
September	1.065	1.009	1.006
October	1.021	1.022	1.012
November	0.952	0.983	0.952
December	0.900	0.941	0.944
Peak	1.112	1.092	1.062
Trough	0.900	0.941	0.944
Ratio	1.236	1.161	1.125

Source: DAM; author's calculations.

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.

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 2.5 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 3 out of 9 years during the 1990s.

Figure 2.4 — Fluctuations in International Rice Prices, 1973/74 to 1998/99 (C&F, US$/Mt)(using a Linear Trend)

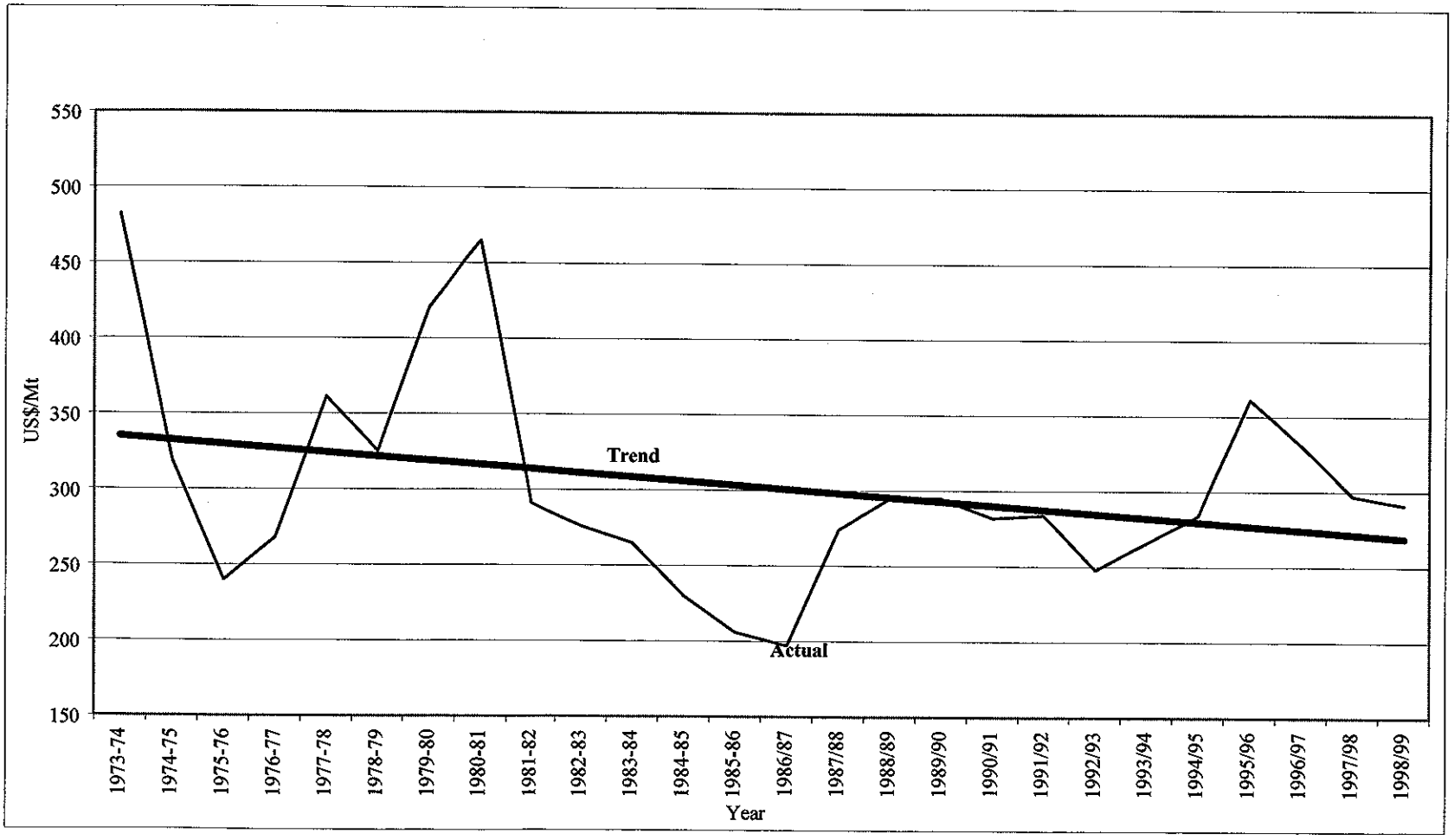


Table 2.5 — Fluctuations in International Rice Prices, 1973/74 to 1998/99

Year	Nominal Price C & F (Thai 15 % Broken) (US $ / Mt)	Changes from Previous Year (%)	3 year Moving Average	Deviation of Actual price from Moving Average (%)	Deviation of Actual price from Linear Trend(%)
1973-74	482	-	-	-	43.87
1974-75	319	-33.82	347	-8.07	-4.03
1975-76	240	-24.76	276	-12.94	-27.22
1976-77	268	11.67	290	-7.48	-18.07
1977-78	361	34.70	318	13.52	11.25
1978-79	325	-9.97	369	-11.92	0.98
1979-80	421	29.54	404	4.29	31.89
1980-81	465	10.45	392	18.52	46.88
1981-82	291	-37.42	344	-15.41	-7.31
1982-83	276	-5.15	277	-0.48	-11.34
1983-84	265	-3.99	257	3.11	-14.15
1984-85	230	-13.21	234	-1.57	-24.84
1985-86	206	-10.43	211	-2.37	-32.10
1986/87	197	-4.37	226	-12.70	-34.50
1987/88	274	39.09	255	7.31	-8.09
1988/89	295	7.66	288	2.43	-0.16
1989/90	295	0.00	291	1.49	0.73
1990/91	282	-4.41	287	-1.74	-2.83
1991/92	284	0.71	271	4.67	-1.24
1992/93	248	-12.68	266	-6.77	-12.96
1993/94	266	7.26	266	0.00	-5.77
1994/95	284	6.77	304	-6.48	1.55
1995/96	361	27.11	325	10.96	30.31
1996/97	331	-8.31	330	0.40	20.63
1997/98	297	-10.27	306	-3.05	9.29
1998/99	291	-2.02	-	-	8.13

Source: (a) Mahmud & others, IFPRI Working Paper # 7 and
(b) Food and Agricultural Organization (FAO), compiled in FPMU database and author's calculation.

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 during the eighties and only 1 out of 8 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.[2]

Table 2.6 presents data on the fluctuations in annual wholesale prices of rice in India, as well as deviations from the moving average. The year-to-year fluctuations in annual prices ranged between 1.3 to 32.7 percent during the 1990-98 period. The deviation from the moving average, on the other hand, indicates that fluctuations in price ranged between 2.4 to 15.1 percent, much lower than the year-to-year fluctuations. What is more significant to observe is that the deviation of actual prices from the moving average greater than 10 percent occurred in only 2 out of 7 years during the 1990-98 period. Year-to-year fluctuations greater than 10 percent occurred in 5 out of 8 years, however.

Table 2.7 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.[3]

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

[3] 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.

Table 2.6 — Fluctuations in International Rice Prices (India), 1990 -1998

Year	Nominal Price FOB (US$/Mt)	Changes from Previous Year (%)	Moving Average Price (3 year)	Deviation of Actual price from Moving Average (%)	Deviation of Actual price from Log linear trend (%)
1990	286.17	-	-	-	16.87
1991	237.83	-16.89	256	-6.95	-3.51
1992	242.75	2.07	227	6.82	-2.17
1993	201.15	-17.14	237	-15.11	-19.47
1994	266.92	32.70	234	13.84	6.16
1995	235.36	-11.82	258	-8.67	-7.00
1996	270.86	15.08	260	4.10	6.32
1997	274.34	1.28	268	2.44	6.98
1998	258.19	-5.89	-	-	0.02

Source: Author's calculations.

Table 2.7 — Fluctuations in Annual Nominal Rice Prices

		1975/76 - 1979/80	1980/81 - 1989/90	1990/91 - 1998/99
Bangladesh Coarse Rice	Average Price	3.91	7.71	11.02
National Average Wholesale (Tk/kg)	Coef. of Variation	0.210	0.218	0.129
Indian	Average Price	n.a.	4.29	8.98
Import Parity Dhaka (Rs/kg)	Coef. of Variation	-	0.124	0.221
Thai Rice (5% broken)	Average Price	353	316	312
C&F Chittagong (US$/MT)	Coef. of Variation	0.135	0.284	0.113
Thai (15% broken)	Average Price	323	279	296
C&F Chittagong (US$/MT)	Coef. of Variation	0.200	0.257	0.118

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

Table 2.8 - Fluctuations in Annual Nominal Rice Prices in Bangladesh Taka

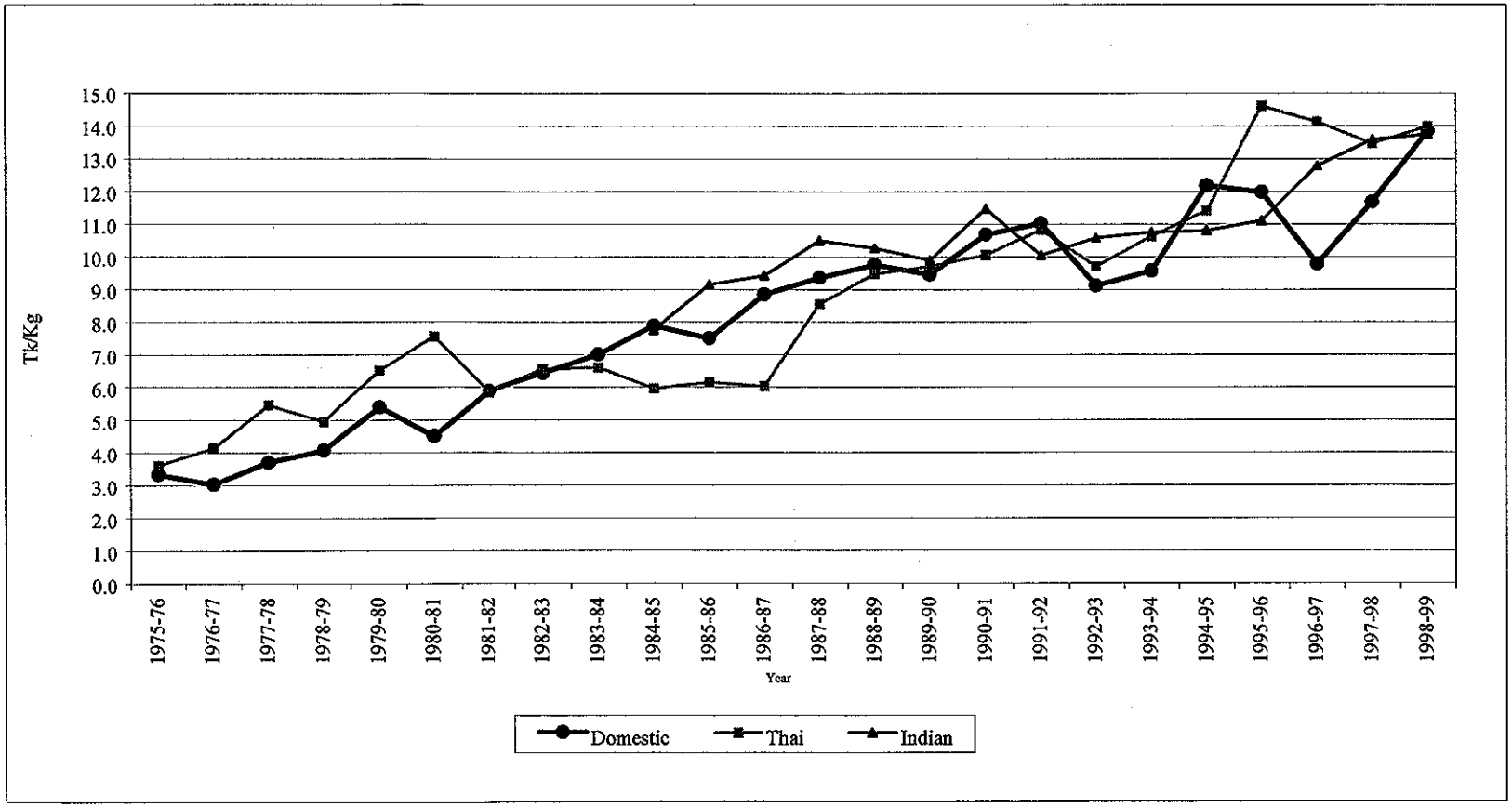
		1975/76 - 1979/80	1980/81 - 1989/90	1990/91 - 1998/99
Bangladesh Coarse Rice	Average Price	3.91	7.71	11.02
National Average Wholesale (Tk/kg)	Coef. of Variation	0.210	0.218	0.129
Indian	Average Price	n.a.	9.50	11.66
Import Parity Dhaka (Tk/kg)	Coef. of Variation	-	0.095	0.111
Thai Rice (5% broken)	Average Price	5.38	8.10	12.85
C&F Chittagong (Tk/kg)	Coef. of Variation	0.145	0.169	0.155
Thai (15% broken)	Average Price	4.93	7.24	12.21
C&F Chittagong (Tk/kg)	Coef. of Variation	0.206	0.202	0.161

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

As shown, the coefficient of variation of Bangladesh coarse rice prices fell sharply in the 1990s, from 0.218 in the 1980s to 0.129 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 0.118 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 0.221 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 2.8 and Figure 2.5). The coefficient of variation increases from 0.095 to only 0.111, 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

Figure 2.5 — Changes in Domestic, Thai and Indian Rice Prices, 1975/76 to 1998/99 (Nominal, Tk/Kg)



Note: Bangladesh prices are Average National Wholesale, Coarse rice; Thai prices are C&F Chittagong, 15% broken and Indian prices are import parity Dhaka.

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. 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 2.9 shows average prices and coefficients of variation for rice prices expressed in real terms, i.e. adjusted for overall price inflation. 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 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 more 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.

Finally, Table 2.10 shows average real prices and coefficients of variation for rice prices expressed in real Taka.[4] In real Taka terms, both Indian and Thai rice prices

[4] 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 2.9 — Fluctuations in Annual Real Rice Prices

		1975/76 - 1979/80	1980/81 - 1989/90	1990/91 - 1998/99
Bangladesh Coarse Rice	Average Price	16.41	17.41	12.35
National Average Wholesale (Tk/kg)	Coef. of Variation	0.227	0.091	0.106
Indian	Average Price	n.a.	10.23	11.32
Import Parity Dhaka (Rs/kg)	Coef. of Variation	-	0.017	0.059
Thai Rice (5% broken)	Average Price	600	379	322
C&F Chittagong (US$/MT)	Coef. of Variation	0.071	0.297	0.095
Thai (15% broken)	Average Price	544	333	307
C&F Chittagong (US$/MT)	Coef. of Variation	0.110	0.274	0.098

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

Table 2.10 — Fluctuations in Annual Real Rice Prices in Bangladesh Taka

		1975/76 - 1979/80	1980/81 - 1989/90	1990/91 - 1998/99
Bangladesh Coarse Rice	Average Price	16.41	17.41	12.35
National Average Wholesale (Tk/kg)	Coef. of Variation	0.227	0.091	0.106
Indian	Average Price	n.a.	18.12	13.06
Import Parity Dhaka (Tk/kg)	Coef. of Variation	-	0.111	0.069
Thai Rice (5% broken)	Average Price	26.28	19.12	14.36
C&F Chittagong (Tk/kg)	Coef. of Variation	0.129	0.291	0.111
Thai (15% broken)	Average Price	24.06	16.81	13.64
C&F Chittagong (Tk/kg)	Coef. of Variation	0.186	0.246	0.113

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

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.

SUMMARY: RICE PRICE TRENDS AND VARIABILITY

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.

Although the different measures give slightly different answers, some general conclusions appear to be robust. First, since the 1970s, Bangladesh rice prices have become more stable, both annually and seasonally. Comparisons between the 1980s and 1990s regarding trends in price instability are mixed, varying by the measure used. Year-to-year fluctations greater than 10 percent occurred more frequently in the 1990s (6 out of 9 years) compared to the 1980s (4 out of 10 years), as did deviations from the moving average of more than 5 percent (6 out of 8 years in the 1990s compared with 5 out of 10 years in the 1980s). Seasonality of monthly prices was reduced in the 1990s, however, and coefficients of variation of nominal prices fell sharply, though coefficients of variation of real prices increased slightly. 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 smaller. 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[5]

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

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

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. 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. A better functioning domestic market suggests improvements in informational efficiency and market integration (see Goletti 1993 and 1994), private sector access to international trade, a better monitoring system, improved infrastructure, and better linkages with world rice and wheat markets.

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 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.

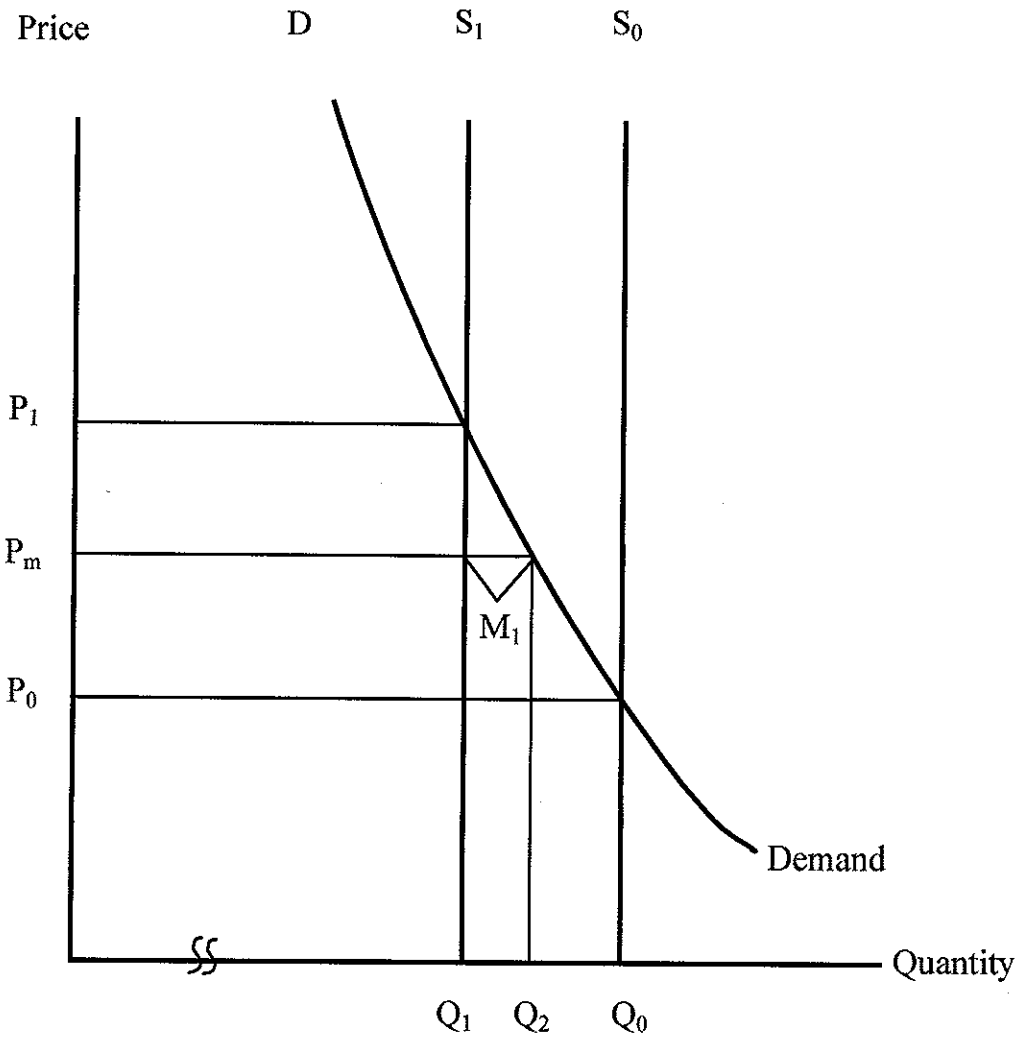
PRICE STABILIZATION THROUGH INTERNATIONAL TRADE

Stock modeling exercises have shown that using private sector trade and setting bands close to import and export parity is most efficient. With 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,[6] net market injections less than or equal to M1 have no effect on the price, but only reduce the quantity of imports.

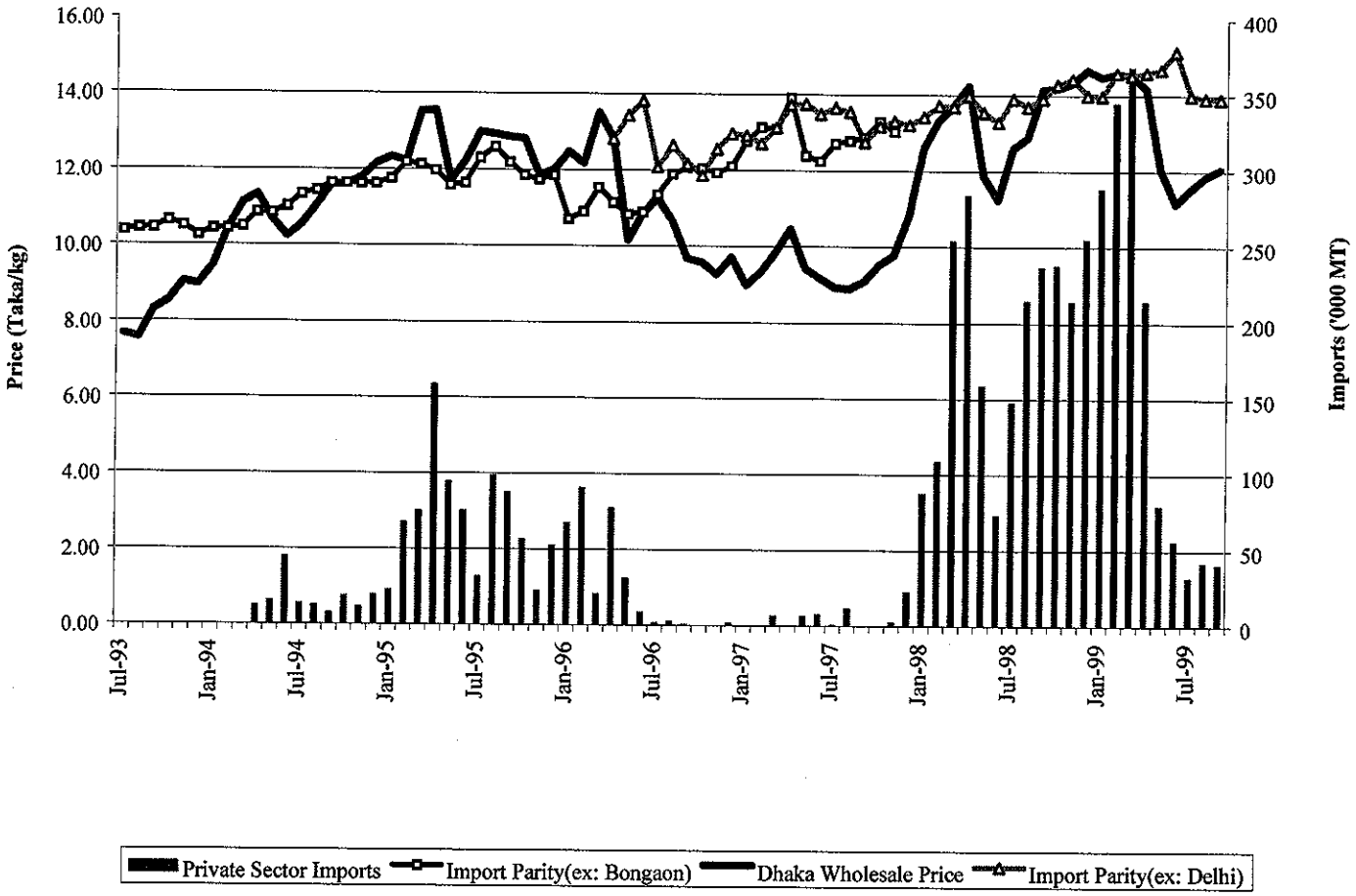
[6] A decrease (increase) in private stocks will reduce (increase) the amount of imports, holding net government sales constant.

Figure 3.1 — Effects of a Production Shortfall



Source : Author

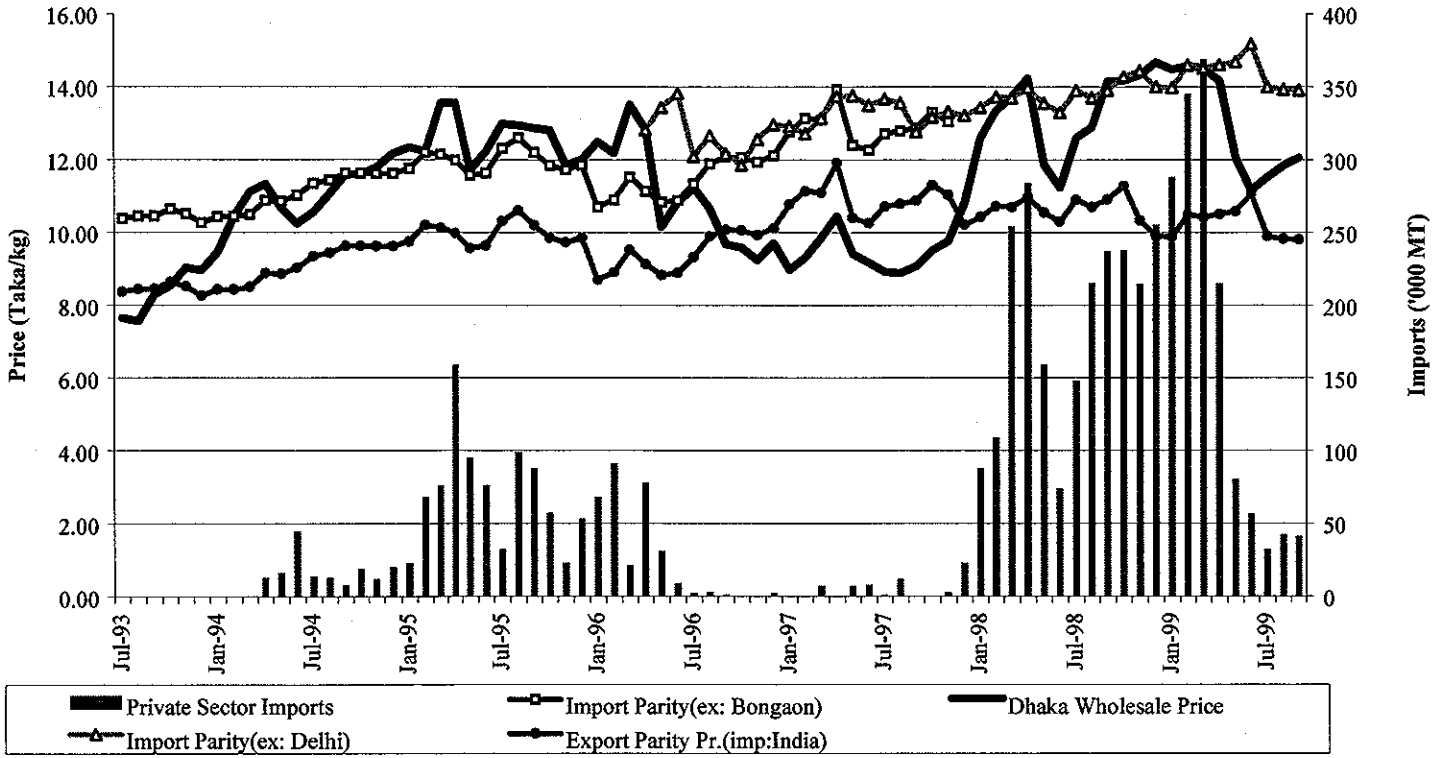
Figure 3.2 — Rice Prices and Quantity of Private Imports in Bangladesh, 1993-99



Note: Price data for September 1999 is up to the second week only; private sector imports are as of 14th September,1999. From November 1998, the carrying cost has increased by 1.1 Tk/kg to 4.1 Tk/kg.

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

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



Note: Price data for September 1999 is up to the second week only; private sector imports are as of 14th September,1999. From November 1998, the carrying cos increased by 1.1 Tk/kg to 4.1 Tk/kg. Export parity price Includes 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).

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 below 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) were not reduced.

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. These

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 MTs)	2182	5473	5635	3598	16,889
Consumption per Capita (kgs)	152.6	162.7	182.6	197.3	174.0
From Own Production ('000 MTs)	195	967	2771	2728	6,661
From Own Production (percent)	9.0%	17.7%	49.2%	75.8%	39.4%
Rice Purchases ('000 MTs)	1986	4507	2864	871	10,228
Rice Purchases (percent)	91.0%	82.3%	50.8%	24.2%	60.6%
Annual Rice Production ('000 MTs)	440	2,102	5,940	8,152	16,633
Rice Sales ('000 MTs) (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 MTs) (b)	244	1135	3169	5424	9,972
Percentage Sold (b)	55.6%	54.0%	53.3%	66.5%	60.0%
Net Rice Sales ('000 MTs) (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 MTs) (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.

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 MTs in a year in which net public foodgrain distribution and private imports were small (240 thousand and 583 thousand MTs, respectively). Using rice sales computed as reported production less reported own consumption, total rice sales are 9.972 million MTs, (60.0 percent of production), and net sales are –256 thousand MTs, 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 MTs), 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.[7] 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*

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

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

Season	Category of Procured Rice	Procurement Target (000 MT)	Actual Procurement (000 MT)	% 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.

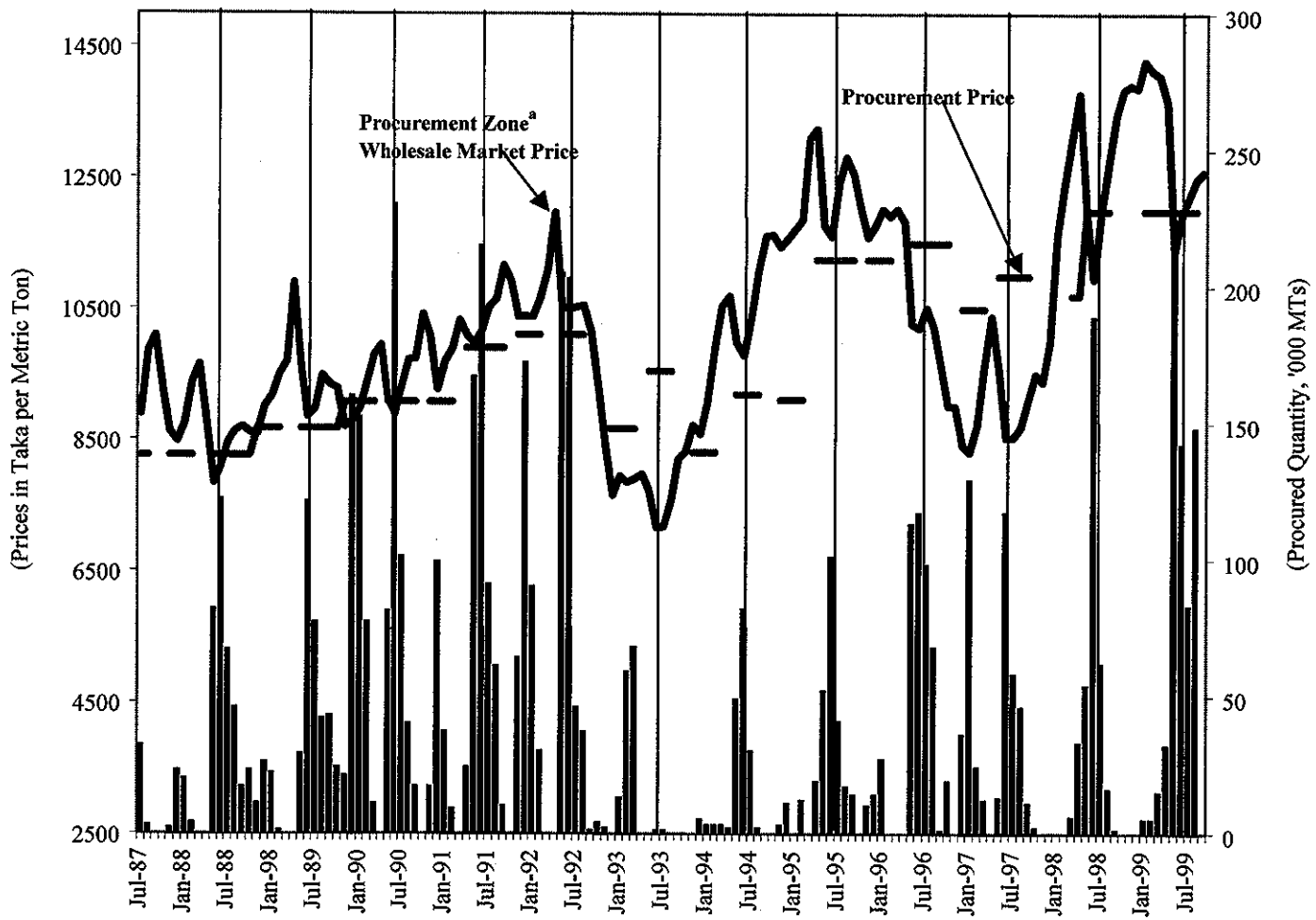
Source: DAM; FPMU and DG Food.

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%

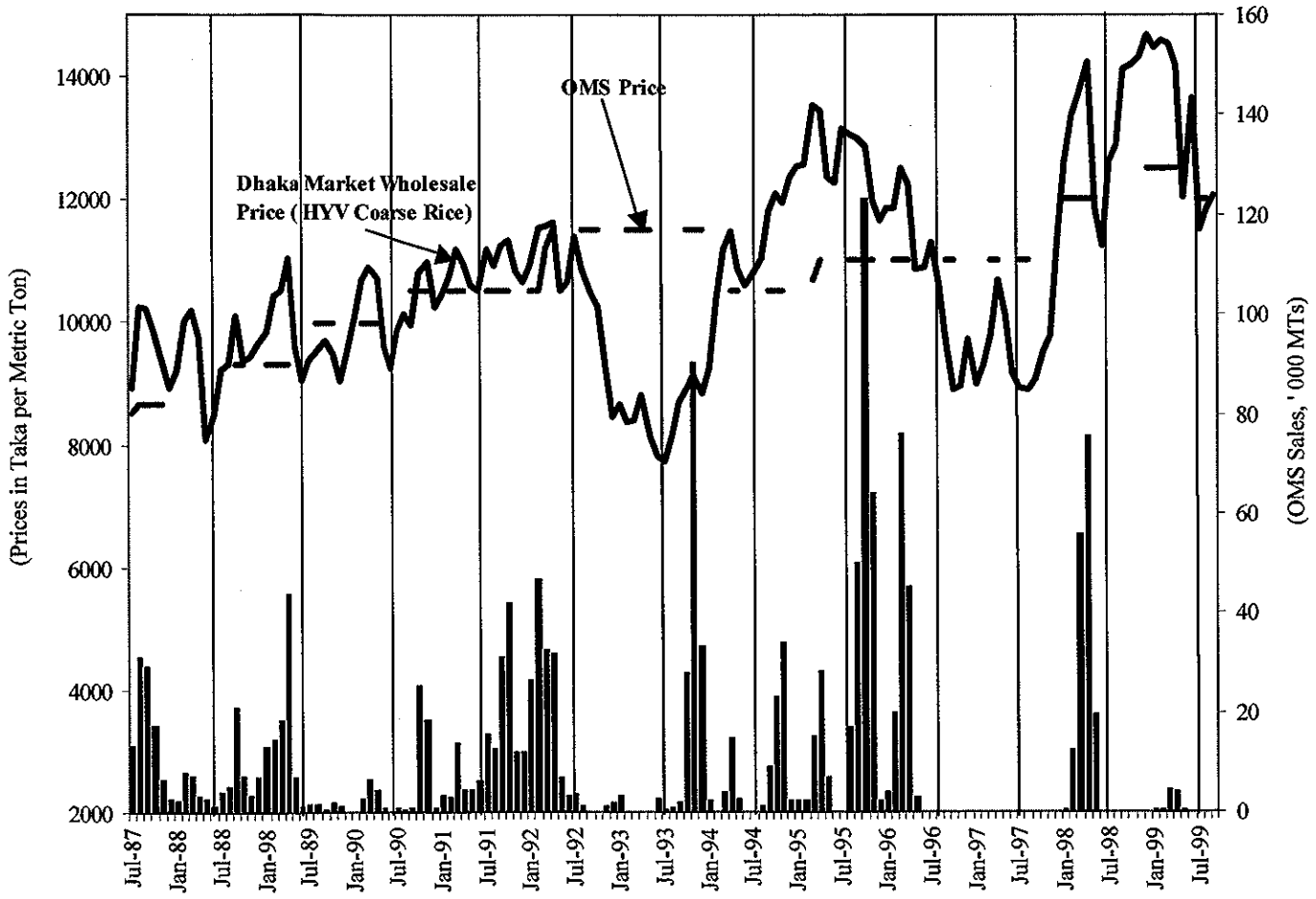
Source: Authors' calculations.

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.

procurement exceeded 80 percent of the target in 9 out of 13 years, and failed to reach at least 60 percent of the target in only one year (1993).[8] *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.[9] There have been numerous times when the OMS price is 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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[8] 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.

[9] 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 MTs 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).

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 reduce the size of private sector rice imports. A similar situation prevailed 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 MTs of imports would only increase availability (net of government procurement and sales) by 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

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.

thousand MTs 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.

5. TARGETED DISTRIBUTION, FOOD AID AND HOUSEHOLD FOOD SECURITY

Short-term price stabilization and relief efforts can assume critical importance in emergencies, but the underlying problem of increasing food security of approximately half of the population who are poor remains perhaps the main challenge of food policy. Targeted distribution programs such as Food-for-Work and Vulnerable Group Development attempt to address this problem through direct distribution of foodgrains (mainly wheat) combined with training and infrastructure development. Unlike rice price stabilization efforts, most of these programs are donor-funded, with foodgrains supplied by food aid. This chapter examines the needs for continued food aid, given trends in production and the calculated "food gap". This chapter begins with an examination of food production trends and per capita availability of foodgrains in Bangladesh. Food aid and real price trends are also presented. The chapter concludes with a discussion of the role of food aid in increasing access to food by the poor.

PRODUCTION TRENDS AND FOODGRAIN AVAILABILITY

Bangladesh has made substantial progress in terms of ensuring availability of food. As shown in Table 5.1, per capita availability of foodgrains has been fairly stable over the past two decades, averaging 162.7 kgs/capita in 1981-90, and increasing slightly to an average of 163.6 kgs/capita in 1991-98. Rice availability per capita, however, actually increased from 137.1 kgs/capita to 142.2 kgs/capita largely due to expanded rice production, particularly in the *boro* (winter) season, made possible through the adoption of High-Yielding Varieties (HYV's), expanded irrigation and increased fertilizer use. This increase in per capita rice production did not lead to an increase in total per capita foodgrain availability however, largely because of declining levels of food aid. Wheat availability per capita actually fell from 25.6 kgs/capita in the 1980s to 21.5 kgs/capita in

Table 5.1 — Total Foodgrain Availability from 1980/81 to 1998/99

Year	Rice Production ('000 MT)	Net PFDS Distribution ('000 MT)	Private Imports ('000 MT)	Net Rice Availability ('000 MT)	Wheat Production ('000 MT)	Net PFDS Distribution ('000 MT)	Private Imports ('000 MT)	Net Wheat Availability ('000 MT)	Total Foodgrain Availability ('000 MT)	Per Capita Rice Availability (kg/cap)	Per Capita Wheat Availability (kg/cap)	Per Capita T.Fgrain Availability (kg/cap)
1980/81	13,880	-327	0	12,165	1,092	852	0	1,835	14,000	135.3	20.4	155.7
1981/82	13,629	482	0	12,748	967	1,282	0	2,153	14,901	138.7	23.4	162.1
1982/83	14,215	328	0	13,121	1,095	1,415	0	2,401	15,522	139.7	25.6	165.3
1983/84	14,509	358	0	13,416	1,211	1,427	0	2,517	15,933	139.7	26.2	166.0
1984/85	14,623	266	0	13,426	1,464	1,948	0	3,265	16,692	136.9	33.3	170.1
1985/86	15,038	153	0	13,687	1,042	1,039	0	1,977	15,664	136.5	19.7	156.2
1986/87	15,406	358	0	14,223	1,091	1,574	0	2,555	16,779	138.8	24.9	163.7
1987/88	15,413	180	0	14,052	1,048	1,948	0	2,891	16,943	134.2	27.6	161.8
1988/89	15,544	326	0	14,316	1,021	2,199	0	3,117	17,433	134.0	29.2	163.2
1989/90	17,856	-243	0	15,827	890	1,447	0	2,248	18,075	145.3	20.6	166.0
1990/91	17,852	244	0	16,311	1,004	1,345	0	2,248	18,559	146.9	20.3	167.2
1991/92	18,252	-180	0	16,246	1,065	1,509	0	2,468	18,714	143.8	21.8	165.6
1992/93	18,341	243	0	16,750	1,176	597	355	2,010	18,761	145.7	17.5	163.1
1993/94	18,041	202	74	16,512	1,131	1,008	312	2,338	18,851	141.1	20.0	161.1
1994/95	16,833	83	583	15,816	1,245	1,213	1,013	3,347	19,162	132.9	28.1	161.0
1995/96	17,687	240	650	16,808	1,369	1,133	850	3,215	20,023	138.9	26.6	165.5
1996/97	18,883	226	15	17,236	1,454	550	237	2,096	19,331	140.1	17.0	157.2
1997/98	18,854	130	993	18,106	1,803	875	142	2,640	20,745	144.8	21.1	166.0
1998/99	19,905	-26	2,663	20,552	1,900	1,588	804	4,102	24,654	161.8	32.3	194.1
Ave 1980s	14,695	236	0	13,462	1,115	1,520	0	2,524	15,985	137.1	25.6	162.7
Ave 1990-98	18,067	105	257	16,624	1,237	1,075	323	2,512	19,136	142.2	21.5	163.6

Source: FPMU, MOF

Table 5.2 — Food Gap in Bangladesh (1980/81 to 1998/99)

Year	Domestic Production (Gross)			Net Production (deducting 10% for Seed, Feed & Wastage)	Mid-year Population (million)	Foodgrain Consumption Requirement (@16oz/day/cap)	Food Gap
	Rice	Wheat	Total				(7- 5)
1980/81	13880	1092	14972	13475	89.9	14419	944
1981/82	13629	967	14596	13136	91.9	14740	1603
1982/83	14215	1095	15310	13779	93.9	15061	1282
1983/84	14509	1211	15720	14148	96.0	15397	1249
1984/85	14623	1464	16087	14478	98.1	15734	1256
1985/86	15038	1042	16080	14472	100.3	16606	2134
1986/87	15406	1091	16497	14847	102.5	16970	2123
1987/88	15413	1048	16461	14815	104.7	17335	2520
1988/89	15544	1021	16565	14909	106.8	17682	2774
1989/90	17856	890	18746	16871	108.9	18030	1159
1990/91	17852	1004	18856	16970	111.0	18378	1407
1991/92	18252	1065	19317	17385	113.0	18709	1323
1992/93	18341	1176	19517	17565	115.0	19040	1475
1993/94	18041	1131	19172	17255	117.0	19371	2116
1994/95	16833	1245	18078	16270	119.0	19702	3432
1995/96	17687	1369	19056	17150	121.0	20033	2883
1996/97	18882	1454	20336	18302	123.0	20364	2062
1997/98	18862	1803	20665	18599	125.0	20696	2097
1998/99	19905	2000	21905	19715	127.0	21027	1312

Note: (i) before 1985/86 requirement was calculated @15.5 oz./day /capita.
(ii) before 1991/92 private import of foodgrain was not allowed.

Source: Bangladesh Bureau of Statistics and Directorate of Food.

Table 5.3 - Per Capita Daily Foodgrain Availability and Requirement in Bangladesh, 1980/81 to 1998/99)

Year	Domestic Production (Gross)			Net Production (deducting 10% for Seed, Feed & Wastage)	Mid-year Population (million)	Foodgrain Consumption Requirement	Food Gap	Private Imports	Public Distri-bution	Internal Procu-rement	National Availa-bility (5+9+10-11)	Availa-bility Gap*	Food Aid	Govt Comm Imps	Change Govt Stocks
	Rice	Wheat	Total				(7-5)								
1980/81	14.92	1.17	16.09	14.48	89.9	15.50	1.02		1.66	1.09	15.05	0.95	0.81	0.35	0.49
1981/82	14.33	1.02	15.35	13.81	91.9	15.50	1.69		2.17	0.32	15.67	0.33	1.20	0.12	-0.67
1982/83	14.63	1.13	15.76	14.18	93.9	15.50	1.32		1.99	0.20	15.97	0.03	1.00	0.89	-0.01
1983/84	14.61	1.22	15.82	14.24	96.0	15.50	1.26		2.06	0.27	16.04	-0.04	1.45	0.62	0.19
1984/85	14.41	1.44	15.85	14.26	98.1	15.50	1.24		2.52	0.34	16.44	-0.44	1.29	1.27	0.21
1985/86	14.49	1.00	15.49	13.94	100.3	16.00	2.06		1.48	0.34	15.09	0.91	1.05	0.11	-0.04
1986/87	14.53	1.03	15.55	14.00	102.5	16.00	2.00		2.00	0.18	15.82	0.18	1.34	0.32	-0.21
1987/88	14.23	0.97	15.19	13.67	104.7	16.00	2.33		2.31	0.35	15.64	0.36	1.65	1.04	0.61
1988/89	14.07	0.92	14.99	13.49	106.8	16.00	2.51		2.66	0.38	15.77	0.23	1.23	0.71	-0.41
1989/90	15.85	0.79	16.64	14.97	108.9	16.00	1.03		1.92	0.85	16.04	-0.04	0.84	0.52	0.17
1990/91	15.54	0.87	16.42	14.77	111.0	16.00	1.23		2.07	0.68	16.16	-0.16	1.34	0.03	-0.09
1991/92	15.61	0.91	16.52	14.87	113.0	16.00	1.13		2.01	0.87	16.00	0.00	1.21	0.13	0.10
1992/93	15.41	0.99	16.40	14.76	115.0	16.00	1.24	0.30	0.90	0.20	15.77	0.23	0.62	0.08	-0.04
1993/94	14.90	0.93	15.84	14.25	117.0	16.00	1.75	0.26	1.14	0.14	15.51	0.49	0.54	0.00	-0.48
1994/95	13.67	1.01	14.68	13.21	119.0	16.00	2.79	0.82	1.28	0.22	15.09	0.91	0.76	0.50	0.19
1995/96	14.13	1.09	15.22	13.70	121.0	16.00	2.30	0.68	1.43	0.34	15.47	0.53	0.59	0.67	0.13
1996/97	14.84	1.14	15.98	14.38	123.0	16.00	1.62	0.19	1.09	0.48	15.18	0.82	0.49	0.09	-0.06
1997/98	14.58	1.39	15.97	14.37	125.0	16.00	1.63	0.88	1.25	0.48	16.03	-0.03	0.42	0.20	-0.18
1998/99	14.73	1.52	16.25	14.62	127.0	16.00	1.38	2.64	1.62	0.57	18.31	-2.31	0.94	0.58	0.43
(1) 1980s	14.60	1.07	15.67	14.11	99.30	15.75	1.64	0.00	2.08	0.43	15.75	0.25	1.19	0.59	0.03
(2) 1990s	14.82	1.10	15.92	14.33	119.00	16.00	1.67	0.64	1.42	0.44	15.95	0.05	0.77	0.25	0.00
(3) 1991-98	14.83	1.04	15.88	14.29	118.00	16.00	1.71	0.39	1.40	0.43	15.65	0.35	0.75	0.21	-0.05
(3) - (1)	0.23	-0.03	0.20	0.18	18.70	0.25	0.07	0.39	-0.68	-0.01	-0.10	0.10	-0.44	-0.38	-0.09

Notes: (i) before 1985/86 requirement was calculated @15.5 oz./day/capita and (ii) before 1991/92 private import of foodgrain was not allowed.
* Availability gap (per capita) is based on a standard of 16 ounces per day for all years.

Sources: Calculated from data from the Bangladesh Bureau of Statistics and Directorate of Food

Figure 5.1 — Foodgrain Production and Food Gap in Bangladesh, 1980/81-1998/99

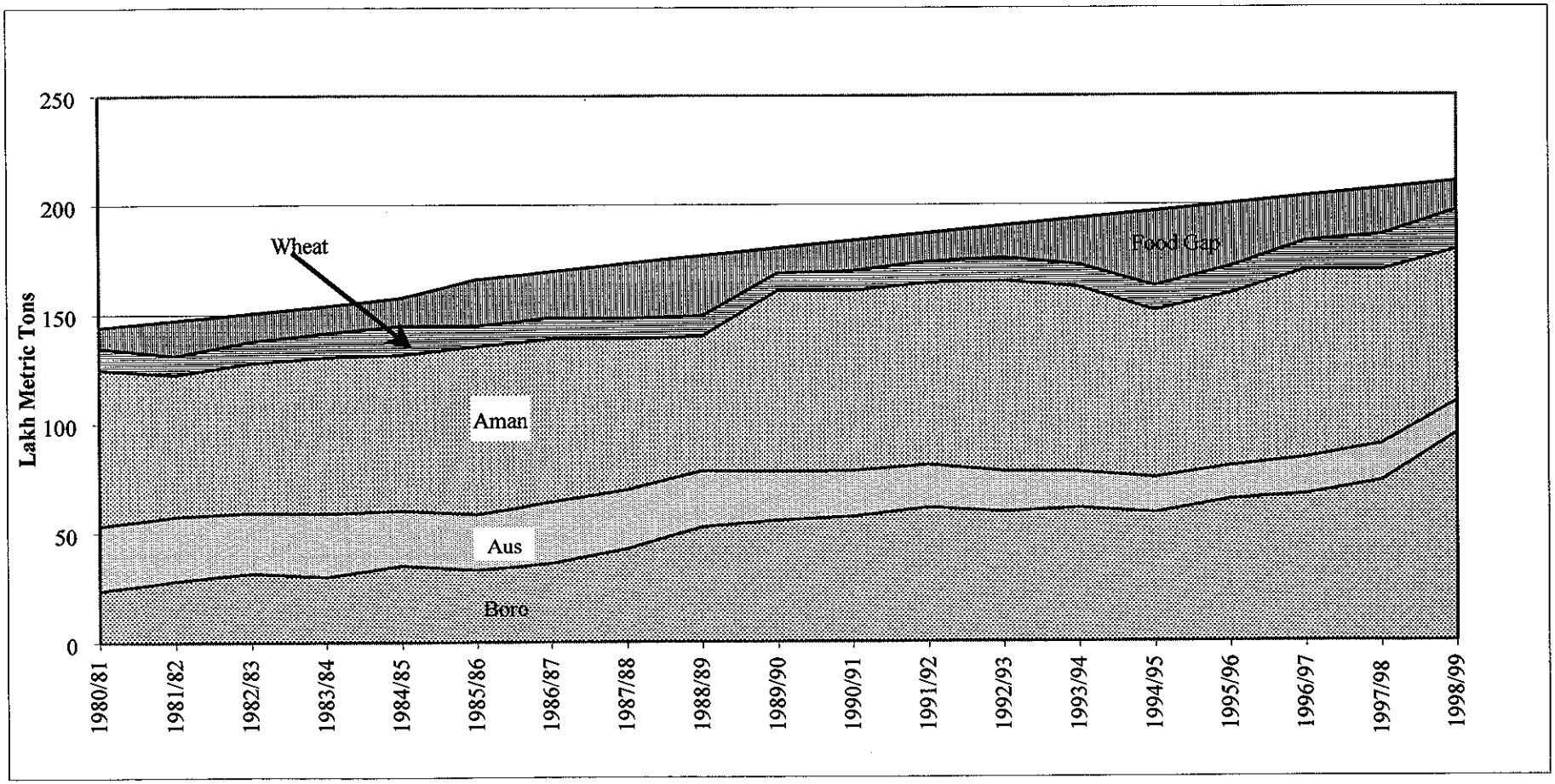
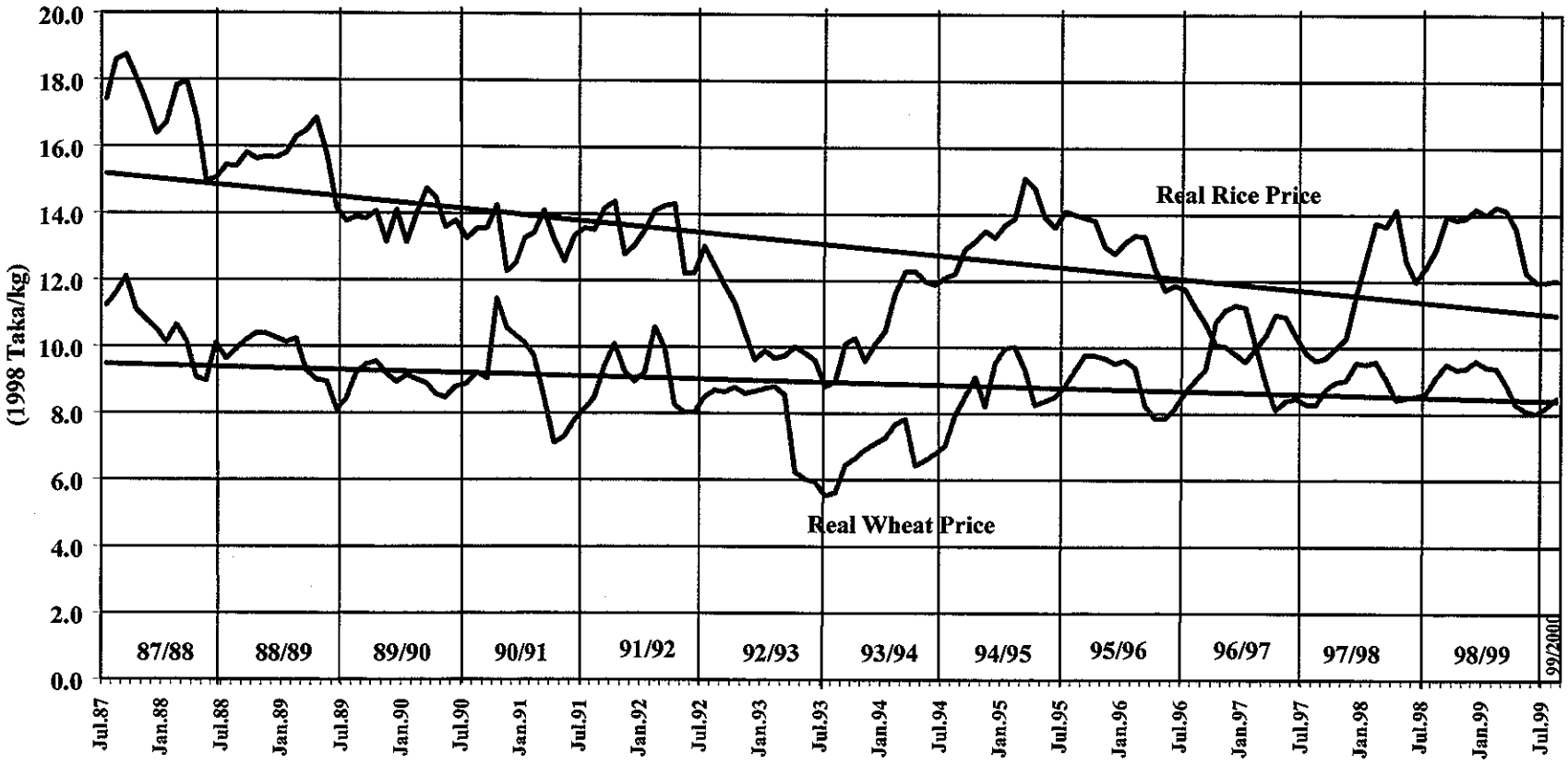


Figure 5.2 — National Average Real Wholesale Price of Rice and Wheat, 1987-99



Note: Prices are deflated using the non-food Dhaka middle-income Cost of Living Index (and the national CPI after June 1998).
Source : FPMU data and author's calculation.

the 1990s. With the increase in production per capita however, the food gap, calculated as the difference between the amount of foodgrain required to meet the consumption target of 454 grams of foodgrain per person per day and net domestic production, declined (Table 5.2 and Figure 5.1).

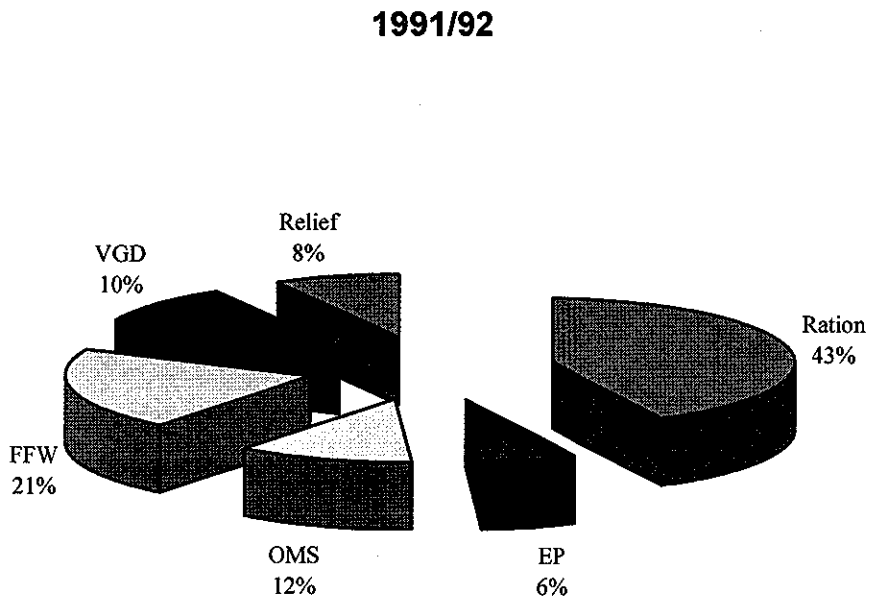
Excluding the 1998/99 flood year, availability per capita for the decade of the 1990s actually falls slightly.[10] Total foodgrain availability per capita in the 1990/91 – 1997/98 period was 15.65 ounces/person/day, down by 0.10 ounces/person/day (0.6 percent) compared with the average for the 1980s (Table 5.3). Average food aid flows fell by 0.44 ounces/person/day (324 thousand MTs per year). Government commercial imports also fell by 0.38 ounces/person/day (353 thousand MTs per year). Increases in domestic production (0.18 ounces/person/day) and significant private sector imports (0.39 ounces/person/day) largely offset the decline in food aid and government commercial imports.

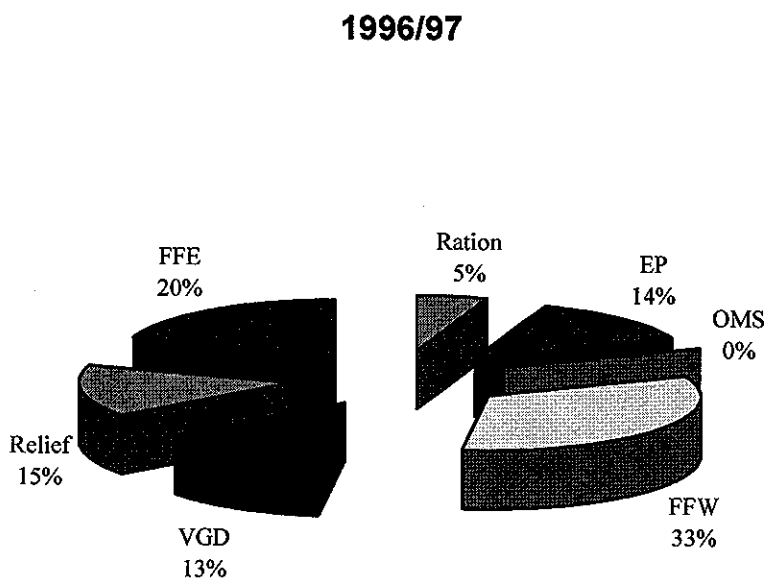
The new technology that permitted increased rice (and wheat) production benefitted farmers who increased their foodgrain production significantly. Consumers also benefited, as increased domestic production contributed to a long-term decline in real rice prices (i.e. rice prices adjusted for overall inflation) from the late 1970s to the early 1990s.[11] As shown in Figure 5.2, real rice prices have on average remained approximately at the level of the early 1990s, though with substantial fluctuations. Moreover, even in calendar year 1998, when domestic supply was reduced sharply

[10] Including 1998/99 gives a somewhat misleading picture since most of the large boro harvest in May/June of 1998/99 was not actually consumed during the 1998/99 fiscal year. Thus, per capita consumption of foodgrain did not increase as much as per capita availability in 1998/99.

[11] Farmers unable to adopt the new technology because of lack of irrigation, appropriate drainage or other constraints, particularly in southern and northeast Bangladesh, however, may have experienced declines in real incomes as real rice prices fell. See Ahmed (forthcoming).

Figure 5.3 — Shift in Composition of Public Food Distribution





because of *aman* crop shortfalls in both 1997/98 and 1998/99, real prices of rice and wheat were lower than in the flood years of 1987/88 and 1988/89 because of substantial private sector rice imports.

While food aid and the size of the Public Foodgrain Distribution System (PFDS) have declined, the share of PFDS foodgrain distributed through programs targeted to the poor has risen (Figure 5.3). The share of these programs (including Food for Work, Vulnerable Group Development, and Vulnerable Group Feeding, among others) rose sharply in the 1990s, from 39 percent in 1991/92 to 81 percent in 1996/97. In 1997/98 the share was 77 percent, of which 20 percent was devoted to Food for Education (targeted to families of poor children who are attending school) and 11 percent to Vulnerable Group Development, (a program targeted to poor women and their families). In 1999, 85 percent of government foodgrain distribution went to targeted programs.

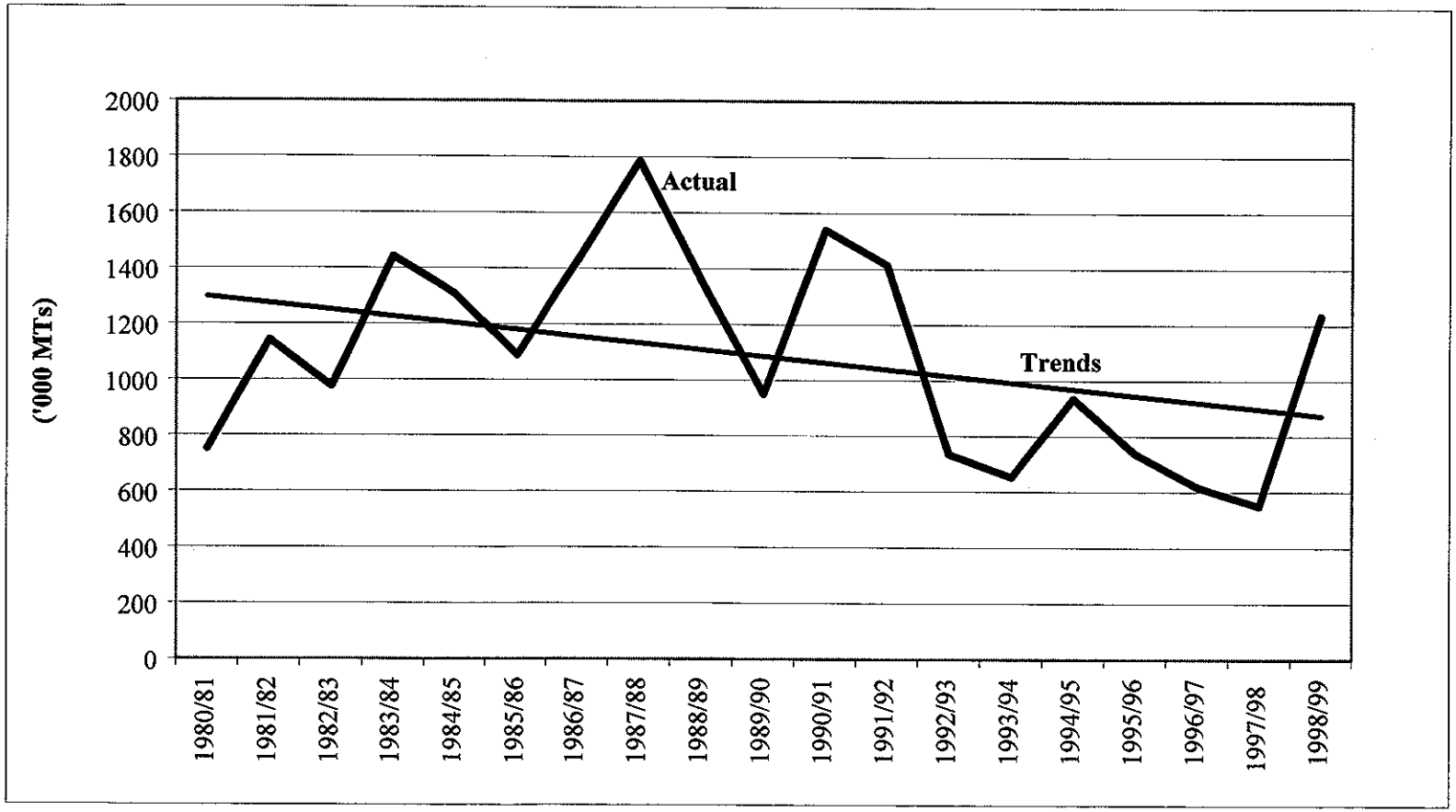
The above data on foodgrain availability and price trends thus reflect the major changes in the Bangladesh food economy of the last decades, particularly the increase in foodgrain production, the elimination of major rationing channels (palli rationing and statutory rationing) in the early 1990s, and the liberalization of private sector foodgrain imports in 1992/93. In the 1990s, with less food aid available, total PFDS distribution is lower (by 0.68 ounces/person/day), but over 80 percent of this foodgrain is targeted to the poor.[12]

IMPROVING ACCESS TO FOOD BY THE POOR

As shown above, increases in domestic production supplemented by additional imports in recent years of poor harvests have significantly contributed to the adequate availability of food (especially foodgrain) at the national level. However, poor households in Bangladesh do not enjoy food security because they lack access to food,

[12] Moreover, since most of the increase in production and imports in the 1990s have been in the form of rice, per capita availability of rice has actually risen, while that of wheat has fallen (See Table 5.1).

Figure 5.4 — Food Aid Trends in Bangladesh, 1980/81 - 1998/99



i.e. they lack sufficient food from own production, cash incomes and other resources to acquire enough food. Direct food transfers of foodgrain provided through food aid are one mechanism used to increase access of poor households in Bangladesh.

As shown in Figure 5.4, the trend in food aid flows to Bangladesh, even considering the large increase in 1998/99 is downward. Food aid levels have fallen along with reductions in donor stocks, increases in Bangladesh foodgrain production, and a persistent food gap, but the needs for poverty alleviation have not decreased. Indeed, this declining trend in food aid simply implies fewer resources available for targeting to poor households.

Yet food aid is an important component of food security to the poor, since various programs targeted to food-insecure households are funded by food aid. It is important to emphasize here that poor households cannot buy adequate food from the market even if the foodgrain is available in sufficient quantity at reasonable prices. These households need additional entitlements (income-earning opportunities or direct transfer of food or cash) to augment their capacity to acquire food. In other words, poverty and food insecurity caused by inadequate access to food are chronic problems that exist even in the absence of flood and other natural disasters. Thus, there is a need for steady and increasing flow of resources from donors and the government's own resources to tackle the food security problems of Bangladesh. These resources need not necessarily come through food aid. Lower levels of food aid, however, are likely to result in less total resources for the government's programs for poverty alleviation unless donors make a long-term commitment to food security. In any case, given that food aid plays a major role in increasing access to food by poor households, food aid decisions should not be made solely on calculations of national availability.

6. 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. 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 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 the 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.

In the medium-term, if Bangladesh increases production and prices fall towards export parity levels, price stabilization, in the absence of some exports will become more difficult. Moreover, increased foodgrain production reduces the estimated food gap, generally used in the determination of food aid flows.

The concept of the food gap is deficient on two counts, however. First, it fails to take into account private sector imports, which depend not only on domestic production, (and more broadly domestic supply and demand), but on international prices as well. Second, the food gap is essentially a measure of food availability, but food security depends not only on availability, but on access and utilization as well. There is a very high likelihood that food aid to Bangladesh will decline in the future because of increased domestic production and, perhaps, more exact estimations of private sector imports in the food availability calculations. Moreover, food aid worldwide may fall due to reductions in producer subsidies in donor countries following the Uruguay Round agreements. Reductions in food aid are likely to result in overall reductions in resources for ensuring household access to food, as well.

Thus, a firm commitment on the part of donors and the Government of Bangladesh regarding resources for access is needed, particularly for programs that combine access with increased skills or infrastructure development to enhance long-term growth in incomes. As domestic production increases and Bangladesh becomes more integrated with world markets, foodgrain price instability may become less important. Tackling the problems of poverty and household food insecurity will require more resources, not less, than those devoted in the past to price stabilization and direct food distribution through the Public Foodgrain Distribution System.

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