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MSSD DISCUSSION PAPER NO. 43

BUMPER CROPS, PRODUCER INCENTIVES AND PERSISTENT POVERTY: IMPLICATIONS FOR FOOD AID PROGRAMS IN BANGLADESH

by

Paul Dorosh, Quazi Shahabuddin, M. Abdul Aziz and Naser Farid

Markets and Structural Studies Division

International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
http://www. ifpri.org

March 2002

Contact: Candice Cohen
c.cohen@cgiar.org
Tel. (202) 862-8120 or Fax. (202) 467-4439

Paul Dorosh is a Senior Research Fellow at the International Food Policy Research Institute (IFPRI), 2033 K Street N.W., Washington, D.C. 20006 – U.S.A. email: p.dorosh@cgiar.org, Quazi Shahabuddin is a Research Director at the Bangladesh Institute of Development Studies (BIDS), E-17, Agargaon Sher-e-Bangla Nagar, GPO Box 3854, Dhaka 1207, Bangladesh, M. Abdul Aziz was Project Director, Food Management and Research Support Project, Naser Farid is a Research Director at the Food Planning and Monitoring Unit, Bangladesh Ministry of Food.

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TABLE OF CONTENTS

ABSTRACT iii

1. INTRODUCTION 1

2. GLOBAL FOOD AID FLOWS AND PROGRAMS: AN OVERVIEW 4

   Trends in the Volume of Food Aid 4
   Geographical Focus 5
   Composition of Food Aid 6
   Food Aid Programs 6
   Disincentive Effects of Food Aid 7
   Program Costs -- The Cash versus In-Kind Debate 8

3. FOOD AID POLICIES AND PROGRAMS IN BANGLADESH 10

   Uses of Food Aid 11

4. RICE DISINCENTIVE EFFECTS OF FOOD AID IN BANGLADESH 14

   Border Prices and Private Sector Imports 17

5. ESTIMATES OF THE SAFE LEVEL OF FOOD AID IN BANGLADESH 19

   Analytical Framework: A Simple Quantitative Model of the Wheat Market 20
   Avoiding Prices Disincentive Effects: Empirical Estimates of the "Safe" Level of Food Aid 23
   Sensitivity Analysis 24

6. CONCLUSIONS 28

REFERENCES 30

LIST OF TABLES

Table 1. Global Food Aid by Donor 32
Table 2: Global Food Aid Deliveries by Recipient Countries: 1990-1999.....33
Table 3. Composition of Food Aid by Commodity 34
Table 4. Food Aid, Government Expenditures and Imports, 1977/78 - 1998/99 35
Table 5. Trends in Food Aid and PFDS Distribution 36
Table 6. Estimates of Wheat Imports in Absence of Food Aid, 1996/97 Base ...37
Table 7. Wheat Imports and Domestic Prices Under Alternative Scenarios 38
Table 8. Maximum Level of Net Wheat PFDS without Causing Wheat Producer Price Disincentives 39
Table 9. Impact of Food Aid on Domestic Wheat Prices (Disincentive Effects) 40

LIST OF FIGURES

Figure 1. Bangladesh Foodgrain Gap, 1980/81 – 2000/2001.....41
Figure 2. World Food Aid by Donors.....42
Figure 3. Food Aid as a Percentage of Total Aid, Imports and Government Expenditure 43
Figure 4. Food Aid to Bangladesh, 1980/81-2000/2001 44
Figure 5. Food Aid and PFDS Distribution, 1976/77-2000/01 (3 Year Centered Moving Average) 45
Figure 6. Channel-wise Distribution of Foodgrain from Public Stock 46
Figure 7. Disincentive Effects of Food Aid 47
Figure 8. Impact of Reduced Demand on Production, Prices, and Imports 48
Figure 9. Wheat Prices and Quantity of Private Wheat Imports in Bangladesh, 1993-2001 49

ABSTRACT

Food aid has played a useful role in Government of Bangladesh efforts to increase food security in the last three decades, adding to foodgrain availability, supplying wheat for targeted distribution to poor households, and helping to finance development projects and programs. However, sustained increases in domestic production of both rice and wheat have increased the likelihood of disincentive effects arising from continued large inflows of food aid.

The analysis shows that if good rice harvests continue so that real rice prices remain at their levels of 2000, and if international wheat prices return to their average 1995-99 levels, then public wheat distribution may need to be cut to levels below the current amount of food aid received (650 thousand tons in 2000/2001) to avoid reducing domestic prices below import parity.

However, resources will continue to be required for programs that increase access to food by the poor, contribute to increased utilization of food and result in improved nutritional outcomes, even if the need for food aid to increase availability of foodgrains diminishes.

1. INTRODUCTION

Food aid, (aid supplied as food commodities on grant or concessional terms),[1] has played a very large and useful role in Government of Bangladesh efforts to increase food security in the last three decades. At the national level, food aid has added to foodgrain availability, helping to reduce the "food gap" between foodgrain consumption needs and supply from domestic production. And at the household level, food aid targeted to poor households has increased their access to food. Resources from food aid also have helped successful development projects and programs in Bangladesh and many other developing countries (Singer et al., 1987, Clay and Stokke, 1991, Ruttan, 1993).

However, food aid's share of total foodgrain availability in Bangladesh has fallen during the last two decades, in large part because of sustained increases in domestic production of both rice and wheat.[2] Moreover, bumper crops in 1999/2000 and 2000/2001 eliminated the calculated "food gap", calculated as the difference between foodgrain needed for a target level of food consumption (454 grams/person/day) and net domestic production (which includes a 10 percent deduction for seed, feed and wastage), (Figure 1). These increases in domestic

---

[1] Food aid includes donations of food commodities by governments, intergovernmental organizations such as the World Food Programme (WFP), and private voluntary and non-governmental organizations, monetary grants tied to food purchases, and sales and loans of food commodities on credit terms with a repayment period of three years or more (FAO, 1980).

[2] There are important exceptions to this long-term trend of diminishing importance of food aid, however, such as in 1998, when food aid levels were substantially increased following major floods that severely damaged the *aman* rice crop.

production have also reduced market demand for food grain imports and increased the likelihood of price disincentive effects arising from continued large inflows of food aid. Given the disappearance of the food gap, the relatively high cost of delivery of food aid and possible price disincentive effects on domestic production, food aid donors have begun to reconsider their use of food aid as a tool to enhance food security in Bangladesh and may choose to reduce their levels of food aid in the future.[3]

Adverse impacts on domestic producer prices of wheat are not the only possible disincentive effects of food aid. Over the medium-term, food aid can enable countries to neglect their domestic agriculture through inadequate lower public investment in rural infrastructure, agricultural research and extension, as well as price and trade policies biased against the agricultural sector. Food aid supported projects can also potentially distort local labor markets. This paper, however, focuses mainly on price disincentives because increases in domestic production of rice and wheat and a return of world wheat prices to their medium-term average levels are likely to make price disincentive effects of food aid a continuing food policy concern for the Government of Bangladesh and food aid donors.

In analyzing price disincentives of food aid, we employ a simple partial equilibrium model of the wheat sector in Bangladesh, extending the earlier

[3] The European Union has already taken this step, as part of its global food security strategy, and has planned to end food aid to Bangladesh by 2003, replacing it with cash-based programs for food security. Moreover, a U.S. statute requires USAID to conduct an annual Bellmon Determination (named after a U.S. Congressman) to certify that its food aid is not creating disincentives to production in the recipient country (see Atwood et. al, 2000; p. 153).

analyses by the Centre for International Economics (1997), Dorosh and Haggblade (1998) and Dorosh (2000) by explicitly taking into account the difference between local soft white wheat and imported high-gluten “milling” wheat. The analysis also includes implications of changes in rice prices and marginal propensities to consume (MPC’s) wheat out of direct food transfers than MPC’s for cash incomes.[4]

In Section 2, we present an overview of food aid policies, programs and trends from a global perspective. Section 3 discusses food aid in Bangladesh, providing a brief history, a description of food-assisted programs, and data on levels, composition and trends in food aid and public foodgrain distribution. Section 4 contains an analysis of the impact of food aid on market prices, imports and domestic production. Conclusions and policy implications are presented in Section 5.

[4] Dorosh and Haggblade (1998) also included alternative marginal propensities to consume wheat in transfer programs and explicit modeling of the rice sector in their multi-market model, but did not differentiate among different qualities of wheat.

2. GLOBAL FOOD AID FLOWS AND PROGRAMS: AN OVERVIEW

Food aid programs have been a major part of development assistance since the middle of the 20th century. Following World War II, food aid was included in U.S. rehabilitation efforts in Western Europe and gradually used in relief and development assistance by more donors and to more recipients. Over time, the geographical focus, levels and objectives of food aid have evolved, driven in part by agricultural and trade policies in donor countries, ever-changing conditions in recipient countries and shifting development paradigms.[5]

Trends in the Volume of Food Aid

Over the past three decades, total global food aid deliveries averaged 10.1 million tons per year,[6] but fluctuated sharply in the 1990s based mainly on supply factors, (especially changes in domestic production subsidies), in donor countries (Figure 2). Total food aid flows peaked in 1992/93 at 15.2 million tons, but then declined steeply to only 5.6 million tons in 1996/97 as U.S. contributions fell from 8.5 to 2.3 million tons in the same period. Total food aid again increased in 1998/99 and 1999/2000 to over 10 million tons each year, with the U.S. contributing about 60 percent of the total, similar to its average over the past two decades (Table 1).

[5] See Shaw and Clay (1993) for an overview of the history of food aid and Atwood, Jahangir, Smith and Kabir (2000) for a review of food aid in Bangladesh.

[6] 1971/72-1998/99, calculated from FAO/INTERFEIS data.

Donors of food aid can be grouped into several broad categories. First, the agricultural exporters – the United States, Canada, Australia and the European Community – became food aid providers as a way of utilizing surpluses for a mixture of developmental, humanitarian, foreign policy and domestic agricultural policy and trade objectives.[7] Other donors, that are not major agricultural exporters, have historically seen themselves as providing finance for food as part of the international commitment to humanitarian relief and developmental assistance under FAC or to multilateral programmes and the work of voluntary agencies. Historically, the latter group has shown more flexibility in resourcing, contributing relatively more to meeting the non-commodity costs of food aid.

Geographical Focus

The geographical focus of food aid has also shifted. From the 1970's to the early 1990's, there was a substantial shift in focus of food aid flows away from South Asia and towards Africa. As India, Pakistan and Bangladesh have exploited the technological opportunities of the Green Revolution and moved towards self-sufficiency in basic food staples, food aid flows to these countries have declined. In contrast, because agriculture has stagnated in much of Sub-Saharan Africa, food deficits have increased along with high population growth (Shaw and Clay, 1993).

[7] Diven (2001) provides econometric evidence that the volume of U.S. food aid from 1954 to 1991 was driven mainly by producer interests in the U.S. (levels of stocks and exports) and not by production shortfalls in developing countries.

During the 1990s, Bangladesh was the largest recipient of food aid, receiving an average of 868 thousand tons per year, 7.2 percent of the total (Table 2). The next three largest recipients were all in Sub-Saharan Africa: Ethiopia (6.2 percent), Egypt (3.8 percent), and Mozambique (3.2 percent), with the region as a whole receiving 30.7 percent of the total.

Composition of Food Aid

Globally, most food aid is in the form of wheat, though the composition of food aid has also fluctuated along with the total volume of aid and the source of food aid (Table 3). Wheat and wheat flour accounted for about 70 percent of food aid in the 1970s, 66 percent in the 1980s and only 53 percent in the 1990s. Wheat food aid was on average only around 3.0 percent of developed countries' wheat production over the three decades, however. Increases in the share of non-cereal food aid, from a mere 1.70 percent during the 1970's to about 11.50 percent in the 1990's account for much of the difference in wheat's share. In Bangladesh, food aid is almost exclusively in the form of wheat; only small amounts of rice and vegetable oil are received as food aid.

Food Aid Programs

Food aid delivery mechanisms and programs have varied widely across countries and over time, including direct distribution of food aid commodities, monetization, triangular transactions, local purchase and exchange arrangements.

In Bangladesh, most food aid is channeled into the public foodgrain distribution system. Neither tri-angular transactions (donor acquisition of food aid commodities in a third country for delivery to the recipient country) nor local purchases have been used in Bangladesh on a major scale.

Disincentive Effects of Food Aid

Food aid has often been criticized for its potential to create disincentives for domestic production and distort domestic food economies. Where food aid adds to the total imports (and food supply) of a country, it can lower local food prices, thereby discouraging local production. In the longer term, food aid may lead to changed food habits and demand for imported goods. The availability of food aid may also create a dependency mentality and reduce incentives for public investment by enabling recipient governments to neglect local agriculture and long-term food security. Finally, on a more micro-level, food aid projects may distort local labor markets by attracting workers away from vital activities during the agricultural year. (See Maxwell and Singer, 1979).

Where cereal food aid simply replaces commercial imports, at least in non-emergency situations, it cannot be held responsible for disincentive effects that would have occurred in any case as a result of commercial imports. More generally, the extent of disincentives is, in practice, determined by the way in which food aid is used. Appropriate policies and precautions, including demand expansion, price support to producers and differentiated markets to increase consumption, can help to reduce or avoid disincentive effects (Cathie, 1991;

Maxwell and Singer, 1991; Clay and Stokke 1991; Singer et al, 1987). For example, additional consumption can be stimulated directly, by distributing food to hungry people or indirectly, by increasing expenditure on poverty alleviation programs.[8]

Historically, appropriate government policies and rapid technological change in agriculture enabled India, Pakistan and Bangladesh to increase food production dramatically from the 1960s to the 1990s, even with substantial flows of food aid (Shaw and Clay, 1993).

Program Costs -- The Cash versus In-Kind Debate

The simplest way to avoid disincentive effects of food aid on domestic production is to use cash rather than food aid to increase access to food by poor households. Aid in cash avoids high costs of international transport (often specified to be on vessels registered in the donor country), as well as domestic transport of commodities from the port to the distribution center. Though monetary aid does not directly increase availability of food, it can provide the foreign exchange resources to permit an expansion of government or private sector imports. Proponents of food aid also argue that leakages may be higher with cash as opposed to direct food transfers, though no conclusive empirical evidence exists to test this hypothesis.

[8] Note, however, that programs to increase demand for food are unlikely to completely offset the increase in supply of food due to food aid. See Dorosh and Haggblade (1997) and del Ninno and Dorosh (2001).

Monetization of food aid through sales to the government or private traders at a major port augments domestic supply and avoids high internal domestic transport costs. Where food aid is distributed in regions of a country that are net exporters of the commodity, (as is the case of Food For Work transfers in much of rural Bangladesh), cash transfers are more efficient than in-kind transfers (assuming that leakages are not greater with cash transfers).[9]

[9] See Coate (1989) and Dorosh and Haggblade (1997).

3. FOOD AID POLICIES AND PROGRAMS IN BANGLADESH

Food aid to Bangladesh has declined over time, from an average of about 1.2 million tons per year in the 1970s and 1980s to only about 600 thousand tons by the end of the 1990s. During the 1970s and 1980s, Bangladesh was one of the world's largest recipients of food aid, receiving on average about 1.2 million tons per year. The value of food aid peaked during the 1980s, and food aid averaged 18.3 billion (2000) Taka in real terms in the first five years of the decade, equal to 22.1 percent of total aid, 11.6 percent of government expenditures and 10.9 percent of total imports (Table 4).

However, food aid in Bangladesh fell sharply (by an average rate of 5.95 percent per year in quantity terms) during the negotiation period of the Uruguay round (1985/86-1993/94). In value terms, average food aid from 1989/90 through 1993/94 was only about half that of 1979/80-1983/84. It declined even further to an annual average of only 6.3 billion (2000) Taka from 1994/95 through 1999/2000, one third of its total fifteen years earlier. Moreover, as total government expenditures and external trade increased, food aid's importance in the fiscal balance and the balance of payments dramatically shrunk. In 1983/84 food accounted for 21.8 percent of total aid, 11.6 percent of government expenditures and 11.7 percent of the value of imports. By 1997/98, these shares had fallen to 7.9 percent, 1.7 percent and 1.3 percent, respectively (Figure 3).

Nonetheless, in quantity terms, the trend in food aid was slightly positive in the late 1990s due to the large increase in emergency food aid to Bangladesh

following the flood of 1998. Normal food aid flows during the late 1990s were only about 600 thousand tons per year, however (Figure 4).

Uses of Food Aid

Uses of food aid in Bangladesh have also changed over time. In the 1970s and 1980s, much of the food aid was sold at subsidized prices through the Public Foodgrain Distribution System (PFDS).[10] Initially, counterpart funds generated by the sale of food were used for general public expenditures, but beginning in the mid-1980s, (check USAID PL480 Title III), donors gradually introduced conditions for the use of counterpart funds, stipulating that they be used for jointly agreed projects. In the peak years of food distribution and food aid, from 1986/87 through 1991/92, food aid averaged 1.4 million tons per year and accounted for nearly 60 percent of average total public distribution of 2.4 million tons.

In the late 1980s and early 1990s, major reforms were initiated in the food-assisted programs in Bangladesh to improve targeting of subsidies and reduce leakages. In the sales channels, prices were gradually raised to levels close to market prices, reducing the subsidy and making these channels less attractive for their beneficiaries. Ultimately, both Statutory Rationing (in urban areas) and Palli Rationing (in rural areas) were terminated in the early 1990s, and a new major targeted channel, Food for Education, was introduced in 1993.

[10] The PFDS has two major types of channels: sales channels, including Open Market Sales, where recipients pay a subsidized price for the commodities, and non-sales channels (such as Food For Work and relief channels) in which recipients do not purchase the food.

The Food For Work (FFW) program also underwent serious reforms after a joint Government of Bangladesh and donor task force, (The Strengthening of Institutions of Food-Assisted Development or SIFAD task force) raised questions about the utility, quality and desirability of the already created structures under FFW. Following the recommendation, the World Food Programme (WFP) moved away from its previous scheme based approach to a project based approach, with the selection of projects made through a rigorous selection criteria and improved quality of construction. Food for Work paid out of donor resources was renamed as RD (Rural Development), and a cash component was introduced as part of the labor wage, to be paid out of the Government of Bangladesh contribution. FFW (RD) components implemented by CARE started using cash as its focus shifted from earthwork to create structures on roads, including culverts to facilitate safe flow of water.

As donors gradually withdrew direct support for so-called local initiative FFW programs from the late 1980s, the Government of Bangladesh began to provide its own resources to fund various programs. By the late 1990s, average annual food aid inflows were only about 600 thousand tons (a decline of about 800 thousand tons from the late 1980s), and food aid accounted for only about one-third of total PFDS distribution of about 1.8 million tons per year (Table 5 and Figure 5). Distribution of grain from non-food aid resources (i.e. GOB-own resources) rose to about 1.2 million tons per year, up by about 200 thousand tons from the late 1980s.

The net result of the elimination of major non-targeted sales channels, initiation of the Food For Education program, and the decline in food aid, was a

smaller, better-targeted PFDS. The share of the public foodgrain distribution through programs targeted to the poor increased from 39.4 percent in 1992 to 84.7 percent in 1999/2000 (Figure 6).

Further reductions in food aid and perhaps the size of the PFDS are likely because of the European Union's decision to phase out food aid to Bangladesh by 2003, unless other donors increase their volume of aid or the GOB increases its expenditures for the PFDS.

4. RICE DISINCENTIVE EFFECTS OF FOOD AID IN BANGLADESH

Since food aid ultimately increases market supply of wheat, it has the potential to lower domestic wheat prices and adversely affect incentives for domestic wheat production and incomes of wheat farmers. Whether food aid actually lowers market prices, however, depends on whether food aid is simply replacing public or private imports, or whether food aid is actually increasing total domestic supply of wheat. In other words, in order to avoid depressing market prices below import parity prices, the total level of food aid must not exceed the amount of wheat that would be imported by the private sector under free trade in the absence of food aid.

Note that in the discussion that follows, it is assumed that wheat food aid results in a corresponding distribution of wheat through the Public Foodgrain Distribution System, i.e. that there is no change in public stocks. Note also that in terms of impact on market prices and private imports, food aid has the same effect as public commercial imports distributed through the PFDS, though of course public commercial imports are purchased with the GOB's own resources, not donor finances.

Figure 7 illustrates the impact of food aid on domestic prices and private sector imports. Food aid adds to domestic supply of wheat, shifting the supply curve from S0 to S'. In the absence of private sector trade, total supply equals total demand at a price of P1. However, if the world price PM (import parity) is

below P1, then there will be private imports equal to M1, in addition to food aid (F1).

Moreover, as long as food aid is less than or equal to the level of private sector imports that would be imported in the absence of food aid (M1 plus F1), then food aid has no disincentive effects on domestic production, since domestic market prices will be equal to import parity (PM). However, in comparison to a higher, long-term import parity price of PM', food aid may cause disincentive effects even when there are private sector imports (Figure 7). At the import parity price of PM', domestic production would be S2 in the absence of food aid, compared with only S3, with food aid.

The import parity price in any given year could be higher than the long-term average import parity price, as well. In this case, even though food aid reduces domestic producer prices below import parity and has a disincentive effect on domestic production, domestic prices would still be high in comparison with other years. Since excessively high prices can have a serious negative impact on access to food by poor households, price stabilization is one of the major objectives of food policy of the Government of Bangladesh. Thus, rather than using the current import parity price, it is more appropriate to compare domestic prices with a reference price calculated on the basis of medium-term average of world prices, (though the exact definition of this reference price is subject to debate).

The basic analytical framework described above focuses on the import parity price of wheat and the short-run response of consumers and producers to changes in the wheat price, holding other factors constant. But other factors,

which influence the shape and location of the domestic supply curve for wheat, the shape and location of the domestic supply and demand curves for wheat must also be taken into account. Domestic supply is determined not only by farmers'expected price of wheat during the growing season, but also by the expected prices of alternative crops, expected yields, available production technologies, weather, prices and availability of inputs. Domestic demand is determined by the responsiveness of consumers to changes in the wheat price (reflected in the shape of the demand curve), as well as the prices of other goods (most importantly, rice) and the level and distribution of household incomes (both of which shift the demand curve to the right or left). Other factors also influence total demand including demand for wheat as animal feed and the amount of wheat distributed through programs targeted to poor women and children.

The impacts of reductions in demand for wheat on domestic prices, production and imports are shown in Figure 8. In years of a good rice harvest, demand for wheat in Bangladesh falls as consumers choose to consume more rice and less wheat. A shift in the demand curve from D0 to D' reduces total private sector imports to M2, but domestic prices remain equal to the import parity level PM. However, an even larger shift in domestic demand to D'' leads to an excess of supply over demand at the import parity price PM. As a result, the domestic price drops to P3 and private sector imports cease. In this case, a level of food aid that did not lead to price disincentive effects with a normal level of demand (D0), caused prices to fall below import parity levels when demand fell to D''.

Two other factors are particularly important. First, there are major quality differences for wheat. Domestically produced wheat is soft wheat with a relatively

low gluten content, and is not suitable for many baking purposes (biscuits, cakes, and many types of breads). To meet the demand for these products, wheat millers use imported wheat with higher gluten content (so-called milling wheat). Discussions with a large international grain company representative indicate that roughly 30 thousand tons of milling wheat per month is used in Bangladesh, totalling about 360 thousand tons per year. Thus, private sector imports of wheat of comparable quality to Bangladesh wheat in 1999/2000 were about 540 thousand tons, (360 thousand tons less than the total 806 thousand tons of private sector wheat imports).

Second, the Bangladesh wheat harvest is concentrated in a few months (March-April), and that the bulk of Food For Work wheat distribution typically occurs from January through May (when soils are dry enough to permit heavy earthwork for road-building and repair), there are potentially large seasonal effects of PFDS distribution. Spreading the distribution of wheat throughout the year through other channels (such as Food For Education), is one means of minimizing the risk of depressing market prices to the detriment of producers.

Border Prices and Private Sector Imports

For much of the last three years, private sector imports have been substantial and Bangladesh domestic prices for wheat have closely tracked import parity prices, (Figure 9).[11] Private sector wheat imports surged in the months

[11] Import parity prices were in fact lower than shown in 1993 due to the U.S. Export Enhancement Program which subsidized wheat exports.

immediately after the mid-1998 floods, averaging 111 thousand tons per month from September through December 1998. Imports were again high from September through December 1999, (averaging 75 thousand tons per month), and totalled 1.611 million tons from July 1998 through June 2000.

In 1999/2000, the private sector imported 806 thousand tons of wheat, and domestic wheat prices (national wholesale) averaged 8.64 Tk/kg. In addition, public net distribution (total distribution less domestic procurement) added 813 thousand tons of wheat to domestic supplies. Thus, a total of 1.619 million tons of wheat was supplied to domestic markets through private imports and the PFDS in 1999/2000. Given that domestic prices remained close to estimated import parity prices for most of the year, and perhaps more important, that large amounts of wheat were imported by the private sector, it appears that food aid did not lead to price disincentive effects for Bangladesh wheat farmers in 1999/2000.

After April 2000, however, national average domestic wheat prices fell to an average of 1.1 Tk/kg below estimated import parity levels. Nonetheless, private sector imports remained high. From April through June 2000, this was apparently due to imports of exceptionally low-priced wheat (about $130/MT C&F Chittagong) from the EU and Turkey. Later in 2000, however, private market imports considerably slowed, suggesting that private imports of non-milling wheat may not have been profitable.

5. ESTIMATES OF THE SAFE LEVEL OF FOOD AID IN BANGLADESH

Assessing the quantity of wheat that can be imported without depressing domestic prices below import parity and causing price disincentives on domestic production requires an analytical model of the wheat supply and demand in Bangladesh. In this section, we provide quantitative estimates of these disincentive effects based on actual levels of supply, demand and prices in 1999/2000 and 2000/01, updating and extending previous analyses by the Centre for International Economics (CIE, 1997) and Dorosh (2000).

CIE (1997) used a basic short-run supply and demand framework to analyze the impacts of expanding food aid beyond the "safe" level. This analysis did not estimate the "safe" level itself, however, but instead used three alternative assumptions regarding the market clearing levels of production, consumption and imports of rice and wheat. Then, using alternative estimates of supply and demand parameters, they simulated the impact of an additional 100 thousand tons of food aid on the level of domestic wheat production. The biggest impacts on production occurred with unresponsive (inelastic) demand parameters and response (elastic) supply parameters. In this case, additional food aid beyond the "safe level" would increase total supply and depress market prices, but demand would increase only slightly and production would drop sharply. Under various scenarios with these parameters, and additional 100 thousand tons of food aid resulted in a reduction of between 81 and 91 thousand tons of wheat production.

Dorosh (2000) calculated the safe level of food aid for 1996/97 based on historical levels of production, food aid, private sector imports and prices, along with alternative assumptions regarding world prices and supply and demand elasticities (Table 6).

Even though the private sector imported 222 thousand tons of wheat in 1996/97, wheat prices in Bangladesh in that year averaged only Tk/kg 8.99, significantly below import parity prices, estimated at Tk/kg 10.15. This suggests that private sector imports were a different quality of wheat than domestically produced wheat. However, the substantial difference between estimated import parity and domestic prices appears to be too large to be accounted for only by quality differences.[12] Thus, the data indicate that food aid (or more accurately, net domestic distribution made possible by food aid and government commercial imports), depressed prices below import parity. Under free trade, total imports would have been only 710 thousand tons, compared to 933 thousand tons actually imported in 1996/97. With lower prices, the free trade level of imports is higher, 868 to 894 thousand tons at a world price of $/MT 197, and 770 to 839 thousand tons at a world price of $MT 208.

Analytical Framework: A Simple Quantitative Model of the Wheat Market

The drop in wheat market prices below import parity levels (based on U.S. hard red winter wheat prices adjusted for quality) in the second half of 2000

[12] Erratic market conditions may have fooled some traders, as well.

suggest that food aid (or more exactly net public foodgrain distribution)[13] may have had disincentive effects on domestic production. This model is similar to those used in earlier studies, but uses an updated base scenario (1999/2000), and unlike CIE (1997) and Dorosh (2000), it explicitly takes into account differences in wheat quality and the impacts of changes in rice prices.

The model determines domestic wheat prices, production, demand and private imports, given the international price of wheat and an exogenous domestic price of rice.[14] Changes in domestic wheat demand are calculated using the base

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[13] Note that net distribution plus private imports is equivalent to total imports if there are no changes in government stocks. The results from Dorosh (2000) shown above also assume no change in government stocks and show only total imports (not the breakdown between food aid, commercial imports and private imports).

Determining the level of total imports is equivalent to determining net domestic distribution (NDD) plus private sector imports (M) when change in government stock (DST) is zero.

From the identity for change in government stocks, (and assuming no storage losses),

AID + GI + DP – DD = change in government stocks,

where AID is food aid, GI is government commercial imports, DP is domestic procurement and DD is domestic distribution. Defining net domestic distribution (NDD) as domestic distribution (DD) less domestic procurement (DP), and adding private sector imports (I) to both sides of equation (1), we have:

AID + GI + I = change in government stocks + NDD + I

and total imports = NDD + I, when change in government stocks is zero.

[14] Since total wheat demand and supply in Bangladesh are small relative to rice (approximately 21.3 million Tons of wheat compared to 3.3 million Tons of rice in 1999/2000), changes in wheat prices have only a minor impact on the price of rice. Thus, keeping the price of rice exogenous is an appropriate simplifying assumption for analysis of changes in food aid. Quantitative analysis of

level of demand, changes in the prices of rice and wheat and the own-price elasticity of demand of wheat and the cross-price elasticity of demand for wheat with respect to the price of rice.[15] Similarly, changes in domestic wheat production are calculated using the base level of demand, changes in the prices of rice and wheat and the own-price elasticity of supply of wheat and the cross-price elasticity of supply for wheat with respect to the price of rice.

Supply of food aid is added to domestic production (less a ten percent deduction for seed, feed and wastage) to get total supply. In addition, in the simulations presented, private sector imports of milling wheat (360 thousand tons), which are assumed to be insensitive to the changes in wheat prices modeled here, are added to total supply. The model then calculates a market- clearing price of wheat given total supply and demand for wheat in the absence of private sector imports for ordinary wheat. If this price is below the import parity price, then this price represents the market price of wheat in Bangladesh. If, however, the equilibrium price is above the import parity price, the model uses the import parity price to recalculate demand. In this case, imports are determined as the difference between domestic supply and demand.

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rice policy and broad food policy issues, however, require a model with an endogenous price of rice, wheat and other commodities as in Dorosh and Haggblade (1995, 1997).

[15] The own-price elasticity of demand for wheat is defined as the percentage change in wheat demand given a one percent change in the real price of wheat. Similarly, the cross-price elasticity of demand for wheat with respect to the price of rice is defined as the percentage change in wheat demand given a one percent change in the real price of rice.

Avoiding Prices Disincentive Effects: Empirical Estimates of the “Safe” Level of Food Aid

Table 7 presents estimates of domestic wheat prices, production and private sector imports under scenarios of international wheat prices, domestic rice prices, and consumer and producer price responsiveness (as measured by demand and supply elasticities). Given a base of 1999/2000, Scenario 1 models an increase in the import parity price of wheat (due to the exchange rate devaluation in mid-2000). In this case, higher producer prices lead to a 2.0 percent increase in domestic production, a 3.2 percent decline in domestic demand, reducing the overall net demand for privately imported or PFDS wheat (non-production net-supply) from 1.62 to 1.48 million tons. Given an assumed 600 thousand tons of food aid and a public net distribution of 917 thousand tons of wheat, private imports would be 563 thousand tons (1.480 million tons less 917 thousand tons).

An increase in international wheat prices (U.S. Hard Red Winter #2, FOB Gulf) to $155/MT (the average level of the previous five years) could reduce demand for privately imported or PFDS wheat to about 1.20 million tons, as domestic production increases and total demand declines (Scenario 2).

The biggest potential impacts on wheat demand could come, however, from continued bumper crops of rice. A reduction in the average wholesale price of rice

from 12.0 Tk/kg to 10.5 Tk/kg[16] could reduce demand for privately imported or PFDS wheat to 1.24 million tons at 1999-2000 world wheat price level (Scenario 4), or to about 940 thousand tons at the higher, five-year average world price level (Scenario 5). Given that import demand for milling wheat is about 360 thousand tons per year, total demand for privately imported or PFDS ordinary wheat would be only about 580 thousand tons in the latter scenario. Net PFDS distribution greater than this amount would drive domestic prices below import parity levels.

Sensitivity Analysis

Table 8 presents estimates of the "safe level" of food aid under alternative assumptions regarding, international wheat prices, price-responsiveness of wheat consumers and producers (as reflected in elasticities of wheat supply and demand), and domestic rice prices. The higher the import parity price, the smaller the amount of net public distribution of wheat that can be distributed without depressing domestic wheat market prices below import parity. For example, with a medium-level rice price of 12.24 Tk/kg (the average wholesale price in 1999/2000), raising the import parity price of wheat from 9.2 to 12.2 Tk/kg reduces the "safe level" of food aid from 1.132 to 0.623 million tons (assuming inelastic supply and demand for wheat). More elastic supply and demand parameters imply that changes in the import parity price have a larger effect on the total quantity of wheat import demand. Thus, with a more elastic demand and supply, raising the import parity price from 9.2 to 12.2 Tk/kg reduces the "safe level" of

[16] The national average nominal price of coarse rice at the wholesale level from July through

food aid from 0.999 to 0.004 million tons. Finally, as in Table 7, rice prices have a major impact on the "safe level" of food aid. With low rice prices, wheat demand falls by about 200 thousand tons with inelastic parameters, and by 350 to 400 thousand tons with elastic parameters.

Table 8 also shows wheat price disincentive effects are easily possible in Bangladesh. Net public wheat distribution on the order of 800 thousand tons (the figure was 813 thousand tons in 1999/2000) exceeds the "safe level" of food aid under all scenarios with low rice prices except that of low international prices and inelastic demand parameters. Even with inelastic demand parameters, the "safe level" of net wheat public foodgrain distribution is only 838 thousand tons, only 25 thousand tons more than actual distribution in 1999/2000, (a year, however, that had lower international wheat prices).

Note that these figures are based on the distribution pattern of wheat in 1999/2000, when 351 thousand tons of wheat were distributed through Food For Education, Vulnerable Group Development and Vulnerable Group Feeding, programs for which participants have a high marginal propensity to consume (MPC) wheat out of transfers received. Assuming an MPC for wheat of about 0.3 in these programs (del Ninno and Dorosh, 2000), then these programs created an additional wheat demand of about 105 thousand tons. If cuts in wheat distribution take place in these programs, this additional wheat demand will be lost, as well, with a potentially negative effect on domestic prices.

Table 9 shows the size of the potential price disincentive effect of 600 and 900 thousand tons of net public wheat distribution under alternative assumptions

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December 2000 was 11.6 Tk/kg, and the average price in December 2000 was 11.9 Tk/kg.

for rice prices and model parameters. The prices shown in the table are the prices that result from the specified level of net public foodgrain distribution if private sector imports of non-milling wheat are zero. In other words, these prices show the market clearing prices in the absence of private sector imports of non-milling wheat.

With net PFDS wheat distribution of 900 thousand tons and medium-level rice prices, wheat prices in Bangladesh would be 10.44 Tk/kg in the absence of non-milling wheat imports by the private sector. This price is 10.6 percent below long-term import parity of 11.67 Tk/kg (calculated using the average dollar price of U.S. Hard Red Winter #2 wheat over the 1995/96 – 1999/2000 period, adjusted for quality, transport and marketing costs). If net PFDS wheat distribution were only 600 thousand tons, then the market clearing price would be 12.32 Tk/kg, which would be above the long-term import parity price.

With low rice prices, even 600 thousand tons of net PFDS wheat distribution is sufficient to bring down market-clearing prices to 11.0 Tk/kg, 5.8 percent below long-term import parity. Nine hundred thousand tons of net PFDS wheat distribution with low rice prices drops wheat prices to 9.31 Tk/kg, 20.3 percent below long-term import parity. Using more elastic demand parameters, the potential price disincentive effects are even larger, ranging from 12.1 to 27.3 percent under the various scenarios.

Thus, net PFDS wheat distribution of 900 thousand tons has small price disincentive effects on wheat production even with medium-level rice prices, and the disincentive effects are quite large (-20.3 percent) when domestic rice prices are low, as in 2000. Reducing net PFDS wheat distribution to 600 thousand tons

completely eliminates the price disincentive effect with medium-level rice prices (and inelastic parameters). If the more elastic parameters are a better indication of medium-term supply and demand behavior, however, then there are still significant price disincentives, even with medium-level rice prices and only 600 thousand tons of net wheat distribution.

Reducing net PFDS wheat distribution from 900 to 600 thousand tons can be accomplished relatively easily by substituting domestic wheat procurement for commercial imports and stock drawdowns. Cutbacks below 600 thousand tons, of course, imply a reduction in food aid.

6. CONCLUSIONS

Over the past two decades, rapid expansion of green revolution technology in the form of small-scale irrigation, improved seeds and increased fertilizer use, have led to a rapid increase in rice and wheat production in Bangladesh. Food grain harvests in 1999/2000 and 2000/2001 reached record levels, eliminating the notional “food gap” and eliminating incentives for private sector imports of ordinary wheat and rice in much of Bangladesh.

If these abundant harvests and low food grain prices persist, then continued large-scale distribution of food aid through the PFDS could result in disincentive effects. In particular, the calculations presented in this paper show that if international wheat prices return to their average 1995-99 levels, then net public wheat distribution equal the 2000/2001 level of food aid received (650 thousand tons) would reduce domestic prices below import parity. In this scenario, food aid donors might decide to reduce food aid flows to avoid price disincentive effects on Bangladesh wheat production.

Cuts in food aid, however, could potentially cost Bangladesh millions of dollars per year in resources that currently provide the resources for programs that increase access to food by poor households. A major loss of resources for food security need not occur in this scenario, though. In place of the food aid imports, donors could provide the equivalent value of resources in the form of cash, either to permit the Government of Bangladesh to procure foodgrain locally for these programs or to use directly in re-designed Cash for Work or other cash programs.

Continued good harvests depend on adequate funding of agricultural research and extension, maintaining appropriate price incentives for production, timely input supplies at reasonable prices, and the weather. If these prerequisites are met, foodgrain availability targets are likely to be achieved and donors may reduce food aid to avoid causing price disincentives on production. Even with abundant food grain availability, however, resources will continue to be required for programs that increase access to food by the poor, contribute to increased utilization of food and result in improved nutritional outcomes. Thus, it is important that resources devoted for food security in Bangladesh not decrease, even if the need for food aid to increase availability of foodgrains diminishes.

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Table 1. Global Food Aid by Donor

(in thousand tons)

	1970's	1980's	1990's
Canada	876	848	544
United States	5,824	6,217	5,586
European Union	1,146	1,843	2,433
Japan	297	535	487
Australia	262	387	261
Other Europe	162	211	590
Other Donors	337	466	428
All Donors	8,905	10,587	10,430

Source: FAO/INTERFEIS
Note: 1970's show data for 1971/72-1978/79

Table 2: Global Food Aid Deliveries by Recipient Countries: 1990-1999

(thousand tons)

Year	Angola	Ethiopia	Mozamb.	Sudan	Egypt	Bangladesh	India	DPR Korea	Pakistan	Peru	Former Yugoslavia	Other Countries	Total
1990	124	864	423	230	1,066	1,050	382	-	462	359	-	8,191	13,150
1991	136	944	543	550	1,824	1,083	250	-	358	406	0	6,723	12,816
1992	114	1,210	1,046	706	617	976	326	-	325	563	165	9,395	15,277
1993	174	534	458	340	221	396	390	-	211	454	372	14,143	17,319
1994	344	949	379	432	295	1,095	360	-	140	391	527	8,506	12,891
1995	220	636	386	82	209	590	398	545	119	255	384	6,763	10,201
1996	251	457	151	108	155	575	359	510	54	171	232	4,456	7,247
1997	181	434	176	115	74	713	300	915	182	140	231	4,147	7,377
1998	203	595	201	206	67	880	331	786	58	262	125	4,691	8,278
1999	134	914	119	332	61	1,325	348	994	449	91	336	9,735	14,501
Average 1990-99	188	754	388	310	459	868	345	375	236	309	237	7,675	11,906

Source: WFP/INTERFAIS

Table 3. Composition of Food Aid by Commodity

(in million tons)

	1970's	1980's	1990's
Wheat and Wheat Flour	7.193	8.556	6.247
Coarse Grains	1.060	1.745	2.723
Other Cereals	1.906	1.687	1.535
Cereals, Total	10.160	11.988	10.506
Non Cereals	0.1711	0.928	1.365
Total Food Aid	10.330	12.916	11.871

Source: FAO/INTERFEI

Table 4. Food Aid, Government Expenditures and Imports, 1977/78 - 1998/99

(Billion 2000 Taka)

Year	Food Aid	Total Aid	Government Expenditure	Imports
1978	10.2	72.2	122.8	122.0
1979	14.1	81.2	141.4	129.4
1980	26.3	85.7	166.2	170.8
1981	12.1	71.3	146.6	161.3
1982	15.5	83.4	153.6	175.7
1983	18.2	83.8	153.6	164.3
1984	19.4	89.2	167.2	165.5
1985	16.2	83.5	163.0	174.0
1986	14.1	91.0	175.1	164.7
1987	15.1	106.6	184.8	175.1
1988	18.0	98.5	180.2	179.3
1989	12.5	92.1	185.7	186.3
1990	9.4	90.8	195.1	188.5
1991	12.9	83.5	181.5	167.3
1992	12.0	80.0	196.0	172.0
1993	5.9	81.4	215.0	197.8
1994	5.6	74.6	201.8	200.7
1995	6.5	82.2	245.1	275.6
1996	6.5	68.3	251.1	325.5
1997	4.9	71.5	266.5	345.7
1998	4.8	61.0	290.0	367.0
1999	8.8	76.2	302.2	397.8
1980-84	18.3	82.7	157.4	167.5
1985-89	15.2	94.3	177.8	175.9
1990-94	9.2	82.1	197.9	185.3
1995-99	6.3	71.8	271.0	342.3
1980-99	12.2	82.7	201.0	217.7
		Share of Food Aid		
1980-84	1.000	0.221	0.116	0.109
1985-89	1.000	0.161	0.086	0.086
1990-94	1.000	0.112	0.046	0.049
1995-99	1.000	0.088	0.023	0.018
1980-99	1.000	0.148	0.061	0.056

Note: Real 2000 prices computed using the non-food consumer price index.
Source: GOB data and authors' calculations.

Table 5. Trends in Food Aid and PFDS Distribution

Financial Year	(000 Tons) Rice Food Aid	(000 Tons) Rice PFDS	(000 Tons) Wheat Food Aid	(000 Tons) Wheat PFDS	(000 Tons) Total PFDS	Wheat PFDS-Food Aid	Rice PFDS-Food Aid	3 Year Moving Average				
								Wheat Food Aid	Wheat PFDS-Food Aid	Rice Food Aid	Rice PFDS-Food Aid	Total PFDS
1975/76	395	517	919	1170	1687	251	122					
1976/77	111	798	552	693	1491	141	687	905	140	204	437	1,685
1977/78	104	606	1244	1271	1877	27	502	951	122	89	570	1,731
1978/79	50	571	1057	1255	1826	198	521	1212	209	60	567	2,048
1979/80	24	702	1336	1738	2440	402	678	1008	333	64	532	1,937
1980/81	119	515	632	1031	1546	399	396	1026	328	58	605	2,018
1981/82	30	772	1111	1295	2067	184	742	863	392	93	501	1,849
1982/83	131	496	845	1439	1935	594	365	1093	334	93	498	2,018
1983/84	117	503	1324	1548	2051	224	386	1117	600	124	342	2,183
1984/85	125	400	1181	2162	2562	981	275	1188	437	90	336	2,051
1985/86	27	373	1060	1167	1540	107	346	1186	466	87	336	2,074
1986/87	108	495	1317	1626	2121	309	387	1324	285	109	336	2,055
1987/88	192	468	1595	2035	2503	440	276	1409	557	113	447	2,527
1988/89	40	719	1316	2239	2958	923	679	1273	648	91	530	2,542
1989/90	41	675	908	1489	2164	581	634	1251	458	30	758	2,498
1990/91	10	971	1530	1401	2372	-129	961	1271	221	30	772	2,294
1991/92	39	759	1375	1586	2345	211	720	1207	-12	23	713	1,930
1992/93	19	476	716	597	1073	-119	457	915	155	19	509	1,598
1993/94	0	350	654	1026	1376	372	350	768	187	6	379	1,341
1994/95	0	329	935	1244	1573	309	329	775	382	0	424	1,581
1995/96	1	593	737	1202	1795	465	592	760	273	4	550	1,587
1996/97	10	739	608	653	1392	45	729	631	351	4	617	1,603
1997/98	0	529	549	1092	1621	543	529	777	339	23	576	1,715
1998/99	59	530	1174	1603	2135	429	471	863	377	21	624	1,885
1999/00	5	876	865	1024	1900	159	872	876	389	34	670	1,969
2000/01p	40	707	589	1167	1874	578	667	681	438	28	735	1,883
2001/02p	40	707	589	1167	1874	578	667					

Source: Directorate of Food and NBR
Note: Food aid only includes only grant

Table 6. Estimates of Wheat Imports in Absence of Food Aid, 1996/97 Base

	World Price ($/ton)	Domestic Price (Tk/kg)	Domestic Price (% Change)	Wheat Imports (Thousand tons)
Base 1996/97	221	8.99	0.0	933
Free Trade	221	10.15	12.9	710
Low World Price				
Base Parameters	197	9.32	3.6	868
Inelastic	197	9.32	3.6	894
Medium World Price				
Base Parameters	208	9.81	9.1	773
Inelastic	208	9.81	9.1	839

Notes: Base parameters: wheat elasticity of supply (0.61), wheat elasticity of demand (-0.5).
Inelastic parameters: wheat elasticity of supply (0.2), wheat elasticity of demand (-0.4).

Source: Dorosh (2000).

Table 7. Wheat Imports and Domestic Prices Under Alternative Scenarios

	Base 1999-2000	Scenario 1 2000/2001 World Price (FOB $120/ton)	Scenario 2 Higher World Price (FOB $155/ton)	Scenario 3 Low Rice Price (11.2 Tk/kg)	Scenario 4 Low Rice Price High World Wheat Price (FOB $155/ton)
Supply					
Production	1.840	1.877	1.975	1.927	2.020
Losses	0.100	0.100	0.100	0.100	0.100
Less 10 Percent Losses	0.184	0.188	0.197	0.193	0.202
Net Production	1.656	1.689	1.777	1.735	1.818
Public Net Distribution	0.813	0.917	0.917	0.917	0.917
Private Imports	0.806	0.563	0.217	0.327	0.019
Total Supply	3.275	3.169	2.911	2.978	2.754
Total Imports	1.671	1.363	1.017	1.127	0.819
Non-production Net Supply	**1.619**	**1.480**	**1.134**	**1.244**	**0.936**
PFDS					
Food Aid	0.865	0.600	0.600	0.600	0.600
Govt Commercial Imports	0.000	0.200	0.200	0.200	0.200
Domestic Procurement	0.211	0.250	0.250	0.250	0.250
Offtake	1.024	1.167	1.167	1.167	1.167
Stock Loss	0.018	0.017	0.017	0.017	0.017
Change in Public Stocks	0.034	-0.134	-0.134	-0.134	-0.134
Demand					
Total Demand	3.275	3.169	2.911	2.978	2.754
CIF Price of Wheat ($/MT)	162	162.00	197	162	194
Exchange Rate (Taka/$)	50	54.00	54	54	54
CIF price (Tk/kg)	8.10	8.75	10.64	8.75	10.48
Handling, Transport (Tk/kg)	1.45	1.45	1.45	1.45	1.45
Import Parity (Tk/kg)	9.55	10.20	12.09	10.20	11.93
Quality Calibration factor	0.905	0.90	0.90	0.90	0.90
Domestic Wheat Price (Tk/kg)	**8.64**	9.23	10.94	9.23	10.79
Percent Change Price		6.79	26.58	6.79	24.88
Percent Change Production		1.99	7.33	4.74	9.78
Percent Change Demand		-3.23	-11.12	-9.06	-15.91
Elasticity of Supply of Wheat	0.30	0.30	0.30	0.30	0.30
Elasticity of Demand of Wheat	-0.50	-0.50	-0.50	-0.50	-0.50

Source: Authors' calculations.
Note: Domestic price of wheat is national average wholesale price from DAM.

Table 8. Maximum Level of Net Wheat PFDS without Causing Wheat Producer Price Disincentives

	International Wheat Price		
	162 $/ton (9.2 Tk/kg)*	**194 $/ton (10.8 Tk/kg)***	**222 $/ton (12.2 Tk/kg)***
Medium Rice Prices - 12.24 Tk/kg (2000)			
Inelastic Parameters	1.132	0.838	0.623
Elastic Parameters	0.999	0.417	0.004
Low Rice Prices - 11.2 Tk/kg (2000)			
Inelastic Parameters	0.916	0.633	0.425
Elastic Parameters	0.589	0.045	-0.345

Source: Authors' calculations

* The international wheat price shown is the cost, insurance and freight price, Chittagong ($/ton), U.S. HRW#2.

Notes: These simulations assume inelastic demand for milling wheat imports of 360,000 Tons per year. Import parity prices include shipping and handling costs to wholesale Dhaka, adjusted with 0.905 quality factor.

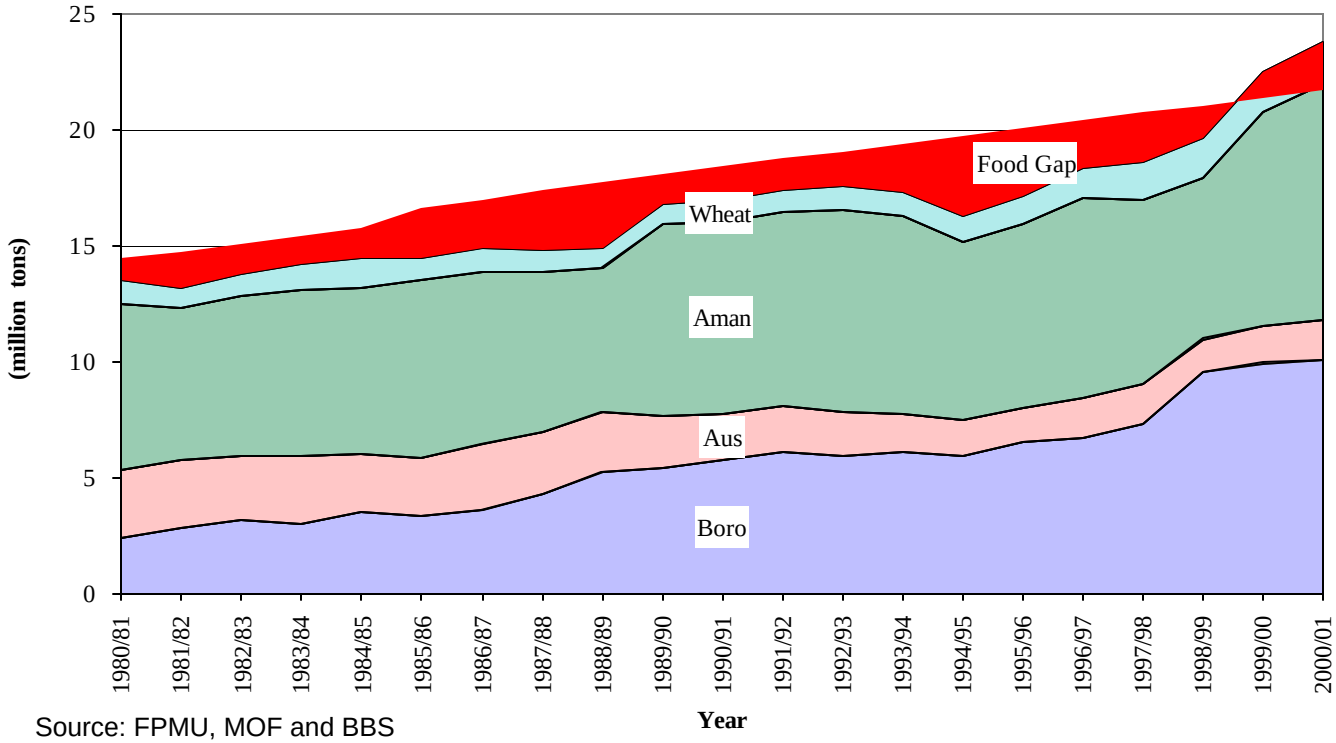
Table 9. Impact of Food Aid on Domestic Wheat Prices (Disincentive Effects)

	Net PFDS Wheat Distribution (thousand Tons)	
	600	**900**
Medium Rice Prices - 12.24 Tk/kg (2000)		
Inelastic Parameters	12.32 Tk/kg ***	10.44 Tk/kg -10.6%
Elastic Parameters	10.26 Tk/kg -12.1%	9.47 Tk/kg -18.9%
Low Rice Prices - 11.2 Tk/kg (2000)		
Inelastic Parameters	11.00 Tk/kg -5.8%	9.310 Tk/kg -20.3%
Elastic Parameters	9.20 Tk/kg -21.2%	8.483 Tk/kg -27.3%

Source: Authors' Calculation

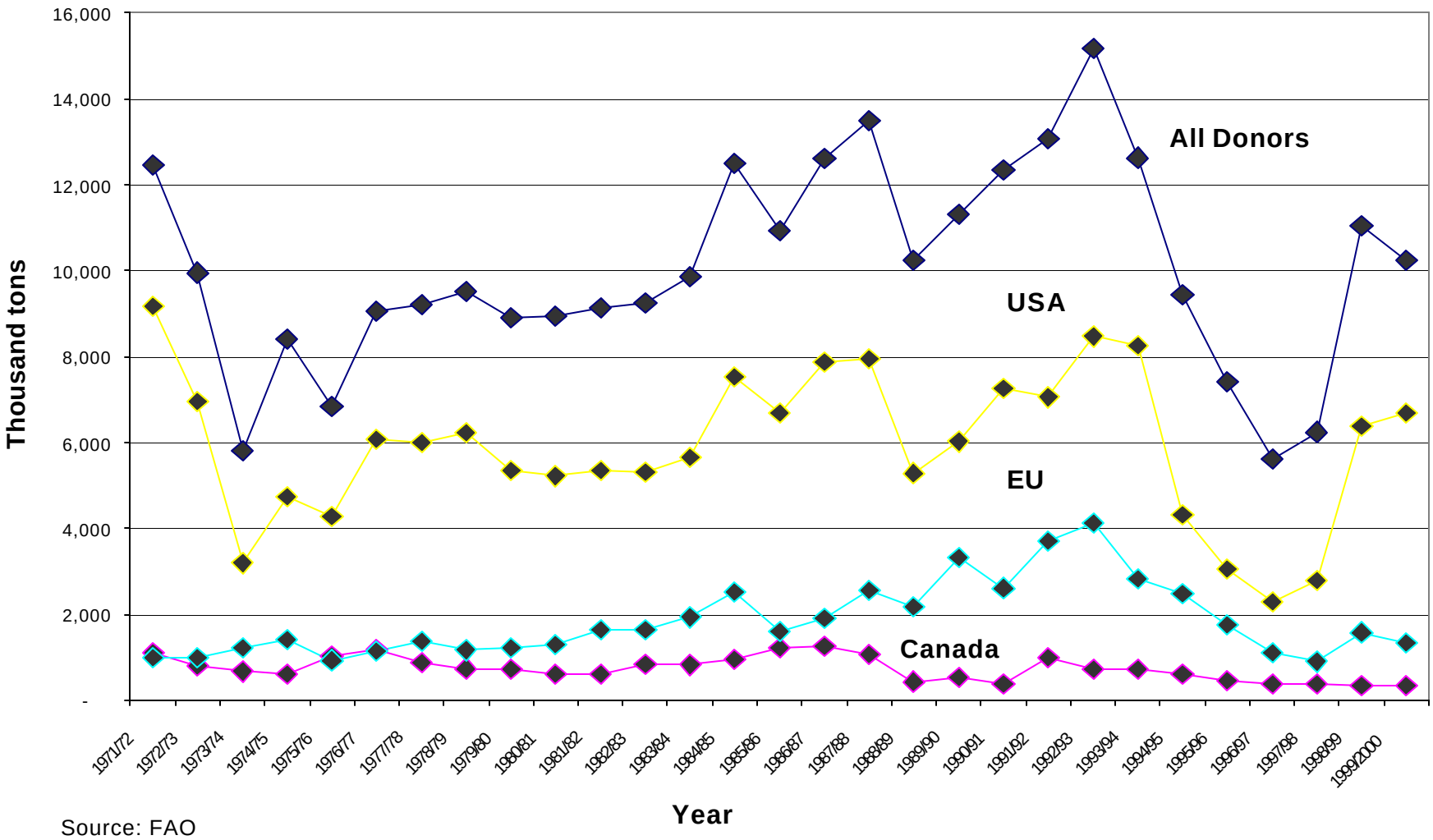
Notes: Wheat prices shown in the table are the prices which result from the specified level of net public foodgrain distribution if private sector imports of non-milling wheat are zero. Percentages shown indicate the percentage below a long-term import parity price of 11.67 Tk/kg. These simulations assume inelastic demand for milling wheat imports of 360,000 Tons per year.

Figure 1. Bangladesh Foodgrain Gap, 1980/81 – 2000/2001



Source: FPMU, MOF and BBS
Note: Production figures indicate net production.
Aman, aus and boro denote different rice

Figure 2. World Food Aid by Donors



Source: FAO

Figure 3. Food Aid as a Percentage of Total Aid, Imports and Government Expenditure

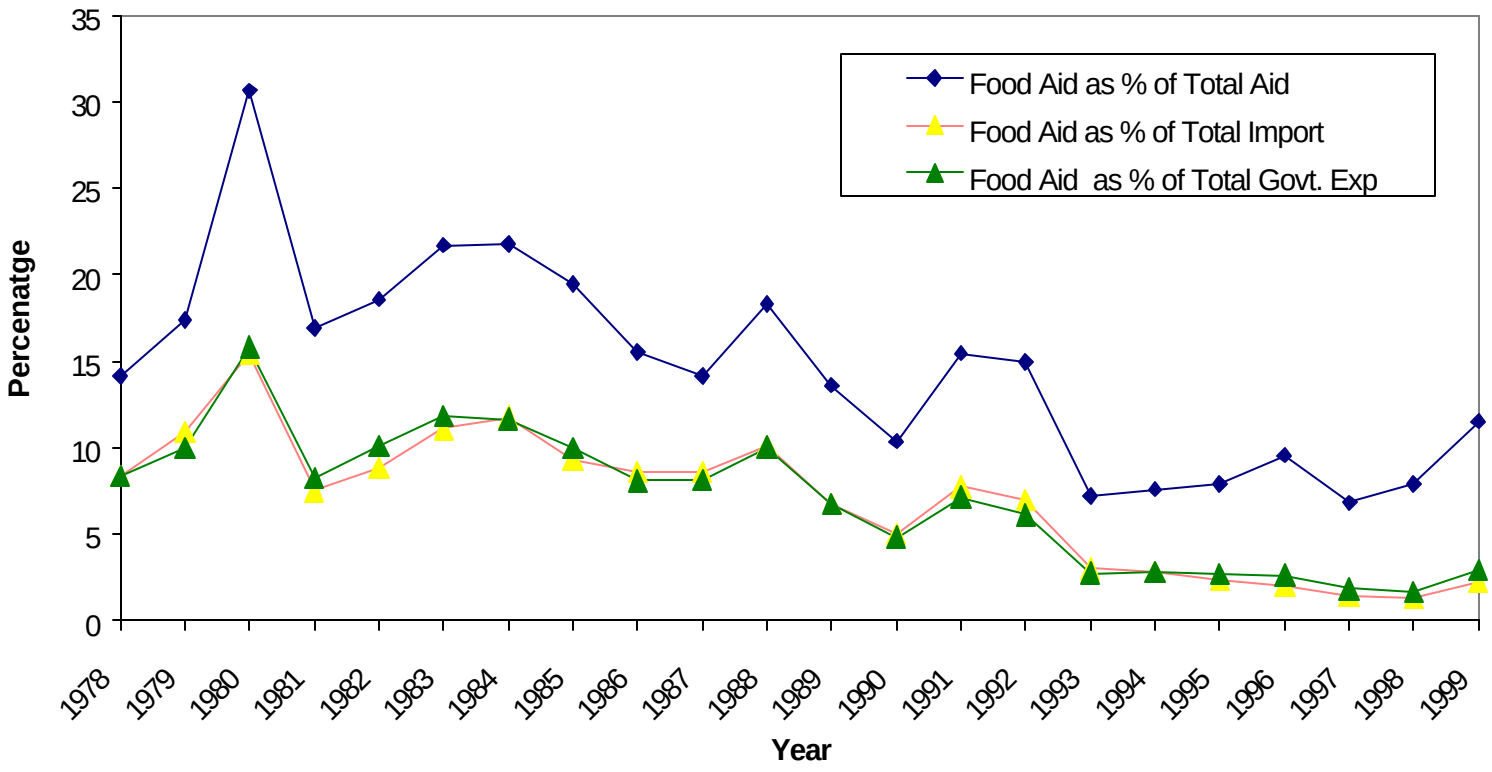


Figure 4. Food Aid to Bangladesh, 1980/81-2000/2001

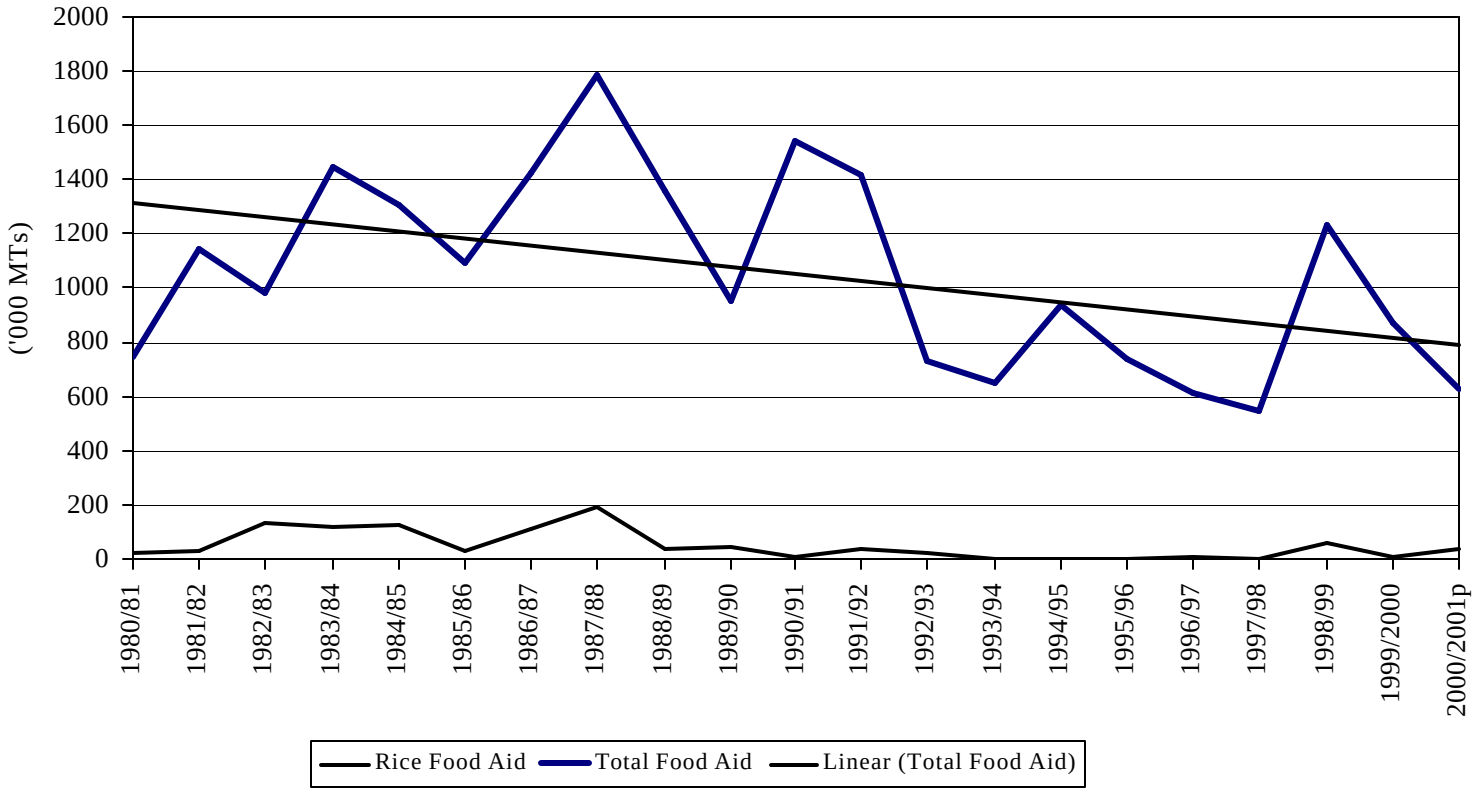


Figure 5. Food Aid and PFDS Distribution, 1976/77-2000/01 (3 Year Centered Moving Average)

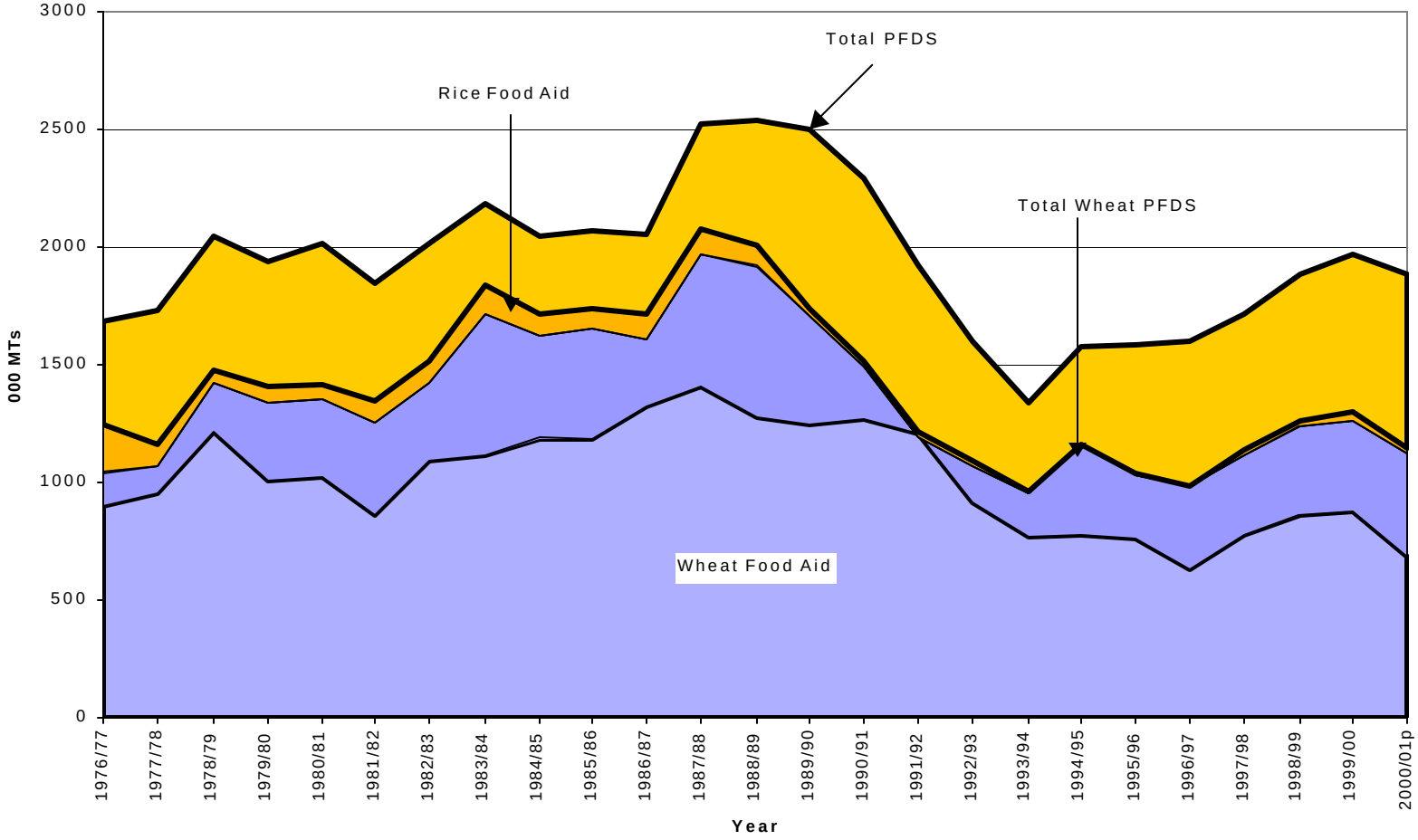


Figure 6. Channel-wise Distribution of Foodgrain from Public Stock

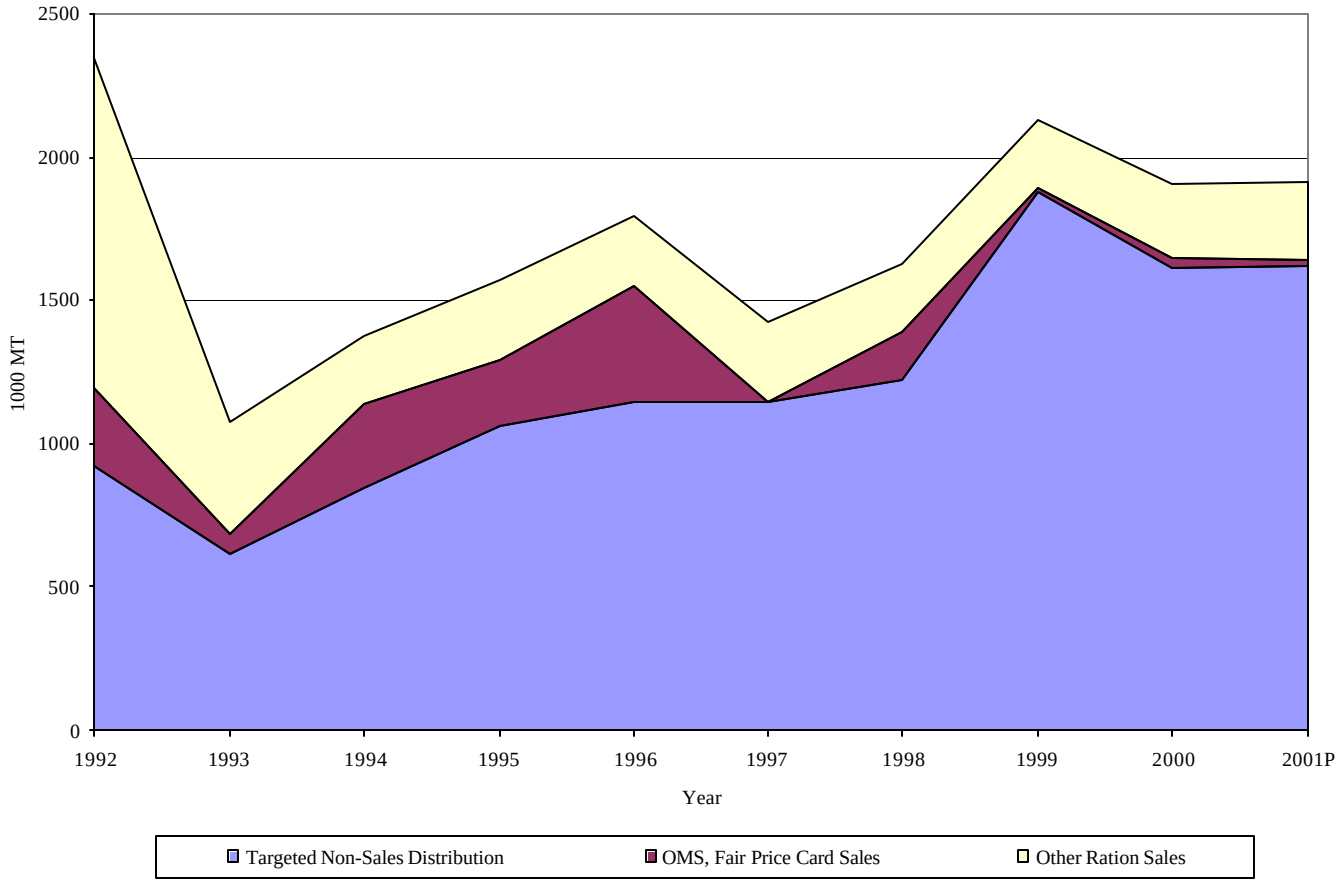
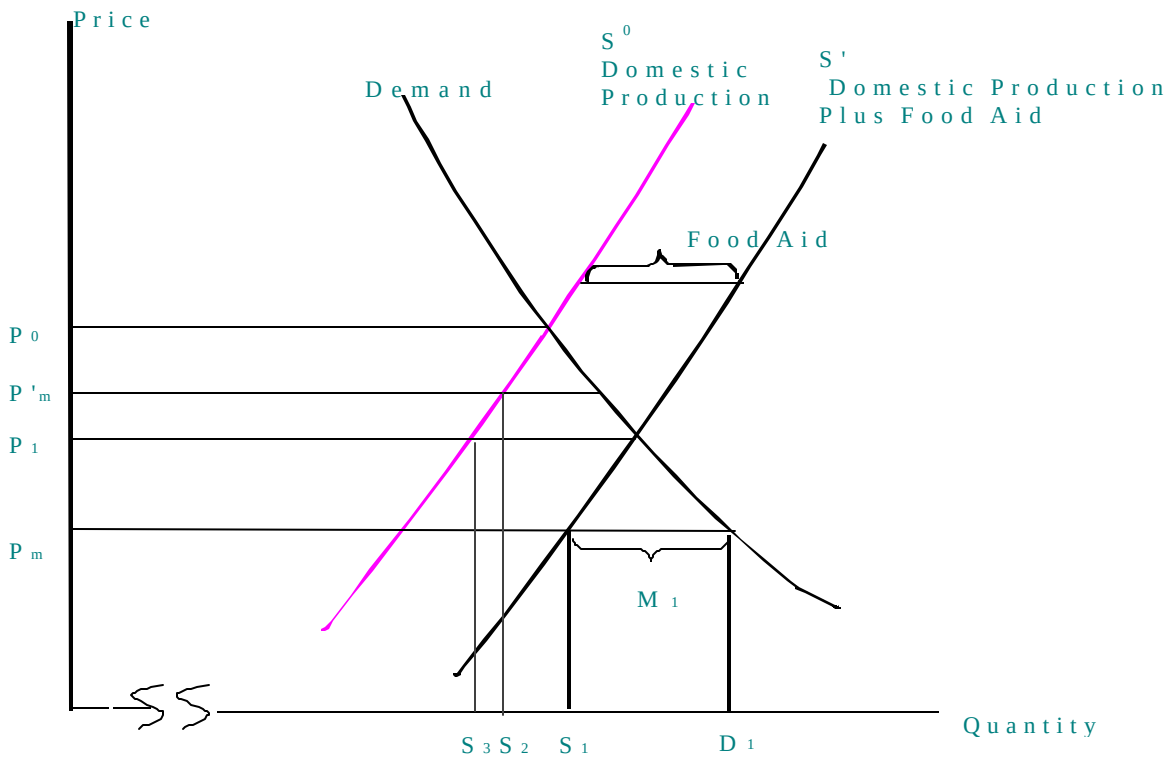
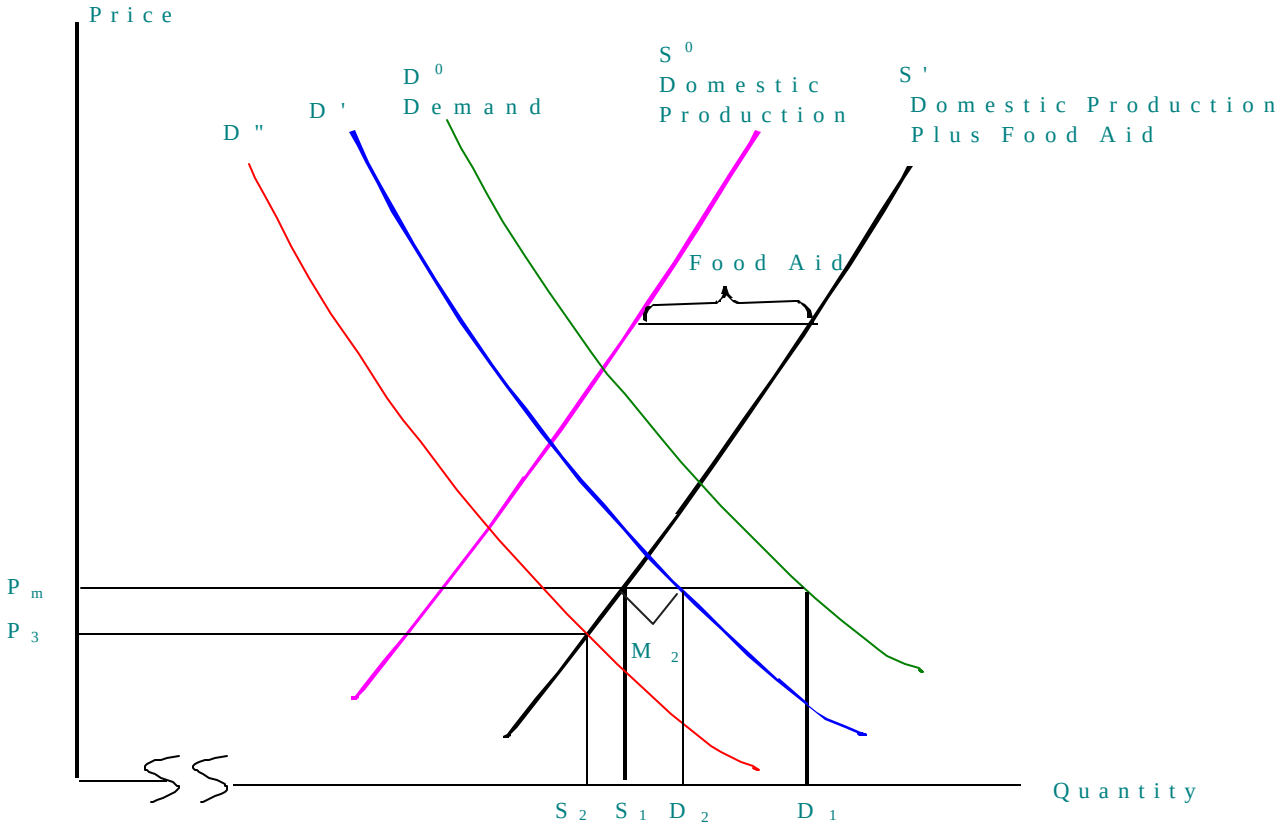


Figure 7. Disincentive Effects of Food Aid



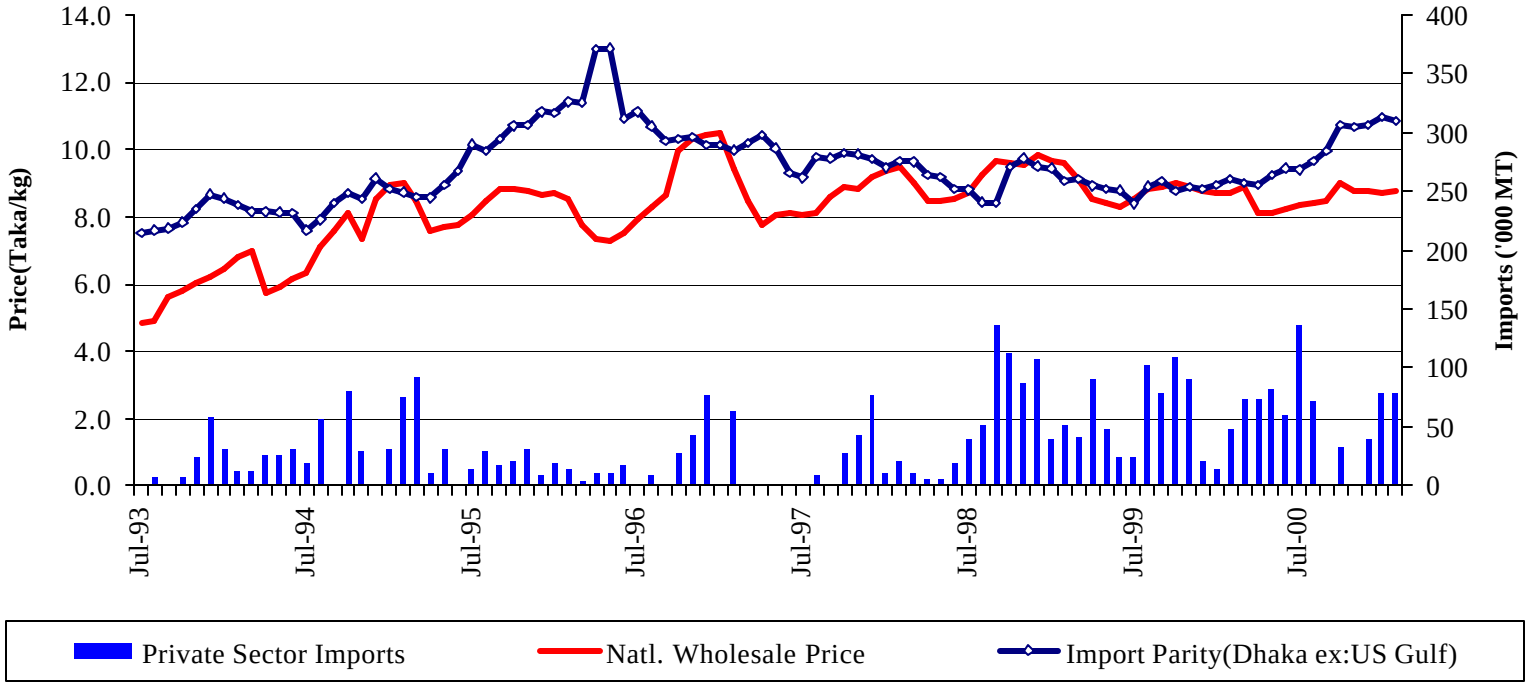
Source: Author

Figure 8. Impact of Reduced Demand on Production, Prices, and Imports



Source: Author

Figure 9. Wheat Prices and Quantity of Private Wheat Imports in Bangladesh, 1993-2001



Note : . Private import quantity data is smoothed to adjust for reporting problems in April 1998, June 1999, and March 2000.
Source : FPMU, DAM, MIS DG Food, USDA and CMIE (1998, 1999, 2000).

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