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PUBLIC POLICY, FOOD MARKETS, AND HOUSEHOLD COPING STRATEGIES IN BANGLADESH: LESSONS FROM THE 1998 FLOODS

Carlo del Ninno, Paul A. Dorosh, and Lisa C. Smith

Food Consumption and Nutrition Division

International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
(202) 862–5600
Fax: (202) 467–4439

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Abstract

At their peak, the 1998 floods covered two-thirds of Bangladesh, causing severe damage to the major rice crop and threatening the food security of tens of millions of households. Ultimately, well-functioning private markets, suitable government policies, and public and NGO interventions combined with effective private coping strategies to prevent a major post-disaster crisis. In this paper, we highlight the contribution of government policy interventions, including an earlier trade liberalization, to stabilization of rice markets during and after the floods. Then, we examine the impacts of the floods on flood-exposed households using a panel data set covering 750 households in three rounds over a 13-month period, focusing on impacts of the flood on household assets, consumption, and nutritional outcomes. The study finds that private sector borrowing, a major household coping strategy, played a key role in helping households maintain consumption, but that long-term debts increased. Finally, based on an econometric analysis of household food consumption, we present empirical estimates of the contribution of rice market stabilization to household food security.

Keywords: safety net programs, Bangladesh, food markets, household coping

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Carlo del Ninno and Paul A. Dorosh
World Bank

Lisa C. Smith
International Food Policy Research Institute

1. Introduction

Flooding is a normal part of the ecology of Bangladesh, through which three major rivers drain into the Bay of Bengal. The 1998 flood, dubbed the flood of the century, was especially serious, however, because of the depth of water and its duration. At its peak in early September, the 1998 flood covered two-thirds of the country, causing severe damage to the *aman* monsoon rice crop (due to be harvested in November/December) and threatening the food security of tens of millions of households. Total rice production losses exceeded 2.0 million tons (equivalent to about 10 percent of annual consumption) as the unusually long duration of the flood forestalled any possibility of replanting rice seedlings destroyed by the standing water.

In spite of the damage to the rice harvest and major disruption of the rural economy and employment opportunities, however, no major food crisis occurred. Instead, large-scale private-sector imports, made possible by trade liberalization in the early 1990s, stabilized rice markets. Government food transfers to about 4 million poor households also limited the impact of the flood on household access to food. Nonetheless, as this paper shows, the flood did exact a heavy cost in terms of increased private debts due to extensive borrowing in private markets, a major coping strategy of the poor.

The success in handling the effects of the 1998 flood stands in sharp contrast to the devastation caused by a flood in 1974 that contributed to tens of thousands of deaths by famine in 1975. Although the *aman* shortfall in 1974 was less than half that of 1998 (measured as the deviation from trend production), rice prices increased much more sharply in the 1974/75 period. Ravallion (1990) argued that this large increase in rice prices was a major cause of famine deaths, as calorie consumption fell below survival thresholds. The analysis in this paper sheds light on the contribution of price stabilization to household food security following a major natural shock through estimates of the impact of rice prices and other factors on calorie consumption in 1998 and 1999 using household data from rural Bangladesh collected in these years.

More broadly, the paper examines the components of the public and private response that prevented a major food crisis. Section 2 highlights the contribution of government policy interventions, including trade liberalization in the early 1990s, to stabilization of rice markets during and after the flood. We also compare and contrast government policy response to major flood-related production shortfalls in 1974, 1988, and 1998, examining the roles of government stocks and external trade, and the magnitude of price increases. In Section 3, we examine the impacts of the 1998 flood on flood-exposed households using a panel data set covering 757 rural households in three rounds over a 13-month period. This section focuses on the impacts of the flood on household income, consumption, and nutritional outcomes, and examines the role of household coping strategies and government intervention. In Section 4, we use an econometric analysis of household calorie consumption to estimate the impact of rice price changes (and thus the contribution of rice market stabilization) to household food security. Section 5 presents conclusions and policy implications.

2. Foodgrain Markets: Production Shocks and Policy Response

Rice dominates agricultural production and food consumption in Bangladesh, accounting for 58.3 percent of value added in agriculture (9.1 percent of total gross domestic product [GDP]) and 72.8 percent of calories consumed in 1998.[1] Bangladesh annually produces three crops of rice: *aman*, typically transplanted in June-July with the onset of monsoon rains and harvested in November-December; *boro,* transplanted in December-January and harvested in May-June; and *aus*, often directly sown in March-April and harvested in July-August. The widespread floods from July through September 1998 threatened national food security in Bangladesh, not because of the initial damage

[1] Unpublished 1997/98 national accounts data (in current prices) from the Bangladesh Bureau of Statistics (BBS) and FAO, Food Balance Sheet.

to standing crops, but because of potential damage to the major monsoon season (*aman*) rice crop and rural incomes.[2]

A large expansion in the number of participants, the size of the market, investments in infrastructure (roads, bridges, electricity, and telecommunications), and a gradual easing of restrictions on the private-sector trade (including lifting of a ban on commercial bank credit for foodgrain trade) have resulted in a well-functioning private market.

In late August 1998, it became clear that the flood would likely lead to a very large shortfall in rice production. The flood had already caused substantial damage to existing crops, roads, and other assets. Damage to the *aus* rice crop, harvested in July and August, was 300 thousand tons, (16 percent of the initial target production, but only 1.4 percent of projected rice production for 1998/99). Damage to the *aman* crop was more substantial, 1.76 million tons (18.5 percent of target production), making the total rice production loss 2.06 million tons. In response to a Government of Bangladesh appeal for aid, donors pledged an extra 1.083 million tons of flood relief food aid (almost exclusively wheat) to supplement the 596,000 tons of regular program food aid already planned for fiscal year 1998/99, but major flood relief food aid shipments did not arrive in Bangladesh until December 1998. As a result, targeted foodgrain distribution through November 1998 was limited by available public stocks.[3]

Rice and Wheat Markets Following the Flood

Government rice policy in the aftermath of the flood was based on the realization that government imports and food aid alone would not make up the projected shortfall in foodgrain supply before the wheat and *boro* harvests in April to June of 1999. Thus, the

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[2] See Ahmed, Haggblade, and Chowdhury (2000) for an in-depth description and analysis of the Bangladesh foodgrain sector.

[3] See del Ninno et al. (2001) for a more detailed description of the Government of Bangladesh and donor response to the 1998 flood.

government encouraged private-sector imports of rice, a policy that had proven successful following a production shortfall the previous year.

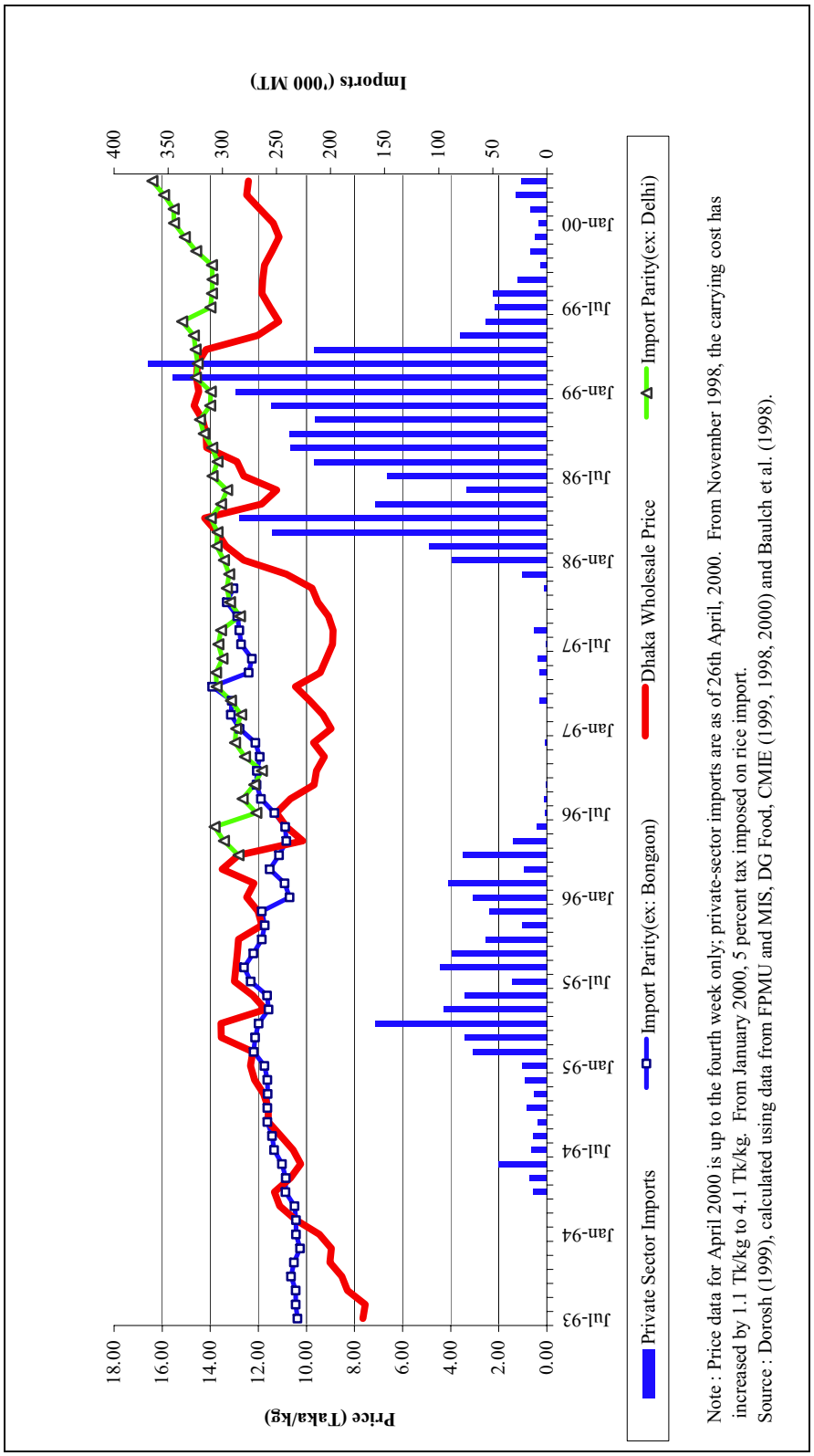
Market prices of rice had been high in the first half of 1998, even before the flood because of a poor 1997/98 *aman* rice harvest in November-December 1997 (Figure 1). Domestic prices rose swiftly up to import parity levels (equal to the cost of rice in Indian markets plus transport, handling, and a normal profit margin), thus making it profitable for the private sector to import rice from India. In early 1998, the Government of Bangladesh took deliberate steps to encourage private-sector imports of rice to stabilize domestic markets. A 2.5 percent tariff on rice imports was removed, government open-market rice sales were minimized, instructions were given to expedite clearance of rice imports through customs, and despite pressure from some groups for more direct market interventions, anti-hoarding laws were not reimposed. As a result, during the first five months of 1998, the private sector imported 894 thousand tons of rice from India,[4] mainly by truck and rail across land borders.

With the onset of the *boro* rice harvest in May, the national average wholesale price of coarse high-yielding varieties (HYV) rice fell from a peak of 14.2 taka per kilogram (Tk/kg)[5] in April to 12.0 Tk/kg in June and private imports slowed to 59 thousand tons in June. Soon thereafter, as the floods began, however, prices again rose to import parity. By continuing its policy of encouraging private-sector imports, the government enabled the private sector to import substantial quantities of rice and keep the domestic market price from rising above import parity levels. According to Government of Bangladesh estimates, more than 200 thousand tons of rice per month were imported from August 1998 to March 1999, with private rice imports reaching 288

[4] According to Government of Bangladesh customs figures.

[5] The 1998 exchange rate was 50 taka per US$1.

Figure 1—Rice prices and quantity of private rice imports in Bangladesh, 1993-2000



Note : Price data for April 2000 is up to the fourth week only; private-sector imports are as of 26th April, 2000. From November 1998, the carrying cost has increased by 1.1 Tk/kg to 4.1 Tk/kg. From January 2000, 5 percent tax imposed on rice import.
Source : Dorosh (1999), calculated using data from FPMU and MIS, DG Food, CMIE (1999, 1998, 2000) and Baulch et al. (1998).

thousand tons in January and 345 thousand tons in February 1999.[6] Data from letters of credit from January through mid-September 1998 show that 793 traders participated in rice imports, with the import market share of the 10 largest traders equal to only 142,369 tons, 16 percent of the total (Dorosh 2001).[7]

Thus, because of the poor 1997/98 *aman* harvest and the flood-damaged *aus* and *aman* harvests in 1998/99, Bangladesh rice prices (wholesale Dhaka) remained close to India import parity prices for most of the calendar year 1998. Wholesale prices after the flood were in fact remarkably stable. The national average wholesale prices of coarse rice remained in the range of 14.14–14.83 Tk/kg from September 1998 through mid-April 1999. With a good *boro* harvest in April and May, market prices fell by 19 percent, from 14.46 Tk/kg (*aman* coarse rice) in the third week of April to 11.74 Tk/kg (*boro* HYV rice) in the second week of May, bringing to an end a nine-month period of high rice prices and concerns about post-flood food availability.

In comparison with private-sector rice imports, government interventions in the domestic rice market were small, only 399 thousand tons of public distribution from July 1998 through April 1999. Private-sector rice imports, equal to 2.42 million tons in this period, were thus 6.1 times larger than government rice distribution. Fifty-seven percent of rice distribution was targeted to flood-exposed households through Vulnerable Group Feeding (VGF) (41.5 percent) and Gratuitous Relief (16.2 percent). Total rice distribution during these months, however, was only slightly above the original target, in

[6] The extremely high figures for recorded rice imports in early 1999 may overstate actual rice imports. Other commodities may have been imported in place of rice using false documents to avoid import tariffs and other surcharges. Government of India data and analysis of rice demand in Bangladesh suggest that the actual level of imports may have been only about two-thirds of the official figures. A lower import figure does not alter the main conclusion that private-sector trade stabilized domestic rice prices at import parity levels (see Dorosh 2001).

[7] The stable and low margin between wholesale prices in Dhaka and India is further evidence of the competitiveness of the trade.

part because the Ministry of Food faced substantial difficulties in procuring rice through both domestic and international tenders.[8]

The private sector also imported substantial volumes of wheat following the flood, even though large amounts of wheat food aid flowed into Bangladesh, and distribution through VGF and food for work (FFW) was expanded. Private-sector wheat imports from July 1998 through February 1999 reached 624 thousand tons, 435 thousand tons more than in the same period in 1997/98. The concurrent large volume of private-sector imports is evidence that domestic wheat prices remained approximately equal to world prices (at import parity), and that food aid inflows did not provide a disincentive for domestic wheat producers.[9]

Market Prices in the Absence of Private-Sector Imports

Though the quantity of private-sector imports from India is uncertain, it is clear that this trade substantially augmented Bangladesh rice supplies in 1997/98 and 1998/99. One measure of the impact of this trade on national food security in Bangladesh is to compare actual prices and imports with estimates of prices and imports in the absence of private-sector imports from India. Given the average wholesale price of coarse rice in Dhaka of 13.3 Tk/kg in 1998/99, rice imports from December 1997 through November 1998 were 2.043 million tons (according to the Bangladesh customs data). Had rice imports from India not been available, the next lowest cost source for private importers would have been Thailand, for which the import parity price of 15 percent broken rice in Dhaka in the same period was 16.1 Tk/kg. Given the 20.9 percent increase in import parity price, estimated rice demand would fall by 4.2–6.3 percent, assuming an own-price

[8] Relatively low rice stocks limited rice distribution, as problems related to the instability of prices and unreliability of suppliers constrained actual procurement of rice through commercial local and international tenders (del Ninno et al. 2001).

[9] Domestic prices in this period were slightly below import parity of U.S. hard red winter wheat, but most wheat imported by the private sector in this period came from lower-cost suppliers (del Ninno et al., 2001).

elasticity of rice demand of –0.2 to –0.3. In this case, rice imports would decline by approximately 700 thousand to 1 million tons.[10]

If private-sector imports were unavailable (or banned) from any source, and there were no change in government imports, total supply would have been 12.1 percent less (apart from private stock changes), and rice prices could have risen 40–60 percent to an average of 18.7–21.3 Tk/kg.[11] Such an increase would likely have been unacceptable to the Government of Bangladesh, and public sector imports would have been increased. But public-sector imports of a magnitude equal to private-sector flows would not have been feasible.

During the 1998 calendar year alone, private-sector imports, mainly from India, reached 2.26 million tons. Had the Government of Bangladesh imported this grain itself, the average cost of the imported rice delivered to local delivery points would have been approximately 14.9–15.9 Tk/kg (due to additional marketing costs of 1.0–2.0 Tk/kg above the private-sector import costs, totaling $50–100 million). And, if the government received a net price of 11.5 Tk/kg (equal to the Open Market Sales [OMS] price of 12.0 Tk/kg less 0.5 Tk/kg OMS dealer's commission), the total unit subsidy would have been 3.4–4.4 Tk/kg, and the total fiscal cost would have been $160–210 million dollars (del Ninno et al. 2001).

A Comparison With Earlier Major Production Shortfalls

As shown above, private-sector imports played a major role in stabilizing rice and wheat markets following the 1998 floods. Government policy in two earlier periods of major foodgrain production shortfalls caused by floods (1974 and 1988) depended much

[10] This calculation assumes no problems with supply of imports from Thailand and a competitive import market involving fewer importers and larger shipments. See Dorosh (2001) for a discussion of implications of importing rice from Thailand as well as the reliability of India as a source of rice supply.

[11] In the absence of private-sector imports, domestic supply would have been 14.839 million tons, a 12.1 percent reduction in per capita supplies relative to the actual estimated levels. Assuming an elasticity of demand of –0.2 to –0.3, prices would need to rise by 12.1/0.3 (40 percent) to 12.1/0.2 (60 percent) to equilibrate market supply and demand.

more heavily on public-sector market interventions. In 1974, a large-scale famine, resulting in 30,000 to 100,000 deaths, followed floods that damaged *aus* and *aman* crops.[12] In contrast, the 1988 floods resulted in an even sharper fall in *aman* production (similar to that in 1998), but no famine occurred.

The 1974 famine was characterized by a very sharp rise in nominal (and real) rice prices following the floods in July. Rice prices in August through November 1974 were, on average, 58.2 percent higher than in May through July 1974. This sharp rise in prices had disastrous consequences for poor households lacking the entitlements to acquire enough of their staple commodity.[13] In contrast to 1974, however, rice prices rose by only 7.0 percent in these months following the floods in 1988/89 and by 12.4 percent in 1998/99.

This difference in market price behavior is not explained by the size of the production shortfall. As shown in Table 1, in comparison to trend *aman* rice production, the *aman* shortfalls in 1988 (18.1 percent) and 1998 (18.0 percent) were much larger than the 1974 *aman* shortfall (8.5 percent). Instead, speculative behavior by traders appears to have played a major role in the 1974 price increase.[14] In addition, traders appear to have believed, correctly, that the government would be unable to intervene effectively to stabilize market prices in the event of a production shortfall, because of extremely low public stocks at the time of the flood (only 27 thousand tons at the end of July 1974), shortage of foreign exchange reserves for commercial imports, extremely high world foodgrain prices, and delays in U.S. food aid deliveries.

Stocks in 1998/99 were significantly larger than in 1974/75 in the crucial August through November months, 669 thousand tons, or 5.3 kg per person, twice the per capita

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[12] The official death toll from the famine was 30,000 (Alamgir 1980); unofficial reports cited in Sobhan (1980, 175) were as high as 100,000.

[13] Wheat prices also rose by 61.2 percent in the same period.

[14] Ravallion (1985, 1990) provides econometric evidence that exaggerated reports of crop failure influenced traders' expectations and led to "excessive hoarding" of stocks.

Table 1—Availability, stocks, and market prices in major flood years in Bangladesh

	1974/75	1988/89	1998/99
Rice production			
Aus (million mt)	3.00	2.86	1.62
Aman (million mt)	6.29	6.86	7.74
Percent below trend (percent)	–8.5	–18.1	–18.0
Boro (million mt)	2.29	5.83	10.55
Total rice production (million mt)	11.58	15.55	19.91
Wheat production (million mt)	0.12	1.02	1.91
Total foodgrain production (million mt)	11.69	16.57	21.81
Per capita rice production (kg/person)	148.05	145.57	156.74
Aus and *Aman* share of production (percent)	80.3	62.5	47.0
PFDS distribution (July–June)			
Total rice (thousand mt)	131	690	530
Total wheat (thousand mt)	1,597	2,251	1,603
Targeted rice (thousand mt)	4	167	386
Targeted wheat (thousand mt)	157	1,259	1,488
Foodgrain imports (July–June)			
Private rice imports (thousand mt)	0	0	2,663
Public rice imports (thousand mt)	267	61	393
Private wheat imports (thousand mt)	0	0	805
Public wheat imports (thousand mt)	2,030	2,075	1,603
Total availability (million mt)			
Rice availability (million mt)	10.42	14.32	20.61
Wheat availability (million mt)	1.7	3.12	3.87
Total foodgrain availability (million mt)	12.12	17.44	24.48
Per capita availability (kg/person)			
Rice availability (kg/person)	133.26	134.07	162.31
Wheat availability (kg/person)	21.76	29.19	30.46
Foodgrain availability (kg/person)	155.03	163.26	192.77
National wholesale prices			
Rice: percent change[a]	58.2	7.0	12.4
Wheat: percent change[a]	61.2	15.3	10.7
Public foodgrain closing stocks			
Average (August–November)			
Rice (thousand mt)	21	621	359
Wheat (thousand mt)	187	546	310
Total (thousand mt)	208	1,167	669
	2.7	10.9	5.3
Foreign exchange reserves ($ million)	175	863	1,744
Mid-year population (millions)	78.2	106.8	127

Source: del Ninno et al. (2001).

[a] Percentage change from May-June average to August-November average.

stocks of 1974/75 though half those of 1988/89.[15] Several factors suggest that the need for public stocks to avert famines in Bangladesh has considerably decreased since 1974, however. First, the record 10.55 million tons *boro* harvest in May/June 1999, only five to six months after the failure of the *aman* crop, shortened the period of uncertainty regarding domestic supply, increasing foodgrain availability, raising farmer incomes, and reducing prices.[16] Second, as shown above, private-sector imports have added to domestic supplies and quickly stabilized prices at import parity levels following *aman* crop shortfalls in 1997/98 and 1998/99. Third, rice markets in Bangladesh are much better developed than in 1988/89 and especially than in 1974/75, so shortages across regions within the country can be more easily met by domestic private (and public) grain flows. (Public-sector imports, an alternative to private-sector imports, encountered serious problems with tenders in 1998/99 and were not a significant source of supply.) Fourth, foreign exchange constraints, which so severely hampered government efforts to procure rice in 1974, have been greatly eased through increased export earnings and availability of commercial and official credit. Fifth, international markets for rice and other grains have grown deeper and more stable, so the risk of facing high international prices has lessened.[17]

3. Household Impacts and Coping Strategies

The 1998 floods led to major crop losses, losses of other assets, and lower employment opportunities; thus, they affected household incomes as well as market prices. In this section, we present an analysis of the short- and medium-term impacts of

[15] Discouraging private speculation was a major Ministry of Food rationale for maintaining a relatively high level of stocks during these crucial months in 1998/99. Early assurances of food aid by donors may also have contributed to calming markets in Bangladesh.

[16] The record 1.91-million-ton wheat harvest in March and April 1999 also added to food availability soon after the *aman* crop shortfall.

[17] In addition, replacement of flood-susceptible deepwater *aman* cultivation by irrigated *boro* cultivation in cropping patterns has reduced the production risk associated with floods (Hossain, Bose, and Chowdhury 2001).

the flood at the household level, using data from a panel data set of 757 rural households. The first round was collected in November/December 1998 (about three months after the flood), the second in April/May 1999 (eight months after the flood), and the third in November/December 1999 (15 months after the flood).[18] In this analysis, households have been classified according to a household's flood exposure index, a measure of the depth of water in the homestead and in the house and the duration of water in the house.[19]

Employment and Income

Households exposed to the flood suffered severe crop losses (equal to 24 percent of the total value of anticipated production for the year). For the 55 percent of households that lost assets, their average loss was Tk 6,936, equivalent to 16 percent of the total value of their pre-flood assets. Employment opportunities for daily laborers declined as well, and their average monthly earnings in July–October 1998 were 46 percent below those in the same months in 1997 (del Ninno et al. 2001).

Within eight months of the flood, as agricultural production and rural employment recovered, household incomes rose substantially, both for flood-exposed households as well as those not directly exposed to the flood. The average monthly household income of all households in the sample was 45 percent higher in Round 2 than in Round 1, and about 50 percent higher in Round 3 (one year after the data collection in Round 1). The income level of flood-exposed households also increased, by 35 percent between Rounds 1 and 2 and by 49 percent between Rounds 1 and 3 (Table 2). The income of poor flood-exposed households did not increase as much as did the rest of the households, however.

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[18] The Food Management Research Support Project-IFPRI survey covered seven flood-affected *thanas* in Bangladesh, selected according to the severity of flood as determined by the Bangladesh Water Development Board and the percentage of poor people in the district in which the *thana* is located. Individual households in each *thana* were randomly selected using a multiple-stage probability sampling technique. See del Ninno and Roy (2001).

[19] A household is considered exposed if had at least one foot of water in the house or in the homestead for at least a day.

Table 2—Average monthly share of household income, by source of income, round, and expenditure category

Source of income	Round 1				Round 2				Round 3			
	Bottom 40 percent	Mid 40 percent	Top 20 percent	Total	Bottom 40 percent	Mid 40 percent	Top 20 percent	Total	Bottom 40 percent	Mid 40 percent	Top 20 percent	Total
All households												
Dependent labor	15.1	14.6	23.4	17.3	13.5	9.0	16.0	12.4	11.4	9.8	12.2	11.0
Daily labor	26.1	13.5	4.7	14.7	26.9	14.6	5.8	15.4	16.8	11.3	3.6	10.3
Business	18.5	23.0	25.3	22.3	14.1	19.6	21.8	18.7	23.1	22.2	26.2	23.7
Agriculture	24.6	32.9	27.0	28.7	30.0	39.1	39.5	36.7	31.6	38.2	35.5	35.5
Livestock	4.0	4.1	4.1	4.1	9.3	9.1	8.4	8.9	8.0	9.2	7.7	8.4
Fish	6.8	6.0	4.5	5.8	1.3	1.7	2.0	1.7	3.8	2.4	1.4	2.5
Asset	2.5	1.3	0.9	1.6	2.3	2.1	1.5	2.0	0.4	0.3	0.5	0.4
Transfer	2.4	4.6	10.0	5.5	2.6	4.8	5.0	4.3	4.9	6.6	12.8	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average household income	1,708	2,323	3,315	2,275	2,326	3,407	5,053	3,303	2,310	3,480	5,545	3,423
Average per capita income	308	438	622	421	435	636	932	615	435	667	1,062	651
Number of households	303	303	151	757	298	299	151	748	291	295	146	732
Flood-exposed households												
Dependent labor	12.3	19.1	25.3	18.6	10.6	10.8	17.2	12.6	10.9	12.3	14.0	12.5
Daily labor	23.4	12.7	6.2	14.4	27.7	15.9	7.6	17.3	16.2	10.8	3.9	10.0
Business	21.1	21.9	18.4	20.7	13.9	22.4	23.5	19.9	22.7	25.2	23.2	23.8
Agriculture	26.6	28.5	27.7	27.7	31.8	30.8	30.6	31.1	33.5	31.9	38.9	34.7
Livestock	4.5	4.1	3.6	4.1	9.2	9.4	9.8	9.4	7.3	9.1	7.7	8.1
Fish	6.4	7.2	6.0	6.6	1.6	1.9	3.0	2.1	3.6	3.2	1.6	2.8
Asset	3.1	1.7	1.0	2.0	2.6	2.2	1.3	2.1	0.1	0.5	0.7	0.4
Transfer	2.6	4.8	11.7	6.0	2.7	6.7	7.0	5.5	5.7	7.1	10.0	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average household income	1,706	2,290	3,003	2,187	2,295	2,987	4,294	2,957	2,280	3,148	5,522	3,255
Average per capita income	298	424	549	394	414	552	775	539	417	592	1,030	604
Number of households	222	209	109	540	219	206	109	534	212	202	105	519

Source: FMRSP/IFPRI household survey 1998-99.

Regression analysis by del Ninno and Roy (2001b) indicates that exposure to the flood did result in a lasting negative impact on the level of income, lowering incomes by about 5 percent for severely flood-exposed households compared to non-exposed households.

Food Consumption

As described previously, the shortfall in rice production caused a large increase in the price of rice up to import parity levels. Vegetables and many other foods were also in short supply at the time of the flood, and households had to increase expenditures for health care and fuel. As a result, the caloric consumption of flood-exposed households in November 1998 was 227 kcal/person/day less than that of non-exposed households (Table 3). We found no evidence that the floods led to an increase in discrimination against females in food consumption within households, however. Female consumption of the main staples (rice and wheat) fell by the same amount as that of male consumption of these commodities as a result of the flood; nor was there an increase in male favoritism in the consumption of animal products (del Ninno et al. 2001).

The mean level of total household expenditure decreased from Tk 4,001 in the first round to Tk 3,663 in the second round and remained relatively stable at Tk 3,508 in the third round (Table 3). The main reason for this change in the average level of total expenditure is due to the decrease of nonfood expenditure from Tk 1,293 in the first round to Tk 842 in the second round and Tk 855 in the third round.[20] On average, households spent 68 percent of their budget on food in the first round, compared to 77 percent in the second and 76 percent in the third round.

As a consequence of the change in the expenditure pattern, the resulting consumption of calories per capita per day increased across the three rounds from 2,249 to 2,518 and 2,526, respectively. This increase was particularly large for poorer households, and especially so for those exposed to the flood. Caloric consumption of

[20] The larger expenditures in the first round were due mainly to expenses on housing, health, and fuel that occurred at the time of the flood. Expenditures on food, clothing, travel, personal, and other cheaper and unnecessary expenses were reduced, though purchases of food on credit increased.

Table 3—Mean values of household expenditure and caloric consumption, by expenditure categories, round of data collection, and the flood exposure

	Round 1			Round 2			Round 3		
	Not exposed to flood	Exposed	All	Not exposed to flood	Exposed	All	Not exposed to flood	Exposed	All
Household food	2,629	2,740	2,708	2,687	2,875	2,821	2,521	2,707	2,653
Household nonfood	1,215	1,324	1,292	755	876	842	828	866	855
Household total	3,843	4,064	4,000	3,442	3,751	3,663	3,348	3,573	3,507
Bottom 40 percent									
PC total	415	424	422	465	516	503	500	505	504
Share of food	77.8	72.6	73.9	80.1	80.0	80.0	79.7	78.9	79.1
Middle 40 percent									
PC total	748	743	745	674	704	695	664	670	668
Share of food	72.9	69.9	70.8	79.9	77.4	78.2	74.8	77.0	76.3
Top 20 percent									
PC total	1,394	1,434	1,423	1,052	996	1,013	1,051	1,033	1,038
Share of food	57.8	62.9	61.4	74.5	72.3	72.9	74.3	72.6	73.1
All									
PC total	761	747	751	679	684	683	685	674	677
Share of food	68.2	67.9	68.0	78.2	76.7	77.2	75.9	76.2	76.1
PC daily calories									
Bottom 40 percent	1,745	1,602	1,638	2,143	2,230	2,208	2,218	2,193	2,200
Middle 40 percent	2,653	2,325	2,428	2,778	2,537	2,613	2,680	2,528	2,577
Top 40 percent	3,049	3,140	3,114	3,176	2,847	2,943	3,204	3,015	3,071
All	2,411	2,184	2,249	2,637	2,471	2,518	2,623	2,486	2,526
Household size	5.05	5.55	5.4	5.06	5.49	5.37	4.92	5.4	5.26
Number	217	540	757	214	534	748	213	519	732

Source: FMRSP/IFPRI household survey 1998-99.

poorer households went from 1,638 kcal/person/day in Round 1 to 2,208 in Round 2 and 2,200 in Round 3, made possible by a sharp decrease in the price of rice, which fell from 16.1 Tk/kg in November/December 1998 to 13.1 Tk/kg and 11.9 Tk/kg in mid- and late 1999, respectively.

Households exposed to the flood spent less on rice, more on wheat, and more on prepared foods in the first than in the second and third rounds. In the following rounds, they reduced the budget share for rice and increased the budget shares for milk and fruits. This is partly due to the changes in the price of rice and also because the consumption of wheat was mostly driven by the larger distribution of wheat transfer programs that took place in early 1999. As a result, poor households were able to increase their level of per capita daily consumption from the period immediately following the flood in Round 1 (Table 4).

In particular, the amount spent on rice decreased over time for almost all households, with the exception of poor and flood-exposed households, in which case the amount actually increased. Nevertheless, the per capita daily quantities of rice consumed increased substantially for poor households exposed to the flood from 324 g in the first round to 392 g in the second round and 405 g in the third round (Table 5).

The percentage of households consuming *atta*[21] and wheat increased from 58 percent in the first round to 70 percent in the second round and decreased to 36 percent in the third round. At the same time, the amount spent on *atta* and wheat remained constant for all households in Rounds 1 and 2 but decreased in Round 3. As a result, the per capita daily consumption of *atta* and wheat (slightly higher for flood-exposed households) increased from 51 g to 65 g in the second round and then dropped to 20 g in the third round.

[21] *Atta* is low quality coarse wheat flour, which contains large amounts of bran.

Table 4—Average per capita daily consumption of food categories, by expenditure categories and round of data collection (grams), all households

	Round 1				Round 2				Round 3			
Categories	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total
Rice	324.0	463.7	517.1	418.4	392.5	441.5	472.8	428.3	404.6	463.1	470.1	441.2
Wheat	51.3	52.7	47.4	51.1	64.7	72.1	50.7	64.8	23.2	18.3	19.3	20.4
Bread and other cereals	0.6	2.4	3.2	1.8	3.0	5.0	5.3	4.3	4.1	4.6	8.8	5.2
Pulses	14.0	16.9	23.9	17.1	21.4	23.6	27.9	23.6	20.7	22.0	26.8	22.5
Oil	5.1	8.3	13.2	8.0	5.8	8.7	12.6	8.4	6.8	8.9	12.9	8.9
Vegetables	123.1	200.1	293.1	187.8	203.1	280.1	333.3	260.2	147.9	193.4	254.6	187.5
Meat	3.1	8.9	23.3	9.5	5.3	9.5	17.5	9.5	6.2	9.6	18.0	9.9
Egg	1.6	3.9	7.7	3.7	2.5	4.2	6.4	4.0	2.2	3.8	5.4	3.5
Milk	5.0	16.9	31.5	15.1	23.4	33.2	52.4	33.1	9.4	18.3	25.9	16.3
Fruits	10.9	28.2	58.7	27.3	40.0	79.2	118.8	71.6	49.9	69.2	97.6	67.2
Fish	19.7	43.8	81.8	41.8	15.1	28.5	43.3	26.1	43.5	51.4	75.3	53.0
Spices	21.6	25.0	29.4	24.5	21.5	24.2	28.9	24.0	23.0	23.9	27.8	24.3
Sugar and snacks	11.3	24.2	49.6	24.1	19.6	28.6	46.3	28.6	20.0	32.0	45.6	29.9
Drinks and others	6.9	9.0	15.6	9.5	7.9	9.1	12.8	9.4	9.3	11.6	18.8	12.1
Prepared foods	11.4	11.9	33.7	16.0	7.0	6.1	8.5	7.0	7.1	7.3	11.3	8.0
N	303	303	151	757	298	299	151	748	291	295	146	732

Source: FMRSP/IFPRI household survey 1998-99.

Table 5—Average per capita daily consumption of food categories, by expenditure categories and round of data collection grams, households exposed to the flood

	Round 1				Round 2				Round 3			
Categories	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total	Bottom 40 percent	Middle 40 percent	Top 20 percent	Total
Rice	303.5	429.4	505.5	393.0	389.7	414.8	447.6	411.2	400.2	435.9	456.4	425.5
Wheat	55.1	57.3	51.3	55.2	68.3	65.5	51.8	63.9	23.5	20.3	16.7	20.9
Bread and other cereals	0.6	2.3	2.9	1.7	2.6	5.3	4.7	4.0	4.5	5.0	9.1	5.7
Pulses	16.1	17.2	25.1	18.4	25.1	24.5	28.5	25.5	23.4	24.9	28.6	25.0
Oil	5.3	8.3	12.7	8.0	6.0	8.7	12.2	8.3	6.9	9.0	12.5	8.8
Vegetables	112.3	174.0	285.9	171.2	207.7	270.2	318.2	254.4	136.3	178.9	242.0	174.3
Meat	3.5	9.0	23.2	9.6	6.0	9.5	14.9	9.2	6.5	9.2	17.4	9.7
Egg	1.3	3.9	7.6	3.6	2.4	4.3	6.1	3.9	1.8	3.8	5.0	3.2
Milk	4.0	14.9	26.6	12.8	24.4	34.4	49.7	33.4	7.3	17.9	22.3	14.5
Fruits	10.4	25.5	59.3	26.1	40.1	77.7	113.5	69.6	50.6	69.0	100.4	67.8
Fish	19.3	46.3	85.9	43.2	15.8	27.2	40.7	25.2	44.1	52.4	75.5	53.7
Spices	21.9	25.0	30.2	24.8	21.9	24.2	28.9	24.2	23.1	23.1	27.4	24.0
Sugar & snacks	11.5	23.7	50.1	24.0	19.7	28.8	47.0	28.8	20.8	33.9	43.4	30.4
Drinks & others	8.0	10.5	18.1	11.0	9.0	9.7	13.5	10.2	10.8	12.5	20.8	13.5
Prepared foods	14.7	14.6	41.5	20.1	9.1	8.0	9.3	8.7	9.3	8.2	14.7	10.0
N	222	209	109	540	219	206	109	534	212	202	105	519

Source: FMRSP/IFPRI household survey 1998-99.

Health and Nutrition

The flood caused a major deterioration in the quality of household health. It damaged or destroyed homes, reduced access to safe water, and destroyed or damaged toilet facilities. These factors, combined with the reduction in food consumption, led to substantial increases in illness—even after the floodwaters receded. Individuals in all age groups experienced deterioration in health status in November–December 1998, especially those who were severely or very severely flood exposed. While adolescents had the greatest increase in illness, the most serious health problem posed by the flood was illness among children. This is because illness among children has more negative consequences, even threatening their survival (del Ninno et al. 2001).

The flood led to increases in both wasting and stunting among preschool children: severe or very severe flood exposure caused many children to lose weight and/or fail to grow at a critical period in their mental and physical development. This situation was brought about by a combination of factors, including reduced access to food, increased difficulties of providing proper care for children who came with disruptions in home life, and greater exposure to contaminants.

At the time of the first round of data collection, 55 percent of children in the sample were stunted and 22 percent were wasted. A year later, children exposed to the flood were still suffering from the consequences of the flood. Fifty-eight percent of the children in flood-exposed households were stunted. These children may never recover from the adverse impact of the flood.

Table 6 shows that the percentage of stunted children had increased by the second round, perhaps because of a lag between a period of deprivation and the resulting malnutrition. The situation improved substantially by the third round, especially for nonflood-exposed households. For flood-exposed households, the percentage of stunted children for those in the bottom two quintiles remained much higher than that of households in the top quintile a year after the flood (at the time of Round 3). This

suggests that the flood may have had a serious long-lasting impact on the nutritional status of poor children who were directly exposed to the flood.

Table 6—Stunting, by expenditure category, household flood exposure, and round

	Not exposed			Exposed			All		
	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
Bottom 40 percent (rate)	57.1	59.0	44.4	64.9	69.6	64.9	63.4	67.4	61.0
Number	35	39	36	148	148	151	183	187	187
Middle 40 percent (rate)	50.0	61.1	63.2	43.7	58.0	50.5	45.5	59.0	54.1
Number	34	36	38	87	81	97	121	117	135
Top 20 percent (rate)	45.5	53.9	50.0	46.2	57.8	53.9	46.0	56.9	52.9
Number	11	13	16	39	45	52	50	58	68
Total (rate)	52.5	59.1	53.3	55.5	64.2	58.3	54.8	63.0	57.2
Number	80	88	90	274	274	300	354	362	390

Source: FMRSP/IFPRI household survey 1998-99.

Table 7 shows that the nutritional status of children in terms of wasting worsened at the time of the second round and then improved substantially for nonflood-exposed households. This trend is similar to a typical seasonal pattern observed in Bangladesh. The lowest prevalence of wasting occurs in February, and the highest from April until August. It is clear that the percentage of wasted children was higher in the fall of 1998 than normal. But while children in nonflood-exposed households returned to a normal situation for that time of the year, the percentage of children in flood-exposed households

Table 7—Wasting, by expenditure category, household flood exposure, and round

	Not exposed			Exposed			All		
	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
Bottom 40 percent (rate)	22.9	25.6	13.9	24.3	19.6	18.5	24.0	20.9	17.7
Number	35	39	36	148	148	151	183	187	187
Middle 40 percent (rate)	20.6	11.1	15.8	20.7	18.5	21.7	20.7	16.2	20.0
Number	34	36	38	87	81	97	121	117	135
Top 20 percent (rate)	27.3	30.8	12.5	18.0	11.1	17.3	20.0	15.5	16.2
Number	11	13	16	39	45	52	50	58	68
Total (rate)	22.5	20.5	14.4	22.3	17.9	19.3	22.3	18.5	18.2
Number	80	88	90	274	274	300	354	362	390

Source: FMRSP/IFPRI household survey 1998-99.

that were wasted did not improve very much, with the exception of children in households in the top quintile of expenditure class.

It is important to stress that the nutritional situation observed in our data for November–December 1998 for the first round and April 1999 for the second round, following the flood, are quite unusual for Bangladesh. In fact, the results of the nutrition surveillance project of Helen Keller International and the Institute of Public Health and Nutrition (HKI/IPHN 1999) show that the usual trend in Bangladesh is to have an increase in the percentage of children who suffer from diarrhea and who are wasted in the period corresponding to the annual floods, between July and August. The percentage of children wasted is at its lowest between December and February.

The percentage of children who suffered from diarrhea in the fall of 1998 was much larger than in 1999, a year after the flood. Overall, 17 percent of the children in the sample suffered from diarrhea in November/December 1998, compared to only 9 percent a year later. This high prevalence of diarrhea in late 1998 may help explain the large increase in the percentage of stunting at the time of the second round of data collection, (April 1999), in spite of the general trend reported by the HKI surveillance project (HKI 1997), showing a decrease in the rates of stunting between 1991 and 1997.

The econometric analysis by del Ninno and Lundberg (2001) confirms that 15 months after the flood (at Round 3), most children appear to have regained the nutritional status they had a few months after the flood (at Round 1). Unfortunately, those children who had a very poor nutritional status at the time of Round 1, in November 1998, and who were exposed to the flood (over 40 percent of the sample), had not regained the nutritional status they had at Round 1 by Round 3. These children were less likely to recover from the shock of the flood, and therefore suffered long-term consequences.

Government Food and Cash Transfers

In response to the flood, the Government of Bangladesh used two main direct transfer relief programs. In the initial flood period, immediate relief through the

Gratuitous Relief program went mainly to seriously flood-exposed households; 35.7 percent of severely flood-exposed households received the transfer, compared to 9.7 percent of nonflood-exposed households.

Vulnerable Group Feeding transfers started in late October and were targeted administratively through union-level committees. They were better targeted to poor than to flood-exposed households. Of the households in the bottom quintile, 38.8 percent received grain transfers compared to 17.2 and 11.2 percent in the top two quintiles. However, almost 20 percent of the nonflood-exposed households received transfers as well (del Ninno and Dorosh 2001).

The survey suggests that government direct transfers were for the most part well targeted to flood-exposed households and to the poor. Yet government transfers were small relative to the needs of households, as indicated by the share of the transfers compared to the monthly expenditure (Table 8).

Table 8—Coping strategies, flood exposure, and poverty in November 1998

	Flood exposed					
	Bottom 40 percent	Middle 40 percent	Top 20 percent	All	Not exposed	All households
Monthly households expenditure (taka)	2,414	3,974	7,721	4,064	3,844	4,001
Share of food expenditures (percent)	72.4	69.5	62.2	67.4	68.4	67.7
Households in debt (percent)	68.2	58.9	62.6	63.5	53.5	60.6
Share of monthly expenditure (percent)	186.1	138.7	131.3	144.4	140.2	143.6
Household purchasing food on credit (percent)	56.7	54.1	50.5	54.4	29.5	47.3
Share of monthly expenditure (percent)	37.6	27.2	17.3	25.8	20.0	25.0
Households receiving government transfers (percent)	60.7	54.1	32.7	52.6	33.6	47.2
Share of monthly transfer on expenditure (percent)	3.4	2.4	0.8	2.0	2.1	2.0
Households selling assets (percent)	25.2	21.3	15.9	21.9	20.3	21.4
Share of monthly expenditure (percent)	45.5	51.3	75.3	51.9	44.2	49.9
Number of households	226	207	107	540	217	757

Source: FMRSP/IFPRI household survey 1998-99.

Small amounts of cash transfers were part of the initial flood relief efforts, but larger cash transfers or credit programs were not part of the medium-term relief to households two to four months after the floods, even though foodgrain stock constraints limited the expansion of the VGF program during this period.

Household Coping Mechanisms

Households adjusted to the shock of the flood in several major ways: reducing expenditures, selling assets, and borrowing. Borrowing to purchase food and to fund other expenses (such as education and health, farming, business, repayment of loans, marriage and dowry, purchases and mortgage of land/agricultural equipment purchases, etc.) has been the most important coping strategy employed by households in Bangladesh after the flood, both in terms of the value of the resources and the number of households that borrowed.

More than 60 percent of poor, flood-exposed households in the sample borrowed money in the months immediately following the flood; of these, more than half borrowed money for food (Figure 2). Household debts rose to an average of 1.5 months of typical consumption compared with only a small percentage of monthly consumption in January 1998, about eight months before the floods (Table 8). This borrowing was sufficient to maintain household expenditure levels in value terms vis-à-vis pre-flood levels, but because of higher prices, the purchasing power of poor flood-affected households declined. As a result, poor flood-exposed households consumed only 1,602 kcal/person/day, suggesting that targeted cash transfers and credit programs could have been an effective complement to direct food distribution. Households borrowed mostly from non-institutional sources such as friends and neighbors rather than from NGOs and banks. Interest rates on the loans ranged from 21 percent from institutional sources to a maximum of 67 percent.

The percentage of households with outstanding debt one year after the flood, reported in Table 9, decreased progressively from November 1998. At that point household debt was at its highest, with 66 percent of the households holding an average of Tk 7,937 in outstanding debt; it decreased to 54 percent of household in November 1999, with an average debt of Tk 6,497. Despite the improvement, the number of households in debt and the amount of debt of the number of households in debt remains

Figure 2—Percentage of households taking a loan, by month and reason, between January 1998 and November 1999

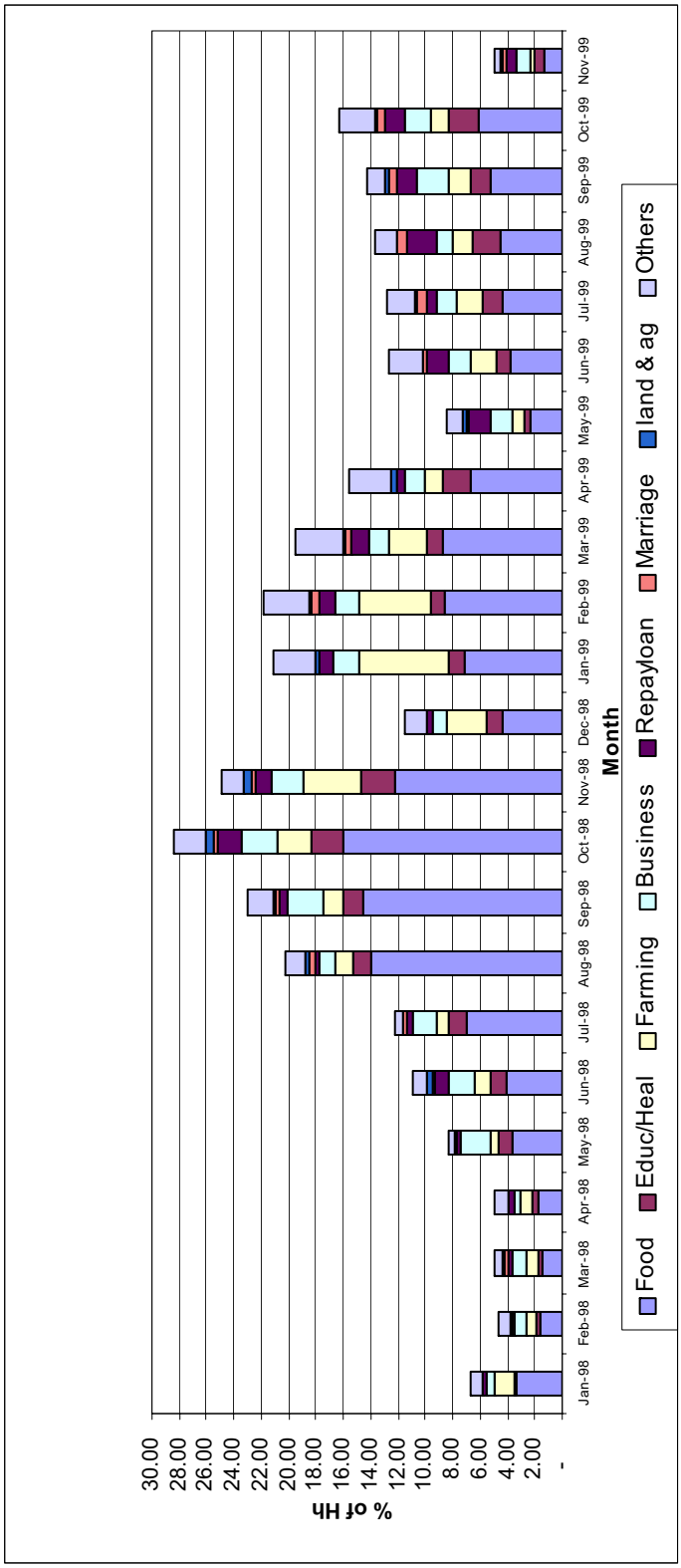

Table 9—Percentage of households with outstanding loans and average amount of debt, by time period, expenditure category, and flood exposure

Period	Exposed to flood in 1998	Bottom 40 percent		Mid 40 percent		Top 20 percent		All	
		Household having outstanding	Average amount	Household having outstanding	Average amount	Household having outstanding	Average amount	Household having outstanding	Average amount
		(percent)	(taka)	(percent)	(taka)	(percent)	(taka)	(percent)	(taka)
Up to December 97	Not exposed	7.8	11,958	10.4	14,455	27.3	21,592	12.9	16,978
	Exposed	7.5	8,264	7.3	34,091	10.3	25,682	8.0	21,729
	All	7.6	9,227	8.3	26,236	15.2	23,548	9.4	19,856
Up to November 98	Not exposed	66.2	4,368	53.1	9,752	54.6	10,565	58.1	7,728
	Exposed	75.2	5,375	65.2	7,257	66.4	15,738	69.6	8,008
	All	72.9	5,143	61.4	7,941	62.9	14,431	66.3	7,937
Up to May 99	Not exposed	50.7	3,911	50.0	4,574	54.6	15,954	51.2	6,801
	Exposed	68.6	4,465	64.3	5,553	56.1	9,217	64.4	5,700
	All	64.0	4,353	59.7	5,293	55.6	11,142	60.6	5,966
Up to November 99	Not exposed	46.8	3,839	39.6	7,369	45.5	17,176	43.3	8,104
	Exposed	64.2	3,991	53.6	7,142	52.3	9,012	57.8	6,014
	All	59.7	3,961	49.2	7,200	50.3	11,160	53.6	6,497

Source: FMRSP-IFPRI Household Survey 1998–99.

Note: The percentages relative to November 98 are slightly higher than those reported in Table 8, because the figures in Table 8 have been calculated using only data from the first round and those reported here include data from the second round as well.

large, and the debt represents a large share of the total expenditure, leaving those households vulnerable to another shock.

4. Policy Impacts on Calorie Consumption

The trade liberalization that enabled private-sector imports to stabilize rice prices and government-targeted food transfers both increased access to food by poor households. In this section, we estimate the contribution of these policies to maintaining household caloric consumption using price and income elasticities of demand from econometric analysis of household consumption data.[22]

We first estimate a reduced form equation of the total level of calories available at the household level regressed on income, prices, and other household characteristics. Then, as a check on the reliability of these estimates, we estimate an equation for rice demand (which accounts for 67 percent of calories consumed by the poorest 40 percent of households surveyed in the first round and 71 percent in the third round). Finally, we use the estimated parameters to simulate the effects of alternative rice prices and transfers on calorie consumption.

Determinants of Calorie Consumption

Using data from the three rounds of the FMRSP-IFPRI household flood survey, we first estimate a static model in which the logarithm of total calories is assumed to be a function of prices, income, values of loans taken, household characteristics (including the composition of the household), the village flood exposure variable,[23] and an error term:

$$\ln CAL_t = \alpha_t + \Sigma_i \beta_{it} \ln P_{it} + \gamma_t Y_t + \delta_t \ln Loan_t + \nu_t H + \eta\ VF + \varepsilon_t\ . \qquad (1)$$

[22] Alderman (1993), Bouis and Haddad (1992), and Grimard (1996) summarize the results of various attempts to estimate the effect of income and prices on calorie consumption (including those of Behrman and Deolalikar 1988; Strauss and Thomas 1990; Subramanian and Deaton 1996; among others). Estimates of calorie income elasticities in the literature vary from 0.03–0.59 in the Philippines (Bouis and Haddad 1992) to 0.78–0.82 in Bangladesh (Pitt 1983).

[23] The village flood exposure variable has been calculated as the median of the households' flood exposure.

Equation 1 was estimated using data from each round of the survey separately, as well as with data from all three rounds together. In order to correct for endogeneity of total expenditures (a proxy for total income) and loans received, we have used fitted values for these variables, with household- and village-level characteristics as instruments.[24] To control for the effects of unobservable errors across *thanas*, we also estimated all these equations with a fixed-effects model, including dummy variables for individual *thanas*.

A second model that takes into account the panel characteristics of the data set was also estimated. In this model, we express all variables in terms of first differences, i.e., the change in the value of the variable between rounds (between Rounds 1 and 2 and Rounds 2 and 3). In this way, we removed the effects of the time-variant household unobservable component of the error term:

$$\text{dlnCAL}_t = \text{lnCAL}_t - \text{lnCAL}_{t-1} = \alpha_t + \eta\ \text{lnCAL}_{t-1} + \Sigma_i\ \beta_{it}\ \text{dlnP}_{it} + \gamma_t\ dY_t + \delta\ \text{dlnLoan}_t + \nu\ H + \eta\ VF + \mu_t\ . \qquad (2)$$

This model was first estimated for the first difference between Rounds 2 and 1 and then for the difference between Rounds 3 and 2, separately. Both sets of regressions were run first without *thana* dummy variables, which do not change between rounds, and then included those variables. We also estimated regressions for all the first differences between Rounds 3 and 2 and 1 together, first using *thana* dummies and then using a full fixed-effect model in which all common characteristics at village and household level were taken into account.

[24] The instruments used in the equation include: *Household characteristics:* a) wealth and other assets; b) number of males and females with elementary and secondary education; c) number of people engaged in four types of earning income activities; d) housing characteristics (electricity, number and material of buildings, and sanitation). *Community-level characteristics:* a) infrastructures (roads, bridges, etc.); b) markets (distance from district and number of markets, shops); c) number of business activities, including poultry rearing; d) prevailing wage rates; e) government subsidies in 1998 and 1999.

Determinants of Rice Consumption

Similarly, we estimated equations for the demand for rice, using the value of rice expenditures as the dependent variable. As for the demand for calories, we first estimated a set of models specified in level terms (equation 3) for Rounds 1, 2, and 3 separately and with a pooled data set:

$$\ln VRice_t = \alpha_t + \Sigma_i \beta_{it} \ln P_{it} + \gamma_t Y_t + \nu_t H + \eta\ VF + \varepsilon_t\ . \qquad (3)$$

Likewise, we estimated first-difference models in which the difference in the value of rice consumed between rounds of data collection are expressed as a function of the lagged consumption value, the difference in prices, the difference in total expenditure, and household characteristics:

$$\begin{aligned} d\ln VRice_t = \ln VRice_t - \ln VRice_{t-1} = \alpha_t + \eta\ \ln VRice_{t-1} + \Sigma_i \beta_{it}\ d\ln P_{it} \\ + \gamma_t\ dY_t + \nu\ H + \eta\ VF + \mu_t\ . \end{aligned} \qquad (4)$$

Econometric Results

Table 10 summarizes the results. (See Appendix Tables 13 and 14 for full results.) In the demand-for-calories levels model with *thana*-fixed effects, the coefficients on the logarithm of per capita expenditure and logarithms of the prices of rice, oil, vegetables, and prepared foods are all significant at the 99 percent confidence level, with an expenditure elasticity of demand for calories of 0.445 and a rice price elasticity of demand of –0.362. Using the first-differences model, the absolute magnitudes of these elasticities fall to 0.363 and –0.142, respectively, but are both still significant at the 95 percent confidence level.

Using the parameters from these regressions, changes in rice prices and household incomes account for about one-fourth to one-half of the change in calorie consumption from Round 1 to Round 2 of the survey. The poorest 40 percent of households in the

Table 10—Summary of regression model results

	Levels model (*thana* fixed effects)	1st Diff. Model (household fixed effects)	Levels model (*thana* fixed effects)	1st Diff. Model (village fixed effects)
Dependent variable	Ln Calories	Ln Change in Calories	Ln Rice Value	Ln Change in Rice Value
Lagged dependent		–1.023		–0.894
		(6.60)**		(40.04)**
Flood exposure	0.010		–0.018	
	(–0.65)		(–0.59)	
Log loans	0.001	0.004		
	(–0.11)	(–0.3)		
Log PC Expend.	**0.445**	**0.363**	**0.349**	**0.275**
	(14.79)**	(2.12)*	(7.56)**	(4.22)**
P Rice	**–0.362**	**–0.142**	**0.551**	**0.679**
	(9.03)**	(2.20)*	(6.70)**	(5.52)**
P Wheat/Atta	–0.022	–0.073	–0.127	0.131
	(–0.42)	(–1.43)	(–1.33)	(–0.86)
P Other Cereals	–0.018	–0.036	–0.019	–0.116
	(–1.04)	(–1.56)	(–0.53)	(2.53)*
P Pulses	0.040	–0.004	0.091	0.001
	(–0.92)	(–0.10)	(–1.18)	(–0.01)
P Oil	–0.091	–0.067	–0.079	0.006
	(2.81)**	(2.05)*	(–1.32)	(–0.08)
P Vegetables	–0.091	–0.017	–0.019	0.082
	(3.06)**	(–0.35)	(–0.36)	(–1.26)
P Meat	–0.001	0.025	–0.012	0.015
	(–0.03)	(–0.86)	(–0.24)	(–0.21)
P Eggs	0.013	–0.028	–0.072	–0.075
	(0.62)	(–1.39)	(–1.58)	(–1.37)
P Milk	–0.043	–0.024	0.091	0.043
	(–1.20)	(–0.54)	(–1.60)	(–0.46)
P Fruits	–0.009	–0.012	–0.033	–0.021
	(–0.64)	(–0.67)	(–1.26)	(–0.60)
P Fish	–0.022	0.005	0.014	–0.008
	(–1.19)	(–0.33)	(–0.34)	(–0.19)
P Spices	–0.086	–0.013	–0.211	–0.048
	(2.17)*	(–0.33)	(2.25)*	(–0.51)
P Snacks	0.031	–0.01	–0.001	0.052
	(–1.23)	(–0.44)	(–0.01)	(–0.98)
P Tea/Bev./etc.	–0.022	–0.012	0.030	0.005
	(–1.41)	(–0.76)	(–0.71)	(–0.14)
P Prepared Food	–0.051	–0.067	0.001	–0.084
	(2.29)*	(2.06)*	(–0.02)	(–0.98)
Constant	–2.024	0.953	3.693	3.412
	(10.06)**	(3.43)**	(12.16)**	(8.38)**
Observations	2,071	1,370	2,061	1,358
R-squared	0.55		0.42	
N. Clusters		693		111

Notes: Robust t statistics in parentheses. + significant at 10 percent; * significant at 5 percent; ** significant at 1 percent.

sample increased their per capita calorie consumption from an average of 1,069 kcal/day in Round 1 to 1,295 kcal/day of rice in Round 2, an increase of 570 kcal/day. Given an 18.7 percent decrease in the average rice price from Tk 16.04 kg to Tk 13.04 kg and a 19.3 percent increase in total expenditures from Tk 422 to Tk 503 person/month, the calorie-demand regression coefficients imply a 160–272 kcal increase in daily per capita consumption (Table 11).

Regressions on the value of rice consumption give results that are broadly consistent with the calorie regressions. Using data on the levels of all variables and

Table 11—Simulated change in calorie demand: Round 1 compared to Round 2

	November/ December 1998	April/ May 1999	Fitted value low elasticity[a]	Fitted value high elasticity[b]
Rice price (taka/kg)	16.04	13.04	13.04	13.04
Total expenditures (taka/capita/month)	422	503	503	503
Total calorie consumption (kcal/person/day)	**1,638**	**2,208**		
Calorie demand function estimates				
Calorie-rice price elasticity			–0.142	–0.362
Change in calories due to rice price change			49	128
Calorie-income elasticity			0.363	0.445
Change in calories due to income change			108	134
Total change in calories (versus November/December 98)	**0**	**570**	**160**	**272**
Rice demand function estimates				
Rice consumption (g/person/day)	324	392	363	378
Calorie consumption (kcal/person/day)				
Rice calories	1,069	1,295	1,199	1,248
Total change in rice calories	0	226	130	179
Price effect			73	104
Income effect			53	68
Other food calories	569	913	622	622
Total change in other food calories[c]			52	52
Total calories			1,821	1,869
Total change in calories (versus November/December 98)	**0**	**570**	**183**	**231**

Source: Authors' calculations

[a] Elasticity estimates from fixed-effects difference model.
[b] Elasticity estimates from fixed effects, all rounds levels model.
[c] Other food calories assumes an income elasticity of demand for other food of 0.5, with no price effects.

fixed-effects estimation of the equation, the expenditure elasticity of demand for rice is 0.349 and own-price elasticity of demand is –0.449 (column 3, Table 10).[25] As is the case for the calorie demand regression, elasticities from the fixed-effects model using the differences in values relative to Round 1 are smaller in absolute magnitude, 0.275 and -0.321 (column 4), for expenditure and price elasticities, respectively. The expenditure and price elasticities estimated from the rice demand regression imply a 130–179 kcal/person/day increase in rice consumption. Assuming a 0.5 income elasticity of demand for nonrice calories associated with an additional 52 kcal/person/day, the resulting change is equal to 183–231 kcal/person/day, within the range of estimates from the calorie demand regression.[26]

Counterfactual Simulations

How much did price stabilization and government-targeted transfers contribute to calorie consumption of the poor following the 1998 floods? As shown in Table 12, estimates based on the parameters from the calorie demand regressions suggest that per capita consumption of the rural poor would have been 44–109 kcal/day less if private-sector rice trade from India had been prohibited and the rice price were 19.4 percent higher (equal to the import parity price of rice imports from Thailand). Given the already very low average per capita consumption of only 1,638 kcal/day, such a reduction could have had serious nutritional consequences. And in the absence of any private-sector imports, if government imports were constrained by administrative delays or shortages of funds and prices increased by 30 percent, per capita calorie consumption could have fallen by 60–148 kcal/day.

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[25] Note that since the dependent variable is the logarithm of the value of rice consumption, the coefficient on the logarithm of rice price is equal to the elasticity of demand plus one.

[26] Note that much of the remaining discrepancy between the estimates presented in Table 11 and the actual 570 kcal/person/day change in consumption observed between Rounds 1 and 2 is likely due to price changes in other goods (particularly vegetable oils, prepared foods, vegetables, and meat) that may explain the 344 increase in kcal/person/day from nonrice foods between these rounds of the survey.

Table 12—Estimated price and income effects on calorie consumption: Counterfactual simulations

			Calories/person/day		
	Rice price	Income	Price effect	Income effect	Total
	(taka/kg)	(taka/cap/month)			
November/December 1998	16.04	422			1,638
April/May 1999					
Actual	13.04	503			2,208
Difference relative to November/December 98					
Survey results					570
Inelastic demand parameters			49	108	160
Elastic demand parameters			128	134	272
November/December 1999					
Actual	12.00	504			2,200
Difference relative to November/December 98					
Survey results					561
Inelastic demand parameters			69	108	182
Elastic demand parameters			181	134	330
Counterfactual simulations, December 1998 (higher rice price; no government transfers)					
1. Rice price + 21 percent; inelastic	19.41	408	–44	–20	–64
2. Rice price + 21 percent; elastic	19.41	408	–109	–25	–133
3. Rice price + 30 percent; inelastic	20.85	408	–60	–20	–80
4. Rice price + 30 percent; elastic	20.85	408	–148	–25	–171

Source: Authors' calculations.

Notes: Inelastic parameters: calorie-rice price elasticity = –0.142; calorie income elasticity = 0.363. Elastic parameters: calorie-rice price elasticity = –0.362; calorie income elasticity = 0.445.

The contribution of direct transfers to households, mainly through the Vulnerable Group Feeding program, was also significant. In the absence of these transfers, per capita calorie consumption would have fallen by an estimated 20–25 kcal/day. Combined, private-sector trade from India and government transfers added 64–133 kcal/person/day in comparison with unsubsidized trade from Bangkok.

To maintain calorie consumption at the actual November/December 1998 levels with a 21 percent higher rice price, targeted transfers would have had to be three to five times larger than the 70 thousand tons/month distributed in October–December. Alternatively, cash transfers of an equivalent value could have been used to supplement

household income.[27] As indicated in the previous section, private-sector borrowing was a major coping strategy of the poor following the flood. With prices of rice and wheat equal to import parity levels and private-sector trade flows uninhibited, cash transfers to supplement direct food transfers might have been a viable policy alternative for increasing calorie consumption during this period. In addition to possible inflationary effects on food prices, cash transfers may have incurred higher leakages (though coupling the cash transfers to food transfers may have prevented the rate of leakages from increasing).[28]

5. Conclusions

In this paper, we have shown that private markets can contribute significantly to food security following a major natural disaster. Following the 1998 flood in Bangladesh, private-sector imports of rice from India supplemented domestic food supplies, stabilizing rice prices and preventing a further deterioration in households' purchasing power and calorie consumption. Without this private cross-border trade, rice prices would likely have been at least 19 percent higher (to a level equal to the import parity price of rice from Thailand) and total calorie consumption of the poor would have fallen by an additional 44–109 kcal/person/day to 1,529–1,594 kcal/person/day.

Nonetheless, government policy did play a major role in avoiding a major food crisis after the flood. Government long-term agricultural and investment policies enabled a long-term expansion in the winter season (*boro*) rice crop that has reduced the country's dependence on the flood-susceptible monsoon season (*aman*) rice crop. Investments in infrastructure and promotion of private-sector trade, including liberalizing rice and wheat

[27] In the calorie demand regressions, food transfers do not have a significant impact on consumption apart from their effect on increasing incomes. Other studies have suggested that marginal propensities to consume (MPC) food out of targeted food transfers may be higher than the MPC out of cash income. See Ahmed (1993); del Ninno and Dorosh (2000); and Ahmed, del Ninno, and Chowdhury (2001).

[28] Cash transfers may have had larger fiscal implications, as well, since donors may not have been as willing to provide resources for a cash program.

import trade in the early 1990s, have helped develop efficient and competitive foodgrain markets that quickly responded to the impending production shortfall.

Short-term government policy focused on public foodgrain distribution targeted to flood-exposed or poor households. Government transfers through the Gratuitous Relief and Vulnerable Group Feeding programs added to household food security and helped children maintain or improve their nutritional status. Nonetheless, these programs were small relative to the needs of households (only one-sixth to one-eighth the size of household borrowing).

Borrowing from private-sector sources was the major household coping strategy in the initial three months after the flood. However, the reliance of poor and flood-exposed households on private-sector borrowing had adverse implications for food security and economic growth in the medium term. Fifteen months after the flood, household debts still averaged 146 percent of one month's average consumption for the 64.2 percent of flood-exposed households in the bottom two quintiles of the expenditure distribution who were in debt. For the poorest two quintiles of total households (flood-exposed and nonflood-exposed), debts averaged 150 percent of monthly expenditures (see Table 9).

To eliminate borrowing following the flood would have required a transfer of approximately Tk 5,000 (approximately $100) for each of the 60 percent of the household that were in debt in December 1998, several months after the flood. At the national level, total private borrowing by households may have reached $1.0–1.5 billion, compared to Tk 303.7 billion ($6.35 billion) in total government expenditures in 1998/99 and about $0.6 billion of annual loan disbursements of the Grameen Bank and the Bangladesh Rural Advancement Committee (BRAC) together.[29]

Moreover, the flood had a long-term negative impact on the nutritional status of preschool children, whose nutritional status was already very low. Thus, medium-term

[29] BRAC loan disbursement in 1999 was Tk 10,880 million ($218 million); Grameen disbursement in May 2001 was 1681 million ($31.13 million).

policies that reduce malnutrition among children would also be effective in softening the negative impact of natural shocks like the flood. In the absence of effective policies to address chronic malnutrition, more children will remain vulnerable and have a lower probability of recovering in the event of a natural disaster, with long-term consequences on the level of human capital.

In summary, the Bangladesh flood experience illustrates the crucial role that private markets and appropriate government investments and policies can play in maintaining food availability, limiting price increases, and supplementing household access to food, thereby helping to avoid a major food crisis. Nonetheless, the poor did suffer, both in the short term through reduced consumption and increased illness, and in the medium term through increases in household debt and lingering nutritional consequences. These adverse effects underscore the need to combine policies that help stabilize availability of food with targeted public distribution, credit, or other safety net programs that ensure access to food by food-insecure households at the time of disasters. Finally, because poor households are more vulnerable to adverse economic shocks, reducing the negative impact of natural disasters on the poor will require effective policies and increased resources over the long term to reduce poverty, malnutrition, and the vulnerability of the poor to adverse economic shocks.

Appendix Tables

Table 13—Results of regression model (dependent variable: Ln of Level of Calories)

					Include *thanas* fixed effects			
	Round 1	Round 2	Round 3	All rounds	Round 1	Round 2	Round 3	All rounds
Log PC Expenditure	0.461	0.490	0.436	0.410	0.453	0.478	0.444	0.445
	(8.44)**	(10.46)**	(8.82)**	(11.44)**	(8.25)**	(9.74)**	(9.55)**	(14.79)**
Log Loans	-0.021	0.004	-0.036	-0.047	-0.005	0.025	-0.016	0.001
	(2.19)*	-0.3	(3.65)**	(3.88)**	-0.52	(2.01)*	-1.43	-0.11
P Rice	-0.213	-0.221	-0.417	-0.392	-0.065	-0.133	-0.336	-0.362
	-1.17	(3.40)**	(2.74)**	(7.98)**	-0.35	(1.94)+	(2.02)*	(9.03)**
P Wheat/Atta	-0.041	-0.283	0.160	-0.067	0.124	-0.198	0.216	-0.022
	-0.49	(3.35)**	(1.69)+	-1.16	-1.42	(2.13)*	(2.22)*	-0.42
P Other Cereals	-0.056	-0.040	0.002	-0.020	-0.037	-0.039	0.008	-0.018
	-1.29	-1.26	-0.08	-0.92	-0.88	-1.15	-0.31	-1.04
P Pulses	0.200	-0.044	0.098	0.060	0.064	-0.025	0.074	0.040
	(2.39)*	-0.68	-1.14	-1.18	-0.76	-0.31	-0.98	-0.92
P Oil	-0.089	-0.036	-0.131	-0.101	-0.142	-0.034	-0.102	-0.091
	-0.94	-0.73	(1.77)+	(2.54)*	-1.49	-0.56	-1.57	(2.81)**
P Vegetables	-0.123	-0.059	-0.068	-0.088	-0.085	-0.090	-0.040	-0.091
	(2.14)*	-0.91	-1.27	(2.60)**	-1.2	-1.2	-0.81	(3.06)**
P Meat	-0.031	0.004	0.011	0.013	-0.009	-0.019	0.030	-0.001
	-0.47	-0.08	-0.23	-0.38	-0.13	-0.31	-0.7	-0.03
P Eggs	0.003	0.002	-0.011	-0.006	-0.022	0.031	-0.007	0.013
	-0.07	-0.05	-0.28	-0.23	-0.5	-0.81	-0.21	-0.62
P Milk	0.045	0.002	-0.034	-0.030	-0.091	-0.003	-0.026	-0.043
	-0.69	-0.05	-0.51	-0.85	-0.93	-0.04	-0.37	-1.2
P Fruits	-0.005	-0.001	-0.042	-0.005	0.000	-0.003	-0.019	-0.009
	-0.16	-0.03	-1.31	-0.25	-0.01	-0.11	-0.59	-0.64
P Fish	-0.017	-0.075	-0.052	-0.044	-0.025	-0.022	-0.053	-0.022
	-0.48	(2.26)*	-1.47	(1.96)*	-0.7	-0.66	-1.58	-1.19
P Spices	0.010	-0.060	-0.074	-0.064	-0.068	-0.032	-0.057	-0.086
	-0.12	-0.9	-1.01	-1.33	-0.89	-0.44	-0.82	(2.17)*
P Snacks	0.089	-0.022	0.043	0.079	0.104	-0.036	0.028	0.031
	(1.67)+	-0.62	-1.07	(2.61)**	(1.94)+	-0.98	-0.75	-1.23
P Tea/Bev./etc.	-0.086	-0.016	-0.036	-0.008	-0.058	-0.047	-0.039	-0.022
	(2.46)*	-0.5	-1.32	-0.45	-1.58	-1.42	-1.57	-1.41
P Prepared Food	-0.048	-0.081	-0.041	-0.077	-0.089	-0.044	-0.043	-0.051
	-1.4	(2.04)*	-1	(3.20)**	(2.43)*	-0.86	-1.08	(2.29)*
Percent Males 0–4	-0.003	-0.003	0.000	-0.002	-0.003	-0.002	0.000	-0.002
	(1.79)+	(1.81)+	-0.24	(1.82)+	(2.05)*	-1.63	-0.29	(2.40)*
Percent Males 5–14	0.001	0.001	0.003	0.002	0.000	0.002	0.003	0.002
	-0.78	-1.62	(2.93)**	(2.71)**	-0.12	(2.30)*	(2.76)**	(2.80)**
Percent Males 15–19	-0.004	0.001	0.004	0.001	-0.004	0.001	0.003	0.001
	(2.11)*	-0.83	(2.35)*	-0.94	(1.99)*	-0.79	(1.92)+	-0.77
Percent Males 20–34	0.000	0.000	0.002	0.002	-0.001	0.000	0.002	0.001
	-0.08	-0.15	-1.42	(1.96)+	-0.57	-0.05	-1.32	-1.15
Percent Males 35–54	-0.001	0.001	0.002	0.002	-0.001	0.000	0.001	0.001
	-0.78	-0.34	-1.07	(1.74)+	-0.95	-0.18	-0.71	-0.61
Percent Fem. 0–4	-0.004	-0.003	0.001	-0.002	-0.004	-0.003	0.000	-0.002
	(2.82)**	(2.81)**	-0.45	(2.16)*	(2.98)**	(2.64)**	-0.04	(3.23)**
Percent Fem. 5–14	-0.001	0.000	0.001	0.000	-0.002	0.000	0.001	0.000
	-1.31	-0.19	-1.12	-0.59	(2.21)*	-0.1	-0.92	-0.55
Percent Fem. 15–19	0.000	0.000	0.003	0.001	-0.001	0.000	0.002	0.001
	-0.01	-0.1	-1.46	-0.78	-0.38	-0.22	-1.01	-0.6
Percent Fem. 20–34	-0.001	0.001	0.002	0.001	-0.002	0.001	0.001	0.000
	-0.61	-0.76	-0.97	-0.84	-1.14	-0.66	-0.4	-0.11
Percent Fem. 35–54	0.001	0.002	0.004	0.003	0.000	0.002	0.003	0.002
	-0.75	-1.6	(2.27)*	(2.93)**	-0.11	-1.56	(1.99)*	(2.05)*
Household Size	-0.008	-0.002	-0.001	0.000	-0.006	-0.005	-0.003	-0.006
	-0.85	-0.27	-0.09	-0.06	-0.71	-0.89	-0.53	-1.44

continued

					Include *thanas* fixed effects			
	Round 1	**Round 2**	**Round 3**	**All rounds**	**Round 1**	**Round 2**	**Round 3**	**All rounds**
Flood Exposure	-0.036	0.003	-0.020	0.006	0.012	0.026	-0.002	0.010
	-1.21	-0.12	-0.79	-0.33	-0.41	-0.87	-0.09	-0.65
Madaripur					-0.003	-0.172	-0.039	-0.074
					-0.06	(3.01)**	-0.8	(2.63)**
Mohamedpur					0.102	-0.027	0.034	0.009
					(1.66)+	-0.41	-0.72	-0.26
Muladi					-0.148	-0.078	-0.025	-0.073
					(2.24)*	-1.23	-0.45	(2.17)*
Saturia					0.094	-0.108	0.038	-0.030
					-1.54	(1.87)+	-0.72	-1.03
Shibpur					0.088	-0.022	-0.006	0.024
					(1.82)+	-0.46	-0.15	-0.97
Sharasti					-0.192	-0.230	-0.104	-0.164
					(3.07)**	(4.42)**	(2.16)*	(5.35)**
Constant	-1.988	-2.363	-2.008	-1.712	-2.007	-2.288	-2.080	-2.024
	(5.31)**	(7.60)**	(6.70)**	(7.00)**	(5.40)**	(7.12)**	(7.50)**	(10.06)**
Observations	700	691	680	2,071	700	691	680	2,071
R-squared	0.48	0.57	0.49	0.33	0.53	0.55	0.58	0.55

Source: Authors' calculations.

Note: The excluded *thana* is Derai.

Table 14—Results of regression model (dependent variable: Change in Ln of Calories)

	Round 2 – Round 1	Round 3 – Round 2	Round 2 – Round 1	Round 3 – Round 2	All periods R.E.	All periods household fixed effects	All periods village fixed effects
Lag of ln PC Calories	-0.415	-0.300	-0.423	-0.253	-0.246	-1.023	-0.2288
	(8.35)**	(5.19)**	(7.76)**	(3.94)**	(4.32)**	(6.60)**	(3.57)**
Log PC Expenditure	**0.705**	**0.747**	**0.712**	**0.828**	**1.037**	**0.363**	**1.0537**
	(7.37)**	(8.01)**	(6.78)**	(7.45)**	(8.95)**	(2.12)*	(8.22)**
Log Loans	-0.001	-0.001	0.012	-0.018	0.003	0.004	0.0052
	-0.05	-0.1	-1.01	-1.62	-0.2	-0.3	-0.31
P Rice	**-0.174**	**-0.242**	**-0.123**	**-0.257**	**-0.333**	**-0.142**	**-0.3272**
	(2.21)*	(3.56)**	-1.62	(3.37)**	(5.31)**	(2.20)*	(4.82)**
P Wheat/Atta	-0.029	-0.127	-0.008	-0.132	-0.126	-0.073	-0.1239
	-0.36	-1.51	-0.1	-1.45	(2.05)*	-1.43	(1.91)+
P Other Cereals	-0.089	-0.014	-0.077	-0.036	-0.031	-0.036	-0.0217
	(2.17)*	-0.59	(1.93)+	-1.44	-1.19	-1.56	-0.79
P Pulses	-0.007	0.013	-0.001	0.028	0.011	-0.004	0.0179
	-0.12	-0.32	-0.01	-0.57	-0.23	-0.1	-0.37
P Oil	-0.045	-0.058	-0.005	-0.049	-0.078	-0.067	-0.0817
	-0.98	-1.52	-0.11	-1.11	(2.04)*	(2.05)*	(1.97)*
P Vegetables	-0.093	-0.095	-0.078	-0.093	-0.164	-0.017	-0.1728
	(1.96)+	(2.35)*	-1.48	(2.15)*	(4.55)**	-0.35	(4.49)**
P Meat	0.058	0.043	0.068	0.047	0.042	0.025	0.0436
	-1.16	-1.12	-1.42	-1.18	-1.25	-0.86	-1.21
P Eggs	-0.002	-0.044	0.009	-0.044	-0.028	-0.028	-0.0282
	-0.06	(1.66)+	-0.27	-1.5	-1.14	-1.39	-1.07
P Milk	-0.084	-0.031	-0.054	0.000	-0.114	-0.024	-0.1142
	-1.35	-0.7	-0.83	-0.01	(2.43)*	-0.54	(2.27)*
P Fruits	-0.019	-0.049	-0.017	-0.059	-0.056	-0.012	-0.0551
	-0.84	(2.49)*	-0.7	(2.64)**	(3.20)**	-0.67	(2.92)**
P Fish	-0.047	0.002	-0.033	0.006	-0.028	0.005	-0.0263
	(1.83)+	-0.07	-1.25	-0.24	-1.48	-0.33	-1.31
P Spices	0.013	-0.072	0.034	-0.068	-0.076	-0.013	-0.0871
	-0.24	-1.48	-0.6	-1.25	(1.73)+	-0.33	(1.88)+
P Snacks	-0.039	-0.035	-0.052	-0.035	-0.039	-0.010	-0.0407
	-1.3	-1.01	(1.73)+	-0.97	-1.47	-0.44	-1.46
P Tea/Bev./etc.	-0.014	0.001	-0.063	0.006	-0.019	-0.012	-0.0162
	-0.58	-0.03	(2.48)*	-0.27	-1.03	-0.76	-0.85
P Prepared Food	-0.078	-0.135	-0.086	-0.129	-0.111	-0.067	-0.1043
	(2.39)*	(3.28)**	(2.61)**	(3.08)**	(3.07)**	(2.06)*	(2.72)**
Percent Males 0–4	-0.003	0.000	-0.003	0.000	-0.001	0.001	-0.0006
	(1.96)*	-0.22	(2.20)*	-0.07	-0.5	-0.25	-0.49
Percent Males 5–14	-0.001	0.001	-0.001	0.001	0.000	-0.001	-0.0002
	-0.73	-0.91	-0.76	-0.74	-0.32	-0.53	-0.32
Percent Males 15–19	0.003	0.002	0.003	0.002	0.002	-0.003	0.0021
	-1.43	-0.9	(1.71)+	-1.21	-1.48	-1.03	(1.79)+
Percent Males 20–34	0.002	0.001	0.002	0.001	0.001	-0.005	0.0011
	-1.39	-1.16	-1.37	-1.05	-0.94	(2.01)*	-1.18
Percent Males 35–54	0.003	0.001	0.003	0.001	0.002	0.008	0.0013
	(1.96)*	-0.4	(2.09)*	-0.7	-1.56	(2.09)*	-1.13
Percent Fem. 0–4	-0.002	0.001	-0.002	0.000	0.000	0.002	0.0002
	(1.97)*	-0.51	(2.09)*	-0.25	-0.35	-0.54	-0.21
Percent Fem. 5–14	-0.001	-0.001	-0.001	-0.001	-0.001	-0.003	-0.0005
	-0.98	-0.56	-1.29	-0.51	-1.33	-1.36	-0.57
Percent Fem. 15–19	-0.001	0.000	-0.002	0.000	-0.001	-0.004	-0.001
	-0.9	-0.12	-1.08	-0.12	-1.08	-1.38	-0.88
Percent Fem. 20–34	0.002	0.000	0.002	0.001	0.001	0.012	0.0014
	-1.35	-0.16	-1.27	-0.3	-1.18	(3.93)**	-1.31
Percent Fem. 35–54	0.002	0.002	0.001	0.002	0.002	-0.002	0.0015
	-1.14	-1.3	-0.95	-1.12	-1.5	-0.55	-1.28
Household Size	0.007	0.003	0.006	0.008	0.007	-0.036	0.0072
	-0.96	-0.56	-0.86	-1.21	-1.44	-1.36	-1.27

continued

	Round 2 – Round 1	Round 3 – Round 2	Round 2 – Round 1	Round 3 – Round 2	All periods R.E.	All periods household fixed effects	All periods village fixed effects
Flood Exposure	0.006	-0.021	0.022	-0.052	-0.007		
	-0.2	-0.86	-0.67	(1.71)+	-0.25		
Madaripur			-0.149	0.048	-0.017		
			(2.86)**	-0.96	-0.45		
Mohamedpur			0.007	-0.086	0.003		
			-0.11	-1.58	-0.07		
Muladi			-0.039	0.027	-0.024		
			-0.88	-0.55	-0.65		
Saturia			-0.084	-0.067	-0.020		
			-1.47	-1.26	-0.44		
Shibpur			-0.077	0.029	-0.010		
			-1.51	-0.66	-0.26		
Sharasti			-0.196	0.055	-0.027		
			(3.45)**	-1.13	-0.68		
Constant	0.357	0.212	0.413	0.242	0.174	0.953	0.1241
	(3.82)**	(2.16)*	(3.82)**	(2.06)*	(1.82)+	(3.43)**	-1.29
Observations	691	679	691	679	1,370	1,370	1,370
R-squared	0.63	0.59	0.64	0.56			
Number of households					693	693	
N. Clusters							111

Source: Authors' calculations.

Note: The excluded *thana* is Derai.

References

Ahmed, A. 1993. *Food consumption and nutritional effects of targeted food interventions in Bangladesh*. Manuscript No. 31. Washington, D.C.: International Food Policy Research Institute

Ahmed, R., S. Haggblade, O. H. Chowdhury, and T. -e-Elahi. 2000. Out of the shadow of famine: Evolving food markets and food policy in Bangladesh. International Food Policy Research Institute, Washington, D.C.

Akhter, A., C. del Ninno, and O. H. Chowdhury. 2001. *Food for education study.* Food Management and Research Support Project Working Paper 35. Dhaka: International Food Policy Research Institute.

Alamgir, M. 1980. *Famine in south Asia—Political economy of mass starvation.* Cambridge, Mass., U.S.A.: Oelgeschlager, Gunn & Hain, Publishers, Inc.

Alderman, H. 1993. New research on poverty and malnutrition: What are the implications for policy? In *Including the poor*, ed. M. Lipton and J. van der Gaag. Regional and Sectoral Studies. Washington, D.C.: World Bank.

Baulch, R., J. Das, W. M. H. Jain, N. Farid, and S. Zohir. 1998. *The spatial integration and pricing efficiency of the private sector grain trade in Bangladesh: Phase II report*. Bangladesh Institute of Development Studies, Bureau of Socioeconomic Research and Training, Bangladesh Agricultural University, Institute of Development Studies, May, University of Sussex, Brighton, U.K.

BBS (Bangladesh Bureau of Statistics). 1998. *Report on household expenditure survey 1995/96*. Dhaka.

Behrman, J. R., and A. Deolalikar. 1987. Will nutrition in developing countries improve with income? A case study for rural south India. *Journal of Political Economy* 95 (3): 108–138.

Bouis, H. E., and L. Haddad. 1992. Are estimates of calorie-income elasticities too high? A recalibration of the plausible range. *Journal of Development Economics* 39 (2): 333–364.

CMIE (Centre for Monitoring Indian Economy). 1999. *Foreign trade and balance of payments*. July. India.

del Ninno, C., and P. Dorosh. 2000. *In-kind transfers and household food consumption: Implication for targeted food programs in Bangladesh*. Food Management and Research Support Project Working Paper No. 17. Dhaka: International Food Policy Research Institute.

_____. 2001. Averting a food crisis: Private imports and public targeted distribution in Bangladesh after the 1998 flood. *Agricultural Economics* 25 (2-3): 337-346.

del Ninno, C., and M. Lundberg. 2001. Long lasting impact of the 1998 flood on nutrition in Bangladesh: Keeping kids' heads above water. Paper presented at the 17th International Congress of Nutrition Modern Aspects of Nutrition—Present Knowledge and Future Perspectives, Vienna, Austria, August 27–30.

del Ninno, C., and D. K Roy. 2001a. *Impact of the 1998 flood on household food security*. Food Management and Research Support Project Synthesis Report No. 6. Dhaka: International Food Policy Research Institute.

_____. 2001b. *Recovering from the shock of the 1998 flood: Household food security and nutritional status one year later*. Food Management and Research Support Project Working Paper No. 23. Dhaka: International Food Policy Research Institute.

del Ninno, C., P. Dorosh, L. Smith, and D. K. Roy. 2001. *The 1998 floods in Bangladesh: Disaster impact, household coping strategies, and response*. Research Report 122. Washington, D.C.: International Food Policy Research Institute.

Dorosh, P. 1999. *The determination of rice prices in Bangladesh: Supply shocks, trade liberalization, and cross-border trade*. Food Management and Research Support Project Working Paper No. 2. Dhaka: International Food Policy Research Institute.

_____. 2001. Trade liberalization and national food security: Rice trade between Bangladesh and India. *World Development* 29 (4): 673-690.

FMRSP/IFPRI (Food Management and Research Support Project/International Food Policy Research Institute). No date. Household Survey 1998–99. Dhaka and Washington, D.C.

Grimard, F. 1996. Does the poor's consumption of calories respond to changes in income? Evidence from Pakistan. *Pakistan Development Review* 35 (3): 257-283.

HKI (Helen Keller International). 1997. Report of Round 43–Rural–Nutritional Surveillance Project, April, 1997 Data Collection. Dhaka.

HKI/IPHN (Helen Keller International and Institute of Public Health and Nutrition). 1999. 1998 NSP annual report—National and divisional trends among children and households in rural Bangladesh. Dhaka. August.

Hossain, M., M. L. Bose, and A. Chowdhury. 2001. Changes in agriculture and economy in the flood-prone environment in Bangladesh, 1988 to 2000: Insights from a repeat survey of 16 villages. Paper presented at the Workshop on Flood-Prone Rice Systems, 9–11 January, organized by the Bangladesh Rice Research Institute and the International Rice Research Institute. Manuscript.

Pitt, M. 1983. Food preferences and nutrition in rural Bangladesh. *Review of Economics and Statistics* 65 (1): 105–114.

Ravallion, M. 1985. The performance of rice markets in Bangladesh during the 1974 famine. *Economic Journal* 95 (March): 15-29.

_____. 1990. *Markets and famines*. Dhaka, Bangladesh: University Press Ltd.

Sobhan, R. 1980. *Politics of food and famine in Bangladesh*. In *Bangladesh politics*, ed. E. Ahamed. Dhaka: Centre for Social Studies, Dhaka University.

Strauss, J., and D. Thomas. 1990. *The shape of the calorie-expenditure curve*. Economic Growth Center Discussion Paper 595. New Haven, Conn., U.S.A.: Yale University.

Subramanian, S., and A. Deaton. 1996. The demand for food and calories. *Journal of Political Economy* 104 (1): 133–162.

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