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# Averting a food crisis: private imports and public targeted distribution in Bangladesh after the 1998 flood

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## Abstract

The 1998 flood in Bangladesh caused a shortfall of 2.2 million tonnes (mill.t) in the rice production and threatened the food security of tens of millions of households. Despite the best efforts of donors and the government, the public distribution of rice and wheat was only 188,000 t more than originally planned for July 1998 to April 1999.

However, a major food crisis was averted as private imports, made possible by trade liberalisation in the early 1990s, stabilised market prices and supplies. The government's direct distribution programs, though small compared to private imports, nonetheless increased access to food by poor households. Household survey data indicate that immediate relief efforts were well targeted to flood-affected households, as were transfers from NGOs. Vulnerable Group Feeding (VGF), a medium-term program, was not targeted well to households directly exposed to the flood, though the program was relatively well targeted to poor households.

More broadly, the Bangladesh experience with the 1998 flood shows that in a liberalised trade regime, where private imports respond to price signals, food aid's contribution to the total availability of food may be minimal. However, foreign assistance in kind or in cash, can provide resources for subsidised, targeted distribution to food-insecure households — assistance not possible otherwise under tight government budget constraints. © 2001 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

The 1998 flood, dubbed 'the flood of the century' in Bangladesh, covered 51% of the country at its peak, caused a shortfall of 2.2 million tonnes (mill.t) in rice production and threatened the food security of tens of millions of households. Government appeals for assistance in August 1998 brought forth pledges of 1.083 mill.t of food aid for flood relief and rehabilitation from donors, providing the food grain for an

expansion of targeted public distribution. Despite the best efforts of donors and government, the public distribution of rice and wheat was only 188,000 t more than originally planned for July 1998 to April 1999. Nonetheless, a major food crisis was averted. This paper explores how.

Unfortunately, food scarcity and famines are not new to Bangladesh. The great Bengal famine of 1943 killed an estimated three million people in what is now Bangladesh and eastern India (Dreze and Sen, 1989). Drought-related crop failures and a shortage of foreign exchange for imports resulted in high rice prices and food shortages that contributed to a sharp increase in mortality in 1974 (Ravallion, 1990). Major floods

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in 1987 and 1988, though not leading to a famine, contributed to crop shortages and sharp increases in rice prices, mitigated by a large increase in public food grain distribution.

However, supply (or availability) of food is not the sole determinant of food security. Food entitlements of households (their legal means and resources to acquire food: own production, other income, public and private transfers, and borrowing) determine their access to food (Sen, 1982).<sup>1</sup> As is described below, the availability of food grains in Bangladesh following the floods of 1998 was maintained mainly through private sector imports, made possible by trade liberalisation in the early 1990s. Government and NGO programs contributed mainly by increasing access to food by the poor.

Section 2 begins with a review of the food grain economy of Bangladesh and major changes in government food policy in the 1990s. The effects of the 1998 flood on the domestic production and the role of public and private sector imports in augmenting the supply and stabilising the prices are then discussed. Section 3 focuses on the household access to food, presenting data from a survey of rural households in flood-affected areas. The analysis focuses on the efficiency of targeting of government programs and the relative contribution of the public, NGO and private transfers in increasing the household access to food. Section 4 concludes the discussion.

## 2. Food availability after the flood

Aggregate food availability in Bangladesh is low, even in years of good harvests. In 1996–1997, the most recent year of good harvests, total calorie consumption was only 2085 cal per person per day, 72.8% from rice and 9.2% from wheat (FAO Food Balance Sheet, 1997). Three crops of rice are cultivated in Bangladesh: *aman*, typically transplanted during the monsoons in June–July 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. Prior to the 1998 flood, *aman* and *boro* rice production in the July 1998 to June 1999 fiscal year were expected to be 9.5 and 7.8 mill.t, 49 and 41%, respectively, of anticipated total production of 19.2 mill.t. Due to the adoption of green revolution technology, (including improved seeds, irrigation of *boro* rice in the dry season and fertiliser), rice production has increased rapidly, particularly since the late 1980s, and the country is nearly self-sufficient in rice. In the 1990s, rice imports averaged only 686,000 t per year, 4.0% of net rice availability and 3.5% of net food grain availability. Wheat imports (about 64.3% in the form of food aid) averaged 52.9 and 7.7% of net wheat and food grain availability, respectively (see Ahmed et al., 2000).

Prior to the April 1994, the liberalisation of private sector rice imports (and the 1992 liberalisation of private sector wheat imports), shortfalls in food grain production were met through food aid, government commercial imports and draw down of public stocks. However, since 1994 the private sector imports of rice, mainly from India (which liberalised its private sector rice exports in late 1994), have added to the domestic supplies in years of below-average harvests in Bangladesh. Thus, the import parity price of rice from Indian markets has provided a ceiling on rice prices in Bangladesh (Fig. 1).<sup>2</sup>

The market prices of rice had been high in the first half of 1998, even before the flood, because of a poor 1997–1998 *aman* rice harvest in November/December 1997. As domestic prices rose, beginning in December 1997, it became profitable for the private sector to import rice from India (mainly by truck and rail across the land borders). Government policy encouraged private sector imports of rice by removing the tariffs on imports, limiting the open market sales, giving instructions to expedite the clearance of rice imports through customs and abstaining from the re-imposition of anti-hoarding laws. An excellent *boro* rice harvest in the mid-1998, brought a temporary respite from high prices of rice in Bangladesh, but the prices soon rose again to import parity levels as the flood waters gradually spread across the country from mid-July 1998 to early-September 1998. Initial flood damage to

<sup>1</sup> In fact, the great Bengal famine was not caused by a crop failure, but was largely due to an increase in urban demand for food during a war-time economic boom that raised food prices for the rural poor (Dreze and Sen, 1989).

<sup>2</sup> See Dorosh (2001) for a more in-depth discussion of the rice trade between India and Bangladesh in recent years.

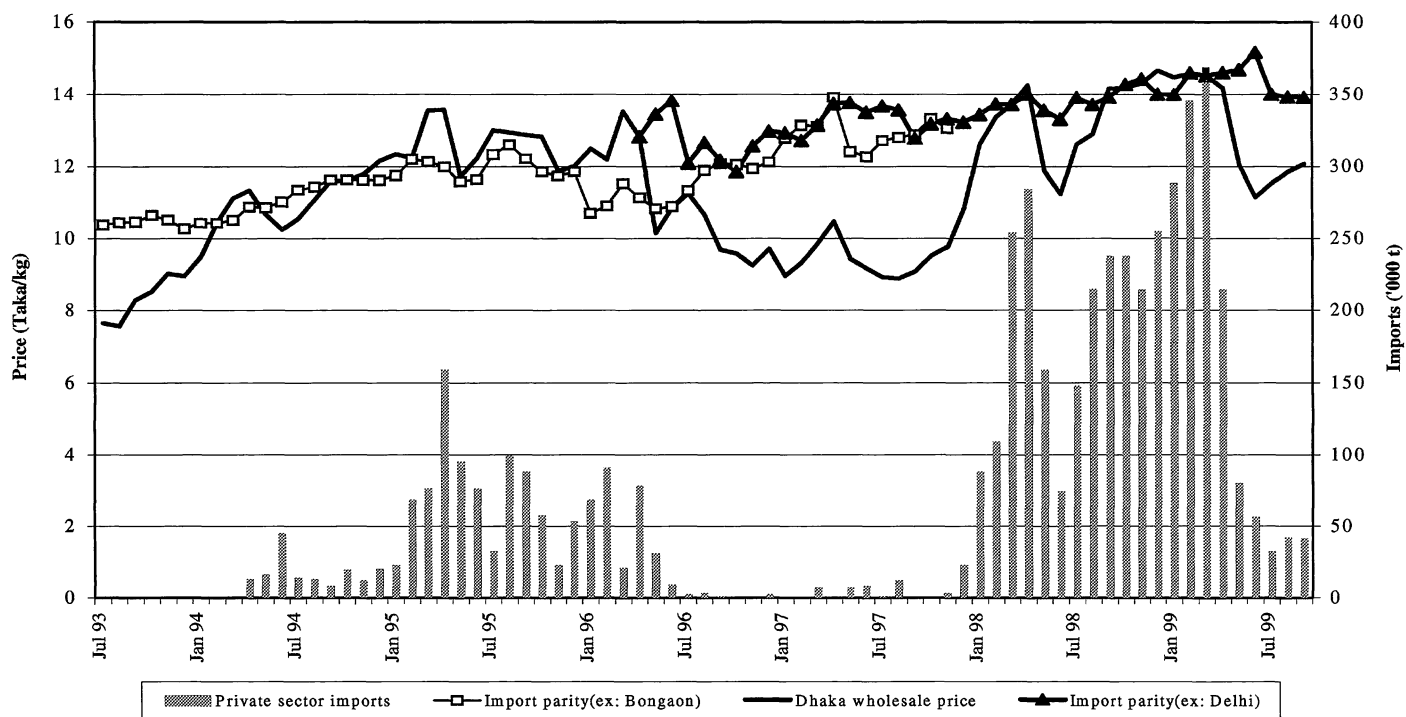


Fig. 1. Rice prices and quantity of private rice imports in Bangladesh, 1993–1999. Note: Beginning in November 1998, the marketing between Delhi and Dhaka was increased by 1.1–4.1 Taka/kg. Source: Dorosh (1999a,b), calculated using data from FPMU, CMIE (1998–1999) and Baulch et al. (1998).

Table 1

Forecast and actual Bangladesh food grain production and trade, 1998–1999<sup>a</sup>

	Forecast (mill.t)	Actual (mill.t)	Difference (mill.t)
Rice production			
<i>Aus</i>	1.900	1.620	−0.280
<i>Aman</i>	9.500	7.740	−1.760
<i>Boro</i>	7.800	10.050	2.250
Total	19.200	19.410	0.210
Wheat production	1.800	1.910	0.110
Total food grain production	21.000	21.320	0.320
Public food grain distribution			
Rice (July 1998–April 1999)	0.732	0.400	−0.332
Wheat (July 1998–April 1999)	0.557	1.185	0.628
Total (July 1998–April 1999)	1.289	1.585	0.296
Rice (July 1998–June 1999)	0.813	0.530	−0.283
Wheat (July 1998–June 1999)	0.905	1.603	0.698
Total (July 1998–June 1999)	1.718	2.133	0.415
Private rice imports	0.600	2.663	2.063
Private wheat imports	0.200	0.805	0.605

<sup>a</sup> Source: Ministry of Food, GOB.

the standing *aus* crop was small (only 280,000 t), but the flood also destroyed seedlings for the following November's *aman* rice crop, ultimately leading to a 1.76 mill.t *aman* crop loss (Table 1). However, private sector imports exceeded 200,000 t of rice per month from August 1998 to April 1999, totalling 2.377 mill.t over this period, more than offsetting the estimated total rice production shortfall of 2.2 mill.t.<sup>3</sup>

In comparison to the private sector rice and wheat imports, public distribution of food grain was relatively small, due to relatively low wheat stock levels at the time of the flood, uncertainties regarding food aid arrivals, problems with government procurement of rice in international markets and a perceived need to maintain sufficient stocks to help stabilise markets in the event of possible severe short-term shortages.<sup>4</sup> Although rice distribution was greater than

originally planned in the months immediately following the flood (July–September), rice distribution was cut back once the food aid wheat became available, partly because international procurement through open tenders failed to acquire the desired quantities. Ultimately, only 399,000 t of rice was distributed from July 1998 to April 1999, 333,000 t less than originally programmed in the pre-flood distribution plan. Private sector rice imports, equal to 2.42 mill.t in this period (using official Government of Bangladesh (GOB) figures), were thus 6.1 times larger than government rice distribution.<sup>5</sup>

Increased inflows of food aid did enable a large increase in the public distribution of wheat from 905,000 t to an eventual 1.603 mill.t for the entire July 1998 to June 1999 fiscal year, but in November 1998 wheat distribution was limited by the slow arrival of food aid and low government stocks. The major role of public distribution of food grain during and after the flood was not one of increasing total supplies but rather one of targeting relief to those in need.

<sup>3</sup> Comparisons of estimated rice demand with total rice availability and comparisons of Bangladesh and Indian data on the volume of rice trade between the two countries suggest that the volume of private imports for the April 1998–March 1999 period may have been overstated by as much as 1.0 mill.t (out of an official Government of Bangladesh total of 3.2 mill.t). See Dorosh (2001) and Del Ninno et al. (2001).

<sup>4</sup> Dorosh (2001) and Del Ninno et al. (2001) give further details of government food policy following the flood.

<sup>5</sup> Using a lower estimate of 1.42 mill.t (1.0 mill.t less than GOB official figures), private sector rice imports were still 3.5 times larger than government rice distribution.

### 3. Household access to food: public distribution and other transfers

Two major channels dominated government food relief efforts following the flood: gratuitous relief (GR), designed to provide emergency relief to disaster victims; and vulnerable group feeding (VGF), aimed at assisting the households over a longer period (ultimately, from September 1998 to April 1999).<sup>6</sup> Immediate short-term relief through GR was targeted by location. In contrast, the VGF program included all the areas of the country (both flooded and non-flood affected areas), and was administratively targeted to poor households through selection by local committees (Del Ninno and Roy, 1999a). However, the sizes of these programs were limited, both by the available wheat stocks (up to early November when the government commercial imports and food aid arrivals added to government stocks) and the financial cost of the programs (covered to a large extent by food aid).

Major flood relief efforts began with the provision of 20,400 t of rice through GR in the flood-affected thanas in August 1998 and an additional 30,800 t of rice in September. In addition, the VGF program began on a large scale in August with an initial distribution of 1.3 million cards, each entitling the holder to 8 kg of rice per month. During August and September, a total of 27,500 t of rice were distributed through this program. At 8 kg per card, an estimated 1.35 and 2.13 million households received the VGF rations in August and September, respectively. Almost no wheat was distributed through relief channels in the initial months of the flood. At the urging of the World Food Programme (WFP), the GOB expanded the VGF program to 4 million cards with an allotment of 16 kg of grain per card, half rice and half wheat in October, and all wheat thereafter.

Data from a survey of 757 households conducted in November–December 1998 (about 2.5 months after the floodwaters had receded) in seven flood-affected thanas were used to provide evidence of the extent to

which the GR and VGF programs were well targeted.<sup>7</sup> As shown in Table 2, average per capita monthly expenditures during the period of 15 July to 14 November 1998 were only 755.2 Taka (US\$ 15.64 at the November 1998 exchange rate of 48.3 Taka per US\$). Sixty-eight percent of all the households, and 85.5% of the households in the lowest per capita expenditure quintile, owned less than 0.5 acres (0.20 ha) of land.

A total of 67.1% of the households in the first quintile received some type of government transfer, 38.8% of these households received VGF grain (mainly wheat) and 31.6% received GR grain (mainly rice). VGF was fairly well-targeted by expenditure. Nonetheless, 17.2 and 11.2% of the households in the top two quintiles were participants. However, the size of these transfers was relatively small. The average value of VGF grain received by the participating households in October and November 1998 was 202.0 Taka per household per month, equal to only 5.0% of total household expenditures. For VGF participants in the lowest quintile, these transfers were more significant, equal to 10.5% of total household expenditures.

Table 3 presents data on household expenditures and transfers according to an index of household exposure to the flood. This index measures the direct exposure to the flood at the household level, taking into account four factors: (1) the depth of water in the homestead; (2) the depth of water in the house; (3) the duration (number of days) of water in the house; and (4) the number of days away from home due to the flood. For each of these four components, we created an index ranging from 0 to 5. The total flood exposure index, equal to the sum of the component variables, ranges in value from 0 to 18. Finally, a categorical variable was defined according to the value of the flood exposure index: 0 = not exposed to the flood, 1–5 =

<sup>6</sup> Food For Work (FFW) programs began on a large scale only in December 1998, following the *aman* rice harvest, when soils were dry enough to permit manual earthwork in the building of roads and culverts.

<sup>7</sup> The seven flood-affected thanas, representing five out of six divisions of the country, were selected according to two major criteria: the severity of flood as determined by the Water Board and the percentage of poor people in the district in which the thana is located. Given these two major criteria, some thanas that were in the samples of earlier studies were purposively selected. Households were randomly selected using a multiple stage probability sampling technique (with the exception of households in one thana that were in the sample of an earlier study). In all, approximately six households were selected per village, 36 per union, and 108 per thana, for a final sample size of 757 households in 126 villages (see Del Ninno and Roy, 1999b, for a more detailed description of the sampling frame).

Table 2  
Transfers received by expenditure quintiles

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	All
Per capita expenditures (Taka per month)	319.4	471.5	600.7	778.0	1603.9	755.2
Total household expenditures (Taka per month)	1812.3	2672.2	3384.0	4160.3	8315.8	4071.5
Household food expenditures (Taka per month)	1331.3	1898.9	2410.1	2793.9	5301.3	2748.6
Flood exposed households (%)	69.7	70.2	76.2	67.6	71.7	71.1
Households owning <0.5 acres (%)	85.5	76.8	67.6	60.9	49.3	68.0
Share of households receiving transfers (%)						
Total government transfers	67.1	43.7	49.0	41.1	34.9	47.2
GR	31.6	23.8	27.8	21.2	17.8	24.4
VGF	38.8	22.5	19.2	17.2	11.2	21.8
Other government transfers	13.2	7.9	14.6	8.6	13.2	11.5
NGO transfers	11.2	11.9	10.6	9.3	11.2	10.8
Private transfers	7.9	9.9	7.9	8.6	11.2	9.1
Total transfers	69.1	53.6	57.6	49.7	46.7	55.4
Average transfer received/household (Taka per month) <sup>a</sup>						
Total government transfers	59.9	31.2	44.1	32.3	25.8	38.7
GR	11.9	9.6	11.5	8.3	8.5	9.9
VGF	32.4	16.0	15.0	14.2	6.9	16.9
Other government transfers	14.0	5.7	15.1	8.7	10.4	10.8
NGO transfers	8.1	9.6	8.5	6.7	13.2	9.2
Private transfers	23.8	73.5	111.6	232.9	165.9	121.5
Total transfers	93.0	114.8	165.9	271.9	205.1	170.1
Number	152	151	151	151	152	757

<sup>a</sup> Average transfer received over the 4 month period, 15 July 1998 to 15 November 1998.

moderately exposed to the flood, 6–10 = severely exposed to the flood and  $\geq 11$  = very severely exposed to the flood (for further details see Del Ninno and Roy, 1999b).<sup>8</sup>

All together 57.6% of the households in the sample were severely exposed to the flood, while 28.9% were not exposed to the flood. The flood affected both rich and poor and there is essentially no correlation between the severity of flood-exposure and the expenditures as indicated by flood exposure by per capita expenditure quintile (Table 2) or per capita expenditure by the degree of flood exposure (Table 3).

The VGF program was not effectively targeted according to flood exposure, even in the flood-affected thanas studied. A total of 18.7% of the households not directly exposed to the flood received cards, only

slightly below the percentage of households very severely exposed to the flood (24.5%). In contrast, only 9.6% of the households not directly exposed to the flood received assistance through the short term GR relief program, compared with 36.7% of the very severely exposed households.

In terms of leakages, GR was better targeted towards flood-exposed households than was VGF. Only 11.4% of the GR recipients, as compared with 24.7% of the VGF recipients, were not directly exposed to the flood. Neither program achieved broad coverage. However, 69.3% of the flood-exposed households did not receive GR, while 76.6% did not receive VGF. Though VGF was better targeted to the poor than GR, 50.9% of the VGF recipients were relatively non-poor households that belonged to the top 60% of the per capita expenditure distribution or that owned 0.5 acres or more of land.

In contrast to VGF, the transfers from NGOs were particularly well-targeted to the households exposed to the flood. A total of 24.5% of the very severely

<sup>8</sup> The findings of the analysis obtained using this flood exposure index appear to be quite robust. Similar results were obtained using a different flood exposure index that uses only three variables and a different cut-off point (Del Ninno et al. (2001)).

Table 3  
Transfers received by index of household exposure to flood

	Not exposed	Moderate	Severe	Very severe	All
Per capita expenditures (Taka per month)	699.2	1019.1	689.6	790.0	755.2
Total household expenditures (Taka per month)	3645.9	4485.9	4114.8	4345.8	4071.5
Household food expenditures (Taka per month)	2388.1	2960.6	2708.0	3247.7	2748.6
Households owning <0.5 acres (%)	67.1	64.7	65.3	77.7	68.0
Percentage of households receiving transfers					
Total government transfers	33.3	44.1	50.5	64.0	47.2
GR	9.6	21.6	30.6	36.7	24.4
VGF	18.7	24.5	21.9	24.5	21.8
Other government transfers	7.8	9.8	11.4	18.7	11.5
NGO transfers	2.7	5.9	12.1	24.5	10.8
Private transfers	8.7	9.8	11.4	4.3	9.1
Total transfers	41.1	48.0	60.9	71.2	55.4
Average transfer received/household (Taka per month) <sup>a</sup>					
Total government transfers	26.3	36.5	40.7	55.4	38.7
GR	3.0	6.2	13.2	16.7	9.9
VGF	13.9	19.8	16.2	20.9	16.9
Other government transfers	9.4	8.8	10.2	15.6	10.8
NGO transfers	2.1	3.1	11.2	20.5	9.2
Private transfers	111.1	218.2	134.3	39.4	121.5
Total transfers	139.7	257.8	186.5	118.5	170.1
Number	219	102	297	139	757

<sup>a</sup> Average transfer received over the 4 month period, 15 July 1998 to 15 November 1998.

flood-exposed households received transfers from NGOs, compared with only 2.7% of the non-flood exposed households. The value of transfers per household was also nearly 10 times larger for the very severely flood-exposed households, 20.5 Taka per month compared with 2.1 Taka per month. The excellent targeting of NGO transfers to flood-exposed households may be largely explained by the types of programs undertaken by the NGOs at this time; relief programs to the flood victims, mainly in the areas that had been more severely affected by the flood. In the thanas surveyed in late 1998, there were no major non-flood relief NGO programs involving transfers in kind or in cash in operation. Private transfers were not highly correlated with flood exposure and it is notable that the poorest 20% of households received only about 1/5 as much transfers per household (23.8 Taka per month) as did the average household in the sample (121.5 Taka per month) (see Table 2).

The analysis of the determinants of participation in GR and VGF programs, conducted using probit regressions, provide further evidence of the degree to which these programs were targeted towards the poor

and flood-exposed households (Table 4). The regressions clearly show that the criteria used for targeting the households with respect to the level of flood exposure varied between the programs. Dummy variables for flood exposure, and particularly dummy variables for severe and very severe flood exposure, are highly significant explanatory variables for the participation in GR. In contrast, flood-exposure variables are not statistically significant explanatory variables for the participation in VGF, even in this sample of households from flood-affected thanas.

The coefficients of the variables that indicate the level of household wealth confirm that the VGF program was better targeted towards the poorer households. Landlessness and housing characteristics (tin roof and the number of buildings in the household compound) are statistically significant explanatory variables for participation in VGF. However, in the GR regression among the household wealth variables, only residing in a house with a tin roof reduces the probability of participation.

Other household characteristics and household size variables are not strong determinants of the probabil-

Table 4

Determinants of participation in GR and VGF programs, probit regression results

Dependent variable	GR participants				VGF participants			
	Coefficients	S.E.	z	$P >  z $	Coefficients	S.E.	z	$P >  z $
Age households head	−0.001	0.009	−0.106	0.916	0.007	0.010	0.672	0.502
Female head	−0.589	0.352	−1.674	0.094	0.430	0.312	1.375	0.169
Dependency ratio	0.005	0.004	1.052	0.293	−0.002	0.005	−0.461	0.645
No. of males								
0–4 years	−0.247	0.149	−1.662	0.097	0.330	0.164	2.012	0.044
5–14 years	0.065	0.076	0.858	0.391	0.042	0.086	0.495	0.621
15–19 years	−0.318	0.133	−2.385	0.017	0.245	0.130	1.881	0.060
20–34 years	−0.163	0.111	−1.468	0.142	−0.083	0.124	−0.673	0.501
35–54 years	0.110	0.164	0.667	0.505	−0.104	0.197	−0.527	0.598
≥55 years	−0.110	0.234	−0.472	0.637	−0.053	0.274	−0.193	0.847
No. of females								
0–4 years	−0.436	0.152	−2.860	0.004	−0.197	0.164	−1.201	0.230
5–14 years	−0.217	0.079	−2.749	0.006	0.000	0.083	0.004	0.997
15–19 years	−0.152	0.131	−1.161	0.246	0.029	0.138	0.208	0.835
20–34 years	−0.128	0.155	−0.829	0.407	−0.065	0.164	−0.400	0.689
35–54 years	0.085	0.195	0.435	0.664	−0.145	0.210	−0.694	0.488
≥55 years	0.131	0.270	0.485	0.628	−0.455	0.305	−1.491	0.136
No. of males with no education	0.062	0.076	0.816	0.414	−0.161	0.083	−1.934	0.053
No. of females with no education	0.190	0.084	2.262	0.024	0.170	0.087	1.958	0.050
No. of dependent workers	−0.186	0.126	−1.479	0.139	−0.050	0.131	−0.384	0.701
No. of daily labourers	−0.016	0.097	−0.167	0.867	0.128	0.105	1.213	0.225
No. of own farm labourers	−0.136	0.123	−1.103	0.270	−0.039	0.140	−0.277	0.782
Landless	0.067	0.149	0.445	0.656	0.311	0.167	1.861	0.063
Owns cattle	−0.141	0.127	−1.114	0.265	−0.075	0.137	−0.549	0.583
Tin roof	−0.560	0.175	−3.201	0.001	−0.322	0.194	−1.661	0.097
No. of house buildings	0.068	0.077	0.888	0.375	−0.159	0.085	−1.872	0.061
Flood exposure								
Moderate	0.528	0.215	2.457	0.014	−0.002	0.208	−0.009	0.993
Severe	0.901	0.177	5.089	0.000	−0.125	0.176	−0.708	0.479
Very severe	0.947	0.203	4.673	0.000	−0.163	0.210	−0.776	0.438
Thana								
2	0.314	0.235	1.334	0.182	0.547	0.270	2.027	0.043
3	0.171	0.257	0.667	0.505	0.365	0.260	1.404	0.160
4	0.430	0.234	1.840	0.066	0.199	0.270	0.736	0.462
5	0.977	0.255	3.829	0.000	0.702	0.267	2.629	0.009
6	0.339	0.241	1.410	0.159	0.673	0.246	2.736	0.006
7	0.848	0.236	3.600	0.000	0.795	0.267	2.974	0.003
Constant	−1.708	0.483	−3.539	0.000	−1.577	0.516	−3.059	0.002
Observations	737				737			
$\chi^2$ (33)	145.06				61.91			
$P > \chi^2$	0				0.0017			
Pseudo $R^2$	0.177				0.099			

ity of receiving either GR or VGF transfers. In the case of GR, this is to be expected, since the flood is likely to have affected all the households in a village, irrespective of household size. Nonetheless, there appears to be a bias in the GR distribution towards smaller families that have fewer younger children, perhaps because these households were more mobile and had less difficulty reaching the distribution centres. In the case of VGF transfers, targeting towards larger families with more children might be expected. However, few household composition variables are significant, apart from those for the number of young males, thus indicating that the overall level of wealth (as reflected in the housing variables discussed above) was the main determinant of participation in the VGF program. Somewhat surprisingly, there is only weak evidence of targeting towards female-headed households. The coefficient on the dummy variable for female household head is positive, but it is significantly different from 0 only at a 17% confidence level.

#### 4. Concluding observations

Food security at the household level depends both on availability of food in markets and on access to food.<sup>9</sup> Liberalisation of private sector imports of rice and wheat in the early 1990s and ensuing government policies supporting the trade in 1998, enabled private imports to stabilise market prices and supplies during the 1998 flood in Bangladesh. Government direct distribution programs, though small compared to private imports, nonetheless increased the access to food by poor households. Given the tight resource constraints that limit the size of distribution programs, effective targeting is crucial. Immediate relief efforts were well-targeted to flood-exposed households, as were transfers from NGOs. VGF, a medium-term program covered non-flood affected regions and, even in flood-affected thanas, was not targeted well to households directly exposed to the flood. Nonetheless, according to survey data from the seven flood-affected thanas, the program was relatively well-targeted to poor households, with households in

the three lowest expenditure quintiles receiving an estimated 75% of the food grain distributed through this program.

More broadly, the Bangladesh experience with the 1998 flood illustrates the dual role of food aid in increasing the availability and providing resources that enhance the access of food insecure households. In a liberalised trade regime, where private imports respond to price signals, food aid's contribution to total availability of food may be minimal. Nonetheless, foreign assistance in kind or in cash can provide resources for subsidised, targeted distribution to food-insecure households — assistance not otherwise possible under tight government budget constraints.

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#### References

- Ahmed, R., Haggblade, S., Chowdhury, T.E., 2000. *Coming Out of the Shadow of Famine: Evolving Food Markets and Food Policy in Bangladesh*. Johns Hopkins University Press, Baltimore, MD.
- Baulch, B., Das, J., Jaim, W.M.H., Farid, N., Zohir, S., 1998. The spatial integration and pricing efficiency of the private sector grain trade in Bangladesh: phase I and II report. Bangladesh Institute of Development Studies, Bangladesh Agricultural University, University of Sussex.
- (CMIE) Centre For Monitoring Indian Economy, 1998–1999. Various Issues of Monthly Review of the Indian Economy. Mumbai, India.
- Del Ninno, C., Roy, D., 1999a. Impact of the 1998 flood on labour markets and food security and effectiveness of relief operations. FMRSP Working Paper, No. 8. Food Management and Research Support Project and International Food Policy Research Institute, Dhaka, Bangladesh.
- Del Ninno, C., Roy, D., 1999b. The 1998 flood and household food security: evidence from rural Bangladesh. FMRSP Working Paper, No. 9. Food Management and Research Support Project and International Food Policy Research Institute, Dhaka, Bangladesh.
- Del Ninno, C., Dorosh, P.A., Smith, L., Roy, D., 2001. The 1998 floods in Bangladesh: disaster impact, household

<sup>9</sup> Utilisation, another aspect of food security, is not covered in this paper.

- coping strategies and responses. Research Report. International Food Policy Research Institute (IFPRI), Washington, DC (in press).
- Dorosh, P.A., 2001. Trade liberalization and national food security: rice trade between Bangladesh and India. *World Dev.* 29 (4), 673–689.
- Dorosh, P.A., 1999a. Foodgrain markets and policy in the aftermath of the 1998 flood. FMRSP Working Paper, No. 7. Food Management and Research Support Project and International Food Policy Research Institute. Dhaka, Bangladesh.
- Dorosh, P.A., 1999b. Trade liberalization and food security in Bangladesh: the role of private sector imports. FMRSP Working Paper, No. 16. Food Management and Research Support Project and International Food Policy Research Institute. Dhaka, Bangladesh.
- Dreze, J., Sen, A., 1989. *Hunger and Public Action*. Clarendon Press, Oxford.
- Ravallion, M., 1990. *Markets and Famines*. University Press, Dhaka, Bangladesh.
- Sen, A., 1982. *Poverty and Famines*. Clarendon Press, Oxford.