Does credit improve the food consumption vulnerability of the extreme poor? - Empirical evidence from Bangladesh

Hasan, Mohammad Monirul
Institute of Microfinance (InM)

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Abstract

This paper examines the extent of seasonal hunger and its food consumption vulnerability among rural households in the North West part of Bangladesh (i.e., the greater Rangpur region) and whether the *Programmed Initiative for Monga Eradication* or PRIME interventions (such as flexible micro-credit, Emergency loan and cash for work) have some positive impact for improving the consumption ordering of *monga* affected households or not. Seasonal hunger, also known as *monga* in greater Rangpur, is caused by a deprivation of food during certain months of the year when households do not have adequate employment, income, and savings. That is, *monga* is an *ex post* measure of seasonal deprivation of food. However, for policymaking purpose, knowing who are going to be in seasonal hunger in future is more important than knowing who already are. This *ex post* measure of seasonal food deprivation through the changes in consumption ordering in two years- 2008 and 2007 can be defined as food consumption vulnerability. That is, vulnerability to seasonal hunger is the likelihood of remaining in or falling into seasonal hunger. Households smooth consumption via income smoothing and other measures, which also reduce their vulnerability to *monga*. When consumption smoothing does not happen for one reason or another, food deprivation is sure to follow.

*The author is a Senior Research Associate at Institute of Microfinance (InM), PKSF Bhaban, Agargaon, Dhaka-1207. Email: monir1021@gmail.com. However any opinions expressed and policy suggestions proposed in the document are the author's own and do not necessarily reflect the views of InM.

Introduction:

The Northwest part of Bangladesh (i.e., the greater Rangpur region) experiences seasonal food deprivation almost every year during mid-September to mid-November, which corresponds to a period between post-planting and pre-harvesting of *aman* rice and known as *monga* period. This is the lean period for labor demand when the impact of scarcity of jobs on household welfare is very pronounced. According to Sen (1981), this is a period when the ability of a large segment of the population is limited in acquiring food, employment and other basic necessities.

Among the various measures that households adopt to stave off the adverse effects of monga, distress sale of assets (such as land), and advance sale of labor and crop are quite common. In addition, they resort to migration and some have access to social safety net programs. But these measures may not be enough. As a result, they may starve for an extended period, which may lead to serious malnutrition and death in extreme circumstances. The intensity of monga varies by households and local socio-economic conditions; it also depends on the incidence of flood or drought that often precedes pre-*aman* period. Households' vulnerability to monga is also a failure of public policies and programs that cannot help mitigate poverty in general and monga in particular.

There is a large body of literature on seasonality and consumption smoothing. Household incomes vary by season, often quite sharply. For example, Chaudhuri and Paxson (2001) finds from the ICRISAT sample of Indian villages that agricultural households on an average receive 75 percent of their annual income in just a three-month period. Like income, household consumption levels also vary by season in rural economies (e.g., Sahn 1989; Paxson 1993; Dercon and Krishnan 2000). It is frequently asserted that the observed seasonality in consumption is driven largely by the seasonal variation in income, and partly by the lack of proper credit markets. However, consumption seasonality may also be due to non-credit factors, such as seasonal variation in prices, preferences, labor efforts and precautionary savings motives (Chaudhuri and Paxson 2001). For instance, Paxson's (1993) findings suggest that in rural Thailand the observed seasonality in consumption patterns results from variation in prices or preferences (which are common to all households) more than from households' inability to use savings or borrowings to smooth consumption.

Yet lack of credit could potentially be an important determinant in seasonal consumption, especially for very poor rural economies (Townsend 1995). There is evidence that credit constraints prevent poor households from smoothing consumption across years (Rosenzweig 1988; Rosenzweig and Wolpin 1993; Chaudhuri and Paxson 2001). Pitt and Khandker (2002) shows that micro-credit provision helps smooth consumption by offering an effective means to diversify agricultural income and employment.

Findings from the literature suggest a few lessons for policymaking. First, it is important to examine the extent and sources of seasonality among rural households of whole Bangladesh vis-à-vis greater Rangpur. The purpose is to examine why *monga* has been persistent in Rangpur as compared to other regions. Second, it is important to ascertain whether seasonality is amenable to policies. For example, if it is driven by price fluctuations, the goal of policy could be to stabilize prices. On the other hand, if seasonality is being driven largely by credit constraints, there is a clear need for more credit.

Definition of Sample Type:

We broadly classified the samples into three groups: program participants and non-participants in program villages, and control group in non-program villages. The sample program participants are the households under PRIME program while non-participants in the program village are not the members of PRIME. Households in non-program villages have similar characteristics as of the program participants.

Distribution of sample type of the sample households is presented below:

Sample Type	Frequency	Percentage
Program participants	1,524	28.71
Program non-participants	3,082	58.06
Control households	702	13.23
Total	5,308	100.00

Evaluating the impact of PRIME interventions on consumption ordering requires comparisons of program beneficiaries with the counterfactual of those who have not received the interventions. In order to find the impact, we have a benchmark data of program participants and program non-participants of Gaibandha, Kurigram, Nilphamari and Rangpur districts for *monga* period and normal period 2007. We also have a sample data of all five districts for both *monga* and normal period of 2008 for program participants and program non-participants. In addition we have a control group data of households having the similar socio economic characteristics of the program participants group.

Difference in Difference (D-i-D) Method

The simplest set up of this method is to observe the outcomes comparing two groups in two time period. One of the groups is exposed to a treatment in the second period but not in the first period. The second group is not exposed to any treatment in either period. The indicators or parameters compared between program participants and non-participants by this method are: income, wealth, principal occupation, land, borrowing status, consumption ordering etc.

With the data that are likely to be available, an obvious place to start is the single difference (D) in mean outcomes between the participants and non-participants:

$$D = \bar{Y}^1 - \bar{Y}^0$$

Where Y is the outcome variable, the bar indicates an average of the outcome variable, and the superscript denotes the group (1 for participants and 0 for non-participants).

The above equation immediately results into a selection bias when we want to measure the average treatment effect on the treated (ATT). D correctly measures the ATT only when non-participants are exactly similar to the participants. That means it is assumed non-participants are proxies for participants average outcome variable if they had not participated. Violation of this assumption gives the biased estimate of ATT.

We get a difference of the particular parameter of the program participants by comparing the pre (*monga* period 2007) and post interventions (*monga* period 2008) situation of the households and denote it as D_p. Similarly, we get a difference of the non-participants group and denote it as D_{np}. The difference between D_p and D_{np} gives the impact of PRIME interventions of the particular indicator. In the same way, we can compare the pre and post intervention situation of the households for the normal time period and observed whether there is any impact of PRIME interventions.

The current data set is a panel type data and we can apply the panel approach to estimate treatment effects without assuming ignorability of treatment and without an instrumental variable, provided the treatment varies over time and is uncorrelated with time-varying unobservable that affect the response. We have estimated the treatment effects on a set of household outcomes such as savings, migration, livestock - number of goats, chickens and cows, number of meals in *monga* and so many other variables of interest using the following specification.

$$Y_{it} = \alpha_0 + \alpha_1 dum_{08} + \alpha_2 D_T + \gamma(D_T * dum_{08}) + X'\beta + \varepsilon_{it}$$

Here, Y_{it} is the outcome variable of interest for households in year t, dum_{08} is a year dummy that is equal to 1 for 2008 and 0 for 2007, D_T is treatment dummy which is equal to 1 for the participant group and 0 for non-participant group, the parameter γ indicates the differential effect of being the participant in the program and X is the vector of observable characteristics. The parameter of interest is γ gives the required D-I-D estimation. D-I-D estimator makes explicit assumptions for consistent estimation of the parameter of interest. The basic assumption is that the time effects are common across treated and untreated individuals, that is, the treated and untreated groups would follow the same trend in absence of the program.

Ordered logit model

Since we are dealing with a natural ordering of different alternatives, such as occasional starvation (1), consumption rationing (2) and three full meals (3), such data can be estimated by unordered multinomial model, but there is a much more parsimonious model and sensible model that take account of this ordering. We will here use the order logit models.

.The introducing point of an index model with single latent variable

$$y^*_i = x'\beta_i + u \qquad (1)$$

As y^* crosses a series of increasing unknown thresholds we move up the ordering of alternatives. In general for an m-alternative ordered model we define

y_i=j if α_j<y $\leq \alpha_{j-1}$, (2)

Where α_0=-∞ and $\alpha_m = \infty$

Pr [α_{j-1}<y$^*_i$ $\leq \alpha_j$]

= F (α_j - x_i' β)-F (α_{j-i} - x_i' β) (3)

Where F is the cdf of u_i. The regression parameters β and the (m-1) threshold parameters α_1 …… α_{m-1} are obtained by maximizing the log likelihood function

$$L=\ln L_N = \sum_{i=1}^{N} \sum_{j=1}^{M} y_{ij} \ln p_{ij} \quad (4)$$

Where $p_{ij} = F_j(x_i, \beta)$ is a function of parameters β and regressors.

If we maximize the log likelihood function of (4) with respect to p_{ij} defined in (3) we will obtain the parameters α_1 …… α_{m-1}. For the ordered logit model u is a logistic distribution with F

$$(y_i = j) = \frac{e^{x_i'\beta}}{1+e^{x_i'\beta}}$$

The sign of the regression parameters β can be immediately interpreted as determining whether or not the latent variable y^* increases with the regressors.

For marginal effect in the probabilities

$$\frac{\partial \Pr[y_i = j]}{\partial x_i} = \{F'(\alpha_{j-i} - x_i'\beta) - F'(\alpha_j - x_i'\beta)\}\beta$$

Where F' denotes the derivative of F.

Change in Consumption Ordering in Normal Period

Let us first start with consumption ordering in normal time of the last two years. This is evident from Table-1 that poor households had higher consumption in normal period of 2008 than in 2007. The participating households had higher consumption than the non-participating households' at all three levels of consumption ordering. The D-i-D shows that occasional starvation declined more for the participants by around 1.35 percentage points. Such decline will take some households to the higher level of consumption ordering consumption rationing and three full meals. The percentage of households with three full meals declined for participants and non-participants, the rate of change was lower for the participants.

Table 1
Consumption ordering during normal times

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-Prime	Post-Prime	% of Change	Pre-Prime	Post-Prime	% of Change	
Occasional starvation	110 (10.12)	21 (1.92)	-8.20	320 (9.23)	83 (2.38)	-6.85	-1.35
Consumption Rationing	524 (48.21)	762 (69.72)	21.51	1,782 (51.41)	2,588 (74.15)	22.74	-1.23
Three meals a day	453 (41.67)	310 (28.36)	-13.31	1,364 (39.35)	819 (23.47)	-15.88	-2.57
Total	1,087 (100)	1,093 (100)	0.55	3,466 (100)	3,490 (100)	0.69	-0.14
$\chi 2$	0.000			0.000			

Note: Figures in parentheses are column percentage Source: Author's calculation

The D-i-D estimate shows a net difference of 1.23 percentage point implying higher percentage of participating households having three full meals than the non-participants. Major increase took place in consumption rationing for both the participants and non-participants. But there was no significant difference between percentage of households in both participant and non-participant groups with consumption rationing. Variation in consumption ordering for both the groups was statistically significant. Such improvement is also observed at the district level. The change in consumption ordering varies by district implying that difference in socio-economic and topographical conditions impact consumption behavior of households.

Generally, the trend in consumption ordering by district follows the overall regional consumption ordering. The participating households were better off during the normal time. In relation to pre-PRIME period, percentage of households on occasional starvation declined for all the five districts in post-prime in 2008[1]. However, the decline was more pronounced in Kurigram (declined by 6.35 percentage point) for the participating households compared to the non-participants in the program villages (Table-A-1). The decline, compared to non-participants, in occasional starvation of participating households was over two percentage points in Gaibandha (Table A-2), Lalmonirhat (Table A-3) and Rangpur (Table A-4). In Kurigram, as D-i-D shows,

[1] District level tables on consumption ordering during normal times are presented in Appendix.

participants had higher consumption ordering for both consumption rationing and three full meals compared to non-participants. The positive value of D-i-D indicates higher increase in percentage of households in either consumption rationing or in three full meals.

There has not been any significant change in consumption ordering of both participants and non-participants in Nilphamari (Table A-5). The participants were worse off in normal time compared to the non participants in Rangpur with respect to consumption rationing and three full meals.

Although the participating households were, in general, better off than the non-participants in normal time, it does not imply that the participants had better consumption ordering during the last two *monga*. The PRIME program will have higher impact if the participants have higher consumption in post-PRIME period compared to pre-PRIME period.

Consumption Ordering of Households during Last Two *Monga* Periods

The increase in consumption ordering for the participating households in normal time does not necessarily imply that participating households were better off. We need to examine the consumption ordering of the participating and non-participating households during the last two *monga* periods. If the participating households had higher consumption in the last *monga* of 2008 than that of the previous year, we will then be able to conclude that the participating households have really gained from participating in PRIME program. Table-2 reports consumption ordering of both participants and non-participants of last two *monga* – one is termed as pre-PRIME *monga* and another as post-PRIME *monga*.

Table 2
Consumption ordering of households during last two *monga*

Meal consumption type	Participants			Non-participants in program village			Overall D-i-D
	Pre-PRIME *monga*	Post-PRIME *monga*	% of Change	Pre-PRIME *monga*	Post-PRIME *monga*	% of Change	
Occasional starvation	517 (47.56)	462 (42.27)	-5.29	1,764 (50.89)	1,612 (46.19)	-4.70	-0.59
Consumption Rationing	517 (47.56)	555 (50.78)	3.22	1,584 (45.7)	1,664 (47.68)	2.0	1.22
Three meals a day	53 (4.88)	76 (6.95)	2.07	118 (3.4)	214 (6.13)	2.73	-0.7
Total	1,087 (100)	1,093 (100)		3,466 (100)	3,490 (100)		
$\chi 2$	0.014			0.000			

Note: Figures in parentheses are column percentage Source: Author's calculation

There have been significant and positive changes in the consumption behavior of the participants during the post-PRIME period in 2008 over the pre-PRIME period, compared to the non-participants. Percentage of participating households in occasional starvation has declined by over

five percentage points. Compared to the non-participants, the rate of decline was higher. This is also the case with consumption rationing. There was higher increase in consumption rationing for the participants in *monga* of 2008 over the pre-PRIME period. The net increase was more than one percentage point – half a times the increase for the non-participants. However, although there was an increase in the percentage of households having three full meals during the last *monga* for both the participants and non-participants, the rate of gain was higher for the non-participants. The change between pre and post intervention for both participant and the non-participant groups were statistically significant, and shows the overall positive impact of the PRIME intervention. A district[2] wise interpretation of consumption ordering of sample type in pre and post intervention might give a better understanding of this scenario.

Matching the overall trend, Gaibandha performed really well in reducing occasional starvation and increasing the capability of consumption rationing among the participant households compared to the non participants (Table A-6). In the first case the incidence of extreme food insecurity reduced more sharply for participants (-22.4 percent) than non- participants (-19.3 percent). This implies that relatively the participants were better off. Such decline contributed to gain in higher consumption ordering. There was an increase in percentage of households in consumption ordering for both participants and non-participants. But the rate of increase was higher for the participants.

Like Gaibandha, in Kurigram similar trend is observed (Table A-7). The D-i-D estimates show, in Kurigram PRIME interventions contributed to reduction in occasional starvation among participant households by 25.61 percent which is 4.36 percent higher than participant households. Both types of households are roughly equal by percentage in consumption rationing level. Though we see a sluggish growth at the 3 meals a day level, it is nevertheless welcome because it definitely indicates progress in one of the most impoverished districts of North Bengal.

Defying the overall trend Lalmonirhat is the district where incidence of occasional starvation actually increased for both participants and non participants. Nonetheless participants are less worse-off than the non participants which is a good sign. Households with consumption rationing for both participants and non participants decreased by roughly equal percentage (7.24 and 7.66 percent respectively). Reduction in 3 meals a day for participants is also less dramatic than non-participants indicating the steady growth of shock absorbing capacity of the participant group.

In Nilphamari, though occasional starvation rose for both participant and non participant groups, it increased less for the participants. In terms of consumption rationing participants did really better than the non participants in the sense that less participant households actually lost this capacity to manage two meals day. Nilphamari is perhaps the only district where participants actually performed better than non participants in terms of securing 3 meals a day.

Rangpur performed well in all three phases of consumption order although at the 3 meals a day level non participants scored a bit higher than the participants. In both reducing occasional starvation and increasing consumption rationing, PRIME interventions seem to have paid off.

[2] District tables concerning changes in consumption ordering during the past two *monga* period are presented in Appendix.

Dynamics of consumption ordering during *monga* period

So far we have presented a comparative picture of the difference in consumption pattern of the participants and non-participants households during normal time and *monga* period. We found that participant households were faring relatively well than the non-participant households. But to have a clearer understanding of the movement of these households in consumption ordering we need to have a closer look at the dynamics of consumption ordering between *monga* periods. This will enable us to discern to what extent PRIME interventions have been able to bring any positive change in *monga* prone areas.

Table 3
Dynamics of consumption ordering during *monga* period

Consumption Order in *Monga* Period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	236 (45.83)	245 (47.57)	34 (6.6)	515 (100)	832 (47.3)	823 (46.79)	104 (5.91)	1,759 (100)
Consumption Rationing	210 (40.46)	274 (52.79)	35 (6.74)	519 (100)	706 (44.43)	776 (48.84)	107 (6.73)	1,589 (100)
Three meals a day	16 (30.19)	31 (58.49)	6 (11.32)	53 (100)	46 (38.98)	70 (59.32)	2 (1.69)	118 (100)
Total	462 (42.5)	550 (50.6)	75 (6.9)	1,087 (100)	1,584 (45.7)	1,669 (48.15)	213 (6.15)	3,466 (100)

Note: Figures in parentheses are row percentage Source: Author's calculation

Generally, both the participants and non-participants had reasonably higher level of consumption during the 2008 *monga* in relation to the 2007 level. But the participant households fared relatively well in terms of upward movement, although it was marginal, at each level of consumption ordering. Percentage of households in occasional starvation during 2008-*monga* declined by 55 percent compared to 53 percent for the non-participants. Similarly, participant-households slipped into occasional starvation only by 30 percent compared to 39 percent for the non-participants. Therefore, it can be concluded that the participants are better off than the non-participant group.

But such trend may not hold for all districts[3] in the region because of diversity in characteristics. Generally, trend is similar – participants are better off. Gaibandha (Table A-11), Kurigram (Table A-12) and Nilphamari (Table A-13) have the similar trend, but the rate of households in occasional starvation in 2008-*monga* declined more for Gaibandha. Although the trend was similar for Lalmonirhat, it experienced higher percentage of participants in occasional starvation than the non-participants in 2008 *monga* (Table A-14). Although Rangpur followed the overall

[3] All district level tables are presented in the Appendix to Chapter Three.

regional trend, the rate of occasional starvation in 2008-*monga* was highest among the districts compared to the non-participants.

The changes in consumption ordering in 2008-*monga* from the 2007-*monga* had all directions. Some households slipped into occasional starvation in 2008 from three full meals a day in 2007. Similarly, some households showed sign of improvement from occasional starvation to three full meals a day. That means, value of changes in ordering may have value of -2 (slipped in 2008-*monga* by two levels of consumption ordering: from Three meals a day (3) to occasional starvation (1) and maximum positive value of 2 (improved by two levels of consumption ordering: from 1 to 3). These changes are indeed determined by household and district level characteristics of 2008. We consider four key household characteristics in Table 4 to understand change in consumption ordering.

Table 4
The determinants of changes in consumption ordering

Change in consumption ordering	Land holding (mean decimal)		Family size (mean)		HH Income (mean Taka)		Percentage of HH Wage employment	
	P	NP	P	NP	P	NP	P	NP
-2	6.5	7.34	4.06	4.52	42917.05	39721.08	75	60.87
-1	9.69	11.33	4.37	4.06	39943.78	41101.74	59.41	57.64
0	13.8	16.65	4.26	4.05	45735.28	38331.91	47.18	52.67
1	15.66	21.3	4.22	4.14	48773.59	48857.88	43.97	49.19
2	32.95	35.12	4.06	4.28	107509.7	74939.76	37.14	33.64

Note: P = Participants; NP = Non-participants. Source: Author's calculation

We find that there is a positive relationship between change in consumption rationing and household landholding. But the level of landholding is relatively less for the participants than the non-participants. Despite little lower landholding, how could the participants maintain higher increase in consumption ordering? It may be due to higher income level of the participants. The participants had mean annual income of Tk. 107,509 compared to around Tk. 75,000 for highest positive movement (by two level) the non-participants. Stability in income perhaps can be attributed to percentage of households in wage employment. Generally, it is lower for the participants than the non-participants. This is the trend that can be observed from Table-2. Households can move to higher level of consumption by higher income but also influencing consumption through lower family size. There is an inverse relationship between change in consumption ordering and mean family size for the participants and positive relation for the non-participants. The positive relation between family size and changes in consumption ordering is little unexpected, but this may due to multiple income earners.

Changes in consumption ordering are also influenced by access to savings and borrowed fund. Table-5 shows changes in consumption rationing by the variables concerning access to finance – savings and borrowed funds. It shows that access to finance matters. This is evident from the positive relationship between higher savings and borrowing. Mean savings is higher for the participants than the non-participants. Mean borrowing is relatively lower too. However, the

positive change in consumption ordering may have been influenced by higher access of participants to the amount of supports (both cash and kind) than the non-participants.

In brief, it can be argued that changes in consumption ordering are determined by household characteristics (land size, family size, income and wage employment) and ability to access finance (borrowing, own savings and supports during 2008 *monga*). Participating households had higher income, higher savings, higher access to finance and higher amount of savings than the non-participants. Therefore, they are likely to have higher positive changes in consumption ordering.

Table-5
Relationship between changes in consumption ordering and access to finance

Change in consumption ordering	HH Borrowing from (Informal sector)		HH Borrowing from Institutions		Support from public & private source		HH savings	
	P	NP	P	NP	P	NP	P	NP
-2	593.75	2342.3	0	0	845.63	948.8	50	23.91
-1	1426.92	1608.35	167.36	114.25	674.56	747.85	58.16	33.89
0	2008.9	2189.33	161.17	98.76	903.49	677.55	56.12	32.48
1	3005.92	2588.67	141.84	205.16	1079.66	637.41	53.9	36.41
2	314.29	3611.5	457.14	1570.09	427.14	355.47	68.57	48.6

Note: P = Participants; NP = Non-participants Source: Author's calculation

Econometric Analysis of the Determinants of Changes in Consumption Ordering

Based on the descriptive analysis of the determinants of changes in consumption ordering, we used Ordered Logit technique to estimate determinants of change in consumption ordering. We included household and community characteristics as exogenous variables. Parameter estimates are reported in Table-6.

The signs of the estimates parameters are quite expected and consistent. Most of the coefficients are significant. The likelihood of positive change in consumption ordering reduces if households are in wage employment. That means, households with self-employment are more likely to have positive change in consumption ordering. The probability was estimated to 0.28. Education matters for the households. Years of schooling of household head have positive change. This is also the case with landholding. Higher landholding increases probability of positive change in consumption ordering. Income generating assets have profound positive impact. Ownership of transport, small business and agricultural equipment has higher impact.

Based on the parameter estimates, we calculated probability of changes in either positive or negative direction. Probability estimates are reported in Table-7. The distribution of probability is almost normal. Probability of positive change is 0.30, but probability of negative change is 0.24. Given the probability of no change (0.46) and probability of positive change is 0.30, it can

perhaps be argued that targeted households during the last *monga* was better off. There is virtually no difference in probability by participants and non-participants. This is what was expected as the non-participant households were also from the program village. It will be quite clear when we evaluate it using cross-sectional data that includes participants and non-participants in control villages.

Table-6
Determinants of change in consumption ordering during pre-PRIME and post-PRIME *monga*

Determinants of change in number of meals in *monga*	Change in *monga* period meals
	Coefficient
Households head's education: years	0.018*
Households head's age: years	-0.014
Square of household head age	0.000
Household size	0.01
Land asset: decimals	0.001*
HH head's main occupation is wage employment: 0=N, 1=Y	-0.28***
Dummy of ownership of agricultural equipment	0.018***
Dummy of ownership of transport	0.31***
Dummy of small business	0.46***
Dummy of availing the Vulnerable Group Development program	-0.07
HH is a member of Old Age program: Y=1, N=0	0.06
Presence of *char* (land very close to big river and subject to river erosion)	0.72***
Household did migration during *monga*: Y=1, N=0	0.06
Value: total support during *monga*: Tk.	0.000
N = 9112 Pseudo R^2 = 0.0437	
note: *** p<0.01, ** p<0.05, * p<0.1	

Notes: Change in number of meals in *monga* is equal to *monga* meals in 2008 minus *monga* meals in 2007

Table-7
Probability of change in consumption ordering

Food Consumption vulnerability [Change in consumption ordering in 2008-*monga* from 2007-*monga*]	Probability of occurrence the Food Consumption vulnerability
-2	0.01
-1	0.23
0	0.46
1	0.27
2	0.03

Conclusion:

So far we have presented a comparative picture of the difference in consumption pattern of the participants and non-participants households during normal time and *monga* period. We found that participant households were faring relatively well than the non-participant households. The credit and cash for work program have unaltered their purchasing power in lean period. The participation to this PRIME program have some significant improvement for their consumption smoothening.

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Appendix

Table A-1
Consumption ordering of households
by participation status in Gaibandha (Current times)

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	55 (20.07)	6 (2.18)	-17.89	111 (13.14)	22 (2.56)	-10.54	-6.35
Consumption Rationing	177 (64.6)	211 (76.73)	12.13	598 (70.77)	688 (80)	9.23	2.90
Three meals a day	42 (15.33)	58 (21.09)	5.66	136 (16.09)	150 (17.44)	1.35	4.31
Total	274 (100)	275 (100)	0.36	845 (100)	860 (100)	1.78	
$\chi 2$	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-2:
Consumption ordering of households
by participation status in Gaibandha (Current times)

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post- PRIME	% of Change	
Occasional starvation	0 (0)	7 (2.58)	-2.58	15 (1.54)	16 (1.63)	-0.19	-2.39
Consumption Rationing	129 (47.6)	155 (57.2)	9.6	474 (48.52)	649 (66.16)	17.64	-8.04
Three meals a day	142 (52.4)	109 (40.22)	-12.18	488 (49.95)	316 (32.21)	-16.74	4.56
Total	271 (100)	271 (100)	0.00	977 (100)	981 (100)	0.41	
$\chi 2$	0.001			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-3
Consumption ordering of households
by participation status in Lalmonirhat (Current times)

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	17 (6.32)	2 (0.74)	-5.48	42 (5.65)	18 (2.42)	-2.93	-2.45
Consumption Rationing	67 (24.91)	194 (72.12)	47.21	253 (34.05)	565 (75.84)	42.79	4.42
Three meals a day	185 (68.77)	73 (27.14)	-41.63	448 (60.3)	162 (21.74)	-38.56	-3.07
Total	269 (100)	269 (100)	0.00	743 (100)	745 (100)	0.27	
$\chi 2$	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-4
Consumption ordering of households
by participation status in Rangpur (Current times)

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post- PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	26 (18.71)	3 (2.11)	-16.60	119 (21.76)	15 (2.73)	-19.03	-2.43
Consumption Rationing	79 (56.83)	97 (68.31)	11.48	273 (49.91)	421 (76.55)	26.64	-15.16
Three meals a day	34 (24.46)	42 (29.58)	-5.12	155 (28.34)	114 (20.73)	-8.39	3.27
Total	139 (100)	142 (100)	2.16	547 (100)	550 (100)	0.55	
$\chi 2$	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-5
Consumption ordering of households
by participation status in Nilphamari (Current times)

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	12 (8.96)	3 (2.21)	-6.75	33 (9.32)	12 (3.39)	-5.93	-0.82
Consumption Rationing	72 (53.73)	105 (77.21)	23.48	184 (51.98)	265 (74.86)	22.88	0.60
Three meals a day	50 (37.31)	28 (20.59)	16.72	137 (38.7)	77 (21.75)	16.95	-0.23
Total	134 (100)	136 (100)	1.49	354 (100)	354 (100)	0.00	
$\chi 2$	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-6
Consumption ordering of households during last two *monga* periods
by participation status in Gaibandha

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post- PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	142 (52.4)	84 (31)	-22.4	549 (56.19)	361 (36.8)	-19.3	-3.1
Consumption Rationing	128 (47.23)	153 (56.46)	9.23	426 (43.6)	502 (51.17)	7.5	1.73
Three meals a day	1 (0.37)	34 (12.55)	12.18	2 (0.2)	118 (12.03)	11.83	0.25
Total	271 (100)	271 (100)	0.00	977 (100)	981 (100)	0.41	
$\chi 2$	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-7
Consumption ordering of households during last two *monga* periods
by participation status in Kurigram

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	164 (59.85)	122 (44.36)	-15.49	524 (62.01)	419 (48.72)	-13.29	-2.20
Consumption Rationing	110 (40.15)	145 (52.73)	12.58	319 (37.75)	418 (48.6)	10.8	1.78
Three meals a day	0 (0)	8 (2.91)	2.91	2 (0.24)	23 (2.67)	2.43	0.38
Total	274 (100)	275 (100)	0.36	845 (100)	860 (100)	1.78	
χ^2	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-8
Consumption ordering of households during last two *monga* periods
by participation status in Lalmonirhat

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	69 (25.65)	109 (40.52)	14.87	198 (26.65)	308 (41.34)	14.69	-0.19
Consumption Rationing	152 (56.51)	141 (52.42)	4.09	444 (59.76)	410 (55.03)	4.73	-0.64
Three meals a day	48 (17.84)	19 (7.06)	-10.82	101 (13.59)	27 (3.62)	-9.97	-0.95
Total	269 (100)	269 (100)	0.00	743 (100)	745 (100)	0.27	
χ^2	0.000			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-9
Consumption ordering of households during last two *monga* periods
by participation status in Nilphamari

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post- PRIME	% of Change	Pre- PRIME	Post-PRIME	% of Change	
Occasional starvation	49 (36.57)	73 (53.68)	17.11	122 (34.46)	202 (57.06)	22.40	-5.29
Consumption Rationing	83 (61.94)	56 (41.18)	-20.76	225 (63.56)	134 (37.85)	-15.71	-5.05
Three meals a day	2 (1.49)	7 (5.15)	3.66	7 (1.98)	18 (5.08)	3.10	0.56
Total	134 (100)	136 (100)	1.49	354 (100)	354 (100)	0.00	
$\chi 2$	0.002			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-10
Consumption ordering of households during last two *monga* periods
by participation status in Rangpur

Meal consumption type	Participants			Non-participants			Overall D-i-D
	Pre-PRIME	Post-PRIME	% of Change	Pre-PRIME	Post-PRIME	% of Change	
Occasional starvation	93 (66.91)	74 (52.11)	-14.80	371 (67.82)	322 (58.55)	-9.27	-5.53
Consumption Rationing	44 (31.65)	60 (42.25)	10.60	170 (31.08)	200 (36.36)	5.31	5.29
Three meals a day	2 (1.44)	8 (5.63)	-4.19	6 (1.1)	28 (5.09)	3.99	0.20
Total	139 (100)	142 (100)	2.16	547 (100)	550 (100)	0.55	
$\chi 2$	0.017			0.000			

Note: ( ) shows percentage. Source: Author's calculation

Table A-11
Dynamics of consumption ordering during *monga* period in Gaibandha

Consumption order in *monga* period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	49 (34.51)	72 (50.7)	21 (14.79)	142 (100)	206 (37.52)	276 (50.27)	67 (12.2)	549 (100)
Consumption Rationing	35 (27.34)	80 (62.5)	13 (10.16)	128 (100)	152 (35.68)	224 (52.58)	50 (11.74)	426 (100)
Three meals a day	0 (0)	1 (100)	0 (0)	1 (100)	2 (100)	0 (0)	0 (0)	2 (100)
Total	84 (31)	153 (56.46)	34 (12.55)	271 (100)	360 (36.85)	500 (51.18)	117 (11.98)	977 (100)

Note: ( ) shows percentage. Source: Author's calculation

Table A-12
Dynamics of Consumption ordering during *monga* period in Kurigram

Consumption order in *monga* period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	74 (45.68)	82 (50.62)	6 (3.7)	162 (100)	246 (47.4)	260 (50.1)	13 (2.5)	519 (100)
Consumption Rationing	49 (43.75)	62 (55.36)	1 (0.89)	112 (100)	151 (46.6)	163 (50.31)	10 (3.09)	324 (100)
Three meals a day	- -	- -	- -	- -	0 (0)	2 (100)	0 (0)	2 (100)
Total	123 (44.89)	144 (52.55)	7 (2.55)	274 (100)	397 (46.98)	425 (50.3)	23 (2.72)	845 (100)

Note: ( ) shows percentage. Source: Author's calculation

Table A-13
Dynamics of consumption ordering during *monga* period in Nilphamari

Consumption order in *monga* period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	28 (57.14)	20 (40.82)	1 (2.04)	49 (100)	76 (62.3)	45 (36.89)	1 (0.82)	122 (100)
Consumption Rationing	44 (53.01)	33 (39.76)	6 (7.23)	83 (100)	122 (54.22)	86 (38.22)	17 (7.56)	225 (100)
Three meals a day	0 (0)	2 (100)	0 (0)	2 (100)	3 (42.86)	4 (57.14)	0 (0)	7 (100)
Total	72 (53.73)	55 (41.04)	7 (5.22)	134 (100)	201 (56.78)	135 (38.14)	18 (5.08)	354 (100)

Note: ( ) shows percentage. Source: Author's calculation

Table A-14
Dynamics of consumption ordering during *monga* period in Lalmonirhat

Consumption order in *monga* period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	32 (46.38)	34 (49.28)	3 (4.35)	69 (100)	79 (39.9)	112 (56.57)	7 (3.54)	198 (100)
Consumption Rationing	61 (40.13)	80 (52.63)	11 (7.24)	152 (100)	192 (43.24)	234 (52.7)	18 (4.05)	444 (100)
Three meals a day	16 (33.33)	27 (56.25)	5 (10.42)	48 (100)	36 (35.64)	63 (62.38)	2 (1.98)	101 (100)
Total	109 (40.52)	141 (52.42)	19 (7.06)	269 (100)	307 (41.32)	409 (55.05)	27 (3.63)	743 (100)

Note: ( ) shows percentage. Source: Author's calculation

Table A-15
Dynamics of consumption ordering during *monga* period in Rangpur

Consumption order in *monga* period (2007)	Participants				Non-Participants			
	Consumption order in *monga* period (2008)				Consumption order in *monga* period (2008)			
	Occasional starvation	Consumption Rationing	3 meals a day	Total	Occasional starvation	Consumption Rationing	3 meals a day	Total
Occasional starvation	53 (56.99)	37 (39.78)	3 (3.23)	93 (100)	225 (60.65)	130 (35.04)	16 (4.31)	371 (100)
Consumption Rationing	21 (47.73)	19 (43.18)	4 (9.09)	44 (100)	89 (52.35)	69 (40.59)	12 (7.06)	170 (100)
Three meals a day	0 (0)	1 (50)	1 (50)	2 (100)	5 (83.33)	1 (16.67)	0 (0)	6 (100)
Total	74 (53.24)	57 (41.01)	8 (5.76)	139 (100)	319 (58.32)	200 (36.56)	28 (5.12)	547 (100)

Note: ( ) shows percentage. Source: Author's calculation