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Abstract

The poor households in the northwest region of Bangladesh are highly vulnerable to the seasonal food deprivation locally known as *monga*. Households adopt different strategies to cope with *monga*, including the advance sale of labor or crop as well as seasonal out-migration. Some 36 percent of poor households migrate out from this region every year to seek employment elsewhere in Bangladesh. This article examines the factors influencing the decision to migrate and its impact on consumption smoothing. An analysis of a large household survey data shows that household and community characteristics determine the probability of out-migration during the lean season. The probability is high for households with high dependency ratio, high dependency on wage employment, and in villages where unemployment rate is high. Access to micro-credit programs reduces the probability of migration perhaps because of alternative employment opportunities created with borrowing from microfinance institutions. More importantly, seasonal migration does help smooth consumption, and migrant families are better off than non-migrant families in mitigating seasonal hardship.

Seasonal Migration and Mitigating Income Seasonality In Northwest Bangladesh

Seasonal food deprivation locally known as *monga* is a recurrent problem in the northwest region of Bangladesh (also known as the greater Rangpur region). This hardship is caused in part by regional economic structure (mostly agriculture dependent), and in part by poor agroclimatic conditions (CARE 2005; Zug 2006; Rahman 1995; Afsar 2005). The agriculture sector of Bangladesh is characterized by three crop seasons based on three kinds of rice - *Aus*, *Aman* and *Boro*. These three crops cannot fully cover the whole year as there is a period of virtual economic inactivity during the months of September to November which is the pre-harvest period of *Aman* rice and known as the *monga* period of the northwest region.[1] There is almost no alternate agricultural activity during this period, and the non-farm sector in the northwest region is not large enough to absorb the seasonally unemployed population who are mostly agricultural laborers or small farmers. Furthermore, ecological vulnerability can intensify the effects of the crop seasonality - *monga* period is often preceded by flood or drought.

An important concern is if seasonal food deprivation is due to the lack of food availability. True, Bangladesh is not fully food solvent, but its own production and import volume are large enough to make such concern a nonissue when it comes to the seasonal deprivation in the northwest region (WFP, 2005). It is the lack of purchasing power, not of food availability, that makes food inaccessible to the poor households and manifests as the seasonal food deprivation. Lack of purchasing power is limited in *monga* season due to lack of income and employment during the pre-harvest *Aman* season, which cannot be overcome with the very little assets and savings that the poor people have. As Sen (1981) points out, seasonal deprivation is due to the working of an economic system that limits the ability of a segment of the population in acquiring food and other basic necessities.

Seasonal deprivation can also happen due to the lack of credit. Many of the poor population in the northwest region do not have access to a well-functioning credit market. As a result, they are frequently drawn to an informal credit market arrangement called *dadan* which forces them to make advance sale of the labor and crops in exchange for immediate food and money, often to their long-term detriment. Moreover, the safety net measures such as cash transfers, food-for-work, food coupons, and public work programs are often inadequate to manage the crisis of *monga*. If variations in consumption were only transitory in nature and are idiosyncratic across households, these interventions would have helped the households mitigate the suffering during the *monga*. But since *monga* is widespread and often a result of structural factors such as low income, low productivity, and lack of diversification of local economies, the government measures, which are not geared toward enhancing income and productivity in general, are of little help to contain *monga* on a sustainable basis.

When the aforementioned measures are inadequate, an important measure that the households adopt to cope with the seasonality is seasonal migration.[2] About 36 percent of poor households from greater Rangpur adopted migration to reduce the severity of *monga* in 2007. Seasonal migration supplements non-farm earnings of the poor, providing them with a means to diversify income opportunities and to accumulate collective capital (IOM 2005). In addition, migrants' remittances may stimulate local economy (Afsar 2005; Deshingkar 2005; IOM 2005; Oberai, Prasad and Sardana 1989).

Neoclassical micro-economic theory defines migration as an individual strategy for income maximization. Namely, given their differential earning potential (which are typically human capital

proxy), individuals migrate when the expected gain from migrating is greater than that from staying local (Todaro 1969). In the model of Todaro (1969), human capital characteristics of individuals may influence both their wages and their likelihood of obtaining a job once they migrate. Similar models that conceptualize migration as an individual decision to maximize income are abundant in literature (Hay 1980; Kalzuny 1975; Nakosteen and Zimmer 1980; Navratil and Doyle 1977; Yezer and Thurston 1976). Stark and Taylor (1989) attributed this tendency to maximize and diversify income to a household strategy for risk minimization in an imperfect market.

Srivastava (2005) explains that, in absence of suitable employment or livelihood opportunities in the local areas, internal migration is most often a viable option with expectations of higher wages, better employment alternatives and factors which maximize family employment in the destination areas. Migration tends to be motivated by a demand for migrant labor which is higher in the destination areas than in the local areas. In other words, labor market segmentation plays a role in internal migration. There are several other impetuses which may create the basis for migration: economic hardships during the time of crisis or emergency such as floods or famine period and so on. Thus, migration is the result of individuals and households weighing the utility that is attainable under different migration regimes against that from not migrating.

Seasonal migration can be seen as a strategy to minimize seasonal hardships such as the lack of food or income during certain months of the year when local markets do not offer income earning opportunities. It can also be seen as a strategy to augment income in general. A study from Vietnam shows that, among other factors, social network matters a lot in deciding who will migrate (Brauw and Harigaya 2007). The same study also shows that seasonal migration played an important role in the improvement of living standards.

This article examines the issue of seasonal migration within the context of mitigating seasonal deprivation. Using a household survey data from the northwest region of Bangladesh, this article asks the following questions: Is seasonal migration a viable strategy to mitigate seasonal hardships? Who migrates and what are the determinants of seasonal migration? What impact does it have on the consumption smoothing behavior? The article's analysis suggests that a substantial percentage of the rural poor from the northwest region migrate in response to the seasonal shortfall in employment and income, and seasonal migration is a valid strategy to mitigate seasonality of income and consumption.

The article is structured as follows. The second section discusses the data and its major characteristics, such as the incidence of seasonal migration as a coping strategy and its relation to seasonal hardships (measured by starvation and meal rationing). The third section presents an analytical framework of how seasonal migration can help smooth consumption during the lean season. Section four presents an analysis of the determinants of seasonal migration. Section five provides an assessment of the impact of seasonal migration on the consumption smoothing behavior of rural households. And, the concluding section summarizes the findings with policy implications.[3]

Data and its characteristics

This article uses the rural household survey data of 480,918 poor households drawn from the five districts of the northwest region of Bangladesh. The survey was conducted by the Institute of Microfinance (InM) and Palli Karma Shahayak Foundation (PKSF) as a baseline data to target the ultra-poor households that are vulnerable to seasonal deprivation during the lean season (or *monga* period). The survey covered all the upazilas in Kurigram and Lalmonirhat districts.[4] In other three districts, selected number of *monga*-prone upazilas was covered.[5] The survey in Lalmonirhat was conducted in 2006 and in other districts in 2007. Data were edited and cleaned

Table- 1: Distribution of HHs their meal consumption status during *monga* period (%)

Meal consumption status	Kurigram	Gaibandha	Nilphamari	Lalmonirhat	Rangpur	All districts
Starvation	48.47	57.62	26.16	47.95	56.34	47.27
Meal rationing	50.14	40.79	60.37	49.54	40.35	48.29
Full meals	1.39	1.59	13.47	2.51	3.31	4.44
Observations	120,426	128,987	102,866	56,772	71.867	480,918

Source: InM survey 2006.

at the Institute of Microfinance (InM). Altogether 15 upazilas were covered with 146 unions and 2,433 villages.

This article uses this large data set to examine the extent of seasonal migration, and its determinants and impacts. It is evident that seasonal hardship is severe in the greater Rangpur region during *monga* (table 1). More than ninety percent of the poor households did not have full meals during the lean season of September-November. The households in the district of Nilphamari fared better than other districts with lowest starvation rate and highest full meal consumption rate.

Households are found to adopt different coping strategies. Table 2 gives a brief overview of the different types of coping mechanisms that households adopt during *monga*, which includes seasonal migration. Overall, 65 percent poor households in the greater Rangpur adopt some kind of coping mechanisms during *monga*. While more households resort to informal coping (30 percent) than formal coping (16 percent), a good share (19 percent) does both. An interesting observation from table 2 is the coping trend in Lalmonirhat district, where coping adoption rate is the highest (72 percent), so is the disparity between formal (9 percent) and informal coping (45 percent) rates. It may be indicative of the limitation of the formal sources in providing immediate

Table- 2: Distribution of HHs by coping measure during *monga* (%)

Monga coping measures	Kurigram	Gaibandha	Nilphamari	Lalmonirhat	Rangpur	All districts
High level view						
Coping households	63.93	65.34	68.99	72.38	56.35	65.25
Formal coping only	14.29	14.94	24.73	09.32	15.38	16.27
Informal coping only	32.94	29.76	21.88	44.68	24.48	29.84
Both formal and informal Coping	16.70	20.64	22.38	18.38	16.49	19.14
Non-coping households	36.07	34.66	31.01	27.62	43.65	34.75

Monga coping measures	Kurigram	Gaibandha	Nilphamari	Lalmonirhat	Rangpur	All districts
Details						
Informal coping	49.64	50.40	44.26	63.06	40.97	48.98
Advance labor sale	1.60	1.96	6.28	10.50	5.70	4.36
Advance crop sale	0.45	0.23	0	1.09	1.59	0.54
Advance asset sale	12.11	17.03	0	18.50	10.51	11.35
Migration	41.82	37.96	24.75	50.37	27.44	35.99
Informal loan	4.73	7.46	25.28	17.34	11.69	12.38
Formal coping	30.99	35.58	47.11	27.70	31.87	35.41
Government and non-government support	29.17	32.55	41.59	22.96	26.97	31.67
Formal loan	2.28	4.26	9.90	7.46	7.21	5.79
Observations	120,426	128,987	102,866	56,772	71.867	480,918

Note: Sum of percentage figures add to more than 100 because households adopt multiple coping mechanisms.

Source: InM survey 2006.

support to *monga* sufferers. As for coping sub-categories, migration is number one - some 36 percent of poor households in the greater Rangpur region adopted seasonal migration as a strategy during the *monga* of 2006/2007. Gaibandha and Nilphamari had the highest rates of migration. Over 50 percent of the poor households in those districts adopted seasonal migration (table 2).

Table- 3: Seasonal migration during *monga* by HH's other coping mechanisms (%) (N=480,918)

Type of HH's other coping	Gaibandha	Kurigram	Lalmonirhat	Nilphamari	Rangpur	All districts
No other coping mechanism adopted (51.2)	33.0	38.8	44.4	21.0	21.1	32.1
Advance sale only (6.5)	39.8	49.8	57.0	41.4	38.3	45.7
Borrowing only (8.2)	45.1	50.8	58.0	25.5	34.4	37.8
Support from SNP only (20.7)	40.5	40.0	39.6	23.8	28.5	34.5
Adopted a combination of coping scheme (13.4)	49.7	57.9	66.2	32.2	42.9	47.3

Note: Figures in parentheses are sample share of each coping mechanism group.

Source: InM data 2006.

In Kurigram, which is the most depressed area of all districts, the migration rate was over 41 percent. Nilphamari and Rangpur districts, which are more developed and less prone to floods than other districts, have had less migration, hovering around 25 percent.The observed higher incidence of migration in Gaibandha, Kurigram and Lalmonirhat districts may be due to higher risk of flood and higher dependency on agriculture, which is not unexpected as a few major rivers flow through these districts.

However, migration pattern varies depending on the other coping mechanisms the households are found to adopt. As table 3 shows the migration pattern among the households that adopt other coping mechanisms or no coping at all. Among the poor households who did not adopt any other coping mechanisms (51 percent of the sample) 32 percent decided to migrate. That is, about 16 percent of the sample households adopt migration as their only coping mechanism. Although the migration rate is quite high (45.7 percent) among those households who sale asset, or advance labor or crop as their only other coping mechanism, these households constitute a small share (6.5 percent) of the sample households. The migration rate is the highest (47.3 percent) among the households who adopt multiple forms of other coping mechanisms (13.4 percent). This trend is generally consistent across districts. Thus, the households who have the flexibility or means to adopt a wide range of coping strategies are perhaps better off during *monga* than the households whose coping options are rather limited.

Table- 4: Seasonal migration during *monga* by HH's food consumption status during *monga* (%) (N=480,918)

HH's Food consumption status during *monga*	Gaibandha	Kurigram	Lalmonirhat	Nilphamari	Rangpur	All districts
Starvation (47.2)	39.6	41.7	52.5	25.3	25.5	37.5
Meal rationing (48.3)	35.9	42.0	48.9	24.6	29.3	35.2
Full meals (4.4)	31.3	38.9	39.7	24.2	38.6	28.7

Note: Figures in parentheses are sample share in each food consumption group.

Source: InM data 2006.

How does migration pattern vary by the meal consumption pattern of the households? Table 4 shows a household's migration rate by its food deprivation pattern during the *monga* period. It is not surprising that a household's migration rate is positively correlated with the degree of seasonal hardship. For example, 28.7 percent households who enjoy full meals migrate during the *monga* season, compared to 35.2 percent among the meal-rationed and 37.5 percent among the starving households. This pattern holds for all districts except for Rangpur where the migration rate is the highest among the households who have full meals during the *monga* period. It is possible that migration may have helped these households avoid food deprivation during the *monga* season. We will investigate this speculation later.

Let us examine the relationship between food deprivation and migration from the opposite perspective. How does starvation status vary by migration status? Does a household's food consumption status vary between *monga* and non-*monga* period? Table 5 gives possible answers to these questions. Besides describing food deprivation during *monga* and non-*monga* periods, we also construct a third measure of food deprivation to demonstrate a household's year-round food deprivation status in the following way. If a household suffers from starvation any time of the year, that is, during either *monga* or non-*monga* we call this hardship year-round starvation. Similarly, there are households that never suffer from starvation, but at the same time cannot secure full meals for the whole year. These households hover between meal rationing and

Table- 5: Distribution HHs by their food consumption status (%) (N=480,918)

Period	Migrant HHs			Non-migrant HHs		
	Starvation	Meal rationing	Full meals	Starvation	Meal rationing	Full meals
Monga period	49.2	47.3	3.5	46.2	48.8	5.0
Non-*monga* period	7.3	53.7	39.0	9.2	49.3	41.5
Year round	51.7	45.5	2.8	49.4	46.3	4.3

Source: InM data 2006.

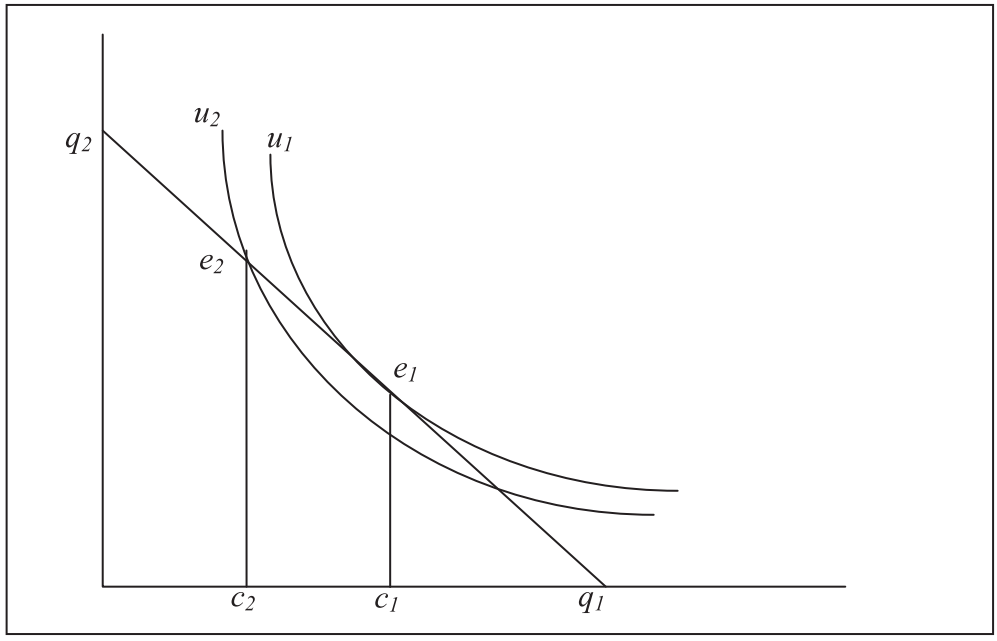
full meal status at any time of the year. We term this status as year-round meal rationing. Combining these two groups together we find the households who are subject to some form of hardship during any time of the year.

Table 5 shows that the incidence of starvation is higher among the migrant households than among the non-migrant households. Does this mean that seasonal migration has made the seasonal hardship worse? One could hypothesize that seasonal hardship would have been even worse had the poor not migrated during the lean season. We shall explore this key question in section 6: Does migration really help the poor? Before we do this, we need to examine the migration decision of a household in the event of a *monga*.

An economic framework of consumption shortfalls and seasonal migration

Figure 1 illustrates the utility framework of a two period consumption model with a binding budget constraint. Assume that period 1 is the lean (*monga*) season and period 2 to be the *aman*

Figure 1: Two-period consumption model



harvest season (season immediately following the *monga* season). Given the utility curve (u_1) with a household meeting its budget constraint, it would maximize its utility by consuming c_1 at e_1.

However, if the household faces a budget constraint in the sense that instead of the budget line q_1q_2, it faces a discontinuous budget line such as $q_2e_2c_2$. This is because the household does not have an income in period 1 (i.e., lean period) to support its desired consumption. In this situation, the household would be forced to consume c_2 at e_2 ($c_2 < c_1$) and thereby would be at a lower welfare level than before. This may cause the household either to starve or ration meals. Note that even if the income in period 2 (*aman* harvest season) were to rise it would have no impact on period 1 (lean season) consumption.

Assuming that the household cannot borrow in period 1 against the income of period 2 (some other households may be able to do so), the alternative to seasonal food deprivation is to migrate to a distant market for wage income to support consumption during the lean period. The decision to migrate depends on the expected returns to migration, the knowledge about jobs in the distant market, and the ease of transition to a distant environment (Brauw and Harigaya 2007). The knowledge about distant markets may again depend on the extent of social network. However, there is a potential cost of migration against expected returns. Other than transport and relocation, the cost also includes the income forgone in the local market due to migration. As long as the returns exceed cost, the household would migrate to the distant market, provided it has at least one able member (usually male) to do so.

This can be modeled as follows. Suppose a typical household's objective is to enhance the lean period consumption from c_2 to c_1 through migration. If this condition is met, seasonal migration helps promote household welfare. Therefore, a migrant household is likely to be better off than a non-migrant household, ceteris paribus.

Assume that households earn income Y during the lean period against N units of labor by either selling labor for wage in the local market or getting involved in other income generating activities. If the derived income per unit labor is W, we get the lean period income as,

(1) $$Y = WN$$

Households may decide to send out m proportion of labor N for an expected wage rate P in a distant market. The expected income gain from migration is mNP. That is, the expected income for the lean period with migration is

(2) $$Y_m = N[(1-m)W + mP]$$

Assuming no savings carried over to the next season, households spend what they earn during the lean period and we get change in consumption as

(3) $$\begin{aligned} \Delta C_1 &= N[(1-m)W + mP] - WN \\ &= m(P-W)N \end{aligned}$$

If P=W, there is no change in seasonal income and hence, no change in consumption in the lean period. Alternatively, ($\Delta C_1>0$) if and only if P>W, i.e., the consumption of lean period increases only if returns to migration are higher than those for not migrating. In logarithmic equation form, we can re-write the above changes in consumption as follows:

(4) $$\ln(C_{ij}) = \ln(N_{ij}) + \ln m_{ij} + \ln(P_j - W_k)$$

Unlike P, W, and N (in (4), the variable m, the migration status, is an endogenous variable determined by the same u_i factors that explain variations in consumption. In other words,

(5) $$\ln(m_{ij}) = \ln(N_{ij}) + \ln(P_j - W_k)$$

Therefore, because of simultaneity of consumption (C) and migration (m), it is difficult to determine the causal effect of seasonal migration on consumption pattern in equation (4). This is the estimation challenge we will deal with in section 5 below.

Determinants of seasonal migration

In equation (5), m measures the decision to migrate which is a discrete choice. That is, the decision to migrate (m) is a binomial choice variable (1,0) that depends on the perceived benefits that the household expects to derive from such migration. If the perceived benefits derived from migration are more than the utility from not making the migration, household will migrate. That is, the perceived net utility (the algebraic sum of utilities from migration and non-migration) has to be positive for the household to make the migration. This net perceived utility for household *i* can be expressed as,

(6) $$y_i^* = \beta x_i + \varepsilon_i$$

where, y_i is perceived utility, is a vector of household $y_i^* > 0$ and community characteristics, β is a vector of parameters to be estimated and ε_i is the random error term. For migrant households. Now, this perceived utility (y_i^*) is an unobserved or latent variable, and what we observe is the household's migration decision, so that, $m_i = 1$ if $y_i^* > 0$, and otherwise. Because of the binomial nature of the migration decision a probit model is used to estimate it, which is given by,

(7) $$prob(m = 1) = \int_{-\infty}^{\beta x} \phi(t)dt = \Phi(\beta x)$$

where, ϕ and Φ are normal density distribution function and cumulative normal distribution function respectively.

Both household and community- level factors are likely to influence the decision to migrate during the *monga* season. Among the household factors, we consider household assets of different types, dependency ratio, and age of the household head. The community-level variables include the village access to microfinance institutions (MFIs), to safety net programs, and the village level unemployment rate. The community factors also include district level data on the rainfall and the proportion of the high land.[6] We also include union dummies to control for the role of unobserved area characteristics.

The probit results of equation (7) are reported in table 6. This table also presents the descriptive statistics of the variables used in the probit regression. With an increase of the household head's age, the probability of migration declines. Intuitively, it is expected because the younger people are more able, energetic and willing to take risks, and consequently they tend to migrate more as

Table- 6: Probit estimates of seasonal migration during *monga*

Household characteristics	Mean	Marginal effects
Head's age (years)	40.0 (12.7)	-0.005** (0.0001)
Dependency ratio	0.63 (0.21)	0.266** (0.0039)
Log of land asset (decimal)	8.20 (12.59)	-0.004** (0.0007)
HH head is self-employed	0.16 (0.37)	-0.023** (0.0026)
HH head is wage employed	0.54 (0.50)	0.104** (0.0020)
HH has agricultural asset	0.49 (0.50)	0.081** (0.0018)
HH has nonagricultural asset	0.13 (0.34)	-0.021** (0.0024)
HH has cash savings	0.34 (0.47)	0.011** (0.0016)
HH has cow	0.26 (0.44)	0.004** (0.0017)
If village has access to a safety net program	0.81 (0.39)	-0.0001 (0.0022)
If village has access to micro-credit programs	0.97 (0.18)	-0.094** (0.0050)
The village level unemployment rate	0.30 (0.24)	0.095** (0.0049)
The proportion of high land in the district	0.81 (0.08)	-1.054** (0.0163)
Average yearly rainfall in district (mm)	198.55 (6.62)	-0.004** (0.0003)
Pseudo R^2		0.162
Log likelihood		-263334.2
Observations		480,918

Note: Figures in parentheses are standard deviations for mean column and standard errors for marginal impact column. ** indicates a significance level of 5 percent or better. Regression additionally includes union dummies to control for unobserved effects of union.

Source: InM data 2006.

opposed to the older people. Similar findings were reported by Mora and Taylor (2005). A large number of dependents (captured by a high dependency ratio) always put an extra demand for food. As such, the migration rate is likely to rise as the dependency ratio rises. A 10 percent increase in dependency ratio increases the migration rate by 2.7 percent.

We find an inverse relationship between migration and land ownership, implying that households with less landholding have a higher tendency to migrate. This finding is corroborated by a number of studies which show that as the value of family landholdings increases, the probability of migration decreases (Mora and Taylor 2005; Garip 2006; Durand et. al 1996; Stark and Taylor 1986). This is what we would expect if household landownership and land quality increase the

productivity of the family labor. As table 6 shows, a 10 percent increase in landholding reduces the probability of migration by 0.04 percent.

The status of household head's employment also matters. So does the type of employment. Zug (2006) attributes the lack of income and employment opportunities as the major reason for migration flows, which takes a severe turn during seasonal fluctuations in rural areas. Households headed by self-employed individuals are less likely to migrate than those headed who are not employed. On the other hand, households who are wage employed are more likely to migrate compared to those who are not wage employed. Agricultural activities are riskier and more seasonal than non-agricultural ones. Therefore, the probability of seasonal migration is higher among the households who have more agricultural assets than those who have less. Savings and livestock (which is considered as good as liquid assets for all practical purposes) have a positive effect on the decision to migrate because these assets help facilitate migration.

Access to micro-credit programs has a negative impact on the seasonal migration.[7] This suggests that people participating in microcredit programs to generate off-farm income and employment are less likely to feel threatened during the lean season and hence, less likely to migrate. In contrast, the social safety net programs (such as old age pension, vulnerable group feeding program or vulnerable group development program) do not have a significant effect on seasonal migration. The village-level overall unemployment increases the decision to migrate. For example, a 10 percent increase in unemployment rate increases the probability of migration by as high as one percent. Better agroclimate factors (such as higher rainfall and share of high lands in the district) which affect both the private and public investments in agriculture and hence, farm productivity can help reduce the probability of seasonal migration.[8]

Effects of seasonal migration on seasonality of income and consumption

If our interest is to relate seasonal migration to seasonal food deprivation, the descriptive analysis of Tables 1, 3 and 4 does not tell us much except for providing a correlation. It does not tell us what causes what? That is, does seasonal deprivation drive seasonal migration or seasonal migration determine the extent of seasonal deprivation? In any event, what we observe at any time are confounding influences of all possible factors causing seasonal migration as well as seasonal deprivation. So, we need to determine the respective role of such factors and find out the extent of the impacts of seasonal migration on seasonal hardship. For policymaking purpose, it is important to determine if seasonal migration reduces seasonal hardship.

As already indicated, the model of equation (4) to assess the impacts of seasonal migration is subject to bias, because a household's decision to migrate is not exogenously given. In fact, as section 5 clearly shows, the seasonal migration is determined by a host of factors that are also likely to influence the extent of seasonal deprivation. However, the factors such as networking and knowledge about jobs outside the local markets could influence only the decision to migrate and thus, do not affect the consumption directly but indirectly through migration (Brauw and Harigay 2007). Indeed an individual's networking ability may enable him (or her) to secure economic opportunities through migration more easily than his (or her) non-migrant counterparts. If such variables were available from the survey, we could have followed a two-stage Heckman selection method to estimate the impact of seasonal migration by combining (4) and (5). However, as these types of instrumental variables are not available, we use the endogenous switching regression as proposed by Maddala (1983) to control for endogeneity of the decision to migrate. This model is described below.

Let us assume that m_i denotes household i's decision to make seasonal migration (m_i =1 when a household migrates, 0 when it does not), which is determined by the following selection model: if $\gamma Z_i + u_i > 0$, then m_i =1, and if $\gamma Z_i + u_i \leq 0$, then m_i =0, where Z_i is a vector of household and

village characteristics that determines household's decision to migrate during *monga* season, γ is the parameter to be estimated and ui is the error term. Let us further assume that outcome (e.g., seasonal food deprivation) equations of migrant and non-migrant households are given by,

(8) $C_{1i} = \beta_1 X_{1i} + \varepsilon_{1i}$ when household migrates (m_i =1)

(9) $C_{0i} = \beta_0 X_{0i} + \varepsilon_{0i}$ when household does not migrate (m_i =0)

where X_{1i} and X_{0i} are vectors of household and village characteristics that determines household's food consumption when household migrates and when it does not respectively, and are parameters to be estimated, and and are the error terms. The error terms, u_i, ε_1 and ε_o are assumed to have a tri-variate normal distribution with mean vector zero and covariance matrix,

$$\Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{01} & \sigma_{1u} \\ & \sigma_0^2 & \sigma_{0u} \\ & & \sigma_u^2 \end{bmatrix}$$

where, σ_u^2 , σ_1^2, and σ_0^2 are the variances of u_i, ε_1, and ε_0 respectively, and σ_{1u}, σ_{0u}, and σ_{01} are covariances of ε_1 and u_i, u_0 and u_i, and ε_0 and ε_1 respectively. In a switching regression model, outcome equations are run after controlling for household selection bias.

As we do not have data on the actual consumption, we use categorical variables representing outcomes such as starvation, meal rationing, or consumption of full meals during a season. Note that, starvation during each period is an extreme form of hardship and is considered an outcome. A more moderate form of hardship is meal rationing, which is combined with starvation to form a variable that implies a hardship of any kind.

Table 7 shows the estimation of starvation of migrant and non-migrant households. A household's asset (both land and non-land) lowers its probability of starvation whether it makes a seasonal migration or not. For example, a 10 percent increase of a household's land asset lowers the migrating household's starvation by 0.4 percentage points during the *monga* period, 0.02 percentage points during the non-*monga* period and 0.4 percentage points year-round. For non-migrating households these figures are 0.5 percentage points, 0.06 percentage points and 0.6 percentage points respectively. A household's cash savings have similar negative effects

Table- 7: Estimates of starvation with and without seasonal migration based on switching regression

Household characteristics	Starvation during *monga* period		Starvation during non-*monga* period		Year round starvation	
	With migration	Without migration	With migration	Without migration	With migration	Without migration
Head's age (years)	0.004** (0.0004)	0.002** (00002)	-0.0002 (0.0001)	0.002** (0.0004)	0.004** (0.0004)	0.003** (0.0002)
Dependency ratio	-0.069** (0.0205)	-0.064** (0.0080)	0.016** (0.0058)	-0.003 (0.0022)	-0.043** (0.0205)	-0.065** (0.0082)
Log of land asset (decimal)	-0.043** (0.0013)	-0.053** (0.0009)	-0.002** (0.0004)	-0.006** (0.0003)	-0.043** (0.0013)	-0.055** (0.0009)

Household characteristics	Starvation during *monga* period		Starvation during non-*monga* period		Year round starvation	
	With migration	Without migration	With migration	Without migration	With migration	Without migration
HH head is self-employed	-0.007 (0.0055)	-0.041** (0.0034)	-0.009** (0.0014)	-0.007** (0.0009)	-0.017** (0.0055)	-0.046** (0.0035)
HH head is wage employed	-0.031** (0.0085)	-0.011** (0.0038)	0.002 (0.0024)	-0.004** (0.0011)	-0.029** (0.0085)	-0.019** (0.0039)
HH has agricultural asset	-0.139** (0.0067)	-0.096** (0.0032)	-0.017** (0.0022)	-0.017** (0.0010)	-0.157** (0.0067)	-0.110** (0.0032)
HH has nonagricultural asset	-0.029** (0.0053)	-0.022** (0.0032)	-0.011** (0.0013)	-0.008** (0.0009)	-0.032** (0.0053)	-0.032** (0.0032)
HH has cash savings	-0.026** (0.0032)	-0.025** (0.0022)	-0.003** (0.010)	-0.0001 (0.0007)	-0.026** (0.0032)	-0.021** (0.0022)
HH has cow	-0.034** (0.0032)	-0.027** (0.0023)	-0.005** (0.0009)	-0.006** (0.0007)	-0.039** (0.0032)	-0.034** (0.0023)
If village has access to a safety net program	-0.045** (0.0041)	0.014** (0.0032)	0.021** (0.0009)	0.012** (0.0008)	-0.007 (0.0042)	0.036** (0.0032)
If village has access to a micro-credit program	-0.002 (0.0101)	-0.036** (0.0080)	-0.016** (0.0042)	-0.025** (0.0035)	0.006 (0.0101)	-0.032** (0.0080)
The village level unemployment rate	0.030** (0.0116)	0.093** (0.0068)	0.032** (0.0034)	-0.002 (0.0020)	0.047** (0.0116)	-0.108** (0.0069)
The proportion of high land in the district	-0.646** (0.0875)	-1.764** (0.0354)	0.010 (0.0261)	-0.152** (0.012)	-0.735** (0.0871)	-1.866** (0.0361)
Average yearly rainfall in district (mm)	-0.021** (0.0008)	-0.037** (0.0004)	-0.005** (0.0002)	-0.008** (0.0002)	-0.024** (0.0008)	-0.040** (0.0004)
Pseudo R^2	0.218	0.180	0.318	0.327	0.225	0.193
Log likelihood	-93,679.76	-174,169.47	-29588.54	-62,659.58	-92,820.86	-172,138.70
σ_1		0.0502** (0.0001)		0.1031** (0.0001)		0.051** (0.0001)
σ_0		0.0344** (0.00003)		0.0733** (0.0001)		0.035** (0.00004)
ρ_1		0.757** (0.0001)		0.600** (0.0001)		0.763** (001)
ρ_0		0.466** (0.0001)		0.247** (0.0001)		0.421** (0.001)

Note: Figures in parentheses are standard errors. ** indicates a significance level of 5 percent or better. Regression additionally includes union dummies to control for unobserved effects of union.

Source: InM data 2006.

on the incidence of starvation. Another important finding from this table is that self-employed households go through starvation less than unemployed ones. The village level unemployment rate, as expected, increases a household's starvation regardless of its migration status. The presence of micro-credit programs in a village has a negative effect on a household's starvation; so do the proportion of the high land and that of the yearly rainfall in the district.

Besides regression coefficients, table 7 reports, σ_1, σ_0, ρ_1, and ρ_0, last two terms being the correlation coefficients between u_0 and u_i, and ε_0 and u_i respectively. The positive signs of ρ_1 and ρ_0 indicate that the unobserved factors which influence a household's migration decision also affect consumption outcomes. And this correlation is much stronger for the migrant households

Table- 8: Estimates of household's general food deprivation with and without seasonal migration based on switching regression

Household characteristics	Food deprivation during *monga* period		Food deprivation during non-*monga* period		Year round food deprivation	
	With migration	Without migration	With migration	Without migration	With migration	Without migration
Head's age (years)	0.0003** (0.0001)	0.0004** (00001)	0.003** (0.0004)	0.003** (0.0002)	0.0002** (0.00005)	0.0003** (0.00003)
Dependency ratio	-0.003 (0.004)	-0.010** (0.0021)	-0.0005 (0.0213)	-0.104** (0.0083)	-0.003** (0.0026)	-0.008** (0.0017)
Log of land asset (decimal)	-0.003** (0.0002)	-0.005** (0.0002)	-0.049** (0.0013)	-0.061** (0.0009)	-0.003** (0.0002)	-0.005** (0.0002)
HH head is self-employed	0.002** (0.0009)	-0.001** (0.0009)	-0.022** (0.0054)	-0.057** (0.0035)	0.00004 (0.0007)	-0.003** (0.0008)
HH head is wage employed	-0.002 (0.001)	-0.001 (0.0009)	0.005 (0.0088)	-0.027** (0.0039)	0.0001 (0.0011)	-0.0002** (0.0008)
HH has agricultural asset	-0.005** (0.0012)	-0.009** (0.0008)	-0.108** (0.0069)	-0.119** (0.0032)	-0.007** (0.0009)	-0.008** (0.0007)
HH has nonagricultural asset	-0.007** (0.0011)	-0.005** (0.0007)	-0.023** (0.0051)	-0.026** (0.0032)	-0.003** (0.0007)	-0.004** (0.0006)
HH has cash savings	-0.003** (0.0006)	-0.010** (0.0005)	-0.049** (0.0031)	-0.046** (0.0022)	-0.004** (0.0005)	-0.010** (0.0005)
HH has cow	-0.0006** (0.0032)	-0.004** (0.0005)	-0.031** (0.0031)	-0.044** (0.0023)	-0.001** (0.0004)	-0.004** (0.0004)
If village has access to a safety net program	-0.004** (0.0008)	0.009** (0.0011)	0.023** (0.0041)	0.007** (0.0033)	-0.003** (0.0005)	0.002** (0.0009)
If village has access to a micro-credit program	-0.009** (0.0010)	-0.007** (0.0018)	-0.065** (0.0098)	-0.018** (0.0082)	-0.006** (0.0007)	-0.005** (0.0016)
The village level unemployment rate	0.014** (0.002)	-0.010** (0.0017)	0.185** (0.0015)	-0.005 (0.0068)	0.002 (0.0016)	-0.005** (0.0014)
The proportion of high land in the district	-0.167** (0.0157)	-0.310** (0.0102)	-0.839 (0.0887)	-1.207** (0.0357)	-0.131** (0.0121)	-0.245** (0.0089)
Average yearly rainfall in district (mm)	-0.001** (0.0001)	-0.004** (0.0001)	-0.028** (0.0007)	-0.038** (0.0004)	-0.002** (0.0001)	-0.003** (0.0001)

Household characteristics	Starvation during *monga* period		Starvation during non-*monga* period		Year round starvation	
	With migration	Without migration	With migration	Without migration	With migration	Without migration
Pseudo R^2	0.253	0.243	0.237	0.218	0.292	0.267
Log likelihood	-19,138.51	-44,749.43	-85,855.61	-160,844.67	-15,213.92	-38,921.75
σ_1	0.1221** (0.0002)		0.0520** (0.0001)		0.137** (0.0002)	
σ_o	0.0833** (0.0001)		0.0392** (0.0001)		0.0890** (0.0001)	
ρ_1	0.493** (0002)		0.541** (0.0001)		0.385** (0.001)	
ρ_0	0.372** (0.0001)		0.373** (0.0001)		0.316** (0.001)	

Note: General food deprivation implies either starvation or meal rationing. Figures in parentheses are standard errors. ** indicates a significance level of 5 percent or better. Regression additionally includes union dummies to control for unobserved effects of union.

Source: InM data 2006.

than for the non-migrant households, demonstrating that seasonal migration and seasonal food deprivation are strongly correlated.

The findings of table 8, which shows estimations of a household's general hardship pattern (which combines starvation with meal rationing), are similar to those reported in table 7. Household's asset, community and district characteristics all have similar effects on the household's general hardship. Similarly, seasonal migration and seasonal deprivation are strongly correlated, more so for the migrant households than for not-migrant households.

Although Tables 7 and 8 show the estimates for migrant and non-migrant households, they do not show us the direct impacts that migration itself has on household outcomes such as seasonal deprivation. In order to calculate the impact of seasonal migration on seasonal deprivation, we construct the following terms following the derivation of Lokshin and Sajaia (2004):

$$yc_{1_1i} = E(y_{1i} \mid m = 1, x_{1i}) = x_{1i}\beta_1 + \sigma_1\rho_1\phi(\gamma Z_i)/\Phi(\gamma Z_i)$$

= Conditional expected value of outcome of a migrant household under migration,

$$yc_{0_1i} = E(y_{0i} \mid m = 1, x_{1i}) = x_{1i}\beta_0 + \sigma_0\rho_0\phi(\gamma Z_i)/\Phi(\gamma Z_i)$$

=Conditional expected value of outcome of a migrant household under non-migration,

$$yc_{0_0i} = E(y_{0i} \mid m = 0, x_{0i}) = x_{0i}\beta_0 - \sigma_0\rho_0\phi(\gamma Z_i)/[1 - \Phi(\gamma Z_i)]$$

=Conditional expected value of outcome of a non-migrant household under non-migration,

$$yc_{1_0i} = E(y_{1i} \mid m = 0, x_{0i}) = x_{0i}\beta_1 - \sigma_1\rho_1\phi(\gamma Z_i)/[1-\Phi(\gamma Z_i)]$$

=Conditional expected value of outcome of a non-migrant household under migration. where, ϕ and Φ are normal density distribution function and cumulative normal distribution function respectively.

Based on the above calculations we construct the migration impacts on household outcomes the following way:

$yc_{1_1i} - yc_{0_1i}$ =Expected outcome of a migrant household - Expected outcome of a migrant household if it had not chosen to migrate (counterfactual)

=Gain in outcome of a migrant household from migration

$yc_{1_0i} - yc_{0_0i}$ =Expected outcome of a non-migrant household if it had chosen to migrate (counterfactual) - Expected outcome of a non-migrant household

=Gain in outcome a non-migrant household would have accrued from migration

Table 9 shows the estimates of the impact of seasonal migration. It is obvious that seasonal migration lowers household's hardship for both migrant and non-migrant households in a counterfactual scenario during *monga* period, non-*monga* period and year round. For example, migration lowers *monga* period starvation by 2.6 percentage points for migrant households and 3.7 percentage points for non-migrant households. However, when both forms of hardship are considered, the migrant households gain (a 12.8 percentage point reduction) more than the non-migrant households (a 8.9 percentage point reduction). The pattern is similar for hardships during non-*monga* period and year round. As for the year-round hardships, the reduction in the extreme hardship of migrant households is less than half that of the non-migrant households, while it is more than double for the general hardship. Therefore, while migration lowers a household's hardship in general, it is more effective in mitigating meal rationing than occasional starvation.

Table- 9: Impacts of seasonal migration on household hardship (based on the outputs of Tables 7 and 8

HH types by seasonal migration	Extreme hardship (starvation)	All hardships (starvation and meal rationing)
Monga period		
Migrant HHs	-0.026** (0.0012)	-0.128** (0.0015)
Non-migrant HHs	-0.037** (0.0011)	-0.089** (0.0014)

HH types by seasonal migration	Extreme hardship (starvation)	All hardships (starvation and meal rationing)
Non-*monga* period		
Migrant HHs	-0.086** (0.0016)	-0.064** (0.0014)
Non-migrant HHs	-0.176** (0.0014)	-0.053** (0.0013)
Year round		
Migrant HHs	-0.018** (0.0013)	-0.076** (0.0017)
Non-migrant HHs	-0.038** (0.0012)	-0.037** (0.0015)

Note: Figures in parentheses are standard errors. ** indicates a significance level of 5 percent or better.

Source: InM survey 2006.

Conclusions

At least 100,000 people in the rural northwest region of Bangladesh migrate each year from the *monga* affected areas to other areas of Bangladesh with better economic opportunities. Migration becomes important when external supports during the *monga* period are not adequate. Only around one-third of the poor households receive some sort of support. In such a situation, migration indeed is an effective strategy for them when their savings are not adequate. But migration does not happen without a cost. People sale labor and crops in advance, sale assets, or borrow for financing migration, and they leave behind families who need support for sustaining consumption until any remittance from migrating member is received. Unfortunately, around twenty percent of the migrant households make advance sale of labor or crops. These transactions make it binding for the migrants to provide future labor at low wages and/or to sell future crops at low prices. So there is a need for the provision of cash support to the would-be migrants from a system that would be more efficient than the current arrangements, under which migrants borrow from local lenders against the future sale of labor or crop.

Younger people migrate more than older ones, simply because they are able to work harder. Over fifty five percent of the poor households are daily labor in the northwest region of Bangladesh. Moreover, given the dominance of agriculture in the rural economy, laborers are highly vulnerable to seasonal deprivation. Not surprisingly, wage employed individuals are more likely to migrate. Households with more agricultural assets are also likely to migrate. The government social safety net programs like VGD/VGF do not have a strong role in keeping seasonal migration in check perhaps because of their limited coverage. Interestingly, microfinance seems to deter seasonal migration by providing an alternative for the seasonally unemployed people.

The impact of migration is positive on household welfare as expected. Migrant households are at least 5.2 percent less likely to be in starvation and 8.5 percent less likely ration meals during the *monga* period. More interestingly, access to outside jobs during lean period seems to reduce households' food deprivation not only during the lean period but also during the non-lean period.

The conclusion of this article is unequivocal - migrant households benefit more than non-migrant households from not migrating. This study also shows (by simulating a counterfactual) that had the non-migrant households migrated, the reduction of seasonal starvation would have been even higher for them. The question is why they do not pursue migration. One of the reasons perhaps is these households need funds to support migration, which may not be available to many households. Moreover, not all households have the networking ability, which is critical because social network matters a lot to the decision to migrate and where to migrate. Finally, financing of seasonal migration through some informal arrangements such as advance sale of labor or crop or even informal borrowing put the migrant households back into the trap of local landlords and moneylenders. A support scheme that provides cash to aid migration during the lean season would possibly alleviate such miseries of the migrant households. However, a detailed long-term study is needed to investigate the effectiveness of such schemes.

The policy options to reduce seasonality of poverty are thus intuitively clear. Both government and non-governmental support would be needed to extend seasonal migration by providing information about the job markets, training, and credit to facilitate migration among the ultra-poor during the lean season. On the other hand, microfinance organizations can target the ultra-poor who are highly vulnerable to seasonal hardships by providing alternate income earning opportunities during the lean season. Agricultural unemployment is the most critical factor in the overall unemployment of the ultra-poor and their hardship during the *monga* season. So it is likely that alternative income earning opportunities, either through migration or microfinance, will help diversify rural income and redress the seasonal deprivation on a sustainable way.

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[1] Throughout this article the term monga has been used to refer to the period of lean season (pre-harvest Aman season), the area where the seasonality is acute (northwest region) and the seasonal food-deprivation in general.

[2] Access to microfinance is another option that allows the households to be engaged in rural nonfarm activities to avoid unemployment in farming. Data shows that although micro-credit program is available in 97% villages surveyed, only 36.6 percent of the ultra-poor households are members of the MFIs. One of the reasons that micro-credit may not be relevant to many ultra-poor households is the strict lending conditions such as weekly payment and meeting schedule. Moreover, as most of the rural non-farm activities in the northwest region are very much dependent on the farm activities, the seasonality of agriculture may also affect those non-farm activities. Nevertheless, as we will see later, microcredit appears a good substitute for seasonal out-migration.

[3] Throughout this article, the term 'household migration' is used to refer to the physical migration of one or more capable male members, as opposed to that of the whole family, which is very rare.

[4] An upazila is an administrative unit (below the district) consisting of a few villages. A union is a collection of 10-12 villages. We could have used a village-level fixed-effects instead of a union-level fixed-effects estimate, in which case we would have lost the village-level explanatory variables.

[5] PKSF is expected to cover the remaining upazilas in 2008. With this, all the poor households in the greater Rangpur will be covered under this ongoing study.

[6] A high land area, according to the definition of Bangladesh Agricultural Research Council (BARC), is where flood water level remains below 3 feet.

[7] Households can have access to micro-credit programs even when no program officially operates in the village. In such case, the households become members of microcredit programs that operate in neighboring villages.

[8] Unfortunately, the survey does not have any information about the areas where these poor households migrate to. Hence, there is no variable showing the expected gains from migration.

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