

EFFECTS OF NON-FARM INCOME ON POVERTY AND INEQUALITY IN RURAL BANGLADESH

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ABSTRACT

The present study examines the impact of non-farm income on poverty and expenditure inequality in rural Bangladesh using a nationally representative Household Income Expenditure Survey (HIES) 2010 data. This study used Horvitz-Thompson (HT) estimator of the Foster, Greer, and Thorbecke (FGT) indices to investigate the effect of non-farm income on poverty. The results reveal that the inclusion of non-farm income reduces the level, depth and severity of poverty in rural Bangladesh. In addition, poverty maps help the policymakers to identify the location of the relatively higher concentration of poor people. However, Gini, Theil's and Atkinson inequality measures show that the inclusion of non-farm income increased expenditure inequality among rural households. This research also employed a probit model for identifying the most significant factors associated with non-farm income participation of the rural households. The results imply that higher levels of education, greater flow of remittances, availability of electricity facilities and involvement in high return sector are likely to be effective in rising non-farm income at the rural household level. The policy implication of this study is non-farm income generating activities should be encouraged among rural households to reduce poverty and hence, to improve welfare and living standards of the rural households.

Key words: Poverty, inequality, non-farm income, rural Bangladesh.

I. INTRODUCTION

Poverty is still a global concern. It is much complex in rural areas. Poverty eradication is the priority of international development agenda including Millennium Development Goal (MDG) and subsequently Sustainable Development Goal (SDG). It has been the worldwide slogan. Globally, 78% of the poor live in rural areas and mainly depend on agriculture (World Bank, 2014). More alarmingly, in a developing country like Bangladesh, the prevalence of poverty is a persistent problem. However, after many successful programme interventions, the incidence of poverty in Bangladesh has decreased to some extent but is still facing a distressing level. According to HIES (2010), the incidence of poverty in national, urban and rural areas were 31.5%, 21.3% and 35.2% respectively. These indicate that there is a significant gap in living standard among people and the people from rural areas are suffering the most. Hence, alleviating rural poverty through effective policies and economic growth remains a challenge for the governments. The rural economy is traditionally dominated by agriculture which is subsistence and semi-commercial in nature. The main embargo in rural economy is that 66% of the labour force mostly depends on farming and where more than 81% of these farmers have less than 1.5 acres of land (Ahmed et al., 2013). Likewise, illiteracy, rapid population growth, low-income sources and excessive urbanization are the key problems in the rural area. In this context, income generating activities is utmost necessary to improve the standard of living of the rural community. Therefore, the income diversification by non-farm employment alleviates poverty, stabilizes the inequality, improves the standards of living and promotes human development.

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Studies have shown that non-farm income plays an imperative role for rising rural household's income (De-Janvry et al, 2005; Arif et al., 2000; Lanjouwand Murgai, 2008). Reardon et al. (1992) mentioned that income diversification via non-farm work is connected with higher income and consumption over years. Haggblade et al. (2010) indicated that in developing countries non-farm income accounts for between 35% and 50% of total income of rural households. In the last two decades, the situation has changed and the government of Bangladesh has identified the non-farm sector as the leading sector in the rural economy. There exists enormous literature covering almost every country of the globe that deal with the determinants of non-farm income (Yunez-Naude and Taylor, 2001; Abdulai and CroleRees, 2001; Malek and Usami, 2009; Escobal, 2001). These studies identified several household and farm characteristics that are significantly associated with non-farm income.

Non-farm employment has been generally recognized for poverty reduction and therefore improving household welfare (De-Janvry et al, 2005; Reardon et al., 1992; Canagarajah et al., 2001). There are various studies related to non-farm income, poverty and inequality (Adams and Richard, 2004; Gounder, 2012; Woldehanna, 2002; Elbers and Lanjouw, 2001). Mat et al. (2012) revealed that the inclusion of non-farm income reduce poverty but increase income inequality among agricultural household in rural Kedah. Arif *et al.* (2000) used the cost of basic needs approach and showed that non-farm workers are in better position than agricultural labourers in rural Pakistan. A study by Adams (2001) revealed that non-farm income has a greater effect on poverty and inequality in Egypt and Jordan. There is a substantial body of literature on poverty in Bangladesh. This literature, however, has mostly ignored the importance of non-farm employment in poverty alleviation in rural areas. In rural Bangladesh context, only a few recent studies (Rahman, 1999; Hossain, 2005; Nargis and Hossain, 2006; Khan et al., 2012) conducted so far shed light on poverty and inequality based on relatively small sample size. But neither study contributed comprehensively on the effects of non-farm income on poverty and inequality in rural Bangladesh.

This study aims to investigate the impact of non-farm income on poverty and expenditure inequality in rural Bangladesh using nationwide Household Income Expenditure Survey (HIES). The HIES is a multistage cluster survey where households were selected within clusters by unequal selection of probabilities (inverse of sampling weight). To protect against misspecification of the sampling design and model, hence produce consistent estimates, it is crucial to utilize sampling weights when analyzing multistage survey data (Pfeffermann, 1993). Therefore, this study identifies the need for the use of sampling weight to estimate poverty and inequality indices. This research also focuses the determinants of non-farm income among rural households in Bangladesh. Factors influencing non-farm employment may lead to policy formulation for the government.

II. METHODOLOGY

Data

This present study uses Household Income and Expenditure Survey (HIES) data in 2010 conducted by Bangladesh Bureau of Statistics (BBS), which is the official nationally representative source for measuring household consumption expenditure as well as poverty in Bangladesh. The two-stage stratified random sampling techniques were used by the BBS during survey which ensures greater precision. In the first stage, the specific geographic area considered

as primary sampling units (PSUs) within each stratum and, in the second stage, 20 households were randomly selected from each PSU covering rural, urban, and statistical municipal areas. A primary sampling unit (PSU) is usually a natural cluster of households. In the 2010 HIES, a total of 12,240 households were randomly selected from 7 divisions, 64 districts, and 384 sub-districts. In this study, we use 7,840 rural households in Bangladesh to assess the impact of non-farm income on poverty and expenditure inequality.

Determinants of the non-farm income of the household

Generally, a farm household decides to diversify into nonfarm work if non-farm income is higher than the reservation income from farm work and leisure. This implies that the likelihood of participating in non-farm activities is determined by different household socio-economic characteristics and farm characteristics. A probit model is employed to examine the factors associated with the participation decision of farm households in non-farm activities (Huffman and Lange, 1989; Lim-Applegate et al., 2002; Chang and Mishra, 2008). Let a binary response variable Y_i takes the value (1 = if household receives non-farm income, 0 otherwise) and has the following functional form:

$$Y_i^* = \beta X_i + \varepsilon_i \Rightarrow Y_i = I[\beta X_i + \varepsilon_i > 0] \quad (1)$$

where $I[\cdot]$ is the binary indicator function and X_i is the $1 \times p$ vector of explanatory variables known for each household i . If it is assumed that the error term, $\varepsilon_i \sim N(0,1)$ then, Y_i follows a probit model:

$$\Pr(Y_i = 1 | X_i) = \Phi(\beta X_i) \quad (2)$$

where $\Phi(\cdot)$ is the cumulative distribution function (CDF) of the standard normal distribution and β is the vector of unknown parameters to be estimated. The consistent, asymptotically normal and efficient estimates of β in Eq. (2) can be obtained by applying the Maximum Likelihood method to the following log-likelihood function:

$$\ln L(\beta) = \sum_{i=1}^n [Y_i \ln \Phi(\beta X_i) + (1 - Y_i) \ln (1 - \Phi(\beta X_i))] \quad (3)$$

Poverty Indicators and their measures

Poverty can be estimated in a number of approaches. The present study estimates poverty indicators based on Cost of Basic Needs (CBN) method. In CBN method, the poverty line (PL) indicates the average level of per capita expenditure at which persons can meet basic food and non-food needs. However, the upper poverty line (UPL) can be computed as adding the food and upper non-food allowances, while the lower poverty line (LPL) constitutes adding the food and upper non-food allowances (HIES, 2010). In Bangladesh, absolute poverty is defined as the households whose per capita expenditures are below the UPL, whilst hard-core or extreme poverty refers to the households whose per capita expenditures are below the LPL.

Consider a finite population of persons (or households) of size N divided into D subgroups (or division) of sizes $N_1, \dots, N_D$ and w_{ij} be the sampling weight (inverse of the inclusion probability)

of household i belonging to the n_j sampled observations from subgroup j and $N_j = \sum_{i=1}^{n_j} w_{ij}$. Let

E_{ij} be the per capita expenditures for individual (or household) i in subgroup (or division) j and

let k be a preset poverty line; that is, the threshold for E_{ij} under which a person is considered as “under poverty”. Then three measures of poverty can be settled in a common mathematical structure, the so-called FGT (Foster, Greer, and Thorbecke) measures for each subgroup j proposed by Foster et al. (1984) is written as

$$F_{\alpha j} = N_j^{-1} \sum_{i=1}^{n_j} w_{ij} F_{\alpha ij}; \quad j = 1, \dots, D; \quad \alpha = 0, 1, 2 \quad (4)$$

where $F_{\alpha ij}$ values defined as

$$F_{\alpha ij} = \left(\frac{k - E_{ij}}{k} \right)^{\alpha} I(E_{ij} < k) \quad (5)$$

where $I(E_{ij} < k)$ is an indicator function (equal to 1 when a person's per capita expenditure is beneath the poverty line, and 0 otherwise). The $F_{\alpha j}$ is also known as the Horvitz-Thompson (HT) design-unbiased direct estimator of the FGT poverty indicators. Poverty incidence or Head Count Ratio (HCR), Poverty Gap (PG) and Poverty Severity (PS) correspond to $\alpha = 0, 1$ and 2 respectively in Eq. 4. HCR is the proportion of individuals whose per capita expenditures are below the poverty line, PG is the average per capita expenditure deficit from the poverty line, and PS is the average squared deficit of per capita expenditure from the poverty line in subgroup j .

Expenditure inequality and its measures

There are many methods of determining expenditure inequality. Any consistent measure of inequality must meet six basic criteria, namely, (i) population homogeneity; (ii) mean independence; (iii) symmetry or anonymity; (iv) Pigou-Dalton transfer sensitivity; (v) decomposability; and (vi) statistical testability (World Bank, 2005). In this paper, the Gini coefficient, Theil's index and Atkinson measures of inequality are used.

Let F_{ij} be the expenditures for persons (or households) i in subgroup (or division) j and $\bar{F}_j$ is average expenditure in subgroup j . In the ground of inequality measurement, the Gini coefficient is the most popular and commonly used technique and is generally based on the Lorenz curve. Mathematically, it can be written as:

$$G_j = 1 + N_j^{-1} - 2[\bar{F}_j N_j^2]^{-1} \left[\sum_{i=1}^{n_j} (N_j - i + 1) F_{ij} \right] \quad (6)$$

There are various studies on inequality measurement using the Gini coefficient (Farris, 2010; Yemtsov and Vijverberg, 2001; Thomas et al., 2001; Catalano et al., 2009; Wan, 2001). Though the Gini coefficient is widely used and popular, it does not meet the above mentioned six criteria. There are several measures of inequality that meets all six criteria. Among the most extensively used is the Theil index (World Bank, 2005). The Theil index can be expressed as follows:

$$T_j(1) = \sum_{i=1}^{n_j} \frac{w_{ij}}{N_j} \left(\frac{F_{ij}}{\bar{F}_j} \right) \log \left(\frac{F_{ij}}{\bar{F}_j} \right) \quad (7)$$

The value of Theil index will be zero, if every individual has exactly the same expenditure; this stands for perfect equality, whereas the value of Theil index equal 1 represents utmost inequality and is the maximum value of Theil's T statistic. Anthony Barnes Atkinson has developed another

technique of inequality measure known as the “Atkinson index” that is infrequently used. The Atkinson index can be written as:

$$A_j(1) = 1 - \left[\sum_{i=1}^{n_j} \frac{w_{ij}}{N_j} \log\left(\frac{F_{ij}}{F_j}\right) \right] \quad (8)$$

III. RESULT AND DISCUSSION

Determinants of the non-farm income of the household

Table 1 represents the maximum likelihood (ML) estimates of the fitted probit model with their significance as well as marginal effects at the means. The significant likelihood ratio statistic implies that the explanatory variables have contributed well to non-farm participation of the rural households. In Table 1, the positive and statistically significant coefficient of the age of household head indicates that at early ages, the young headed households are more likely to have non-farm income, which may be related to their experience and the negative and statistically significant coefficient of age squared term indicates that at older ages, the probability of non-farm work of the household head decreases with the increase in age this may be due the loss of their caliber after reaching a certain age. This implies that a quadratic relationship exists in the life cycle of the household head. This result is consistent with the findings of (Chang and Mishra, 2008; Hallberg et al., 1991; Huffman, 1980). In Bangladesh, the farm activities are mainly run by the male but the work of post-harvest management is mainly run by the female. The result is consistent with the scenarios of the country and the result indicate that male headed households are less likely to participate in non-farm income compare to female, the fact is that male are engaged in farm activities and have little scope to involve them in non-farm especially in rural Bangladesh. Loening and Mikael (2009) as well as Ali and Peerlings (2012) also confirm the same result. Higher education (i.e. tertiary) of the household head has significant positive impact on non-farm income involvement. That is, the household head having tertiary education has a significantly more likelihood of engaging in non-farm work implying that education raises the household's non-farm income because educated farmers are more innovative and have entrepreneurial capabilities (Rao and Qaim, 2011). Abdulai and Delgado (1999) also confirm that households with more education are more likely to involve in non-farm income.

The significant squared household size indicates that there exists a non-linear relationship between non-farm income and household size. The results show that after certain number an increase in household size increases the likelihood of non-farm income of the household head because with large members in household always indicate labour endowment and the surplus labours are more likely to start any non-farm activities. Readdon et al. (1992) reported that household having large family tends to incur high expenditure which indicates their participation in non-farm enterprise activities. This result shows that the elderly people are more likely to have non-farm income due to their experience. Marginal, small, medium and large farmers are less likely to have non-farm involvement compare to landless farmers this may be due to their intensive involvement in farming. Household's engagement in cultivated crops has significant negative effect on non-farm income. Hwang and Lee (2015) mentioned that in Korea, the likelihood of engaging non-farm activities is much less for the farmers who cultivate profitable crops. Furthermore, households involving in fishing, livestock or poultry and foresting are more likely to have non-farm income. Increasing flow of remittance is one of the key determinants of non-farm income. Results show that increasing remittances more likely to raise non-farm income

(the marginal effect is 86%). Seidu and Onel (2015) also have the same trend. The availability of electricity facilities and savings are more likely to be effective in increasing non-farm income at the household level in rural Bangladesh. The fact is that electricity connection opens the door of a wide range of activities through its direct and indirect linkages to earning and the involvement in high return sectors always ensures the well-being. This result is in the line of Olivia (2009); Gautam and Andersen (2016).

Table 1. Parameter estimates of probit model by ML to identify associated factors with non-farm income of the household

Independent variables	Dependent Variable = Non-farm income (NFI)		
	$\hat{\beta}$	SE	Marginal effects
HH heads age	0.019**	0.008	0.007
HH heads age square	0.000**	0.000	0.000
HH heads sex(<i>r</i> : female)			
male	-0.282***	0.068	-0.103
HH heads education (<i>r</i> : no schooling)			
Primary	0.040	0.045	0.014
Secondary	0.094	0.059	0.034
Tertiary	0.090*	0.048	0.033
HH head employed (<i>r</i> : Not employed)	-0.083	0.063	-0.030
HH heads occupation (<i>r</i> : Non-agri)			
Agriculture	-0.033	0.032	-0.012
HH size	0.004	0.013	0.002
HH size square	0.007***	0.003	0.003
Has sanitary latrine(<i>r</i> :non-sanitary)	0.043	0.034	0.016
HH has semi-pukka house (<i>r</i> :others)	0.038	0.053	0.014
HH has tap water access (<i>r</i> : others)	-0.027	0.126	-0.010
Proportion of 15-59 yrs. persons in HHs	-0.037	0.175	-0.013
Proportion of 60+ yrs. persons in HHs	0.351*	0.179	0.128
Proportion of 1-4 yrs. children in HHs	-0.082	0.154	-0.030
Prop. 11-15 yrs. females attend school	0.016	0.191	0.006
Prop. 11-15 yrs. males attend school	0.101	0.185	0.037
HHs dependency ratio	0.079	0.048	0.029
Cultivated own land (Decimal)	0.0003**	0.0001	0.0001
Farmer category (<i>r</i> :landless)			
Marginal	-0.191***	0.054	-0.069
Small	-0.220***	0.052	-0.080
Medium	-0.318***	0.078	-0.118
Large	-0.281**	0.141	-0.104
HH has cultivated any crops (<i>r</i> : No)	-0.095**	0.043	-0.035
HH engages in fishing (<i>r</i> : No)	0.086**	0.042	0.031
HH raise any livestock or poultry (<i>r</i> : No)	0.119**	0.040	0.043
HH engages in farm forestry (<i>r</i> : No)	0.246***	0.035	0.089
HH has received any remittance (<i>r</i> : No)	2.359***	0.149	0.856

Independent variables	Dependent Variable = Non-farm income (NFI)		
	$\hat{\beta}$	SE	Marginal effects
HH has electricity facilities(r: No)	0.152***	0.035	0.055
HH has any savings(r: No)	0.286***	0.043	0.104
HH is under Ssf programme (r: No)	0.006	0.041	0.002
Constant	-0.399	0.255	-
LR: $\chi^2_{(32)}$	1485.51		
Prob> $\chi^2_{(32)}$	0.000		
Log likelihood	-4451.27		
Pseudo R ²	0.14		
Number of observations	7683		

Impact of non-farm income on poverty

In this study, per capita consumption expenditures of the household are divided into two groups: one is for non-farm income recipient households and the second one is for non-farm income non-recipient households. In addition, to have a clear picture of non-farm income on poverty at the sub-national level we separate the households according to the division. This study used Horvitz-Thompson (HT) design-unbiased direct estimator of the FGT poverty indicators based on CBN method to investigate the impact of non-farm income on poverty. The upper poverty line (UPL) can be computed as adding the food and upper non-food allowances, while the lower poverty line (LPL) constitutes adding the food and upper non-food allowances. Table 2 represents three different poverty indices, percentage of poverty share and poverty risk at lower poverty line. The incidence of poverty estimate for rural Bangladesh without non-farm income and with non-farm income recipient households are 22.66% and 15.37% respectively. According to the headcount measure, non-farm income reduces the poverty by 32.18%. The deficiency from the poverty line is 3.86% and 2.75% without non-farm income and with non-farm income recipient households respectively, indicating that the depth of poverty reduces by 28.56%. Furthermore, the severity of poverty reduces by 23.74%. Therefore, the poverty measures reveal that the inclusion of non-farm income reduces the level, depth and severity of poverty in rural Bangladesh. Moreover, the inclusion of non-farm income reduces the level, depth and severity of poverty risk. Mat et. al. (2012) showed that inclusion of non-farm income abates the poverty level in rural Kedah. Poverty estimates for rural Bangladesh at division level show that without non-farm income Barisal division has the highest and Khulna division has the lowest incidence of poverty which is 30.46% and 13.16%, whilst with non-farm income recipient households Rangpur division has the highest and Chittagong division has the lowest incidence of poverty which is 23.47% and 10.31% respectively. However, the poverty measures at division level show that non-farm income reduces the level, depth and severity of poverty as well as poverty risk in rural Bangladesh.

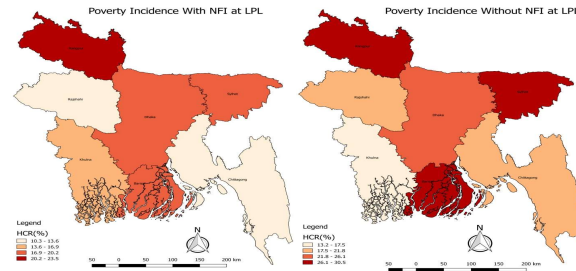
Table 2. FGT indices based on lower poverty line: The effect of non-farm income on extreme poverty in rural Bangladesh

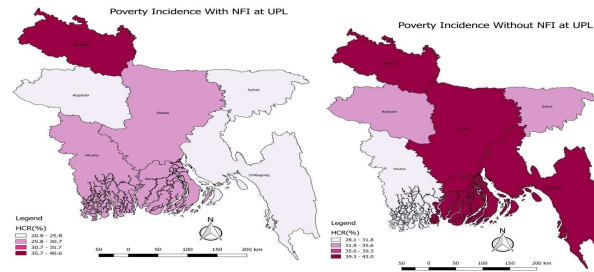
	Division	Sub-group FGT index (%)			Sub-group poverty 'share' (%)			Sub-group poverty 'risk'		
		HCR	PG	PS	HCR	PG	PS	HCR	PG	PS
Without NFI HHs	Barisal	30.46	5.76	1.70	5.20	5.63	6.23	1.66	1.80	1.99
	Chittagong	21.24	3.42	0.81	5.25	4.85	4.30	1.16	1.07	0.95
	Dhaka	24.82	3.98	1.01	14.61	13.43	12.75	1.35	1.24	1.18
	Khulna	13.16	2.50	0.80	4.42	4.80	5.76	0.72	0.78	0.93
	Rajshahi	17.73	2.88	0.72	6.41	5.96	5.56	0.97	0.90	0.84
	Rangpur	28.27	5.17	1.26	11.44	12.00	10.97	1.54	1.61	1.48
	Sylhet	26.38	3.69	0.77	3.20	2.57	2.01	1.44	1.15	0.90
With NFI HHs	Barisal	17.73	3.58	1.03	3.79	4.38	4.70	0.97	1.12	1.20
	Chittagong	10.31	1.77	0.47	7.17	7.04	7.05	0.56	0.55	0.55
	Dhaka	17.12	3.09	0.87	15.17	15.67	16.61	0.93	0.96	1.02
	Khulna	14.04	2.56	0.73	5.47	5.72	6.14	0.77	0.80	0.86
	Rajshahi	12.39	2.13	0.53	5.89	5.80	5.45	0.67	0.66	0.62
	Rangpur	23.47	4.21	1.13	8.54	8.77	8.84	1.28	1.31	1.32
	Sylhet	17.73	3.07	0.87	3.44	3.41	3.63	0.97	0.96	1.02
Without NFI HHs		22.66	3.86	0.99	50.52	49.22	47.57	1.23	1.20	1.16
With NFI HHs		15.37	2.75	0.76	49.48	50.78	52.43	0.84	0.86	0.89
All Observations		18.35	3.20	0.86	100.00	100.00	100.00	1.00	1.00	1.00

The FGT poverty indices, poverty share and poverty risk at upper poverty line are shown in Table 3. Without non-farm income and with non-farm income recipient households the incidence of poverty estimate for rural Bangladesh are 37.62% and 27.05% respectively, showing that non-farm income reduces the poverty incidence by 28.09%. The poverty measures based on upper poverty line also reveals that non-farm income reduces the level, depth and severity of poverty as well as poverty risk at division level and in rural Bangladesh. Figure 1 shows the incidence of poverty for both LPL and UPL among rural households with and without non-farm income at the division level. The poverty maps reveal locations with a relatively higher concentration of poor people. Darker regions on the maps correspond to regions with high poverty rates. As the map demonstrates, poverty rates in the north and southeastern Bangladesh are high. However, the inclusion of non-farm income reduces the incidence of poverty in rural Bangladesh.

Table 3. FGT Indices based on Upper Poverty Line: The effect of non-farm income on Poverty in rural Bangladesh

	Division	Sub-group FGT index (%)			Sub-group poverty 'share' (%)			Subgroup poverty 'risk'		
		HCR	PG	PS	HCR	PG	PS	HCR	PG	PS
Without NFI HHs	Barisal	43.05	9.94	3.26	4.30	4.81	5.17	1.37	1.54	1.65
	Chittagong	39.79	7.76	2.26	5.75	5.44	5.18	1.27	1.20	1.14
	Dhaka	41.41	8.22	2.38	14.26	13.73	13.02	1.32	1.27	1.21
	Khulna	28.09	5.50	1.76	5.52	5.23	5.49	0.90	0.85	0.89
	Rajshahi	33.81	6.76	1.96	7.14	6.93	6.59	1.08	1.04	0.99
	Rangpur	40.93	10.02	3.23	9.69	11.50	12.15	1.30	1.55	1.64
	Sylhet	33.86	5.18	1.16	2.40	1.78	1.31	1.08	0.80	0.59
With NFI HHs	Barisal	26.98	6.19	2.00	3.37	3.75	3.96	0.86	0.96	1.01
	Chittagong	21.37	4.00	1.19	8.70	7.89	7.71	0.68	0.62	0.60
	Dhaka	30.03	6.08	1.87	15.57	15.28	15.40	0.96	0.94	0.95
	Khulna	27.07	5.63	1.76	6.17	6.23	6.39	0.86	0.87	0.89
	Rajshahi	20.83	4.39	1.37	5.80	5.93	6.06	0.66	0.68	0.69
	Rangpur	40.61	9.02	2.81	8.64	9.31	9.50	1.29	1.39	1.42
	Sylhet	23.65	4.01	1.15	2.68	2.20	2.08	0.75	0.62	0.58
Without NFI HHs		37.62	7.82	2.36	49.06	49.42	48.90	1.20	1.21	1.20
With NFI HHs		27.05	5.54	1.71	50.94	50.58	51.10	0.86	0.86	0.86
All Observations		31.37	6.47	1.98	100.00	100.00	100.00	1.00	1.00	1.00





Impact of non-f Figure 1. Poverty mapping showing incidence of poverty among rural households with and without non-farm income at division level.

The present study divides the household's consumption expenditure into without non-farm income recipient households and with non-farm income recipient households. The sub-national levels (division) provide detailed picture of the effects of non-farm income on expenditure inequality among the rural households. This study incorporates most popular and widely used Gini, Theil's and Atkinson expenditure inequality measures to examine the impact of non-farm income on expenditure distribution.

Table 4 shows that the Gini coefficient measure of expenditure inequality without non-farm income and with non-farm income recipient households are 28.10% and 34.17% respectively, representing that non-farm income increased expenditure inequality among rural households in Bangladesh. The Theil's and Atkinson indices also showed similar trends. In addition, the expenditure inequality measures at division levels reveal that non-farm income increases the expenditure inequality of rural Bangladesh. The Lorenz curves in Figure 2 reveal that the consumption expenditure distribution of the households with non-farm income is more unequal than the consumption expenditure distribution of the households without non-farm income. The possible reason may be non-farm income is not equally distributed in favour of the rich. Mat et. al. (2012) and Adams (2001) were observed the same trends. Empirical evidence on the impact of non-farm income on income inequality in rural areas is mixed and (Canagarajah et al., 2001) revealed that this is may be due to the non-farm sectors heterogeneity.

Table 4. Expenditure inequality measures according to location: The effect of non-farm income on expenditure distribution in rural Bangladesh

	Division	Gini	Theil	Atkinson	Population share	Income share
Without NFI HHs	Barisal	0.1878	0.2917	0.1402	0.0313	0.0279
	Chittagong	0.0954	0.2370	0.0874	0.0454	0.0502
	Dhaka	0.1093	0.2541	0.1016	0.1080	0.0917
	Khulna	0.1284	0.2764	0.1232	0.0616	0.0516
	Rajshahi	0.1762	0.3019	0.1422	0.0663	0.0551
	Rangpur	0.1654	0.3031	0.1405	0.0743	0.0587
	Sylhet	0.1165	0.2514	0.1015	0.0223	0.0215
With NFI HHs	Barisal	0.2085	0.3282	0.1712	0.0392	0.0414
	Chittagong	0.1855	0.3062	0.1495	0.1278	0.1750
	Dhaka	0.1844	0.3298	0.1690	0.1627	0.1606
	Khulna	0.2082	0.3383	0.1764	0.0715	0.0715
	Rajshahi	0.2039	0.3417	0.1805	0.0873	0.0924

Rangpur	0.2031	0.3359	0.1755	0.0668	0.0565
Sylhet	0.2556	0.3784	0.2153	0.0356	0.0460
Without NFI HHs	0.2810	0.1415	0.1245	0.4092	0.3567
With NFI HHs	0.3417	0.2108	0.1813	0.5908	0.6433
All observations	0.3245	0.1919	0.1634	1.0000	1.0000

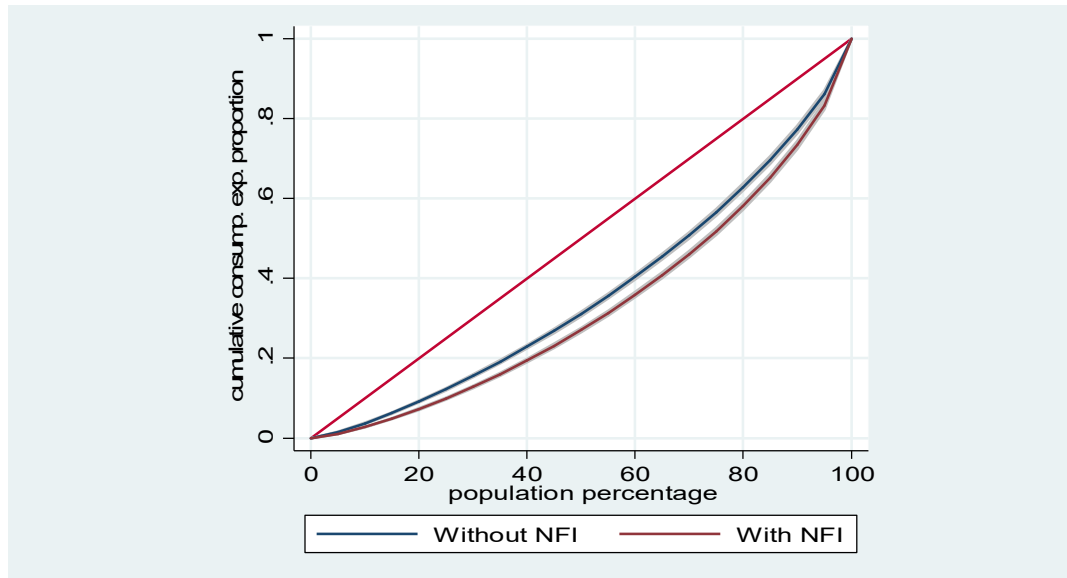


Figure 2. Lorenz curve representing the impact of non-farm income on consumption expenditure distribution among rural households.

IV: CONCLUSION AND POLICY IMPLICATIONS

This study examines the impact of the inclusion of non-farm income on poverty and inequality among rural Bangladeshi households using a nationally representative HIES 2010 dataset. The Horvitz-Thompson (HT) direct estimator of the FGT indices is utilized to assess the level, depth and severity of poverty among rural households. In the context of Bangladesh, this is the first study which used such relatively innovative approach and is an additional contribution of this paper. The results show that the incidence of poverty among rural households with non-farm income and without non-farm income is 15.4% and 22.7% at lower poverty line; and 27.1% and 37.6% at upper poverty line respectively. These indicate that the inclusion of non-farm income decreases the incidence of poverty among rural households. Likewise, the results from three FGT indices confirm that inclusion of non-farm income reduces the level, depth and severity of poverty as well as poverty risk in both division level and overall rural Bangladesh. In addition, poverty maps help the government, civil society organizations and development partners to identify the location of the relatively higher concentration of the poor population. On the other hand, Gini,

Theil's and Atkinson inequality measures reveal that non-farm income sources contributed to increase expenditure inequality among rural households. The Lorenz curves also support this finding that the consumption expenditures of the non-farm income recipient's rural households are more unequally distributed than their counterparts. This is may be due to the non-farm sectors heterogeneity and require specific interventions favour the poor to involve themselves more in non-farm income-generating activities.

The study also identifies several risk factors associated with non-farm income participation of the rural households using probit regression model. The results suggest that higher levels of education, greater flow of remittances received from national and international sources, availability of electricity facilities and involvement in high return sector (savings) are likely to be effective in increasing non-farm income at the rural household level.

The findings of this study suggest that non-farm income generating activities should be encouraged among rural households to reduce poverty. Therefore, to improve rural household's welfare through non-farm activities, an emphasis should be placed on the rural non-farm economy. The policymakers should address the risk factors identified in this study for promoting the rural non-farm economy, especially, improving the education level of household heads and electricity facilities. More policy guidelines need to discourage rural to urban migration, support existing local non-farm sectors (i.e., revive traditional crafts, build cottage industries, ensuring training facilities of the rural young force), increase more non-farm employment opportunities to raise income and hence, eradicate poverty which ultimately enhance the standard of living of the rural households in Bangladesh.

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