Impact of income diversification on rural livelihood in some selected areas of Bangladesh

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Abstract

Diverse set of income generating activities may have varying effect on household's welfare situation. This study intends to assess the extent of different income diversification strategies on rural household welfare. A total sample of 153 households from three districts of Bangladesh was randomly selected. Considering simultaneous causality between different livelihood strategies and welfare indicators, the Two Stage Least Square (2SLS) methods with instrumental variable was applied to estimate impact of the strategies on household welfare. Household per capita expenditure was treated as the welfare indicator which includes both food and non-food expenditures. The findings show that involving in any type of non-farm activities jointly with farming has a significantly positive effect on the household's welfare. Among different non-farm activities, participation in wage employment and migration along with agricultural activities ensured significantly higher per capita household expenditure. On the other hand, the impact of currently participation in only agricultural activities on household expenditure is insignificant. Besides, Farm size, higher education and infrastructural facilities also play an important role in improving household's welfare. Therefore, policy should be directed to create opportunities to participate in non-farm activities through establishment of small and medium industries, especially agro-based industries in the rural areas.

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Introduction

Over the last two decades, poverty situation of Bangladesh is remarkably changed. Although it reduces to almost half, but the difference between rural and urban population in terms of income and poverty situation is still prominent (HIES, 2010). Therefore, more attention is needed to focus on rural economic development. Identifying appropriate way of poverty reduction as well as improving welfare is the main aim to analyze rural livelihood. In development research, it deals with how people can earn promising income and improve standard of living. It is well recognized that farm households' engagement in non-farm activities is a pathway out of poverty in rural areas of developing countries (IFAD, 2011). In general, empirical studies points to a significant relationship between rural household's welfare and diverse set of income generating activities. All of these activities may not have same impact on household's welfare indicators. The main purpose of this research is to find out how and to what extent income diversification strategies are affecting rural livelihoods as well as welfare of the households.

In the process of gradually decreasing labor employment in agriculture, income diversification outside agriculture can play a crucial role in the development of rural economy. In general, involvements in various non-income activities in combination with agricultural production contribute to the income level of farm household. This type of strategy adoption may stabilize household incomes through its expanding self-insurance mechanism (Seng, 2015). The existing literature identified income expansion, wealth accumulation and risk reduction as major reasons for participation in a distinct set of income generating activities (Davis *et al*., 2010; Nielsen *et al*., 2013). Moreover, a set of additional empirical works focused on economic impacts of engagement in nonfarm employment on farm households by analyzing the impacts on farming practices, household incomes or household food-consumption (Mcnally, 2002; Goodwin & Mishra 2004; De Janvry *et al*., 2005; Chang & Mishra, 2008; Owusu *et al*., 2011; Akaakohol & Aye, 2014; Scharf & Rahut, 2014; Seng, 2015). The results confirmed the crucial role of non-farm activities on farm household's income through increasing farming income, production efficiency and farming practices. Participation in non-farm activities improves per capita food consumption in Cambodia (Seng, 2015). However, engagement in all types of non-farm employment does not represent the same level of welfare improvement. Participation in high-return non-farm activities represented higher economic welfare than engagement in low-return non-

farm work (Scharf & Rahut, 2014). Even those households earn income from non-farm activities or a combination of non-farm and farming activities can emphasize their welfare more positively than only farming groups (Adepoju & Obayelu, 2013).

Although, the relationship between engagement in non-farm employment and economic wellbeing predominantly show its impact on reducing poverty in Bangladesh, but small households cannot get rid from education poverty still now (Nargis & Hossain, 2006; Malek, 2011). Malek and Usami (2009) found education poverty was 42.3% in Cumilla Sadar Upazila in 2008 whereas income poverty was only 20% (by upper-poverty line). Therefore, only poverty reduction cannot always represent household's overall welfare. Besides, food consumption, non-food expenditures like expenditure for education, health, clothing etc. also could be a welfare indicator for the household. There is no doubt that non-farm employment is important for rural poverty alleviation, though its effect on improving total welfare of the rural poor is still remains a debatable issue. Pursuing this, the impact of present several pattern of rural livelihood on household welfare is vaguer. Thus, it is important to pay attention into different income diversification strategies, which are differentially accessible to rural households. Though it is

expected that farm households' participation in nonfarm activities in Bangladesh would very likely to have a significant effect on household's food consumption and non-food expenditure (ultimately their welfare) like other developing countries, existing research has not yet focus on all of these issues in Bangladesh. Due to filling this gap, this study examined the impact of income diversification on the welfare of rural households in Bangladesh. In doing so, attention is given to the household's specific livelihood strategies include farm and combinations of farm and non-farm income earning opportunities. Besides, the form of structural equations was used in this study for better understanding the causal linkages between components of different strategies and household welfare.

Materials and Methods

Study areas and sample size
The required data for this study was derived from a cross-sectional dataset, collected through farm household survey based on their agricultural and different nonfarm activities intensity. Multi-stage sampling procedure was used to identify the 153 sample households from four villages. The number of households is not the same for each village (Table 1).

Table 1. Distribution of the interviewed households (HH) in the study area

Agro-ecological Zone (AEZ)	District	Sub-district	Village	Total no. of HH in village*	Sample size	%
Old Brahmaputra Floodplain (AEZ 9)	Mymensingh	Haluaghat	Konapara	255	31	20
Madhupur Tract (AEZ 28)	Mymensingh	Bhaluka	Nishaiganj	184	18	12
Old Maghna Estuarine Floodplain (AEZ 19)	Comilla	Borura	Bhabanipur	237	51	33
Old Himalayan Piedmont Plain (AEZ 1)	Dinajpur	Birol	Routnour	168	53	35
Total: 4	3	4	4	844	153	100

Note: (*) indicates figures in the year 2011
Source: VDSA (2013a); VDSA (2013b)

Sample households were categorized into farm households (income source is only agricultural activities), and part-time farming households (income source is both agriculture and non-farm activities) consisting of 59 and 94 households respectively. Data were collected through household survey, key informant interviews (KII) and focus group discussion (FGD) with farm households during July to November 2014.

Analytical techniques
The term welfare indicates a broader area and it is explained in different ways in different studies. In general, poverty alleviation is mostly used as economic wellbeing indicator (Reardon *et al*., 1992; Block & Webb, 2001; Ravallion & Datt, 2002; Holden *et al*., 2004). The term welfare indicates a broader area and it is explained in different ways in different studies. In general, poverty alleviation is mostly used as welfare

indicator (Ravallion & Datt, 2002; Holden *et al*., 2004). Some studies use food consumption or calorie intake as a welfare indicator (Musyoka *et al*., 2014; Seng, 2015). However, only food consumption cannot fully indicate the whole standard of living of a household. Access of the rural people to basic services such as electricity, water, sewage facilities along with fundamental needs (food intake, consumption of cloth, housing, medicine and education services) are viewed as a reflection of the household's welfare standing (Jesko & Lanjouw, 2006). The expenditure incurred on these various needs is vital to enhance the welfare status of households (Ismail & Bakar, 2012; Scharf & Rahut, 2014). Household's insecurity, uncertainty and discrimination to get these facilities and services reducing their income and consumption level, as well as their welfare (Brück, 2004). Though savings is another part of the income

provides household security, expected to expense in future for improving living standard. Therefore, it is generally assumed that more expenditure on the daily necessaries indicates more welfare situation. Household's per capita total expenditure comprising of expense on food, clothing, education, health, transport, fuel and festival is used as household-level indicator of welfare in this study. Household's total consumption expenditure is considered here instead of household income, as many empirical works in different countries stated that it can be measured with more accuracy than using income. It is generally assumed that, poor people expense less on consumption of food and other non-food goods and services comparing to rich people.

Livelihood strategy is likely to be endogenous in rural household welfare estimation, as household adopts different strategy mainly to improve their livelihood situation, ultimately welfare. Participations in different income generating sources have effect on rural household welfare, and vice versa. For addressing this simultaneous causality between different livelihood strategies and welfare indicators, the Two Stage Least Square (2SLS) methods with instrumental variable is applied to estimate impact of the strategies on household welfare. Following model is used as a first stage to estimate this impact:

$$Y_k = \alpha_k + \sum \alpha_k X_k + \sum \alpha_k I_k + \varepsilon \quad \text{............. (1)}$$

k= 1,..,4 = Strategies
Y_k= Income generated by the household by adopting different strategies
X_k= The set of explanatory variables which includes farm households demographic and socio-economic characteristics
I_k= Instrumental variables and
ε = The error term

In the second stage, estimated income generated through different strategies from first stage of the regression is used (Kilic *et al.*, 2009):

$$E_k = \beta_0 + \sum \beta_k X_k + \beta_l \hat{Y} + \varepsilon \quad \text{..........................(2)}$$

Here, E indicates total expenditure; and $\hat{Y}$ implies the predicted values of income from first stage regression

The issue of endogeneity between different income generating activities and household welfare has manifested to be one of the most difficult problems in these analyses so far. Valid instrument should be satisfied following two conditions. In case of IV estimation, movements those are not correlated with ε are isolated from *Y* with the help of appropriate IV that predicts income but has no impact on outcome E_k (Kilic *et al.*, 2009).

Description of the variables used in the model
As the concern of this study is to analyze the impact of different livelihood strategy on welfare, welfare indicator namely household per capita expenditure is treated as the outcome variable. Natural logarithm is taken of the dependent variable to meet the linearity assumption. Descriptions of selected explanatory variables are briefly presented in Table 2.

Selection of instrumental variables
Following Imbens & Angrist (1994), Abadie (2003), Awotide *et al.* (2012), farmer's access to improved rice varieties seed and fertilizer, and local market distance have been selected as instruments for households those involved in only agricultural activities. The first instrumental variable denotes a binary variable equal to 1 if a household has easy access to improved seed and fertilizer and 0 otherwise. Another instrument, distance from local market expected to influence agricultural income but not the outcome variable.

But it does not have any direct impact on agricultural household's welfare indicators. For analyzing the impact of income from a combination of agriculture and wage or self-employment on household welfare, following two instruments are used: (1) Distance from district level urban centre and (2) Share of non-farm employment at district level. Scharf & Rahut (2014) used proportion of the working population engaged in non-farm sector at village level. Due to unavailability of data at village level, this study followed Kilic *et al.* (2009), where he used this data at district level. Bangladesh agricultural census of 2008 is used to find out the share of non-farm employment in district level. In addition, for estimating welfare impact of the income, generated through a combination of agriculture and migration based non-farm activities, two instruments are also used, namely family migration network and district level migration network.

Table 2. Description of the explanatory variables and instruments used in the model

Strategies and Variables	Description
Strategies	
Only agriculture	Households earn their livelihood only from agriculture
Agriculture & wage	Households earn their livelihood from both agriculture and wage based works in non-farm activities
Agriculture & self	Households involved in both agriculture and self-employment in non-farm activities
Agriculture & migration	Households generated income from both agriculture and remittance from in-country and/ out-country migration of household member(s)
Demographic variables	
Household head age	Age of household head in years
Active male	Number of economically active males (aged between 15 and 59 years) in the household
Active female	Number of economically active females (aged between 15 and 59 years) in the household
Number of dependent	The total number of household member below 15 and upper than 59 years
Socio-economic variables	
Primary completed	Number of household member completing 5 years of schooling
Secondary completed	Number of household member completing 10 years of schooling
Higher educated	Number of household member completing more than 10 years of schooling
Farming experience	Household head's agricultural experience in year
Farm size	Total cultivated land holding of household in hectares
Credit	Household received credit (Yes = 1 & No = 0)
Market distance	Household's distance from the local market
Infrastructure	Household's respective village with developed infrastructure (Yes =1 & No = 0)
Instrumental variables	
Access to the input	Access to the improved varieties rice seed and fertilizer (Yes =1 & No = 0)
Local market distance	Household's distance from the local market
Distance from urban centre	Distance from respective district's urban centre
Share of non-farm employment	Share of non-farm employment at district level
Family migration network	Previous household member involved in migration (Yes =1 & No = 0)
District level migration network	Proportion of internal migrated people at district level

Source: Author's specifications

The proportion of internal migrated people at district level in 2011 is used as district level migration network. Migration network has been used as a valid instrument in many researches (Kilic *et al*., 2009; Brauw & Harigaya, 2007; Akhter, 2015; Mckenzie & Sasin, 2007; Gyimah-Brempong & Asiedu, 2011; Yame ogo, 2014).

Results and Discussion
Testing for endogeneity and instruments
Durbin-Wu-Hausman (DWH) test is used for checking the endogeneity among data. It is probably the most widely used approach for endogeneity test. The result of the test is presented in Table 3. In all of the cases, p-values indicate the rejection of null hypotheses that the incomes from different strategies (based on various activities) are exogenous. The result is consistent to the previous findings from Scharf & Rahut (2014), where income from non-farm activities is found endogenous.

IV is used for removing the endogeneity problem. As a beginning stage of the analysis of different strategies on household welfare, considered instruments are tested.

Table 3. Result of endogeneity test and instrument identification test

Variables	DWH test p- value	Hansen J statistic p-value	F-value
Only agriculture	0.027	0.2648	11.45
Agriculture and wage employment	0.008	0.2728	17.25
Agriculture and self-employment	0.005	0.1969	14.45
Agriculture and migration	0.001	0.2459	17.42

Source: Author's calculation, 2017

In this analysis, Hansen J statistics is applied for over-identification test of instruments. Hansen J statistic satisfies both the hypothesis of correctly specification of the model and orthogonality condition of the model (Miluka *et al*., 2007). Therefore, acceptance of null hypothesis implies instruments are correctly removed from the regression analysis and orthogonality condition is satisfied. The test statistic as well as the p-value of

Hansen J statistic is provided in Table 4. The result implies that, we cannot reject the null hypothesis of valid instruments in all cases. Thus, it is clear from this test that selected instruments for specific livelihood strategy are valid for that strategy. Besides, according to existing literature, if the first stage F-statistic value is less than common threshold (10), then the set of instruments is week. Therefore, the higher values of F-statistics in this study conclude that considered set of instruments is strong enough.

Impact of different strategy adoption on per capita household expenditure
The results based on 2SLS estimation of equations (1) and (2) are represented in Table 4. The effect of participation in various income generating activities on household's per capita expenditure depends on which types of activities households are involved in. Involving in any type of non-farm activities jointly with agricultural work has a significantly positive effect on the household's livelihood or welfare. In case of second strategy (agriculture and wage employment) and forth strategy (agriculture and migration) the effect found significant at 5% level. Participations in wage employment and migration activities along with agriculture contribute to an increase of 35.7 % and 45.8 % yearly per capita expenditures respectively with an increase of 100 % of these groups incomes. The result is consistent with other developing countries, for example, an additional migrant increases household per-capita expenditures by 4.8% in Vietnam, holding other

conditions as constant (Brauw & Harigaya, 2007). Similar positive effect on household welfare is also found in case of self-employment based strategy (Strategy 3), though it is statistically less significant (10% level of significant). Household can increase 23.4% per capita annual expenditure by increasing 100% income from a combination of farming and self-employed activities. On the other hand, the impact of participation in only agricultural activities on household expenditure is insignificant. Thus, the general direction of household income and expenditure seems not to hold for all forms of income generation. One possible reason for this result might be that agricultural household has to save some amount from its income for further investment in agriculture or asset purchasing or facing future uncertainties.

As agriculture is their only source of income, they have to save from this income. Therefore, increasing agricultural income might not have any significant effect on their food consumption and non-food expenditures, as well as better standard of living in Bangladesh.

Impact of other household characteristics on per capita expenditure
All the signs shown by demographic and socio-economic variables included in the welfare equation are expected (Table 4). Among demographic variables, the number of active male shows significant positive impact on farm household's per capita expenditure except in case of only agriculture.

Table 4. 2SLS estimates of the impact of livelihood strategies on household's welfare

Explanatory variables	Log of per capita expenditure (BDT)			
	Only Agriculture (Strategy S1)	Agriculture & wage (Strategy S2)	Agriculture & self (Strategy S3)	Agriculture & migration (Strategy S4)
Non-farm income				
Log of respective non-farm income (¤)	0.007 (0.153)	0.357** (0.133)	0.234* (0.107)	0.458** (0.1536)
Demographic variable				
Household head age	0.003 (0.001)	0.006 (0.005)	0.006 (0.005)	0.004 (0.004)
Active male	-0.018** (0.007)	0.097** (0.046)	0.142*** (0.049)	0.112*** (0.030)
Active female	0.047** (0.072)	0.012*** (0.005)	0.104*** (0.036)	0.058* (0.054)
Dependent	-0.003** (0.050)	-0.028 (0.038)	0.061** (0.032)	-0.038** (0.034)
Socio-economic variable				
Primary completed	0.079 (0.074)	0.121 (0.053)	0.035 (0.044)	0.076 (0.044)
Secondary completed	0.124 (0.092)	0.205*** (0.074)	0.141*** (0.052)	0.187** (0.073)
Higher educated	0.184* (0.104)	0.213** (0.093)	0.174** (0.073)	0.260*** (0.090)
Farm size	0.689** (0.595)	0.190* (0.194)	0.094** (0.216)	0.003 (0.103)
Farming experience	0.001 (0.000)	0.002 (0.003)	-0.001 (0.003)	-0.007** (0.003)
Credit	0.228 (0.188)	0.041 (0.016)	0.082 (0.080)	0.142* (0.087)
Infrastructure	-0.166* (0.148)	-0.087 (0.090)	-0.057* (0.082)	-0.142 (0.097)
Constant	13.235 *** (4.921)	9.192*** (2.087)	8.798*** (2.274)	6.553*** (1.012)
Model summary				
F value (p-value)	11.45 (0.000)	17.25 (0.000)	14.45 (0.000)	17.42 (0.000)
Weak identification test (F-stat)	12.01	12.50	13.35	12.91
Hansen J statistic (p-value)	0.2648	0.2728	0.1969	0.2459

Notes: BDT = Bangladeshi Taka; Asterisks (***, **, *) denote significance at the 1%, 5% & 10% level respectively; Figures in the parentheses implies standard errors.
(¤) This income is different for different strategy adaptors. i.e., remittance for migration adopted households (Strategy S4).
Source: Author's estimation

In general it can be argued that adult male consumes more food and moving more than female or children in the household, so larger number of active male is associated with higher per capita expenditure (Akhter, 2015). One of the probable reasons for agricultural household is that benefits from engagement in only agricultural activities are not big enough to compensate for the cost of having more active male member. Moreover, number of active female show positive effect in all types of livelihood strategy adopted households. On the contrary, number of dependent members of household has a negative impact on expenditure excluding self-employment based households. Besides, results show that household's per capita expenditure is increases with the increasing number of different level of educations. Only for primary education completed member, the expenditure is not increasing significantly. This may be due to free primary education service from the government of Bangladesh. As secondary and higher education is not free for all students, household need to spend more on it. Cultivated land is positively related to expenditure, whilst living in an infrastructural backward place increased household's expenditure. Household cultivated large amount of land are in better economic situation and thus they are more capable to spent money to improve their standard of living. An increase in farming experience of household head provides household more ability to expend in case of only agricultural and wage-employment based farm households. It is expected that experienced households can better manage the farming matters, which ultimately increase production and decrease cost. Thus with this more agricultural income, they can better off their livelihood. Similar to the previous research, this study also found negative impact of migration oriented household head's farming experience on their consumption expenditure (Akhter, 2015). Credit is also matters since it affects both the adoption of different non-farm activities and also expenditure of the households. Credit accessibility is positively associated with expenditure, though it is only significant for migration adopted farm households. The reasoning behind this can be explained in two ways. In one side, household can spend more in food consumption or invest in health, education or purchasing inputs with this credit. In the other way, they have to spend more money for repaying this credit, which may also increase household's per capita expenditure.

Conclusion and Policy Recommendation

Strategies based on non-farm activities along with farming activities play a significant role in welfare determination of households holding all other household influencing variables constant. The effect of engagement in different income generating activities on household's welfare depends on which type of activity households are involved in. Results show the need for non-farm employment opportunities, as income from a combination of farming and various form of non-farm activities influenced welfare positively compare to only

agricultural activities. Among different non-farm activities, participation in wage employment and migration along with agricultural activities ensured significantly higher per capita household expenditure. On the other side, only agricultural income imposed an insignificant effect on household welfare, implying that farming alone cannot be a sufficient source of income for maintaining standard of living in rural areas. Besides different income generating strategies, households demographic, socio-economic variables also have an influence in determining welfare of the households. Farm size, higher education and infrastructural situation play an important role in improving household's welfare as well. In order to improve the rural livelihood of Bangladesh, opportunities to participate in non-farm activities should be created through establishment of small and medium industries, especially agro-based industries in the rural area. Therefore, infrastructural facilities like roads, transportation, electricity, water and health facilities, which are mandatory for establishing industries in rural areas, should be improved. Apart from the government, private sector should be encouraged to create employment opportunities by constructing rural environment-friendly industries in rural areas. As the result of this study suggests that still education is an important determinant to participate in the non-farm sector of Bangladesh, the government should provide some measures like, financial help or some program launched for reducing the cost of higher education in rural areas.

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