

Factors Affecting Income Diversification of Farming Households in Rajshahi District: A Microeconometric Analysis

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Abstract

Income diversification is often considered as an essential strategy for socio-economic and livelihood development of the rural households. To reduce rural poverty through raising income of the rural people, it is necessary to diversify the sources of their income. Earlier studies revealed that income diversification is influenced by many factors. This study aims at examining the extent of income diversification as well as identifying the factors affecting income diversification in Rajshahi region of Bangladesh. For this purpose, a survey is conducted in selected areas of Rajshahi district, and primary data are collected from 138 respondents using a pre-tested questionnaire. Multi-stage random sampling technique is used to select the appropriate respondents. To measure the degree of diversification, this research employed the widely used Simpson Index of Diversification (SID), and a multiple regression model to identify the determinants of income diversification in the study area. The results revealed that the value of the index (SID = 0.25) is low indicating low level of diversification existing in the study area. Results of the multiple regression model indicate that the factors- age, education, farm size, number of adults aged more than 60 years, distance from urban area, number of working members, and skill of the household heads are significantly associated with the number of income sources of the households. It is found specifically that education, number of adults aged more than 60 years, number of working members, and skill of the household head have positive effect while age, farm size and distance from urban area have negative effect on income diversification. Finally, this study suggests that government should provide necessary training and credit supports so that a section of rural people can switch to other income generating activities that would augment their income sources. Improving infrastructure and information facilities, and developing growth centers in the rural areas would also facilitate rural people to engage in multiple income generating activities.

Keywords: Income Source, Diversification, Determinant, Simpson Index, Multiple Regression, Bangladesh.

1. Introduction

Extreme poverty increased worldwide during the ongoing Coronavirus pandemic, and around one hundred and twenty million people are added to the existing stock of poor people, which is expected to become one hundred and fifty million by the end of 2021 (World Bank, 2020). The rural sector generally contains majority of the poor people in many developing countries like Bangladesh. The people of Bangladesh generally cope

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with poverty and income variability by shifting from subsistence agriculture to a more developed and technologically efficient production system. In an advanced society, both farm and off-farm activities are available compared to a primitive society. According to a report of BBS (2019), rural poverty in Bangladesh is higher than urban poverty and the majority of the rural poor earn their livelihood from subsistence agriculture. Although some rural people are engaged in informal jobs and small business such as rickshaw/van/truck driving, day laboring, shop keeping, etc., their number is very low (BBS, 2019). The economy of the rural sector is driven mostly by agricultural activities suggesting that rural households depend on production of food and other crops such as rice, maize, potato, vegetables, fruits etc. for earning their livelihood. Besides crops, other agricultural subsectors such as fisheries, livestock and poultry, and forestry activities provide additional sources of income for the rural households in Bangladesh. Thus, agriculture and its subsectors are the main income sources of the rural population. It is mostly found in the rural areas that households mostly have only one source of income, and they generally devote their resources and efforts to that single economic activity (Sultana, 2014). Rural households' income in Bangladesh varies substantially by occupational groups. From all occupational groups, about 45% of the poor are engaged in casual wage employment, and the remaining 55% are in other occupations, mostly related to agriculture, and agricultural income is the biggest revenue source for rural households which vary from 45 to 80 percent. However, non-agricultural income earning activities have also been expanding that constitute approximately 25 to 40 percent of the total income of the people (Sultana, 2014). Poverty and employment levels in a rural setting are by and large influenced by ability to add value to agriculture as well as to non-agricultural sectors (ADB, 2005).

Rajshahi is located in the Northern part of Bangladesh and it is one of the eight administrative divisions of Bangladesh. Rajshahi division has 8 districts and 70 *upazilas* (sub-districts). Among them Rajshahi districts has 9 *upazillas*, 70 unions, and 1,858 villages (WASPA, n.d.). Rajshahi division comprises a large proportion of the total population of Bangladesh, and this division is known as the second most populous division after Dhaka. In Rajshahi district, majority of the people (around 63 percent) live in rural areas, and most of the rural households depend mainly on agriculture for earning their livelihood and obviously their standard of living is very low (WASPA, n.d.). The reason is none but their low level of income earning, which can be attributed to inadequate infrastructure, weak marketing facilities, poor health and sanitation system, lack of education, limited income sources, and lack of government facilities (Sultana, 2014). Besides, households' income from agriculture fluctuates from season to season. The reasons behind this less stability of agricultural production and hence agricultural income are climatic events and natural disasters like drought, flood, storm etc. as well as economic risks (Duc *et al.*, 2009). The economic risks for agriculture are associated with the open economy policy followed by the government in the last two decades. The domestic markets become more fluctuating due to the reduction of trade protection and subsidies (Duc *et al.*, 2009; Sultana, 2014). Rajshahi region could be one of the most economically vibrant part of Bangladesh if both agriculture and industry would have grown together. Due to low market price of

agricultural products, and increase in labor and fertilizer costs, farmers gradually lose their interest in traditional cereal crop farming. As a result, non-traditional fruit gardening, fish farming and forestry raising activities are getting priority to the farmers in the recent times. Thus, the rural sector is getting diversified, though not in a balanced way, and the rural people are also getting opportunity to involve with multiple economic activities. However, most of the people of Rajshahi district are vulnerable in terms of income earning due to lack of sufficient work opportunities, and the condition of the rural people is more susceptible compared to urban people. Although the rich farmers are getting involved in growing mango orchard, fish cultivation and livestock rearing, etc., the poor and marginal farmers have no such opportunities.

Livestock and fish farming are significant occupations of the farming community in this region as well. However, these occupations are not supportive at all as the recent situation has worsened the condition of rural farmers. Due to COVID-19 induced lock down, the people could not move from one region to another, and the commodity transportation faced a lot of disruptions. For this reason, the farmers had to sell much of their products at low prices to the local businessman. Besides these, low level of education, inadequate skill and lack of training force most of the rural households blocked in single income activity and they have no opportunity to switch to other income activities. For this reason, many rural households migrate from rural subsistence sector to urban economic sectors, and move to the city areas.

Diversification of income sources can be a means to increase income of the rural people. Income diversification can enable a large number of households to cross the poverty line as well as to reduce the rate of poverty in the study area. If multiple sources of income can be made available for them, then it will be possible to increase the income of the rural people. The present study tries to find out different sources of income and the extent of diversification of the sources, and also to identify the determinants of income diversification among the farming households in rural areas of Rajshahi.

The rest of the paper is organized as follows: Section 2 provides a brief literature review; Section 3 presents the methodology followed in the study; and Section 4 explains the results and interpretation of the results. Finally, Section 5 concludes the paper.

2. Literature Review

There are many studies which have been devoted to analyze income diversification and the factors that affect income diversification. The patterns of income diversification vary from country to country and region to region. Reardon et. al., (1998) and De Jenvry and Sadoulet (2001) found that the sources and extent of diversification depend mainly on household asset endowments. In the developing regions, non-farm activities accounts roughly 25 percent of total employment, which is 40 percent in rural Latin America, 32 percent in Asia and 42 percent in Africa (Reardon *et al.*, 1998). Reardon, Cruz and Berdegue (1998) and Reardon (1997) showed that in the developing countries, rural households can earn more from their own farming compared to any other income source. A few households, who are landless farmers, earn more from non-farm activities than farm sources. For the rural African households, the non-farm income share is greater for the rich

compared to the poor households and this is also true for some Latin American countries such as Argentina, Mexico and Ecuador (Reardon, 1997; Reardon *et al.*, 1998). For some Asian countries, it is also observed that the country with more wealth has diversified sources of income for the rural households (Reardon and Barrett, 2000).

Rural households in the developing countries face many problems such as natural disasters, imperfect market system, wrong as well as misguided policy regimes etc. and for this reason they need diversified sources of income to ensure a better livelihood (Alderman and Paxson, 1992). Laszlo (2000) examined that educated households with more training are associated with large number of activities compared to less educated households. New technologies and skills also help the rural household to diversify their sources of income (Davis and Pearce, 2001). Land has important impact on income diversification identified by Menon (2006). In Kenya, poorer households depend mainly on crop production but also increase their income by working as seasonal wage laborers for earning their livelihood. Due to sufficient agricultural land, the rural households in Kenya involved themselves with multiple income activities as concluded by Menon (2006). Ahmed and Fausat (2012) examined the determinants of income diversification of Borno State, Nigeria and found that, age, level of education, and asset ownership positively influence income diversification. On the other hand, size of household (family size), access to credit and marital status has no effect on income diversification (Ahmed and Fausat, 2012). The main diversified sources of income identified by Ahmed and Fausat (2012) is small business, matting and tailoring. Development of marketing facilities as well as infrastructural development can also play a vital role to enhance income diversification (Ahmed and Fausat, 2012).

Schwarze and Zeller (2005) used Tobit model to evaluate the determinants of non-farm income diversification and showed that socio-economic characteristics of rural households such as age, education, land ownership, family size, asset endowments etc. and access to credit facilities have positive impact on income. On the other hand, lack of transport facilities and distance to local markets/roads have negative influence on income (Schwarze and Zeller, 2005). Demissie and Legesse (2013) investigated the determinants of income diversification in Ethiopia and found that income diversification can be influenced by human capital related variables such as gender and age of the household head, number of earning members in the family, education level of the household head, number of school going children, assets (livestock holding, size of cultivated land), infrastructure (access to market, road condition), etc. Kimenju (2009) opined that individual farms must switch from subsistence-oriented mono-cultural crop production to more diversified system of production towards benefiting from markets or other systems of exchange. In this study, a conceptual model has been developed that distinguishes between different types of economic diversification and links these to the process of agricultural transformation.

Though agriculture is the major earning source of the people in Rajshahi district, the patterns of income generating activities have been changing gradually and diversification of income sources is also increasing among the rural households. Bangladesh is one of the

most vulnerable countries in the world due to climate change which causes uncertainty of household income and subsistence agricultural system. The importance of farm sector has been declining day by day, while the non-farm activities have been increasing. Therefore, the relevant question is that which sector has most influence on the well-being of the rural people. Limited studies have been done on this important issue related to the rural sector in Bangladesh, and scant attention has been given on the extent of income diversification and its determinants in the rural areas as well. This research tries to find out the extent of income diversification as well as the factors affecting income diversification in the context of Bangladesh. Thus, this research would contribute to understand the importance of farm and non-farm income generating activities to increase household welfare which makes it different from the previous works.

3. Methodology

3.1 Diversification Index

There are several methods which have been frequently used in different studies to measure diversification such as the Index of Maximum Proportion (MI), the Herfindahl index, the Entropy index, etc. (Duc *et al.*, (2009); Culas *et al.*, (2005); and Minot *et al.*, 2006). Considering the objective of this study and the nature of data, this study used the Simpson Index of Diversification (SID) to measure the extent of income diversification following the studies of Minot *et al.*, (2006), Ibrahim *et al.*, (2009), Dev, Sultana and Hossain (2017) and Sultana, Hossain and Islam (2015). The Simpson index is expressed as follows:

$$SID = 1 - \sum P_i^2$$

In the above formulation, SID measures the extent of income diversity and P_i is the proportion of income from source i . The value of SID always falls between 0 and 1. In case that there is just one source of income, the $P_i = 1$ and $SID = 0$ (Minot *et al.*, 2006; Ibrahim *et al.*, 2009; Dev, Sultana and Hossain, 2017 and Sultana, Hossain and Islam, 2015). As the number of sources increases, the shares of P_i declines, as does the sum of the squared shares, so that SID approaches 1. If there are k sources of income, then SID falls between zero and $1-1/k$. The closer the SID is to zero, the more the specialization, and the further it is from zero, implying more diversification (Dev, Sultana and Hossain, 2017 and Sultana, Hossain and Islam, 2015).

3.2 Regression Model for Identifying the Determinants of Income Diversification

The empirical model for identifying the determinants of income diversification is given below:

$$ID = f(X_i, Z_i) \quad \text{---} \quad (1)$$

Where, ID means income diversification and X_i stands for demographic and household specific variables, and Z_i stands for socioeconomic variables. From the discussion of previous literature, it is observed that, there are several factors such as age, education, household size, land ownership, number of children, number of adults in the family, available infrastructure (electricity, transportation facilities), availability of credit, number of earning members, marital status, skill of the household head, membership of any co-operative group, etc., which affect income diversification of the rural households.

According to Nkamleu *et al.*, (1995) age of the household head has negative relationship with income diversification. The chance to earn from diversified sources reduces if the age of the household head is high. Total number of children has a positive relationship with income diversification (Rahman *et al.*, 2009), because large number of children means large number of working people in the family. The households with more family members always try to find alternative income sources to earn their livelihood i.e., family size is also another important factors that can affect income diversification identified by Rahman *et al.* (2009). Households having better skilled members contribute to increased income diversification (Joshi *et al.*, 2003; Minot *et al.*, 2006). Ducand Waibel. (2009), Joshi *et al.* (2003) and Minot *et al.* (2006) confirmed that education is a key factor to increase people's skill as it helps the households to earn from different sources of income. Educated households can manage their resources better compared to illiterate households. Besides these, through better resource allocation educated households can be self-employed and be able to involve themselves into different economic activities (Joshi *et al.*, 2003; Minot *et al.*, 2006). Land ownership has inverse relationship with income diversification as people with less amount of land have a tendency to involve themselves with different types of activities for increasing their income (Duc *et al.*, 2009). Better infrastructural facilities such as availability of electricity, distance of market from the local area (location of respondent's residence) etc. can also affects income diversification (Ibrahim *et al.*, 2009). Duc and Waibel (2009) found that the people living in the hill track or away from city have limited opportunity to work on non-farm activities. Household head's marital status has positive influence on income diversification (Ahmed and Fausat, 2012). Credit facilities is another important factors related to income diversification (Reardon *et al.*, 1998). Group membership such as political party involvement, member of any organization (national and international), and membership of local NGO etc. can help to boost up household's earnings (Israr, 2010).

3.3 Model Specification

From the previous literature, it is clear that several socio-economic factors contribute as determinants of income diversification. Oluwatayo (2009) observed that though the determinants of income diversification are same everywhere and all of them have no similar influence on income diversification. For estimation of the influences, this study has specified a model which enables testing the hypotheses that whether the above mentioned factors positively or negatively affect income diversification. Thus, this research has taken a multiple regression model (Gujarati 2003) where total number of income sources is the dependent variable, and some demographic, socio-economic and household specific variables are the explanatory variables. So, a linear regression equation is adapted from the empirical model employed by Ibrahim *et al.*, (2009). The specified model is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + U_i \quad \text{---} \quad (2)$$

Where, Y is total number of income sources. X_1 , X_4 , X_5 , X_9 and X_{10} are demographic variable which affects income diversification. They indicate age, number of children under 12 years old, number of adults over 60 years old, marital status (dummy: 1 for married, 0 for otherwise) and number of working members in the household, respectively. The others

variables included in the model are known as socio-economic and household specific variables. Where, X_2 and X_3 indicate education and total farm size of the household head. X_6 is the availability of electricity in the house (dummy: 1 = Yes, 0 = Otherwise). X_7 is distance from urban area, X_8 access to credit (dummy: 1 = Yes, 0 = Otherwise), X_{11} having skill (dummy: 1 = skill, 0 = Otherwise) and X_{12} having group membership (dummy: 1 = Yes, 0 = Otherwise). β 's are regression coefficients and μ_i is the stochastic error term.

3.4 Sampling and Data Collection Design

For this research, the study area and the sample size are selected very carefully. Rajshahi districts is selected purposively, and from this district three upazilas namely, Puthia, Paba and Mohanpur are randomly selected as study areas. In the selected upazilas, a large number of people depend on agricultural activities as their primary source of income for maintaining livelihood. A multi-stage random sampling technique is used and data are obtained through a survey of 138 farming households with the help of a well-structured questionnaire. As planned, the data are fitted to compute the Simson Diversification Index and to estimate the multiple regression model towards achieving the objectives of the study. The collected data are analyzed using SPSS software version 15. A graphical presentation of the study area is given below:

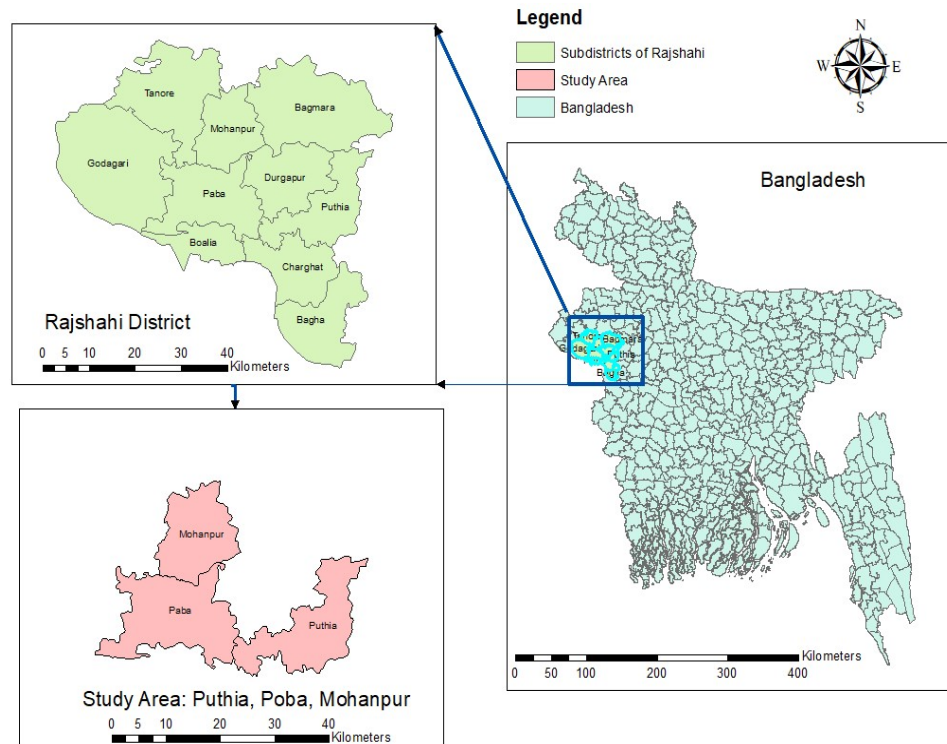


Figure 3.1 Rajshahi district map with the study areas:
1. Puthia, 2. Paba and 3. Mohanpur sub-districts.

4. Findings and Discussion

4.1 Sources and Extent of Diversification

It is observed that the people in the study area are mainly involved with agriculture to earn their livelihoods. Besides farming, the sample households depends on other alternative sources such as small business, day laboring, service (public or private), truck driving, rickshaw-auto rickshaw-van pulling, etc. About 82 (59.42%) of the sample households in the study area are involved with agriculture and agriculture related activities. The distribution of sample households by sources of income is shown in Table 4.1. From the table it is found that 59.42% household members are engaged in farming. The second source of income of the sample households is small business and (15.94%) members of respondent households are involved in this occupation. In the study area, some households have no land or limited land to grow crops, and these households worked as day laborers to meet their family needs. The result found that 16 (11.59%) of the total households earn their livelihood through working as a day laborer. Public and private organization job holders such as primary or high school teacher, NGO worker etc. are also seen in the study area. This service sector (public and private) covers only 11 (7.97%) of the total sample which is very low.

Table 4.1: Diversification Sources of the Study Households

Diversification Sources	Frequency	Percentage (%)
Farming	82	59.42
Small business	22	15.94
Day laboring	16	11.59
Service	11	7.97
Other informal jobs	7	5.08
Total	138	100

Source: Field Survey, 2020

In addition, informal self-chosen occupations such as rickshaw pulling, auto-driving, truck driving, van pulling etc., are also found as income sources in the study area. Around 7 (5.08%) members of the study households earn income from this others informal jobs. Thus, the analysis of income diversification of the study households indicates that the source of income varies in the study area but most of the household's main occupation is farming.

4.2 Extent of Income Diversification

To measure income diversity among the sample households, Simpson Diversity Index is used in the present study. The average value of the Simpson index is found as 0.25. This is value of index indicates very low diversification of income sources in study area. The extent of income diversification of the study households is shown in Table 4.2.

Table 4.2: Extent of Income Diversification among the Study Households

Index Value	Frequency	Percentage
0.00 – 0.20	68	49.28
0.21 - 0.40	20	14.49
0.41 - 0.60	37	26.81
0.61 – 0.80	13	9.42
0.81 – 1.00	0	0

Source: Field Survey, 2020

According to Ibrahim *et al.*, (2009) the value of SID ranges from 0.00 to 0.40 indicates low diversification, 0.41 to 0.60 indicates medium level of diversification, and 0.61 to 1.00 indicates high diversification. From Table 4.2 it is found that the index value of 49.28% households is in between 0.00 to 0.20, and the index value of 14.49% households is from 0.21 to 0.40. This results indicate that the extent of income diversification among 63.77% households is low. From the table it is also found that the value of Simpson index of 26.81% households is from 0.41 to 0.60 indicating medium income diversification. However, high income diversification is found in the case of only 9.42% households.

4.3 Result of Multiple Regressions

Regression results show that demographic, socio-economic and household specific factors affect income diversification of the rural households in Bangladesh. For example, age, level of education, farm size, number of children, number of age-old person in family, distance from urban area, marital status, and access to credit, working members in household, skill etc. affect income diversification of rural households. In this study, factors of income diversification among sample households have been estimated using equation 2. The empirical results found from the estimation are presented in Table 4.3.

Table 4.3: Results of Multiple Regressions Analysis

Variables	Coefficients	Standard error	t-ratio	p-value
AGE (X_1)	-0.214 ^{**}	0.096	2.226	0.029
EDU (X_2)	0.064 ^{**}	0.027	2.28	0.025
FS (X_3)	-0.239 [*]	0.082	-2.896	0.005
CLD12 (X_4)	0.060	0.120	0.497	0.620
AGE60 (X_5)	0.327 ^{***}	0.183	1.791	0.076
AE (X_6)	0.014	0.011	1.249	0.214
DIST (X_7)	-0.393 [*]	0.135	-2.917	0.004
AC (X_8)	0.200	0.252	0.793	0.430
MS (X_9)	0.299	0.538	0.556	0.579
WM (X_{10})	0.271 ^{***}	0.148	1.829	0.070
SKL (X_{11})	0.472 ^{***}	0.280	1.685	0.094
MEM (X_{12})	0.058	0.255	0.226	0.822
Constant	1.014	0.984	1.030	0.305

R-Square = 0.735, Adjusted R-Square = 0.714, F-ratio = 2.843, *, ** and *** indicate 1%, 5% and 10% level of significance, respectively.

Source: Authors' estimation based on field survey, 2020

From Table 4.3, it is found that the value of the co-efficient of determination (R^2) is 0.735. This result means that 73.5% variation in income diversification of households can be explained by the explanatory variables under consideration in the present research. From the table it is observed that the variables- availability of electricity, number of children in household, marital status, access to credit and group membership are not statistically significant. Therefore, these factors do not bear any significant meaning to explain the effects of them on income diversification among the rural households in Rajshahi district. In contrast, the variables- age, farm size, education of household head, number of adults aged above 60 years, distance from urban area, number of working members in the family and skill have important influence on income diversification. It is found from the field survey that a household head with higher age may fail to involve himself with other income generating activities besides his main occupation. This result is similar to the findings of the research done by Nkamleu *et al.* (1995). The coefficient of the education level of household head (EH) is statistically significant. This result indicates that education positively affects income diversification of the households. This means that increase in the level of education of household head increases income diversification among the households. This may imply that a more educated people can earn more income from other sources besides his main income source using his level of education which is considered as human capital. In addition, higher education indicates greater skills which may be helpful to create employment opportunities as well as raise the awareness towards diversification of income. This result is similar to the result obtained in the study of John and Wobst (2006) and Haile *et al.*, (2005).

The regression results also revealed that farm size (FS) also affects income diversification of households. The sign of the coefficient of farm size is negative. It means that if farm size increases then it will cause to decrease household income diversification and vice versa. The explanation is that if a household head possesses large farm he will mostly confine himself in agriculture and will not devote to other sources of income to earn addition income. This result is similar to the findings of Marong *et al.*, (2007), Rijal (2007), Haile *et al.*, (2005) and John and Wobst (2006). They all found negative relationship between farm size and income diversification in rural areas. Number of adults with more than 60 years (NAM60) has positive and significant co-efficient. This may indicate that if an individual household has more dependent people then the household head has to earn more income and hence he has to devote to other sources of income besides his main income source. This result matched with the findings of the study done by Dynan *et al.* (2007). Skill of household head is statistically significant. Therefore, this factor has significant effect of income diversification of the sample households. The variable age is negatively related to income diversification and is statistically significant. Distance from urban area (DU) is also negatively and significantly related to income diversification. The negative sign of the factor implies that the longer the distance of home from the urban area, the lower will be the income diversification of households and vice versa. This result is consistent with the result of the study conducted by Duc and Waibel (2009), who found that due to some problem such as limited information, high transportation costs etc. the households lives in hilly area or away from the city have limited access to

off-farm activities. Number of working members in the household (WM) is significantly related to income diversification. The positive sign implies that if households have more people to earn then the chance of diversification will rise. This may mean that a household with more working people can involve with different sources of income. Skill of the household head (SK) is statistically significant and indicate that skilled household heads have more sources of income. This result means that a household head can earn income from different sources applying his skill of different activities.

In the Appendix the ANOVA test results (Table 1), full model summary (Table 2), collinearity test (Table 3) are given. The Figures- 1, 2 and 3 in the Appendix show the results of multicollinearity and heteroscedasticity tests. The results of these diagnostic tests indicate that there is no multicollinearity and heteroscedasticity problem in the model.

5. Conclusion and Recommendation

On the basis of the above discussion it can be concluded that income diversification in the rural areas of Rajshahi district is still low and most of the households in the rural areas have single source of income. This causes them to expose to income vulnerability and to fall below the poverty line. The recent COVID-19 pandemic has worsened the existing vulnerability of this group of people living in the rural areas of Bangladesh. To overcome this situation as well as to reduce poverty it is necessary to diversify the income sources of the rural households in Bangladesh. From the field survey data, the extent of income diversification is calculated using the Simpson Index of Diversity and the determinants of income diversification are investigated using multiple regression analysis techniques. The results of the present research indicate that in the Northern part of Bangladesh, although most of the people are engaged in agriculture, there is a scope of engaging these people in diversified income generating activities. The results of the regression model found that, among others, education and skill development can play significant role to diversify the sources of income of the rural people. Depending on the above findings some recommendations can be put forward. The government should take initiatives to increase various training programs along with emphasizing on education in the rural areas. It is necessary to increase credit facilities for the rural poor people so that they can initiate new economic activities. Infrastructural development such as better transportation facilities, good communication system, better marketing facilities, development of growth centers, supply of electricity etc. need to be ensured to enhance income diversification. Besides these, government and non-government organizations can play important roles to increase the pace of income diversification by providing training and other skill development facilities in a collaborative way for the rural households towards diversifying their income sources.

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APPENDICES

Table 1: ANOVA of (Ln) Total Number of Income Sources of the Full Model of Multiple Regressions

ANOVA(b)						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.450	12	.621	2.809	.002(a)
	Residual	27.625	125	.221		
	Total	35.075	137			
a. Predictors: (Constant), (Ln) Age of the household head, (Ln) Education of the household head, (Ln) Farm size, Availability of Electricity, (Ln) Number of Children less than 12 years, (Ln) Number of Adults more than 60 years, (Ln) Distance from market, Marital Status, Access to Credit, (Ln) Working members of the households, Skill, Group Affiliation.						
b. Dependent Variable: (Ln)Total HH income sources						

Table 2: The Full Model Summary (Multiple Regression)

Model Summary (b)					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.914(a)	.759	.738	.47011	1.689
a. Predictors: (Constant), (Ln) Age of the household head, (Ln) Education of the household head, (Ln) Farm size, Availability of Electricity, (Ln) Number of Children less than 12 years, (Ln) Number of Adults more than 60 years, (Ln) Distance from market, Marital Status, Access to Credit, (Ln) Working members of the households, Skill, Group Affiliation.					
b. Dependent Variable: (Ln) Total HH income sources					

Table 3: Collinearity statistics of (Ln) total household income sources

Variability	Collinearity Statistics			
	Tolerance	VIF	Eigen value	Condition index
AGE	.648	1.542	1.121	2.431
EDU	.796	1.256	1.004	2.569
FS	.800	1.251	.851	2.790
AE	.903	1.107	.790	2.896
CLD12	.891	1.123	.674	3.135
AGE60	.867	1.153	.535	3.520
DU	.834	1.199	.469	3.758
MS	.920	1.087	.406	4.039
AC	.915	1.092	.284	4.831
WM	.828	1.208	.206	5.675
SKL	.875	1.142	.033	14.102
GM	.836	1.197	.002	54.449

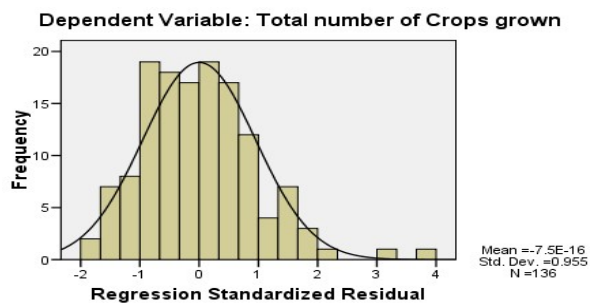
Note: AGE = (Ln) Age of the household head, EDU = (Ln) Education of the household head, FS = (Ln) Farm size, AE = Availability of Electricity, CLD12 = (Ln)Number of Children less than 12 years, AGE60 = (Ln)Number of Adults more than 60 years, DU = (Ln) Distance from market, MS = Marital Status, AC = Access to Credit, WM = (Ln) Working members of the households, SKL = Skill, GM = Group Affiliation.

Table 4: Residuals statistics of (Ln) total HH income sources of multiple regressions

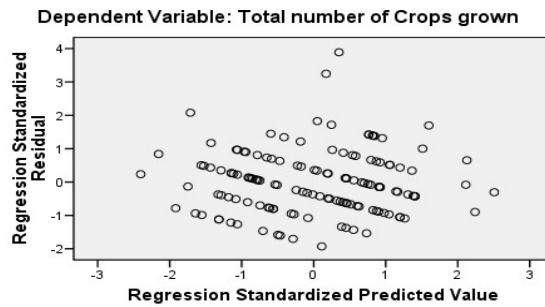
Residuals Statistics(a)					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.3830	1.6102	.9365	.23319	138
Residual	-.99930	1.09434	.00000	.44905	138
Std. Predicted Value	-2.373	2.889	.000	1.000	138
Std. Residual	-2.126	2.328	.000	.955	138

a. Dependent Variable: (Ln) Total HH income sources

Histogram



Scatterplot



Normal P-P Plot of Regression Standardized Residual

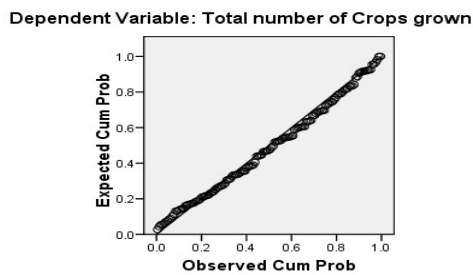


Figure 1, 2 and 3: Presents Histogram and P-P plot and Scatter plot of Regression standardized residual showing the non-linear distribution of data and heterogeneity of variances.