

Original Research Article

Farm and Non-farm Income Diversification in Selected Areas of Sunamganj District of Bangladesh

ABSTRACT

The study assesses the occupational patterns, sources of income diversification and factors that affect farmer's decision towards income diversification. Data were collected from 120 respondents using convenience sampling technique. To collect data, a questionnaire was administered through face to face interview method. Data were analyzed using descriptive statistics, Logistic regression (logit) model and Simpson index of diversification (SID). The results of the analyses showed that the maximum farmers (25) were following the crop cultivation + fish catching + non-farm occupational pattern. The SID index showed that the low, medium and high levels of diversified farmers were 22.5%, 42.5%, and 13.33%, respectively. The result of the Logit model shows that age and farm size influence income diversification decision of the farmer while sex, education level, marital status, family size, membership status of the respondent, access to credit and market distance did not. The FGD revealed some coping strategies during the lean period.

Keywords: SID, Logit model, FGD.

1. INTRODUCTION

Agriculture is the single largest producing sector of Bangladesh economy and contributes about 17.22% to the total GDP of the country. This sector also accommodates around 45.6% of labor force. GDP growth rate of Bangladesh mainly depends on the performance of the agriculture sector [1]. In Bangladesh, food security of the vast population is associated with the development of agriculture. Besides this, agriculture

has a direct link to the issues like poverty alleviation, improved standard of living and employment generation. Broad agriculture sector and rural development sector have been given the highest priority in order to make Bangladesh self-sufficient in food [2]. There is now total 15183183 farm and 13512580 nonfarm holdings in Bangladesh [1].

In small farming in Bangladesh, there are four main components of farm sector such as crops, livestock, fisheries and poultry [3]. Non-farm activities in Bangladesh is comprised of a diversified activities like cottage industries, mechanics, wage employment in rural business enterprises, transport operations, and construction labor, salaried service in public and private sector institutions, teachers, religious leaders, lawyers, village doctors, and various types of personal services (barbers, laundry services, midwives etc.), agro-processing, shop-keeping, peddling, petty trading, medium and large scale trading, and contractor services. This diversification is driven by different incentives and capacity to undertake non-farm activities among rural household [4]. This is often necessary for the agriculture based economies where various types of risks exist such as variability in soil quality, crop diseases, price shock, unpredictable rainfall and other weather related events. These risks leads to low productivity, low output and invariably low income which continually trap them in the vicious cycle of poverty. Increasing the sources of income, therefore, has become an important component of livelihood strategies among rural households.

Sunamganj district was one of the sub-divisions of former Sylhet district. The district is full of *Haors* and *Baors* [5]. The district has 95 *Haors*, which is 268531 ha out of total 367000 ha area [6]. The total household in Sunamganj district is 440332 and the total population is 21500. Out of total 387205 holdings of the districts, 53.39% holdings are farms that produce varieties of crops, namely, local and HYV rice, wheat, vegetables, jute, spices, cash crops, pulses, oil seeds and others. There are 37539 establishments in the districts, in which 99,660 persons are engaged in different types of non-farm activities [5]. *Dekhara Haor* is a prominent *Haor* area in Sunamganj district. Because of having low income, the people of this area cannot meet their basic needs of life properly. Sanitation, safe drinking water, hospital facilities, communication problems, lack of government support are the common problems of them. In rabi season, the people can cultivate rice, mustard, sweet potato etc. Some households also have homestead vegetables. The production of vegetables is also very low. They mainly cultivate for their

own consumption. Many families have small livestock rearing opportunities. Sheep, goat, cattle, and hen are the common livestock.

During the rainy season most of the area goes under the water by 12-15m. As a result, the farmers mostly depend on earning through fishing opportunities. They catch fishes and sell them to the local market with low price. The income earned from it is not sufficient to meet their daily requirement. Some of the farmers also engaged in non-farm activities in the period. The main working activities are artisans, day labor, rickshaw pulling, etc. So, during lean period of time, if they do some non-farm activities along with farming, the income level will rise up. The minimum standard of living will improve. This process of diversification will make them self-sufficient and help them to cope with risk.

Some relevant literature on these modalities can be pictured as: Ahmed *et al.* conducted a study on patterns and extent of rural areas livelihood diversification of Bangladesh and they found that the livelihood diversification of rural Bangladeshi households is at a medium level [7]. Sultana *et al.* have used the Simpson Index of Diversity (SID) to calculate the annual average expenditure of households by the level of income diversification in the rural areas of Rajshahi district of Bangladesh and found that in the study area the income level diversification is very low and it is significantly and positively related to households' well-being [8]. Abimbola and Olaniyi conducted a research on diversification of rural livelihood and inequality of income in Nigeria and revealed that the age, education level, and household size has a negative and positive relationship to adopt farming and non-farming activities, respectively [9]. Lama studied on livelihood diversification and determinants in West Bengal based on primary survey and the results of Binary Logit Model identified that to adopt non-farm activities, education plays a very significant role [10]. Adebayo *et al.* carried out a study on income diversification determinants among farm households in Kaduna State and suggested the importance of basic infrastructure in the farming communities to increase their non-farm activities [11].

Moreover, most of the studies were done either on the extent of diversification or on the determinants of diversification. Although there is several works on income diversification, very limited study was done on diversification of livelihood in *Haor* areas of Bangladesh. In this context, the study was undertaken.

- i. To identify the occupational pattern and sources of income diversification of the *Haor* households,
- ii. To examine the factors that influence farmers' decision towards income diversification; and

iii. To suggest enhanced coping strategies for the poor households during the lean period.

2. MATERIALS AND METHODS

To analyze the sources of income diversification and the factors that affect the farmer's decision towards income diversification the researcher selected *Noagaon* and *Bahadurpur* village of *Dakshin Sunamganj* Upazila of Sunamganj district. By using convenient sampling technique a total 120 samples were selected where 60 sample respondents have been selected from each village. The researcher collected the data during period Nov/15 to March/16.

2.1 Analytical Technique

The tabular analysis was used to measure the occupational pattern of the sample farmers. The sources of income diversification were analyzed by using Simpson Index of Diversification (SID) (12-14). The formula for Simpson Index of Diversification [7] is:

$$SID = 1 - \sum_{i=1}^n P_i^2$$

Where n is the total number of income sources and P_i is the income portion of i -th income source. The value of SID ranges between 0 and 1. The index's value is zero if there are just one source of income. As the number of sources increases, the shares (P_i) decline, as does the sum of the squared shares so that SID approaches to 1. Households with most diversified income sources have the largest SID value, and the least diversified income sources have the smallest SID value. The higher the number of income sources as well as more evenly distributes the income shares, the higher the value of SID. The Simpson index of diversity was affected both by the number income of sources as well as by the distribution of income among different sources. Based on the SID values, the level of livelihood diversification was classified as:

- i. No diversification ($SDI \leq 0.01$);
- ii. Low level of diversification ($SDI = 0.01-0.25$);
- iii. Medium level of diversification ($SDI = 0.26-0.50$);
- iv. High level of diversification ($SDI = 0.51-0.75$) and
- v. Very high level of diversification ($SDI \geq 0.75$).

108 In order to identify the factors that influence farmer's decision towards income diversification Logit model
109 was used [15]. The Logit model for the study is specified as [16]-

$$\frac{P_i}{1 - P_i} = \frac{1 + \exp (Z_i)}{1 + \exp (-Z_i)}$$

110 Because the equation is nonlinear, one can linearize the model by taking the natural log. This gives the
111 following linear Logit model:

$$112 \quad L_i = \ln\left[\frac{P_i}{1-P_i}\right] = \beta_0 + \beta_1 X_{i1} + \dots + \beta_9 X_{i9} + e$$

113 Where $P_i / (1-P_i)$ is the ratio of the probability that a farmer will be engaged in other income generating
114 activities apart from farming (non-farm work) to the probability that a farmer will not engage in any non-
115 farm work. Hence the dependent (endogenous) is binary and its value is 1 for a farmer who does at least
116 one non-farm work and 0 for a farmer who did not do any non-farm work. Here

117 β_0 = Constant

118 $\beta_1 - \beta_8$ = Logistic regression co-efficient.

119 $X_1 - X_8$ = Independent variables

120 Where,

121 X_1 = Age of the household head (year)

122 X_2 = Sex of the respondent (if male = 1 otherwise if female = 0)

123 X_3 = Educational level of the household head (0 for illiterate, 1 for literate, 2 for primary, 3 for high school,
124 4 for S. S. C, 5 for H. S. C, 6 for graduation)

125 X_4 = Marital status of the household head (1 for married and 0 for unmarried)

126 X_5 = Family size (No. of people living or eating together)

127 X_6 = Farm size (area of land cultivated in acre)

128 X_7 = Credit (1 for having credit access and 0 for otherwise)

129 X_8 = Market distance (distance from house to nearest market in km)

130 X_9 = Membership status of the household head (1 for membership of farmer group and 0 for otherwise)

131 e = error term

PRA tool such as Focus Group Discussion (FGD) was conducted with sampled respondents including farmer, fisherman, and persons engaged in non-farm activities to find out some coping strategies during their lean period.

3. RESULT ANDDISCUSSION

3.1 Occupational pattern

The study examined the occupational pattern of the farmer between farm and non-farm activities. The sampled farmers were engaged in farm activities as crop production, livestock rearing and fish catching along with different non-farm activities such as nonagricultural wage labor, contract job, service holder, small business, transportation labor etc. There were some farmers who have only one source of income and some others have more than one that means they are diversified.

Table 3.1 shows the occupational patterns of the sampled farmers. It can be seen from the Table that majority of the farmers (25%) were doing crop cultivation + fish catching + non-farm occupational pattern. The Table also reveals that 2.5% farmers were engaged only either in crop production or fish catching and 14.17% farmers were only in non-farm activities. In the study area, 5 percent, 23.33 percent, 1.67 percent and 10 percent have crop cultivation + livestock rearing, crop production + non-farm, crop production + fish catching + livestock rearing and fish catching + non-farm livelihood patterns, respectively. Among all the respondents, only 1 farmer had crop production+ livestock rearing + non-farm and crop production+ fish catching + livestock rearing + non-farm occupation pattern.

159 Table 3.1: Occupation status of sampled farmers in the study area

Occupational status	Frequency	% of the occupational status
Crop cultivation	3.0	2.50
Fish catching	3.0	2.50
Non-farm	17.0	14.17
Crop cultivation + non-farm	28.0	23.33
Crop cultivation + fish catching	17.0	14.17
Crop cultivation + livestock rearing	6.0	5.0
Crop cultivation + fish catching + livestock rearing	2.0	1.67
Crop cultivation + fish catching + non-farm	30.0	25.0
Fish catching + non-farm	12.0	10.0
Crop cultivation + livestock rearing + non-farm	1.0	0.83
Crop cultivation + fish catching + livestock rearing + non-farm	1.0	0.83
Total	120.0	100.0

160 Source: Field survey, 2016.

161 3.2 Sources of income diversification

162 The number of income sources is a measurement of diversification used by different researchers in the
 163 past [12]. The person having more sources of income is more diversified. Diversification of the selected
 164 respondent was analyzed by using Simpson Index of Diversification (SID). The diversification index has
 165 been categorized into five groups [7]. The index up to 0.01 has been considered as no diversification.
 166 Low, medium, high and very high level of diversification was between 0.01-0.25, 0.26-0.50, 0.51-0.75 and
 167 more than 0.75, respectively.

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Table 3.2: Percentage distribution of the respondent by sources of income diversification

Items	No. of respondents	Percentages of respondent (%)
<0.01 (no diversification)	26.0	21.67
0.01-0.25 (low level)	27.0	22.50
0.26-0.50 (medium level)	51.0	42.50
0.51-0.75 (high level)	16.0	13.33
>0.75 (very high level)	-	-
Total	120.0	100.00
Average	0.2733	

Source: Field survey, 2016.

The Table 3.2 depicts that the average Simpson index was 0.2733. The Table also shows that majority of the respondents (42.5%) were a medium level of the diversified group. Only 26 respondents (21.67%) had zero Simpson index. Of the sampled households, 22.5% had low and 13.33% had a high level of livelihood diversification while there was no very high level of diversified farmers. That implies that majority of the households are diversifying their earning sources.

3.3 Factors affecting farmer's decision towards income diversification

To determine the effect of different independent variables on the decision of farmers towards income diversification in *Dekhar Haor*, a Logit model was used.

3.3.1 Functional Relationship

The estimated model for measuring the effect of different independent variables on the decision of farmer towards income diversification was:

$$Li = -13.987 - .033X_1 + .408X_2 + .198X_3 - 19.085X_4 - .060X_5 + 2.622X_6 - .793X_7 + .062X_8 - 1.653X_9$$

3.3.2 Model Specification for Quantitative Analysis

The estimated coefficient of the Logit model, standard errors, level of significance and odds ratio are presented in Table 3.3.

188 Table 3.3: Estimated values of coefficient and related statistics for measuring the effect on decisions
189 towards income diversification

Selected variables	Coefficients	Standard errors	Level of significance	Exponential of coefficient or odds ratio
Constant	-13.987	2.199	.999	0.000
Age (X ₁)	-0.033*	0.018	.069	0.968
Sex of the respondent(X ₂)	0.408	1.501	.786	1.504
Education level(X ₃)	0.198	0.281	.481	1.219
Marital status(X ₄)	19.085	2.20	.999	1.944
Family size(X ₅)	-0.060	0.144	.679	0.942
Farm size(X ₆)	2.622***	0.831	.002	13.764
Credit access(X ₇)	-0.793	0.573	.166	0.453
Market distance(X ₈)	0.062	0.137	.652	1.064
Membership status(X ₉)	-1.653	1.127	.143	0.191

190 Source: Author's estimation, 2016

191 *** = 1% level of significance, ** = 5% level of significance and * = 10% level of significance

192 **4.3.3 Measures of the Proportion of Variation Explained**

193 Table 3.4: Value of R and R² for measuring the effect on decision towards income diversification

Step	-2 Log likelihood	Cox & Snell R ²	Nagelkerke R ²
1	87.361	0.256	0.399

194 Source: Author's estimation, 2016

195 The Cox and Snell R² were 0.256 and Nagelkerke's R² was 0.399. The interpretation is that the model
196 explains about 39.9% of the variation in the data.

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199 **3.3.4 Interpretation of the Results of logit model**

200 The results of the model were presented in Table 3.3 and the interpretation of the model was discussed
201 below:

202 **Age of household head (X_1)**

203 The result showed that the age of the household head had a negative value of coefficient and it was
204 significant at 10% level. This indicates that the older the household head, the lower the probability of
205 farmer's decision towards income diversification. A unit increase in the age of the household head will
206 reduce the probability of household income diversification by on an average 0.968 holding other factors
207 remaining constant. The reason of such negative sign was that the older farmers do not want to take
208 the risk to change their profession.

209 **Farm size (X_6)**

210 The result says that the farm size has a positive effect on income diversification decision and it was highly
211 significant. Which implies that the larger the farm size greater the probability towards income
212 diversification decision of the household. Holding other factors fixed, one unit increase in farm size would
213 lead to increase the probability of income diversification decision by 13.764. That represents farmers
214 having large farm size had more scope of diversification than small farm sized farmers. This finding is
215 similar with [16].

216 **3.4 Coping Strategies**

217 The livelihood of the farmers is intermingled with different problems. Those problems make their life more
218 uncertain and affect their farming system as well as the engagement of non-farm activities resulting in
219 a gradual reduction in their standard of living. The researcher has done an FGD to identify some coping
220 strategies during the lean period. A total 50 farmers were selected for FGD, 25 farmers from *Noagaon* and
221 25 farmers from *Bahadurpur* village. Sampled farmers pointed out some important issues and strategies
222 to overcome the crisis period, and they found these might be helpful for them to overcome crises during
223 the lean period. Those strategies are described below-

224 **3.4.1 Adopting modern farming system**

225 Most of the respondent argued that the farming systems they use are traditional which give them less
226 amount of yield. Farmers said that improving farming system will be able them to get production and will
227 make them self-sufficient and secured in food all year round.

228 **3.4.2 Improving physical structure of farm area**

229 The physical structure of the farming area was not so good and well-constructed. The drainage and
230 irrigation system was also not well developed. For this reason, during the period of flood, the water
231 cannot pass from the field properly. Because of this, they got less amount of production which made them
232 suffer in alean period. So it is one of their other strategies that they will improve their physical structure of
233 the farming system.

234 **3.4.3 Homestead gardening**

235 Many farmers had argued that making a homestead vegetable garden will help them to meet the demand
236 for vegetable. The fellow land around their homestead area can be used for it. Besides, cultivation of
237 small amount of different vegetables in their small pieces of land is not so costly. But the output from it will
238 be immense. The vegetable can be used for their home consumption. This will be a good source of
239 nutrition for making them food secured. The surplus amount can be sold in the market which will give
240 them some cash also.

241 **3.4.4 Homestead livestock rearing**

242 Most of them suggested that livestock can be reared in their house which is not so much cost for them.
243 The hay from the rice production can be used for their feed. The livestock may be cattle, hen, duck,
244 sheep or goat, etc. Cattle can be reared for meat, drought and also for dairy purpose. Dairy purpose
245 cattle can give milk daily in their lactation period. This will provide nutrition to the small children and also
246 will earn some revenue by selling it. They can also rear duck or hen. Duck can be easily reared by them
247 cause of wide available water body. This will provide them meat and adequate amount of eggs resulting
248 make them food secured and self-sufficient.

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250 **3.4.5 Acquiring knowledge of farming through training**

251 To cultivate properly, they need proper knowledge about it. They can acquire it from training. They found
252 that the application of the knowledge from training will improve their productivity. So they assured that
253 they will participate actively in all training program organized by the government and different non-
254 government organizations.

255 **3.4.6 Adoption of proper education**

256 Education will change their lifestyle and make their thinking broad. Proper education will improve their
257 decision-making capacity, adoption of modern technology and will also help them to improve their farming
258 system. So they also came in a single decision that they will manage proper education for their child
259 rather than involving different earning sources.

260 **3.4.7 Adoption of improved variety of seed and modern technology**

261 Use of HYV quality seeds and modern technologies will increase their production. They had strategized
262 that they will adopt modern technologies for their production and will use good quality seeds in theright
263 amount.

264 **3.4.8 Proper application of fertilizer in right amount**

265 Most of the farmers did not know the right amount of fertilizer to be used in their field which hampers the
266 crop production and hence amount of crop yield. But theproper amount of fertilizer application in right time
267 might increase their yield. So they made the strategy to use theright amount of fertilizer in right time.

268 **3.4.9 Co-operative farming system**

269 At present, there is a cooperative fishing organization in the *Bahadurpur* village which had made their
270 fishing profitable with low cost. So, they suggested that they can also apply the cooperative system at the
271 time of seed sowing, intercultural operation, harvesting and post-harvesting operations of crop production.
272 This decision will be effective when there are so many crises in labor with high wage rate.

273 **3.4.10 Catching of fish in right time**

274 Many respondents did not know the proper time of fishing. Those who knew did not obey the rules. Some
275 of them caught fish during banning times which is breeding period. This will hamper proper fish growth in

size and in quantity results the lack amount of fish at the time of harvesting. To they mentioned out that catching of fish in right time will make them more profitable in fishing.

3.4.11 Proper use of their financial and other assets

The major problem of the farmer was having low amount of financial and other assets. But they commented that the assets will be productive through the use of them in a proper way. They should use the capital in productive purpose instead of unproductive one. This decision will help them to cope in the time of no working period and also invest in farm production as a well small business.

3.4.12 increasing sources of income means diversification

There were many respondents of the FGD participation who had only a single source of income which is not sufficient for all year round. Sometimes it may be sufficient but in some month they face difficulty. Those respondents who had only farm activity can diversify their income in non-farm ones like rickshaw pulling, transportation labor, small business, etc. If they adopt their activities with more than one income sources, this would make them self-sufficient throughout the year.

4. CONCLUSION

The livelihood condition of *Haor* area is different from the other parts of a country. They are subjected to different types of risk and natural calamities. Fishing activities and crop cultivation are their main earnings sources. Besides in the study area, many people also diversified with some non-farm activities along with farm activities. This diversification process will increase their standard of living. The people of the area should increase different kinds of non-farm activities. The farmers should adopt a modern and newly introduced method of cultivation process and fish catching.

In order to increase their livelihood process, the provision of credit facilities, improving the transportation system, providing proper information about their product prices is essential. It is necessary to encourage the small entrepreneur and small scale business. The government, non-government, cooperatives and other autonomous institutions should take initial steps in order to expand credit market, infrastructure development, providing proper information and training, proper medical facilities. The Proper amount of agricultural inputs with appropriate prices is needed for them. The transportation systems, electrification,

and their marketing process should be developed. The proper prices of their product should be ensured. The women should also come forward in both farm and non-farm activities.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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