Micro-Level Determinants of Livelihood Diversification in The Rural Areas of Tinsukia District of India

Parswa Jyoti Neog, Pranjal Protim Buragohain

Abstract- Livelihood diversification is a strategy to avoid the risk associated with shocks and to improve livelihood security. Different socio-economic and demographic factors influence the decision of livelihood diversification of households. An attempt has been made in this paper to identify the determinants of livelihood diversification of the rural people using primary data collected from 255 households of Tinsukia, one of the remote districts of India. This study, by employing the logistic regression model reveals that, at least 10 percent probability level among 11 variables, six variables namely Age of the household Head (AGEH), Type of the Family (FAMILYT), Size of the Family (FAMILYS), Monthly Per Capita Income (MPCI), Access to Credit (CREDIT) and remittance (REMIT) are significant determinant of livelihood diversification. This study will help to formulate proper development policies on the part of various concerned authorities for supporting diversification in the rural areas.

Keywords: demographic factors, diversification, livelihood, livelihood security, logistic regression.

I. INTRODUCTION

Livelihood is a broad concept that includes various aspects of human life. Income is the main component of livelihood and besides this, it also involves the social institutions, gender relations, and property rights required to support and to sustain a given standard of living [1]. Diversification is viewed as a livelihood strategy for most of the rural areas in developing countries. The rural people normally instead of specializing in a particular activity, diversify their productive activities to incorporate a variety of other productive areas in order to secure livelihood. The word diversification is not a simple term and the process of diversification is common to all the countries in the process of development. Diversification may be due to the “survival strategy” adopted by poor people to overcome the risk involved in their income earning capacity or accumulation strategy adopted by the rich farmers to accumulate more wealth and income [2].

Thus, diversification is a deliberate strategy adopted by a household to avoid the risk associated with the fluctuation of income or to manage risks associated with the shocks [4] or to efficiently use the available resources. Livelihood diversification among rural households is very important due to the pressure of population growth, shrinking of land holdings size and environmental degradation. In several studies, livelihood diversification was measured using a vector of shares of income earned from various sources [3]. Both push factors and pull factors may be involved in spurring on the process of livelihood diversification [4]. Asfaw et al. [3] in their study recognizes some push factors of livelihood diversification such as risk management and variability of income, adapting to heterogeneous agro-ecological production conditions, etc. [5]. Several factors such as risk strategies, coping behaviour to shocks, seasonality, market imperfection, etc. determine diversification of activities. An effort has been made in this paper, to find out the influencing factors which determine the diversification of livelihood activities in the study area.

II. OBJECTIVES

The main objective of our study is to identify the factors that determine households’ participation in livelihood diversification.

III. METHODOLOGY

In this study, to calculate Livelihood Diversification at the household level, Inverse Herfindahl–Hirschman Diversity Index (IHDI) was used. IHDI helps to measure diversity and it is generally used to estimate the distribution of market share. To measure diversity by using IHDI the number of elements studied and their proportional distribution are taken into consideration [6]. Following formula gives us the value of the index-

\[ D = \frac{1}{\sum a_i^2} \]

Where, \( D \) = Diversification index,
\( a_i \) = Share of livelihood activity \( j \) to household’s total income.

The minimum value of the index is 1 and the maximum value is the total number of income sources. If a household earns income from a single source then the value of the index will be one and if a household earns income from different sources then the value of this index will be greater than one. The highest possible value of the index is attained if the household earns an equal amount of income from each source.
To identify the influencing factors i.e., the determinants of livelihood diversification decision, a binary logistic regression model was estimated by taking into consideration 11 explanatory variables. The logistic regression model can be explained as follows:

\[ P_i = \frac{e^{\beta_0 + \sum_{k=1}^{m} \beta_k X_{ki}}}{1 + e^{\beta_0 + \sum_{k=1}^{m} \beta_k X_{ki}}} \quad (1) \]

Where \( P_i \) represents the probability of participation of ith household in livelihood diversification whose value ranges from 0 to 1;

Equation (1) can be rewritten for ease of exposition as follows:

\[ P_i = \frac{1}{1 + e^{-(\beta_0 + \sum_{k=1}^{m} \beta_k X_{ki})}} \quad (2) \]

Where,

\[ Z_i = \beta_0 + \sum_{k=1}^{m} \beta_k X_{ki}, \quad i=1,2,3,...m \]

\( \beta_0 \) and \( \beta_i \) are the intercept and slope parameters respectively.

Since the probability of a household’s participation in livelihood diversification is represented by \( P_i \), then the probability of not participating in livelihood diversification by a household is represented by 1-\( P_i \), which can be written as:

\[ 1 - P_i = \frac{1}{1 + e^{-(\beta_0 + \sum_{k=1}^{m} \beta_k X_{ki})}} \quad (3) \]

From (1) and (3) we get,

\[ e^{Z_i} = \frac{P_i}{1 - P_i} = \frac{1}{1 + e^{-(\beta_0 + \sum_{k=1}^{m} \beta_k X_{ki})}} \quad (4) \]

Now \( \frac{P_i}{1 - P_i} \) is the ratio of the probability of household’s participation to the probability of household’s not participation in livelihood diversification. Thus, it represents the odds ratio in favor of a given household’s participation in livelihood diversification.

Finally, natural logarithm of (4) gives the logit model as follows:

\[ L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \sum_{k=1}^{m} \beta_k X_{ki} \quad (5) \]

Thus, the complete logit model can be written as:

\[ L_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_m X_{im} \quad (6) \]

Household’s participation in livelihood diversification is the dependent variable in this study, which takes the value 1 if a household diversifies its income sources and 0 otherwise. The factors which are considered as influential factors of livelihood diversification i.e., the independent variables are namely, Household Head’s Age, Sex, Education, Family Size, Type of Family, Credit, Remittance, Dependency Ratio of The Households, Value of Economic Status Index, and Economically Active Adults. A brief explanation of these independent variables is given below.

**AGE:** The effect of Age of the households on livelihood diversity is ambiguous. Some research study suggests that the age of the household head negatively affects livelihood diversification [9], [10], [11]. Capability to engage in multiple sources of income declines with the increase in age [9]. Further, well established and experienced older household head may also become more resistant towards diversification of livelihood activities [10]. On the other hand, it is also possible that with an increase in age more experience and accumulation of assets may allow the household to manage diversified income portfolios [12]. Thus, it is left as an empirical question to be verified in a particular context.

**SEX:** Sex of the household head positively affects a household’s livelihood diversification [11]. Gender inequalities are apparent in livelihood diversification with the predominance of males [13]. So, the sex of the household head is considered as an explanatory variable in the model. The male household head has a better livelihood diversification option than females. This may be due to the fact that the responsibility of the household works is more on the part of the female household head in comparison to male household head and traveling for searching jobs is not very common among the females in the rural areas of study area. In this study, a positive effect of the sex of the household head is expected on livelihood diversification.

**EDUCATION:** The role of education as a determinant of livelihood diversification has been highlighted in the literature. Many researchers [8], [11], [14], [15], [16], [17], [18] have identified that household head’s education level and livelihood diversification are positively correlated. Educated persons are more able to diversify livelihood activities than uneducated persons [14].

**FAMILY SIZE (FAMILYS):** Researchers found a positive influence of Family size on livelihood diversification [19], [10], [17], [15]. This is due to the fact that a large number of family members can practice multiple activities [11].

**FAMILY TYPE (FAMILYT):** The type of family is either joint or nuclear. A joint family comprises of more numbers of members than a nuclear family. Hence, it is expected that joint families will engage in more activities than a nuclear family.

**CREDIT (CR):** It has been identified by many researchers that, with credit market imperfections, the lack of access to credit may act as a constraint to diversification of livelihood activities [1], [20]. Anshiso [19] found a positive and significant influence of credit on diversification. Besides this, Smith et al. [21] found that lack of credit is a constraint to potential diversification. It is therefore expected that credit will have a negative significant influence on livelihood diversification. As a proxy to measuring access to credit, a dummy variable has been included in the model whether the household has received any external finance or not.

**REMITTANCE (REMITA):** Researchers found that diversification is positively related to remittance. The probability of diversification of rural farmers into activities apart from agriculture increases with the increase in the chance of receiving remittance, and this helps the farmers to expand the income activities [19], [22].

**DEPENDENCY RATIO OF THE HOUSEHOLDS (DR):** The dependency ratio is taken in the model as an explanatory variable, which is expected to have a negative impact on the diversification of livelihood activities. With a higher dependency ratio, a household faces the problem of lower availability of labour and a lower incentive to participate in diversified activities [23]. Thus, the dependency ratio is supposed to be negatively correlated with livelihood diversity.

**ECONOMIC STATUS (ES):** To account for the influence of household economic status on livelihood diversification, we construct a proxy index called Economic Status Index by following Goyal [24]. The economic status of a household is
expected to influence diversification negatively. This is expected because with an increase in economic status households’ members may want to engage in a more specialized activity instead of diversifying livelihood activities.

**ECONOMICALLY ACTIVE ADULTS (EAA):** In this study, the number of economically active adults of the age group 15 to 59 was taken as an explanatory variable. The number of economically active adults is expected to demonstrate a positive relation with diversification. A household having relatively more economically active family members from the total household's size is more diversified [19].

**MONTHLY PER CAPITA INCOME (MPCI):** In this study, an attempt has been made to understand the effects of monthly per capita income on livelihood diversification. This study expects that Monthly per capita income will demonstrate a positive correlation with livelihood diversification. It is because with higher income household members may find it easy to involve in different livelihood activities. With the paucity of income, a household finds it difficult to participate in multiple livelihood activities. The availability of adequate income helps a household to overcome financial constraints and further it helps to engage in different activities to earn income [8], [10].

The description of the variables considered for the analysis is given in table-I.

<table>
<thead>
<tr>
<th>Name of the Variables</th>
<th>DESCRIPTION</th>
<th>VALUE</th>
<th>Type of Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
<td>Livelihood Diversification</td>
<td>Diversification status of Households</td>
<td>0= Not Diversified; 1= Diversified</td>
</tr>
<tr>
<td></td>
<td>AGE</td>
<td>Present Age of The Household Head</td>
<td>Different Quantitative or measurable values</td>
</tr>
<tr>
<td></td>
<td>SEX</td>
<td>Sex of House Hold Head</td>
<td>0= Male; 1= Female</td>
</tr>
<tr>
<td></td>
<td>EDUCATION</td>
<td>Education of The Household Head</td>
<td>1= if 10th passed; 0= otherwise</td>
</tr>
<tr>
<td></td>
<td>FAMILYYS</td>
<td>Family Size in Numbers</td>
<td>Different Quantitative or measurable values</td>
</tr>
<tr>
<td></td>
<td>FAMIL YT</td>
<td>Type of Family</td>
<td>0= Nuclear; 1= Joint</td>
</tr>
<tr>
<td></td>
<td>CR</td>
<td>Access to credit</td>
<td>0= otherwise; 1=Yes</td>
</tr>
<tr>
<td></td>
<td>REMITTA</td>
<td>Economic Support to Household</td>
<td>0= otherwise; 1=Yes</td>
</tr>
<tr>
<td></td>
<td>DR</td>
<td>Dependency Ratio of The Households</td>
<td>Different Quantitative or measurable values</td>
</tr>
<tr>
<td></td>
<td>ES</td>
<td>Value of Economic Status Index</td>
<td>Different Quantitative or measurable values</td>
</tr>
<tr>
<td></td>
<td>EAA</td>
<td>Economically Active Adults; in numbers.</td>
<td>Different Quantitative or measurable values</td>
</tr>
<tr>
<td></td>
<td>MPCI</td>
<td>Monthly Per Capita Income</td>
<td>Different Quantitative or measurable values</td>
</tr>
</tbody>
</table>

**A. Estimation Procedure**

The empirical model used in this study is given below:

\[
\ln \left( \frac{\tilde{Y}}{1-\tilde{Y}} \right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + u
\]

Where,

\[\tilde{Y} = \text{Probability of household’s participation in livelihood diversification, which is coded by 1;}\]

\[1 - \tilde{Y} = \text{Probability of household’s no participation in livelihood diversification, which is coded by 0;}\]

\[\alpha = \text{Intercept term;}\]

\[\beta_1, \beta_2, \beta_3 \ldots \text{are the coefficients of the explanatory variables.}\]

\[u = \text{disturbance term.}\]

\[X_1 = \text{AGEH}; X_2 = \text{SEXH}; X_3 = \text{EDUCAT}; X_4 = \text{FAMILYYS}; X_5 = \text{FAMIL YT}; X_6 = \text{CR}; X_7 = \text{REMITTA}; X_8 = \text{DR}; X_9 = \text{ES}; X_{10} = \text{EAA}; X_{11} = \text{MPCI}\]

**IV. RESULTS AND DISCUSSION**

Based on the Inverse Herfindahl index, households are categorized as diversified and not diversified. Following table shows distribution of households according to their diversification status.

<table>
<thead>
<tr>
<th>Diversification Status</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Diversified</td>
<td>85</td>
<td>33.33</td>
</tr>
<tr>
<td>Diversified</td>
<td>170</td>
<td>66.66</td>
</tr>
<tr>
<td>Total</td>
<td>255</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field study

According to the survey result, 33 percent households have not diversified their livelihood. On the other hand, 66 percent households have diversified their livelihood.
As mentioned in the methodology part to identify the influencing factors of livelihood diversification a binary logistic regression model was applied. The results of the binary logistic regression model are given in the following table-III.

Table-III: logit estimates of determinants of diversification

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Wald</th>
<th>Sig</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEX</td>
<td>-.147</td>
<td>.059</td>
<td>.808</td>
<td>.863</td>
</tr>
<tr>
<td>AGE</td>
<td>-.048***</td>
<td>7.626</td>
<td>.006</td>
<td>.953</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>-.185</td>
<td>.118</td>
<td>.731</td>
<td>.831</td>
</tr>
<tr>
<td>FAMILYT</td>
<td>.672*</td>
<td>3.298</td>
<td>.069</td>
<td>1.959</td>
</tr>
<tr>
<td>FAMILYS</td>
<td>1.059***</td>
<td>15.806</td>
<td>.000</td>
<td>2.884</td>
</tr>
<tr>
<td>DERATIO</td>
<td>-.006</td>
<td>1.889</td>
<td>.169</td>
<td>.994</td>
</tr>
<tr>
<td>EAA</td>
<td>.062</td>
<td>.029</td>
<td>.865</td>
<td>1.064</td>
</tr>
<tr>
<td>MPCI</td>
<td>2.408***</td>
<td>9.174</td>
<td>.002</td>
<td>11.107</td>
</tr>
<tr>
<td>CREDIT</td>
<td>-.714*</td>
<td>3.330</td>
<td>.068</td>
<td>.490</td>
</tr>
<tr>
<td>REMIT</td>
<td>2.099**</td>
<td>4.722</td>
<td>.030</td>
<td>8.154</td>
</tr>
<tr>
<td>ESI</td>
<td>.705</td>
<td>.142</td>
<td>.707</td>
<td>2.024</td>
</tr>
<tr>
<td>Constant</td>
<td>-.9867</td>
<td>12.842</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

\[ -2 \text{Log likelihood} = 193.406 \]
\[ \text{Cox & Snell R Square} = 0.402 \]
\[ \text{Nagelkerke R Square} = 0.559 \]

Source: Computed from primary data

Note: *Significant at 10% level  ** Significant at 5% level  *** Significant at 1% level

The result of the logistic regression model revealed that Age of the household Head (AGE), Type of the Family (FAMILYT) Size of the Family (FAMILYS), Monthly Per Capita Income (MPCI), Access to Credit (CREDIT) and remittance (REMIT) are significant determinants of livelihood diversification in the study area, whereas the rest five explanatory variables are insignificant. The results are discussed below:

**Age:** The results indicate that Household Head’s Age is negatively correlated with household’s participation in livelihood diversification and the result is significant at less than 1 percent significance level. This means that with the increase in age of the household head the probability of household’s participation in livelihood diversification will decline. This is because young household heads are better educated than the older households in the study area as well as young households head prefer to use new technologies which allows them to work more efficiently and to engage in more than one activity. The result of the model also reveals that the odds ratio in favor of households’ participation in livelihood diversification decreases by a factor of 0.953 with the increase in household head’s age by one year. The result is analogous to the earlier findings of Gebre at el. [25].

**Type of Family (FAMILYT):** It has been observed from the table-II that at a level of significance less than 10 percent, Type of Family had a positive influence on households’ livelihood diversification decision. This may be due to the fact that joint families are consist of an extra labour force and hence they can have access to different income sources and a higher amount of income can be earned. This result implies that households with nuclear families are less likely to diversify their livelihood than joint families. The odds ratio of 1.959 for type of the family indicates that for a household with a joint family the probability of diversification increases by a factor of 1.959.

**Size of the Family (FAMILYS):** From table-II it is clear to us that at less than 1 percent level of significance, households’ participation in livelihood diversification is positively correlated with Size of Family. The implication is that households with smaller family sizes are less likely and households with higher family sizes are more likely to diversify their livelihood. The result also reveals, with the increase in family size by one unit, the probability of households’ livelihood diversification increases by a factor of 1.107.

**Monthly Per Capita Income (MPCI):** From the result of the regression model it was seen that at less than 1 percent level of significance, Monthly Per Capita Income is a positive determinant of household’s participation in diversification of livelihood activities. This result implies that households with higher Monthly Per Capita Income are more likely to diversify their livelihood than households with relatively less Monthly Per Capita Income. The odds ratio for Monthly Per Capita Income shows that with one unit increase in monthly per capita income there will be an increase by a factor of 11.107 in the probability of households’ participation in livelihood diversification.

**Access to Credit (CREDIT):** As the result reveals, the probability of participation in livelihood diversification decreases by a factor of 0.49 as a household gets access to credit. It was observed from the regression result that at less than 10 percent significant level, access to credit had a negative influence on the households’ participation in livelihood diversification. This result demonstrates that households with access to credit are less likely to diversify their livelihood activities. This result is analogous to the findings obtained by Saikia [23] and Asfir [10]. This might be due to households who already have a less risky source of income have better access to credit and use the same for housing or purchasing other durable assets. And the households who do not have access to credit possess a diversified portfolio of activities to secure livelihood.

**Remittance (REMIT):** Remittance is positively correlated with the livelihood diversification decision of households at less than 5 percent significance level. Thus the probability of a given household’s participation in livelihood diversification increases with the increase in the chance of getting remittance. A similar result was found by Gebre et al. [25] and Anshiso & Shiferaw [19].

V. FINDINGS AND CONCLUSION

This study was carried out to identify the determinants of livelihood diversifications of rural households. To come up with the final result and implication of the study, a binomial logistic regression model was employed for analyzing the cross-sectional data that was collected from a total of 255 rural households of the Tinsukia district of India. Determinants of livelihood diversification can vary from area to area, across time and individuals. In this study, various factors have been found to be statistically significant which influence a household’s decision...
regarding participation in livelihood diversification. Factors like Age of the household Head (AGE) and CREDIT had demonstrated a negative but significant influence on household’s participation in diversification of livelihood activities; while, factors like Type of the Family (FAMILY) and Size of the Family (FAMILYS), Monthly Per Capita Income (MPCI), and remittance (REMIT) had shown a significant positive influence on household’s participation in diversification of livelihood activities.

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REFERENCES


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