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Factors Affecting Extent of Income Diversification in the Rural Areas of Nagaland

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ABSTRACT

The present study was carried out to evaluate the extent of income diversification in Chumoukedima rural area of Nagaland State; aimed to access the sources and status of diversifications was highlighted. The present research investigation was carried out during the agricultural year 2020-22 with a total of 160 respondents was selected by following a multi-stage simple random stratified sampling technique. Study reveals that the overall average value of Simpson Index of diversification was 0.283 and more than 50.00 per cent of the rural households had "medium" level diversified livelihood. A multiple regression analysis had positive and significant effects on the extent of livelihood diversification.

HIGHLIGHTS

◉ Status and level of diversification by Simpson Index Diversification method.
◉ Estimated Variance Inflation Factor to avoid the serious multicollinearity problem.
◉ To highlight the different Factors affecting the Income Diversification Index.
◉ Fitting of multiple regression analysis to identify the important factors contribution.

Keywords: Diversification, income, index, multiple regressions, rural

The economy of India is typically agriculture driven. More than 67.00 per cent of the country's population lives in rural areas (Areef *et al.* 2021). Agriculture has remained the main source of livelihood; however in the recent years the trend has rapidly declining and divert towards the non-agricultural sector due to having the importance of business, services, remittance and non-farm labourer is increasing (Israr *et al.* 2014).

It is well known fact that India is still a predominantly in the agricultural sectors with 82.00 per cent of farmers being small and marginal farmers (Bhavya, 2021). It continues to be the key source of income for the majority of households, engaging 54.60 per cent of the total workforce (Anon. 2016) and accounting for 17.80 per cent of the nation's Gross Value Added for the year 2019 to 2020 (at current prices) (Anon. 2016). Some of them include land

fragmentation, uncontrolled variables - production risks and market unpredictability, controlled regime - difficulty in doing agri-business, agricultural policies - hindrances to income growth, and infrastructural constraints - limiting the market (Vishandass *et al.* 2018).

Livelihood diversification can be measured using different indicators and indices, such as Simpson index, Herfindahl index, Ogive index, Entropy index, Modified Entropy index and Composite Entropy index (Khatun and Roy, 2012; Senadya, 2012; Gecho, 2017; Sen *et al.* 2017; Khan *et al.* 2020).

Several studies have used the Simpson index to measure livelihood diversification (Joshi *et al.* 2004; Malek and Usami, 2009). Rural livelihood diversification can be defined as the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living (Agyeman *et al.* 2014).

Extreme poverty increased worldwide during the ongoing Coronavirus pandemic around 120 million people, which is to be 150 million by the end of 2021 (Yani and Sharma, 2022). Study reveals that from the non-agricultural income earning activities have also been expanding that constitutes approximately 25.00 to 40.00 per cent of the total income of the people (Malami *et al.* 2021). Poverty and employment levels in a rural setting are by and large influenced by ability to add value to agriculture and non-agricultural sectors (Talukdar and Chile, 2013).

MATERIALS AND METHODS

The study was based on primary data collected through personal interview method with the help of well-structured and pretested questionnaire exclusively designed for the study pertaining for the agricultural year 2020 to 2022. For the current study, a multistage stratified cum random sampling technique were used, with district as the first stage, block as the second stage, village as the third stage and farm holding as the final stage of sampling.

Several studies have used the Simpson index to measure livelihood diversification (Joshi *et al.* 2004; Malek and Usami, 2009; Khatun and Roy, 2012; Senadza, 2012; Basantaray and Nancharaiah, 2017; Khan *et al.* 2020; Yadav *et al.* 2021). This study followed the suite because of its computational simplicity, robustness and wider applicability.

Simpson Index Diversification (SID) is:

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

Whereas: n = the total number of income sources,

P_i = the income proportion of i-th income source.

The value of SID falls between 0 and 1. The index's value is zero if there is just one source of income. As the number of sources increase, 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 distributed the income shares, the higher the value of *SID*. The Simpson index of diversity is affected both by the number of income sources as well as by the distribution of income among different sources. Based on the *SID* values, the level of livelihood diversification was defined as:

The most practical remedial measure of multicollinearity is to drop one of the correlated variables from the regression model (Gujarati, 2003). Here, land-man ratio was dropped from the model. Another diagnostic test of multicollinearity, variance inflation factor (VIF), was also conducted and found no serious multicollinearity problem anymore.

For calculation of Income Diversification Index (IDI), crop cultivation was considered as one production unit, though sample farmers diversify within the crops, fishery activity as one production unit and livestock (piggery and poultry) as one production unit (Yadav *et al.* 2022). They are expressed as:

$$IDI = 1 - \sum P_i N^2 \qquad \text{…(i)}$$

Whereas: N = number of crop area (in ha) or income sources;

P_i = denotes the proportion of i that come source with respect to total household farm income.

The value of the indices ranges between 0 and 1, with 1 representing complete diversification and 0 representing specialization.

The multiple regression analysis was carried out to identify the important factors affecting farm income diversification (Likert, 1932). The Simpson Index of Diversification was calculated for Income Diversification Index (IDI) and to identify the various factors underlying for income diversification in the study area, the income diversification index was regressed viz; demographic, socio-economic and household activities for specific explanatory variables, which was estimated using SPSS 17 version. Formally, the regression equation is modeled using Ordinary Least Squares (OLS) estimation (Gujarati, 2003) and it can be written as:

$$Y_i = \alpha_0 + \sum \beta_k X_k + u_i \qquad \ldots(ii)$$

Whereas: Y_i = Outcome of income diversification index (IDI) for i = 1, 2, 3, … by the households.

X_k = Represents the vector of factors mentioned earlier, where k = 1, 2, 3, … factors.

α_0 = The constant term, β_k represents the regression coefficients of the k = 1, 2, 3, … factors.

u_i = the error term.

RESULTS AND DISCUSSION

Table 1 reveals that 58.75 per cent of the sample households are involved with agriculture and agriculture related activities. The second source of income of the sample households is business 14.37 per cent, followed by service 11.88 per cent of households were engaged. Even some households have limited land to grow crops, but rearing livestock and worked as casual laborers 9.37 per cent to meet their family needs. Other part time jobs viz; truck driving, taxi driving, auto rickshaw driving etc; are also found as income sources 5.63 per cent earn income as informal jobs.

Table 1: Status of diversification Sources of the Households

Sl. No.	Diversification sources	Frequency	Percentage (%)
1	Agriculture	94	58.75
2	Business	23	14.37
3	Service	19	11.88
4	Casual labour	15	9.37
5	Other Part Time Jobs	9	5.63
Total		160	100.00

Source: Authors' computation, 2022.

Table 2: Level of diversification of the Households

Sl. No.	Index Value	Frequency	Percentage (%)
1	0.00 to 0.20 (Very Low Diversification)	15	9.73
2	0.21 to 0.40 (Low Diversification)	23	14.38
3	0.41 to 0.60 (Medium Diversification)	81	50.62
4	0.61 to 0.80 (High Diversification)	41	25.27
5	0.81 to 1.00 (Very High Diversification)	0	0.00
Total		160	100.00

Source: Authors' computation, 2022.

According to Ibrahim *et al.* (2009) the value of Simpson Diversity Index (SID) further table 2 reveals the overall average value of the Simpson index is found 0.283, which was very low diversification of income sources. 50.62 per cent households with very low diversification and the index value of 14.38 per cent households with low diversification with medium diversification indicating medium income diversification. However, high diversification is found in the case of 25.27 per cent households.

The results of the regression estimates of factors affecting income diversification reveals that various factors affect income diversification, with some factors having a direct relationship and others an inverse relationship.

Table 3: Status of collinearity statistics for independent variables of Income Diversification

Index (IDI) during the 2020-22

Sl. No.	Variables	VIF
1	Age	3.24
Education Qualification		
2	Up to Primary Education (5th Class)	4.84
3	Middle (8th Class)	4.26
4	High School (10th Class)	3.24
5	Intermediate / PU (12 Class)	3.01
6	Graduate and Above	2.99
7	Size of Household	3.65
8	Marital Status	4.25
9	Co-operative / SHG's Membership	4.19
10	Government Scheme beneficiaries	4.02
11	Advance Technology Adopted	3.68
12	Extension Services	2.54
13	Basic input / infrastructures	3.98
Farming Size		
14	Marginal	3.56
15	Small	2.35
16	Medium	2.03
Farming Experiences		
17	Up to 5 years	3.31
18	6 years to 10 years	2.95
19	11 years to 15 years	3.03
20	15 years to 20 years	4.01
21	20 years and above	3.84
22	Non-farm Income	3.74
23	Farm income	3.93
24	Distance of Market Place	4.02
Mean		3.53

Source: Authors' computation, 2022.

Table 3 reveals the value obtained from the calculation of Income Diversification Index (IDI) that explains the farm diversity status of households was taken as dependent variable and identified factors were taken as explanatory variables. The estimated Variance Inflation Factor (VIF) value for the identified explanatory factors, further the explanatory variables has values that are less than 10 (Yeasmin *et al.* 2020), with a mean VIF value of 3.53; this indicates the absence of multicollinearity between the explanatory variables. Multiple regression analysis was therefore selected and run for the present data.

Table 4 reveals that the study found no multicollinearity and 79.82 per cent of variation in income diversification can be explained by the explanatory variables with F-value of 41.53 and R^2 value of 0.7982 considerations in the present study. The association between age and participation in income diversification was positive and statistically significant at 5 per cent, ceteris paribus. It is most likely that as farmers get older, they gain experience and knowledge of weather patterns that help them avoid negative uncertainty in the climatic conditions of the study area, which causes crop production losses. Therefore, in an effort to mitigate risk, older farmers tend to get more diversified. This finding is in agreement with the study conducted by Yeasmin *et al.* (2020). As assumed, farmers with education levels of middle, high school, intermediate / higher secondary, and graduate and above were shown to be statistically significant at 1 per cent, keeping other factors constant and had a positive impact on the likelihood of income diversification. This shows the level of education of farmers plays a significant role in triggering income diversification as compared to illiterate farmers (which was found to be non-significant). The results are consistent that education is one of the key factors affecting the adoption of diversification patterns.

It is evident from the results that household size is positively related to income diversification in line with the expectation. An increase in holding size increases diversification, and it is statistically significant at the 5 per cent level, ceteris paribus. Household size directly influences farm income diversification, especially in terms of boosting output and diet in order to provide steady provision of household necessities. Family size is also

another important factor that can affect income diversification identified by Pamela and Sharma (2021).

As per expected results from the study that married farmers were shown to be statistically significant at 5 per cent and had a positive impact on the likelihood of income diversification, keeping other factors constant. For stable generation of income and meet their families demand for food security, married farmers are implied to diversify more than unmarried farmers. As per the result by Mahajan (2013) the married households are having better skilled of members and further will contribute towards increase income diversification.

The analysis resulted in a direct relationship between co-operative societies / SHG's membership and income diversification, it was found to be statistically significant at 10 per cent, ceteris paribus. It shows that co-operative societies / SHG's membership increases the likelihood of diversification. This is due to taking the collective decision of the majority engaged in farming activities in the study area, such as feeding livestock, maintaining fisheries and taking pig rearing etc. The findings of the study are consistent with Borah and Sharma (2021) in their study.

As expected, at the 10 per cent level of significance recorded for the farmers availing the government scheme benefits has significantly increase the likelihood of income diversification, which was due to the farmers share information about the benefit of government scheme beneficiaries based on their experiences with different farming techniques in order to learn from one another and enhance diversified farming. These results availing the government scheme benefits are consistent with some other studies on income diversification by Parvin and Akteruzzaman (2012); Walling and Sharma (2018).

Training was significant at the 5 per cent level of significance, implies that farmers who consistently attend training tend to have more knowledge of their farming operations and increase the likelihood of diversification. This finding is consistent with the result reported by Mozhui and Sharma (2020).

Further the extension services and basic inputs / infrastructures both inputs were having inverse impact towards the income diversification and

Table 4: Factors affecting income diversification during the 2020-21

Sl. No.	Factors	Coefficients	Std error	t-value	P-value
1.	Constant	-0.253***	0.052	-3.821	0.000
2.	Age	0.0017*	0.0061	2.32	0.027
Education Qualification					
3	Illiterates	0.012	0.013	1.15	0.112
4	Primary (5th Class)	0.125***	0.035	3.43	0.000
5	High School (10th Class)	0.142***	0.032	4.05	0.000
6	Intermediate / PU (12 Class)	0.141***	0.036	3.92	0.000
7	Graduate and Above	0.172***	0.052	4.31	0.000
8	Size of Household	0.059**	0.034	3.03	0.002
9	Marital Status	0.047**	0.021	2.26	0.016
10	Co-operative / SHG's Membership	0.011*	0.020	2.42	0.012
11	Government Scheme Beneficiaries	0.034*	0.017	2.31	0.028
12	Advance Technology Adopted	-0.006	0.027	-0.137	0.865
13	Extension Services	-0.008*	0.003	-4.23	0.000
14	Basic inputs / infrastructures	-0.016*	0.009	-3.35	0.000
Farming Size					
15	Marginal	0.002	0.008	1.01	0.205
16	Small	0.052**	0.032	2.64	0.023
17	Medium	0.037	0.024	1.03	0.015
Farming Experiences					
18	Up to 5 years	-0.043	0.023	-1.48	0.173
19	6 years to 10 years	0.0014	0.032	0.004	0.987
20	11 years to 15 years	0.006*	0.003	1.582	0.037
21	15 years to 20 years	0.073**	0.032	2.172	0.068
22	20 years and above	0.067**	0.016	4.452	0.000
23	Non-farm Income	0.069**	0.024	2.112	0.034
24	Farm income	0.059*	0.028	2.67	0.013
25	Distance of Market Place	-0.052*	0.043	2.130	0.037
Multiple R-squared		0.7982			
Adjusted R-squared		0.7645			
F-statistics		41.53			

***, ** and * indicate statistical significance at 1, 5 and 10 per cent level of significance) (Source: Authors' computation, 2022.

recorded as negative significant at 10 per cent, which indicate decrease trend; so it need attention towards the lack of proper services / management and improper distribution of inputs and development of infrastructure in the desire / required areas, probably because timely availability of farm inputs is the most important factor for production. The results obtained were similar to the earlier findings of Lama (2019).

Table 4 shows a positive relationship between farming experience and income diversification. Those farmers with farming experience of 16 to 20 years and 20 years and above was found to be statistically significant at the 5 per cent level of significance and farmers with farming experience of 11 to 15 years was found to be statistically significant at the 10 per cent level of significance. It implies that as farmers gain experience, they are more likely to diversify their income sources, which will integrate it into their current agricultural practices and increase their diversification Borah and Sharma (2015).

Non-farm income has positively and significantly affected the decision to diversify income at the 5 per cent level of significance. Income from non-farm sources helps the farmers purchase necessary

inputs and hire machinery or labour, keeping other factors constant. The study carried out by Narayanmoorthy (2017); Pamela and Sharma (2020) reported a positive relationship between non-farm income and agriculture farm income diversification.

Farm income was also found to be statistically significant at 10 per cent and positively influence income diversification. This finding indicated that farmers intend to enhance farm income diversification as farm income rises. Similar results reported by Mahajan (2013); Mellaku *et al.* (2018) will contribute to increased income diversification. Distance from the market has a significant negative effect at 10 per cent on income diversification. This shows that farms closer to the market are generally more diverse. This seems like marketing a number of enterprises from a greater distance, similar finding is in line with the findings reported by Narayanmoorthy (2017).

CONCLUSION

The main conclusion of the study reveals that the selected multiple factors has affect the income diversification, viz; age of the farmer, education qualification, marital status, household size, co-operative / SHG membership, training attended and new technology adoption. Even the age of the farmer and farming experience was found to have a positive association with income diversification, as older farmers gain experience and knowledge that help them mitigate risk by diversifying their farm income sources. Further the education was also found to have a positive association with income diversification to adopt new production techniques and seek new information on technology. This could be due to the fact that these farmers may have more labour or better financial resources available to them, which can enable them to engage in multiple income generating activities, providing a buffer against crop failures and market fluctuations. Thus, the income diversification index shows that the majority of farmers had a specialized level of farm income diversification; with an income derived from the diversification is an important strategy for risk management and improving farmer's livelihoods, as it helps to increase farm profitability and sustainability.

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