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## **ASSESSMENT OF INCOME DIVERSIFICATION AND FAMILY WELFARE: AN EMPIRICAL STUDY OF SMALL-SCALE RICE FARMERS IN DINAJPUR DISTRICT, BANGLADESH**

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### **ABSTRACT**

This study is to investigate how household welfare is impacted by income diversity. To account for the small-scale rice farmers living in Dinajpur Sadar Upazila, six villages from the Dinajpur district's Sadar Upazila were picked with attention. Next, utilizing the random sampling approach and a pre-testing survey questionnaire, 402 samples were gathered. To achieve the study's purpose, we used summary statistics and a multivariable regression model to analyze the data. This study uses the Simpson Diversity Index (SDI) and Henderfild Index to assess income diversity. The findings showed that the following factors are statistically significant in influencing the household welfare of small-scale growers in the research regions: land holdings, distance from the closest market, age, experience in farming, education, creation of financial services, income diversification (measured by the SDI and Henderfild index), and off-farm income. Furthermore, this research suggests that to improve their living prospects and boost their living standards, governments and politicians should assist them by offering more significant educational opportunities, financial services, and financing options for self-employment.

**Keywords:** Income diversification, rice farmers, household welfare, Simpson diversity index

### **I. INTRODUCTION**

Bangladesh is a country with a large population and relies on agriculture. The rural sector accounts for a sizable portion of Bangladesh's GDP (Ayon, 2018; Rahman, 2017). This is because about 70 percent of people live in villages and about 77% of total workers come from the villages. Besides, two-thirds of the population in the village is engaged in agriculture. On the other hand, about a third of the income of about 87% of the population comes from the agricultural sector (World Bank, 2016). The livelihood of the people in the countryside depends agriculture because of favorable soil condition, water and climate, sufficient rainfall, ground water availability and motherland traditional farming. There are also some exceptions such as

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in the dry season, lack of sufficient rainfall and sudden natural disasters can cause difficulties for farmers, but farmers also became sectarian in the face of harmful environmental apocalypse (Akanda et al., 2008). Diversified income is defined as having multiple sources of income or having an equitable mix between them. According to Joshi et al. (2003), this indicates that while household income is derived from a variety of sources, it is not dominated by any one of them. A healthy life is one of high-quality living attributes. There are two ways in which we might define well-being: material well-being and social well-being. In contrast to social well-being, which likewise involves self-respect, caring for one's family and community, civil peace, security, a healthy atmosphere, private and social safety, and hope for the future, and material welfare is defined as strength, mental clarity, and physical attractiveness. Freedom of choice and action, including the capacity to support other individuals and groups, is another aspect of wellbeing. The poverty situation in Bangladesh has remained the same for the past twenty years, has changed significantly. Even if it falls almost in half in recent years, the difference between rural and the urban poverty situation of the population is still marked (Household Income and Expenditure Survey 2010). Therefore, emphasizing the economic development of rural areas needs more attention. The primary goal of development analysis is to identify effective strategies for lowering poverty and enhancing the nation's welfare and standard of living. The challenge in research on developmental issues is figuring out how to raise everyone's standard of living while providing them with a steady income. It is generally accepted that farmers engage in non-agricultural activities. Agricultural activity is a strategy for overcoming poverty in developing nations' rural areas (IFAD, 2011). In general, empirical findings recommend that there are significant correlations between household benefits and various income-generating activities in rural areas.

It's likely that not all of these acts affected the home welfare measures in the same way. This study's primary goal is to determine how and to what extent income diversification initiatives impact not only rural livelihoods but also the welfare of families. Dinajpur district in Bangladesh is a predominantly agricultural region with poor infrastructure, poor health, and sanitation, education, and income sources. Comparatively speaking to metropolitan areas, the rural population is more susceptible to unemployment and lower living conditions. Landless and marginal farmers face limited opportunities in agriculture, leading to low productivity and migration from agrarian livelihood to poor-skill urbanized fields. This study looks at how diversifying incomes affects the welfare of families in Bangladesh's rural districts. Land scarcity and agricultural risks in Ethiopia lead to food deficits and asset depletion, affecting household welfare (Holden et al., 2004). In Bangladesh's rural areas, diversifying one's source of income is thought to be a successful way to combat poverty and food insecurity.

However, evidence of its importance and its effect on household welfare is scarce. Although it's unclear if this is the best course of action, Bangladeshi rural farming households supplement their income by participating in a variety of non-farm revenue-generating activities. The purpose of the study is to determine the relationship between household well-being and income diversification in rural areas of Bangladesh.

Income diversification involves generating income from various sources, including farming and non-farm works, to reduce risk, increase income, or improve well-being. The financial standing level distinction determines the quantity of sources a household relies on. Well-being measures a household's overall quality of life, including income, health, education, and access to necessities. Income diversification and farmers' ability to achieve their external life objectives while maintaining sustainable lives are closely related (Kimkong et al. 2023).

In Bangladesh, diversified nature of rural livelihoods revealed that remittances are the most important contributor to household income, followed by employment in the caste system, business, and agriculture (Ahmed *et al.*, 2015). Income diversification in dairy farms found that older operators, small farms, and full owners significantly influence off-farm income, with moderate intensity in the Pacific and Southern regions (Mishra *et al.* 2010). Resource allocation and expected income are the primary economic incentives for income diversification in German household farms, with resource accessibility playing a crucial role (Pieniadz *et al.*, 2009). To enhance living conditions, farm households must use a concentric approach that calls for interference in policy on targeted agricultural technical institution installations, research, information transmission, and infrastructure development (Khan *et al.* 2020). The income level of agricultural households is influenced by factors such as initial capital, economic situation, land size, culture, agricultural level, adaptability and application of modern technology (Charoenkittayawut *et al.*, 2019). According to Getahun *et al.* (2023 and Ahmad *et al.* (2022), most of the rural farmers have several different sources of income, varying in intensity. Livestock, additional jobs, wooded areas, non-farm, and supplementary sources are among them. To reduce the dangers and uncertainty that come with farming and to alleviate poverty and food insecurity, households in rural regions frequently engage in a variety of income diversification activities (Getahun *et al.*, 2023). Danso-Abbeam *et al.* (2020) discovered that diversifying rather than farm incomes grows household welfare in rural regions through the adoption of modern technology. As a result, they recommend enhancing the work of farmer-based organizations and agricultural extension services to help with income diversification away from the farm. As they made an effort to look into how diversifying one's earnings affects wellness in Sri Lanka, Senevirathna *et al.* (2021) discovered that over half of all households had diversified their income portfolio.

In addition, compared to their urban counterparts, households in commercial and countryside settings seemed to have a more diversified income mix. In another study by Ahmad *et al.* (2022), the OLS was used to detect the impact of income diversification and found that age, education, diversification, religious status, credit facility and marital status had significant effect on the level of household welfare. Salam (2020) studied livelihood diversification in Bangladesh, where she used both primary and secondary data for analysis. The deductions demonstrated that the poverty status of households had been tremendously reduced, and the diversification of livelihoods from part-time farming to self-employment and the migration towards urban industrial employment had a significant positive contribution to declining income inequality since 2000. Nazir *et al.* (2018) investigated the variables influencing rural family decisions to diversify their sources of earnings. They collected primary data from farm household level in Sindh province of Pakistan. They also collected 400 samples for conducting the study. They also offer proof that farmers, particularly small and marginal farmers, should be given access to low-interest loans so they can develop their own non-agricultural sources of income enabling farmers to advance, earn more, raise living standards, and lessen poverty. All of the earlier research, including Getahun *et al.* (2023), Nazir *et al.* (2018), Ahmad *et al.* (2022), and KimKong *et al.* (2023) used the Simpson diversity index, but they did not consider this with the comparison of other method like Herfindahl Index as well as the creation of the financial services as an activity of the income diversity. But this study takes into consideration all the issues that are mentioned above missing in the earlier studies.

## II. METHODOLOGY

### *Study Areas*

The primary data used in this investigation was collected in Dinajpur Sadar Upazila. The districts of Thakurgaon and Panchagarh border Dinajpur on the northeast; Gaibandha and Joypurhat border it on the south; Nilphamari and Rangpur border it on the east; and the

Indian state of West Bengal borders it on the west. The district is 3,437.98 km<sup>2</sup> in total size.

#### **Determination of Sample Size**

Any type of research must first determine the size of its samples from the universe or population, and a suitable sample size is a prerequisite for a better research project conclusion (Mallick & Mishra, 2019). The suitable number of samples for this study is determined using Yamane's (1967) formula, which is calculated below in equation (1).

$$n = \frac{N}{1-N(e^2)} \dots\dots\dots(1)$$

Here,

$n$  = Size of sampled households;  $N$  = Total households existing in the study areas;  $e$  = Degree of precision

In our study,  $N = 34526$  farmers (Full time and part-time) are living according to the publication of Dinajpur sadar upazila parishad office,  $e = 0.05$ .

Then, by putting these values in the equation (1) we have;

$$n = \frac{(34526)}{1 + (34526)(0.05)^2} \approx 405$$

For the present investigation, 405 participants make up the survey number.

#### **Data**

Data from both primary and secondary sources were collected for the study. Through in-person interviews with the study area's individual farmers and the use of a well-defined, structured questionnaire with closed-ended questions, a significant amount of primary data at the farm level was gathered. Secondary data were examined from scholarly books, research reviews, and internet publications.

#### **Measurement of Income Diversification**

Diversification may be quantified in a variety of ways. This includes the entropy approach, the Herfindahl equation, and the maximum proportion (MI) approach. The Simpson Index of Diversity was utilized by Ibrahim et al. (2009), Ijaiya et al. (2009), Duc et al. (2009), and Minot et al. (2006), among a few more, as a gauge of income diversity. The Simpson Index of Diversity (SID) is commonly used to measure an ecological diversity. The likelihood that two randomly chosen animals would belong to the same species is another way to interpret the SID. As a gauge of diversity of income in the current study, we employed the Simpson Index of Diversity, which is expressed as follows:

$$SDI = 1 - \sum_{i=1}^n p_i^2 \dots\dots\dots(2)$$

Where,

SDI = Simpson Diversity Index which is used to measure the diversity of income for individuals;

$n$  = the total number of means of earnings;

$P_i$  = percentage of earnings derived through the  $i$ th source of earnings

SDI has a worth that ranges from 0 to 1. SDI is 0 when There is a single income stream, or  $P_i = 1$ . Similar to the number of squares, if the quantity of ways of earning increases, the portion of  $P_i$  decreases, which implies that the SDI approaches one. The expected value of SDI for an income source of  $k$  ranges from 0 to  $1-(1/k)$ . A more specialized income source is indicated if the SDI value is closer to zero. Conversely, a greater degree of diversity for households is implied if the SDI value is closer to 1. In other words, a value close to zero indicates the lowest level of variety (Ahmad et al., 2022).

[This study also used herfindahl index for alternative calculation of income diversification. The income diversification index was obtained by using the inverse of herfindahl index by following Kaija (2007), Idowu et al. (2011) and Sallawu et al. (2016). The index is as below:

$$D = \sum_{j=1}^n S_j^\alpha \dots \dots \dots (3)$$

Where,

$D$  = the diversification index,

$S_j$  = the share of income source with respect to total income,  $S_j = \frac{Y_j}{Y}$ ,

$Y_j$  = the total income from source  $j$ ,

$Y = \sum_j^n Y_j$  is the total household income from all source;  $j = 1, 2, 3, \dots, n$ .

$\alpha$  = diversity parameter, such as  $\alpha \geq 0$  and  $\alpha = 1, 2$  and  $3$ .

If  $\alpha$  approaches to 1, then the index would be entropy index that would be calculated as

$D = [-\sum S_j \log S_j]$ , here  $\log$  represents the natural logarithm.

For  $\alpha = 2$ , Index  $D$  is the inverse of the Herfindahl index, which is frequently employed as a measure of income diversification (Sallawu et al., 2016). Then, the Herfindahl index can be measured as

$$D = \sum_{j=1}^n S_j^2 \dots \dots \dots (4)$$

$$\text{Then, } D = \frac{1}{\sum_{j=1}^n S_j^2} \dots \dots \dots (5)$$

The parameter  $\alpha$  determines the weight of the number of source earner combinations versus evenness in the distribution of income shares. The generalized index ( $D = \sum_{j=1}^n S_j^\alpha$ ) assesses the variety of earnings sources and the evenness of income portions across different income source earner combinations. The distribution is given more weight when the  $\alpha$  value is higher; on the other hand, a parameter value of  $\alpha = 0$  just counts the number of sources of revenue. The number of income sources is the index's maximum value for any  $\alpha$  value, while one is the smallest. A household with only one source of income will have the smallest value, and a fair split among every source of earnings will only result in the upper value if the shares are equal. The Herfindahl index's inverse, with  $\alpha = 2$ , was employed in this investigation.

### ***Measurement of Household Well-Being***

We employed an economic welfare index, which defines well-being as reflecting the quantity of spending equal to that of an adult, to gauge the families' degree of well-being. Because it is the most commonly recognized and user-friendly definition of adult equivalent, it is offered

from the organization for the economic cooperation and development (OECD). This scale has the following expression:

$$EXP_{eq} = EXP/n^{0.7} \dots \dots \dots (6)$$

Here, EXP = Total family expenses, and n = number of family members, 0.7 = Exponential structure that represents additional persons living in a specific home (Grootaert and Braithwaite, 1998).

### **Specification of Empirical Model**

For the current investigation, a linear regression equation from Ibrahim et al. (2009) is modified, and the model that is provided is as follows:

$$y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_{10} X_{10} + e_i \dots \dots \dots (7)$$

Where, in terms of yearly consumer spending, household well-being is represented by Y.

X<sub>1</sub> = Income diversification is measured by the index of SDI and Henderfild;

X<sub>2</sub> = Creation of financial service measured as dummy: 1 for yes and 0 for no.

X<sub>3</sub> = Off farm income measured as BDT (yearly).

X<sub>4</sub> = Age of household head is measured as year.

X<sub>5</sub> = Year of formal schooling is measured as years spending by the household head in formal education.

X<sub>6</sub> = Family size is measured in numbers.

X<sub>7</sub> = Household landholdings measured as hectare.

X<sub>8</sub> = Distance of the living place of household from the nearest market measured in walking time.

X<sub>9</sub> = Household membership in any cooperative organization is measured as a dummy: 1 for yes and 0 for no.

X<sub>10</sub> = Household credit access from any organization is measured as a dummy: 1 for yes and 0 for no.

$\alpha_1, \alpha_2$  etc. are coefficients in the model and  $e_i$  is the stochastic disturbance term. The previously mentioned possibilities or the anticipated course of factors (earning diversity as well as the respondent's demographic characteristics vector) on the variable of interest (household well-being) are derived from the equation as follows:

$$\alpha_1 > 0; \alpha_2 < 0; \alpha_3 < 0; \alpha_4 > 0; \alpha_6 > 0.$$

These generally explain that  $\alpha_1$  is greater than zero ( $\alpha_1 > 0$ ): This means that  $\alpha_1$  is a positive number.  $\alpha_2$  is less than zero ( $\alpha_2 < 0$ ): This means that  $\alpha_2$  is a negative number,  $\alpha_3$  is less than zero ( $\alpha_3 < 0$ ): This means that  $\alpha_3$  is a negative number,  $\alpha_4$  is greater than zero ( $\alpha_4 > 0$ ): This means that  $\alpha_4$  is a positive number,  $\alpha_6$  is greater than zero ( $\alpha_6 > 0$ ): This means that  $\alpha_6$  is a positive number.

## **III. RESULT AND DISCUSSION**

### **Farmers' Socioeconomic Characteristics**

The standard deviation of the household head's age was 12.35 years, or 46 years on average. Household heads in the samples varied in age from 25 to 68. Most respondents, according to the research, were in the labour force. The study also discovered that most households' farming

activities were carried out by two to five people. The average travel time, measured in kilometers, between the sample residence and the closest marketplace is 19.56 minutes, with a range of 1.00 to 70 minutes (Table 1). According to the survey, there are 5.19 people in the average home, with a standard deviation of 1.84. Average household heads have finished less than a primary level of education (4.67). The average farm size per household is 6.91 acres, with a standard deviation of 4.13. Table 1's very specialized, specialized, diversified, and much diversified mean values are, as the figure illustrates, -0.029, 0.217, 0.462, and 0.725, respectively.

**Table 1. Summary of Concerned Variables**

<b>Variables</b>	<b>Mean</b>	<b>St. dev.</b>	<b>Min.</b>	<b>Max.</b>
household head's age (years)	46.83	12.35	17	80
household head's education (years)	4.67	4.40	00.00	17
Household size (Number)	5.19	1.85	1	14
Farm size (Hectares)	6.91	4.13	00.00	100
Distance to the nearest market (Walking minutes)	19.56	1.48	1.00	70.00
<b>SDI</b>				
Very Specialized (SDI $\cong$ 0.00)	0.0029	0.019	0.0009	00.01
Specialized (SDI $\geq$ 0.01 to $\leq$ 0.35 )	0.217	0.18	0.05	0.34
Diversified (SDI $>$ 0.35 to $\leq$ 0.65 )	0.462	0.22	0.371	0.629
Very Diversified (SDI $>$ 0.65 )	0.725	0.52	0.67	0.98
Gender	0.967	0.17	0	1
Access to credit	0.497	0.502	0	1
Livestock holding (BDT.)	73853.24	131744.2	0	1250000
Extension service	0.671	0.419	0	1
Agricultural information	0.843	0.363	0	1

Source: Authors own computation from field survey 2022.

Table 2 shows that men headed 92.10% of the houses under study, with women heading the remaining 7.90% of the families in the study. Approximately 99.01%, 0.25%, and 0.74% were married, divorced, or widowed. According to the findings of the study, the vast majority (68.39%) were members of farmer cooperatives. Only 49.62% of the sample households received credit, while the remaining 50.38% did not for a variety of reasons. Almost all non-users did not use credit because of their religious affiliations, and many did not use credit because they were afraid of repayment (Table 2). While 36.05% of respondents received some information, the majority of respondents (63.95%) had no access to current agricultural information. About 60% of sample homes interacted with agricultural extension, per survey data (Table 2). Additionally, according to the survey results, 69.62% of the sample homes had no impact on society or politics (Table 2). Through targeted group discussions, the aforementioned findings were triangulated. Participants revealed that the availability of assets, particularly livestock and income diversification, as well as regional farmers' own agricultural production, had a significant impact on these farmers' household well-being. In addition, the landholding's size matters. Participants in this study asserted, however, that the study area's landholding size is declining, mostly due to the growing population and the challenge of pursuing non-farm pursuits.

Additionally, participants reported that the vulnerability of food production has been sparked and made worse by increased variability in rain fall. As a result of low food production, farmers are now unexpectedly vulnerable due to the seasonal fluctuation of rainfall. Stated differently, unanticipated adverse weather conditions have damaged assets used for sustaining subsistence and threatened the stability of the food supply chain.



**Table 2. Attributes of households for category variables**

Variables	Frequency	%
Gender of the household head		
Men	373	92.10
Women	32	7.9
State of marriage		
Married	401	99.01
Divorced	1	0.25
Widowed	3	0.74
Membership in any cooperative		
Yes	277	68.39
No	128	31.61
Extension service		
Yes	243	60.00
No	162	40.00
Credit Access		
Yes	198	49.62
No	204	50.38
Agricultural information Access		
Yes	146	36.05
No	259	63.95
Hold any social or political influential position		
Yes	123	30.37
No	282	69.62

Source: Authors own computation from field survey 2022.

### *Estimated Result of OLS*

Multivariate regression analysis was utilized in Salam et al.'s 2019 study to achieve the objective of the income diversification impact analysis, as was previously mentioned. Because of the intricacy of the research, household income is not employed as a dependent variable; instead, the amount spent on home consumption is used as a stand-in for household wellbeing. According to Table 3, the explanatory factors account for roughly 79% of the variance in the dependent variables, based on the model's goodness of fit (R-squared) value of 79.0%. Put another way, the variables in the model account for 79% of the variation in household welfare, while other variables that are not part of the model account for 21%.

The OLS model has a positive and significant coefficient of SDI (0.154) at 1 percent level (Table 2, model 1). This implies that, as the SDI goes up, the welfare of a household in terms of its per capita consumption also goes up. Farmers with higher SDIs tend to have better household conditions or welfare compared to farmers with lower SDIs. This means that farmers with higher SDIs are more diversified in income compared to farmers with low SDIs. Generally, higher SDIs are expected to have a good effect on consumption expenditure as they have earned more or are less exposed to low income. The Herfindahl index model has a negative and significant coefficient of financial service (-0.014) at the 1 percent level. This indicates that, as the level of financial service goes up, so does the well-being of families with regard to spending on consumption. This effect of financial service for SDI model was 0.055 at 1% level of significance that cannot be ignored.

A positive and significant result was observed for off-farming activities at the 1 percent level, suggesting a rise in household income as well as an increase in family wellness in terms of per capita consumption. Analogous outcomes were noted for the Herfindahl index model (Table 3, model 2). The household head's age was significant at a negative level (-0.01) and negative at the five percentile. Likewise, at the five percentile, educational status was noteworthy and favorable at a positive level (0.431). This demonstrates an increase in the welfare of the household because of a year of schooling. Household consumption per capita would decline as family size grows, according to the household size (-0.045) analysis, which was determined to be negative and significant at the 5% level. Similar results were also obtained using the Herfindahl index model. The amount of land owned by the household (0.293) was shown to be significant and beneficial at the 1% level, suggesting that the household's wellness will improve in tandem with the volume of land owned by the head of the family. Similar results were also obtained using the Herfindahl index model.

**Table 3. Estimated Outcome of OLS Model**

Variables	1			2		
	Coeff.	Std. error	t-value	Coeff.	Std. error	t-value
<i>Income Diversification</i>						
<i>Activities</i>						
SDI	0.154***	0.046	3.37			
Herfindahl index				0.13***	0.044	2.97
Creation of financial service	-0.055*	0.031	-1.76	-	0.005	-2.76
Off-farm income	0.134***	0.037	3.58	0.014***		
				0.498***	0.171	2.90
<i>Control variables</i>						
Age	-0.01**	0.005	-1.99	-0.241*	0.123	-1.96
Education	0.431**	0.182	2.37	0.227***	0.029	7.90
Household size	-0.045*	0.024	-1.83	-0.04	0.03	-1.33
Land holdings	0.239***	0.029	8.11	0.034	0.023	1.45
Distance	-0.264**	0.128	-2.06	-0.12***	0.036	-3.29
Membership	0.024	0.034	0.71	0.015	0.033	0.44
Credit access	-0.001	0.002	-0.34	0.002	0.001	2.60
Constant	10.202**	0.432	23.59	10.265**	0.414	24.78
	*			*		
<i>Extra Statistics</i>						
R-squared	0.798			R-squared	0.813	
F-test	33.546			F-test	36.840	
Prob > F	0.000			Prob > F	0.000	
Breusch-Pagan test	0.68 (P value = 0.40)			Breusch-Pagan test	1.80 (P value = 0.179)	
Number of obs.	405.00					

\*\*\* for  $p < .01$ , \*\* for  $p < .05$  and \* for  $p < .1$ . 1 means SDI model and 2 for Herfindahl index

#### *Test of Heteroscedasticity and Multicollinearity*

Heteroscedasticity, also known as the difference of residuals, is when there's an uneven spread of residuals over a certain area. This is usually a problem with OLS analysis because it breaks the Gaussian-Markov rule of constant variation. The Breusch and Pagan test, developed by

Trevor Breusch and Adrian Pagan, is a popular method for detecting this (Breusch and Pagan, 1979). In this work, the Breusch-Pagan test was used to examine whether the current models and findings had heteroscedasticity concerns. Table 4 is a representation of the Breusch Pagan test. If  $\text{Pro} > \chi^2 = 0.68$ , that's  $\geq 5\%$ , then it's clear that the result isn't affected by heteroscedasticity. Table 4 shows the result of multicollinearity test by the VIF, and if each variable has a VIF lower than 5, then it's expected. The average value of the VIF was 2.750, and the median value was 1.980, which is also below 5. So, it's clear that this study isn't affected by any problems with multicollinearity

**Table 4. Test of multicollinearity**

Predictors	1		2	
	VIF	1/VIF	VIF	1/VIF
SDI	6.700	0.149		
Herfindahl index			4.570	0.209
Creation of financial service	6.040	0.165	4.450	0.220
Off-farm income	3.350	0.299	1.800	0.557
Age	3.250	0.308	1.720	0.580
Education	1.570	0.635	1.250	0.801
Household size	1.560	0.639	1.200	0.832
Land holdings	1.410	0.707	1.110	0.864
Distance	1.260	0.791	1.080	0.873
Membership	1.200	0.830	1.040	0.898
Credit access	1.150	0.867	2.020	0.962
Mean	2.750		1.980	

Source: Authors own computation from field survey 2022.

### Discussion

The outcome of this investigation shows that earning diversity has a beneficial effect on the wellness of family. It also demonstrates how the degree of household well-being is influenced by the degree of income diversification. These findings also demonstrate how income diversification is being embraced by the majority in the study regions as an important new tool for managing their livelihood strategies and household welfare, a subject that is relatively understudied in Bangladesh (Shakila et al., 2019; Roy and Basu, 2020; Ahmad et al., 2022; Matsuura et al., 2023). Both models show that increasing income diversity significantly raises a household's standard of living. This outcome is supported by the results of Shakila et al. (2019), Ahmad et al. (2022), Asfaw et al. (2019), Sultana et al. (2015), and Dev et al. (2016). The degree of household welfare is significantly impacted by financial services and off-farm revenue as an income diversification approach; these findings are consistent with those of Zhao, & Barry (2014), Wan et al. (2016), and Shakila et al. (2019). The age, educational attainment, and family size of the head of the household are some of the factors that determine the well-being of an average household. Since each person is unique, there might be significant variations in the welfare of an average household (Daud et al., 2018; Zhao and Barry, 2014; Shakila et al., 2019; Sultana et al., 2015; Akaakohol, and Aye, 2014). When people's land holding size and credit availability are favorable, they are more probable to engage in financial and economic operations and increase household income on average (Daud et al., 2018; Akaakohol and Aye, 2014; Ahmad et al., 2022). Membership in cooperative societies and the distance of living place of the respondent from the closest market are significant factors that affect the general well-being of the household. They promote increased social interaction, which in turn promotes using income to pay bills and make plans for future sources of income (Ahmad et al., 2022; Asfaw et al., 2019; Dev et al., 2016; and Matsuura et al., 2023). In

summary, this study suggests that to improve living conditions and household welfare, people should engage in a variety of income-generating activities, have access to credit, and stay up to date with new technologies that support higher education and financial services.

#### IV. CONCLUSION

This study focused at how household wellbeing among small-scale agricultural producers in the Dinajpur area was affected by diversifying their incomes. The findings of this investigation make it abundantly evident that improving these issues is necessary because they have a major impact on household welfare. These issues include education, financial creation, non-farm income and level of income diversification, credit access, membership, and distance from the nearest town. They are a low-income civilization that heavily relies on agriculture and lacks the potential skills to further these pursuits. It is possible for them to pursue new revenue streams through proper training in technological skills and self-employment. They must get involved in income-generating activities early in life because they have few possessions. Just a small percentage of their students received financial aid from various sources, which is quite insignificant for them. A special stipend for assuring the tribal people's compulsory education can also be used, in addition to the government's establishment of specialized schools for them and numerous NGOs' provision of pre-primary education. To entice people to obtain training on various aspects of self-employment, training with daily payments might also be provided. In certain districts of Bangladesh, the government also offers this kind of training with daily compensation; it ought to be implemented in the research regions as well. A single authority cannot make this improvement, hence, to do so. This study's scope, however, was constrained to one Bangladeshi area and a tiny sample size. This may be enhanced even further by using a large sample size and including Bangladesh in the study's design. Additionally, it has been determined that training and education significantly improve the welfare of the households. Therefore, greater training on skill development and self-employment should be organized by the government and policy authorities. It was discovered that numerous nongovernmental organizations (NGOs) made significant contributions in this area. Particularly, missionaries (in the local language) have greatly aided in their development, and the organization continues to provide essential services including housing, sanitation, and children's educational facilities. Moreover, this group does nothing to support the development of the populace through training. They should concentrate on offering financial facilities for self-employment, as this might help them out by giving them better possibilities for a living. By increasing awareness among them, the government and policy makers should make it simpler for them to access education. As a result, the government must manage some alternative means of improving their development and farming potential.

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