

ORIGINAL ARTICLE

## Rural Livelihood Portfolios and Determinants of Livelihood Diversification among Rural Households in North-Western Ethiopia

Mersha Tewodros Getnet<sup>a</sup> Mengistu Ketema<sup>b</sup> Bamlaku Alamirew Alemu<sup>c</sup> Girma Demilew<sup>d</sup>

### Abstract

*In Ethiopia, over the past decades, researchers in the field of rural development have tended to agree that the number of poor people in rural areas of Ethiopia exceeds the capacity of agriculture to provide sustainable livelihood opportunities. Thus, despite the persistent image of Ethiopia as a country of subsistence farmers, over the past decades, there has been an outstanding tendency for rural economic diversification. Thus, the aim of this study is to characterize rural households' livelihood portfolios and examine the major determinants of income diversification in the study area. The study employed a sequential embedded research design. To evaluate the level of household livelihood diversification, the Simpson Diversification Index (SDI) was used. Censored regression models were also employed to identify the major determinants of livelihood diversification. The findings of the study revealed that households in the study area depend on a variety of livelihood portfolios. Diversification into off-farm sources contributed 35% to total household income. The result also indicated that household livelihood diversification is significantly determined by household head educational status, access to training, age, family size, livestock ownership, land ownership, the proportion of infertile land, access to roads, and agro ecology at less than 5% probability level. As a result, the traditional sector-based approach should be broadened by adopting and implementing a local development strategy that includes both farm and non-farm activities.*

**Keywords:** *Livelihood Diversification, Tobit Regression, Censored Regression, Off-Farm Activities, Ethiopia*

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- a. Assistant Professor in University of Gondar, College of Social Science and the Humanities, Department of Development and Environmental Management Studies (Corresponding author email: [kukuget22@gmail.com](mailto:kukuget22@gmail.com))
- b. Chief Executive Officer, Ethiopian Economics Association
- c. Ph.D, Associate Professor, Addis Ababa University
- d. Ph.D. Assistant professor, University of Gondar
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## Introduction

Ethiopia is an agrarian economy dominated by subsistence farmers. In fact, livelihoods based on subsistence agriculture are inherently vulnerable and subject to a wide range of shocks and seasonal fluctuations. Researchers in the field of rural development tend to agree that the number of poor people in rural areas of Ethiopia exceeds the capacity of agriculture to provide sustainable livelihood opportunities (Eshetu et al., 2022; Leta et al., 2021). Rural households maintain diverse livelihoods. Rural farm households regulate activities to find new opportunities and cope with risks. Over the past decades, in Ethiopia, there has been an outstanding tendency for rural economic diversification (Mark et al., 2022; Adamnesh *et al.*, 2014). One of these strategies is the procurement and marketing of forest products.

Bryceson (2002) calls this process “deagrarianisation”, i.e. the shrinking role of agriculture in the households’ income and livelihood strategy. Many recent studies showed that rural off-farm incomes in Africa are increasing and played an important role in determining rural household incomes, consumption, expenditure, and household food security with the share off-farm income to the total income from 30% to 50% (Ghimire et al., 2014; Loschet et al., 2012). This process of diversification in SSA has been commonly explained by the combinations of push and pull factors, which determine the level and type of diversification strategy pursued by a given household (Abera et al., 2021; Seid, 2016).

Rural farm households regulate activities to find new opportunities and to cope with risks. Numerous motives prompt households and individuals to expand the range of assets, incomes, and activities. These motives comprise different push and pull factors like household size, farm landholding, seasonality of agriculture, increasing price of agricultural inputs, risk aversion, and earn more incomes (Mathewos and Nigatu 2016, Yishak 2017, Geremew et al. 2017, Seid 2016). Subsequently, in Ethiopia, there has been increased attention received by the diversity of rural livelihood in rural poverty reduction (Yishak 2017; Geremew et al., 2017; Worku, 2016; Prowse 2015; Mathewos and Nigatu 2016; Seid 2016; Yenesew et al., 2015; Yisihake and Abebe 2015; Brhanu 2016; Eneyew & Bekele 2012). However, in most of these studies, diversification has been measured either as the amount of income which is derived from off-farm sources (Brhanu, 2016; Tsega and Mary 2013) or a number of portfolios (Mohammed et al., 2018; Yishak, 2017; Geremew et al. 2017; Geremew 2017; Seid, 2016; Yenesew et al. 2015; Tsega and Mary 2013), which may lead to a wrong conclusion in a case where households might gain most of their income from a single source while the rest only from more than one sources.

On top of this, in all of these studies, the values of plantation income were underestimated. In fact, Adanchet et al., (2013) describe how rural households across developing countries rely on diversified sources of income, where forest resources play an important role in this regard. The availability of forest products determines the prospects for forest-based livelihood options. Tree plantation is one of the economically acceptable opportunities of income diversification in most highland areas of Ethiopia and Amhara Region (Wubalem et al., 2019; Bekele 2011; Tilashworket et al., 2013). Alongside the main objective set in Ethiopian rural policy to attain food self-sufficiency by accelerating the transformation of subsistence agriculture to market-oriented agriculture, it has not been able to generate the desperately needed rural transformation. The possible reasons could be the little attention given to diversification to off-farm and non-farm employment in rural areas.

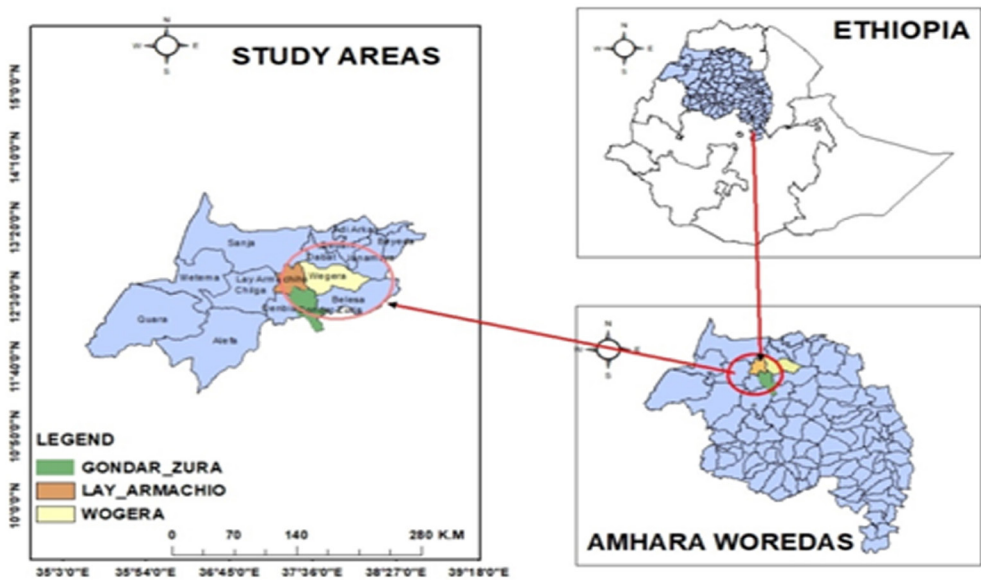
Hence, it is essential in this research to evaluate the level of livelihood diversification considering both the type of income source and share of income and factors affecting a level

of diversification. Therefore, this study examined the livelihood portfolios and major determinants of livelihood diversification among rural households in the study area thereby ensuring lifeblood security for rural at household level is possible.

## RESEARCH METHODS

### Research Design, Sampling Techniques and Data Collection

The study was conducted in three districts of Central Gondar Zone in Amhara Regional State. These are Wegera, Lay-Armachio and Gondar Zuria Districts (Figure 2 1). The respective administrative districts in the zone were selected purposefully with a set of criteria.



**Figure 2 1: Map of the Study Area**

A mixed research design was used for this study because the nature of the research objectives set and the research questions raised necessitated both quantitative and qualitative evidence. There are various kinds of mixed-method research designs (Creswell, 2012). The current study used a sequential embedded mixed method which uses qualitative data to support research that is primarily quantitative type of data.

In this study, the Cochran (1977) formula was used to determine sample respondents as it enables one to determine sample size based on the degree of accuracy required for the sample and the heterogeneity or homogeneity of the population. The formula is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where,  $e$  is the desired level of precision (i.e. the margin of error),  $p$  is the (estimated) proportion of the population that has the attribute in question, and  $q$  is  $1-p$ . Once the total sample sizes were determined, the next step was to distribute the samples in a representative manner. A three-stage multi-stage sampling method was used to come up with a more representative sampling unit and size.

### Method of Data Analysis

There are several ways to measure livelihood diversification. For this research to measure the level of household livelihood diversification, Simpson's Index of Diversity (SID) was used because SID takes into consideration both the number of income sources and how evenly the income is distributed between the different sources (Minot et al., 2006 and Jianmei and Peter, 2013). Besides, Simpson index of diversity is used because of its computational simplicity, robustness, and wider applicability (Jianmei and Peter, 2013). The formula for the Simpson index is given below:

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

Where, SID is Simpson's index of diversity;  $N$  is the total number of income sources (including forest income), and  $P_i$  represents the income proportion of  $i$ -th income sources including farm income and off-farm incomes which are classified based on different empirical works of literature explained in the literature section. Its value lies between zero and one. Then, following the approach used by Ahmed and Melesse (2018), households were classified in to four categories based on their SID value. Those are No diversification means a score of 0 (zero). Low, medium and high levels of diversification mean a score less than 0.33, between 0.331-0.66, and above 66.1 values in SDI calculation, respectively. Furthermore, to examine factors affecting livelihood diversification, Tobit regressions were estimated. It is specified as follows (Gujarati, 2004):

$$Y_i^* = \beta_0 + \beta_n X_i + \varepsilon_i$$

$$Y = Y^* \text{ if } Y^* > 0; \text{ and}$$

$$Y = 0 \text{ if } Y^* \leq 0$$

Where,  $Y$  is the value of SDI;  $\beta_0$  is the constant term;  $\beta_n$  is parameters to be estimated;  $X$  is a set of household characteristics, and  $\varepsilon$  is the error term.  $X_1$  to  $X_{14}$  are independent factors hypothesized to affect farm household investment (Table 1 2).

Table 1 2 : Definition of variable, measurement and hypothesis in Tobit model

Variable Name	Symbol	Description and variable measurement	
<b>Dependent Variables</b>			
<b>SID (Simpson Index of Diversification)</b>	<b>SID</b>	<b>Continuous, level of livelihood diversification measured in (SID).</b>	<b>Researcher Expectation</b>
<b>Independent Variables</b>			
Age of household head	AGE_HH	Continuous, Age of household head in years	-
Household size	HH_SIZE	Discrete, Total size of household member takes the value of 1, 2, 3....	-
Sex of Household Head	SEX_HH	Binary, 1 if the household head is male, and 0 if household head is female	±
Household head Education status	HH_EDU	Binary, 1 if the household head is literate, and 0 if household head is illiterate	+
Dependence ratio	DEP_RATIO	Continuous, the ratio of dependent household members compared with the total population aged 15 to 64.	+
Farm Size	FARM_SIZE	Continuous, Farm size holding of the household in hectare	-
Soil Quality	INFER_LAND	Continuous, Proportion of landholdings perceived as “infertile in quality”	+
Livestock ownership	LIV_OWN	Continuous, Total livestock ownership in tropical Livestock unit (TLU)	+
Ox-ownership	OX_OWN	Discrete, Oxen owned by the households take the value of (0, 1, 2, 3...).	+
Road access	ROAD_DIS	Continuous, Walking distance to all weather roads in minute	-
Credit access	CREDIT	Binary, 1 if households had access to credit, and 0 otherwise	+
Access for Training	TRAN_ACCSS	Binary, 1 if there were access for any training in the last 5 years; and 0 if otherwise	±
Health problem	SIK_DAY	Binary, 1 if there were health problems in the household within a year, and 0 if otherwise	±
Agro-ecology	AGR0_ECO	Binary, 1 if households live in highland agro ecology, and 0 if otherwise	±

## RESULTS AND DISCUSSION

Households in the study area are characterized by the presence of various livelihood activities. Some are farm-related and others are not. Besides, a high level of engagement in crop production, households in the study area participate in different non-farm and wage farm activities. Almost all households (over 95.6%) in the study area were involved in crop farming. It is also indicated that the main source of income in the area, on-farm activity, comprises about 65% of the total income on average (Figure 3 1). The rest (35 %) of the households' income comes from other engagement.

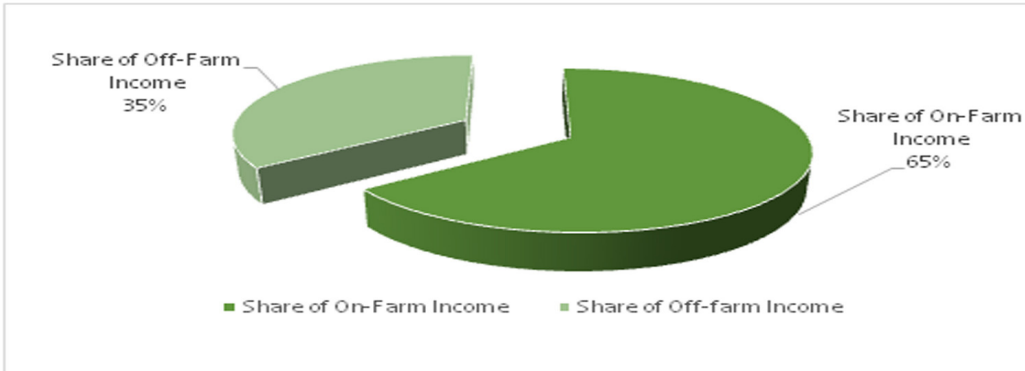


Figure 3 1: Mean-share of on-farm and off-farm livelihood portfolios

The finding of the study; thus; confirms the notion of diversified livelihood activities pursued by rural households in the study area. Similar results were observed in the studies conducted by Eneyew and Bekele (2012) in southern Ethiopia, and by Dereje and Desale (2016) in Oromia Region. Beyene and Muche (2014) also found out that more than half of rural households have one or more members participating in activities outside agriculture.

### Level of Livelihood Diversification

As depicted in Figure 3 2, most households were under the category of medium levels of diversification (51.6%). Only 16 percent of the population gathers 100 percent of their income from only one source; hence, zero levels of diversification. These groups of households are those who make their livelihood mostly from crop cultivation. On the other hand, 21 percent and 10.4 percent of households were under the categories of low and high levels of diversification.

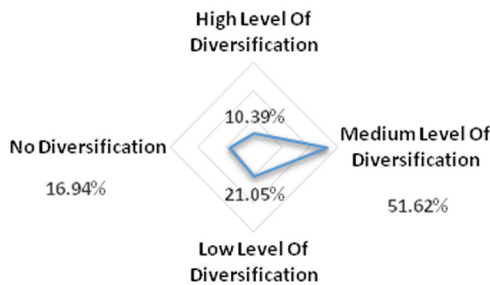


Figure 3 2 Households' level of livelihood diversification

## Determinants of Livelihood Diversification

Tobit regression model was used to estimate the factors that influence livelihood diversification. The four basic assumptions underlying the Tobit model were validated, according to Maddala (1983) and Gujarati (2004). These are multicollinearity, homoscedasticity (constant variance), residual normality, and residual independence. To test model fitness, the likelihood ratio test was used. The Likelihood Ratio Chi-Square test i.e.,  $\chi^2(14) = 217.62$ ; Prob  $\chi^2 = 0.000$  revealed that at least one of the predictors' regression coefficients is not equal to zero (Table 2.2). To obtain computationally and statistically efficient and consistent estimates of the regression coefficients, a few assumptions must be made.

Table 2.2. Results of Tobit model on factors influencing livelihood portfolio diversification

VARIABLES	COEFFICIENT	STANDARD ERROR	P> T
Constant	.3833451	.0617464	0.000
SEX_HH Female	-.0267652	.0397449	0.501
HH_EDU Illiterate	-.0928812	.0257332	0.000***
CRE_ACCSS No	.0306853	.0218564	0.161
TRAN_ACCSS No	-.0621122	.0230801	0.007***
SIK_DAY No	.0105608	.0219746	0.631
AGE_HH	.0042527	.0010306	0.000***
FAM_SIZE	.0178872	.0080925	0.028**
DEPEND_RATIO	-.0162698	.012366	0.189
LIV_OWN	.011937	.0034927	0.001***
OX_OWN	-.0639348	.0109264	0.000***
FARM_SIZE	-.03031	.0165131	0.051**
ROAD_DIS	-.002128	.0004746	0.000***
INFERTILE_LAND	.0009282	.000391	0.018**
AGRO_ECO Midland	-.0662346	.0229951	0.004***

Number of Observations = 385  
65 left-censored observations at SDI <= 0  
320 uncensored observations  
0 right-censored observations  
LR  $\chi^2(14) = 217.62$   
Prob >  $\chi^2 = 0.0000$   
Pseudo R2 = 0.9478

Note: \*\*, \* significance levels at  $P < 0.01$  and  $P < 0.05$  respectively

## DISCUSSION

Both farm and non-farm activities are important sources of income for sampled rural households. As indicated, almost all households (over 95.6%) in the study area were involved in crop farming. Crop is the most important source of farm income. Besides, a high level of engagement in crop production, households in the study area participate in different non-farm and wage farm activities. Diversification into off-farm sources contributed to the income, and its income accounts 35% of household total income. Moreover, based on SDI measurement of the level of livelihood diversification, only 16% of the population gathers 100 % of their income from only one source (See Figure 3 2); hence, zero levels of diversification. Table 2 2 shows the results of the Tobit regression. The findings show that the extent of household livelihood diversification is influenced by a variety of socio-demographic, economic, institutional, and geographical factors. These are:

### Socio-demographic Factors

One of the demographic factors expected to influence the level of livelihood diversification is the age of the household head. Unlike the researchers' expectations, the age of the household heads was found to positively and statistically influence income diversification at  $P < 0.001$  level. This implies that as the age of the household head increases, so does the level of engagement in a diverse income portfolio. This means every unit increase in the age of the household head is associated with a 0.0042 increase in the Simpson Diversification Index value (SDI) (Table 2 2). This may be because older household heads have more adult family members who may be involved in a variety of livelihood portfolios. As a result, those adult family members can work both on and off the farm to support their families. The finding is consistent with findings of IrohibeAgwu (2017); Gecho (2016), and Vinefall (2015).

The other demographic factor is households' family size measured in adult equivalents, which is an indicator of available labor in the family. At a 5% significance level, it has a positive and significant effect on income diversification. In other words, as the number of family members measured in adult equivalents increases, so does the likelihood of the household earning income from a variety of sources. More family means more labor in a rural area, allowing households to engage in a variety of livelihood activities. Perhaps, it could be when there is a large family size, as land is a fixed input, there would be high number of under-employed family members whose marginal productivity is zero or negligible. Therefore, such households would try to find other alternative employments and diversify their income sources.

Education and skill are also socio-demographic variables that influence the level of diversity in the study area. As a result of the findings in Table 2 2, education has the expected effect, with households headed by literate heads having 0.092 more chances of being engaged in diverse activities. It also encourages job mobility and the acquisition of skills that may be required to engage in other economic activities. Education increases households' motivation to earn money through self-employment and wage labor in the non-farm sector. As a result, being illiterate has a significant negative impact on income diversification. This finding is consistent with findings from Birthal (2014), Gecho (2016), Ghimireet al. (2014), Irohibe and Agwu (2014), and Idowuet al. (2011) in which education was found to be a key determinant of income-generating activity diversification. Households' choice of livelihood portfolios is determined not only by formal education but also by opportunities for training. Access to training, as indicated by the model result, increases a household's



chances of diversification by providing the necessary skills and awareness about options other than agriculture. Thus, households that received life skill training in the previous five years, increased their SDI level of diversification by 0.062 (see Table 2 2). According to Fufa (2015), non-farm training plays a positive role in income diversification.

### **Economic Factors**

Table 2 2 shows that a unit increase in TLU ownership is associated with a 0.011 increase in SDI at  $P \leq 0.001$ . This is because livestock in remote areas are liquid assets that can be sold to fulfill household financial needs or to start a new business. This finding is consistent with Teame's discovery (2018). Thus, households with a larger livestock holding can participate in more rewarding non/off-farm employment activities, putting them in a better position than households with no or a small livestock holding. On the other hand, as shown by the model result, household ox ownership is inversely related to livelihood diversification at  $P \leq 0.001$ . According to the model results, owning an additional ox reduces household diversification by a factor of 0.063. This is most likely because livestock-owning households are less likely to be forced to diversify their income outside of agriculture, particularly toward agricultural wage employment and other low-paying non-agricultural employments rather than specialize. Ox ownership in the study area is an indication of access to animal plow since it is the only source of power in plugging. Consequently, those farm households that can access animal plows for farmland preparation are less diversified in their income sources and are possibly more involved in farm activities via specialization.

Farmland is the other most important asset and economic factor in a rural area. Table 2 2 shows that contrary to the researchers' expectations, farm size had a negative and significant influence on the probability of household engagement in income diversification at  $P \leq 0.05$ . The expectation was that as households acquired more farmland, they would be able to earn more income from agriculture and invest the excessive income in other activities. One possible explanation for the negative relationship is that as farmers' land holdings increase, they may not have extra time or labor to invest in non-agricultural income sources because cultivating their land requires more time and labor. Furthermore, households will not be compelled to diversify their income sources in order to reduce the risk of specialization. Similar findings were also revealed by Tekle (2019) and Yishak (2017). On the other hand, an additional proportion of land perceived as not good for crop production increases household livelihood diversification by a factor of 0.00092 at 5% alpha levels. Thus, at a 5% significance level, the proportion of farmland perceived as infertile is positively associated with a high level of diversification. It is because if a household owns more unproductive land, they will be forced to seek other off/non-farm employment in order to secure their future.

### **Institutional and Geographical Factors**

Access to basic infrastructure and institutions has an impact on livelihood diversification at a household level. The depicted finding indicated that household distance to all-weather roads is inversely related to household rate of livelihood diversification. According to Table 2 2, an additional walking minute increase from an all-weather road reduces a household's level of livelihood diversification by a factor of 0.0021 at  $P \leq 0.001$ . As a result, households with year-round access to transportation to other areas had significantly higher levels of income diversification. This could be because household access for road determines the household's movability, opportunities to engage in other income-generating activities outside their own location, and market access. Market access factors are

linked to transportation accessibility, and the ability to sell farm products in the market is determined by road access. It is obvious that if farmers are unable to reach the market to sell their off-farm outputs, they may be discouraged from engaging in such activities. Furthermore, easy access to transportation may imply proximity to other urban areas or nearby towns that are hubs for non-farm and off-farm activities in the study area. Thus, at  $P \leq 0.001$ , access to transportation increased the level of income diversification significantly. This finding is consistent with the findings of Asmah (2011).

Furthermore, the result indicated that access for credit was positively correlated with income diversification among households in the study area. This is because it relaxes liquidity constraints (Teame, 2018; Gecho 2016; Beyene and Muche 2014). However, such an effect is not significant. It could be due to less developed credit access in the study area. In addition, societies in the locality depend on informal sources of credit which substitute formal sources of credit. Hence, the econometric result confirms that this variable has no influence over income diversification in the study area. According to Table 2 2, agro ecological factors are also one of the determinants of livelihood diversification decision in the study area. The Tobit result indicated that highland agroecology households diversify their income sources more than midland agroecology households. The extent of diversification was found to have a strong positive relationship with living in a highland area. A household in the highlands area diversifies its income more than a household in the midlands with a factor of 0.066 measured in SDI at  $P \leq 0.001$  (Table 2 2). Perhaps, this is due to close proximity of highland household to town and market and their greater access to credit compared to rural households.

## **Conclusion and Recommendation**

This study found out that farming was not the only source of income for households in the study areas. It was found that sample households tended to diversify their activities away from agriculture in order to supplement their agricultural income. A significant portion of households are cultivating trees as one form of the cash crop. The majority of households in the study area are engaged in off-farm activity as a means of risk mitigation. It was found that household rate of livelihood diversification is a function of a wide range of socio-economic and institutional factors. In Ethiopia, the ADLI (Agricultural Development Led Industrialization) strategy adheres to the rural growth linkage model in which agricultural growth stimulates growth in rural non-farm activities through technological advancement. However, the evidence suggests that, primarily, the vast majority of rural households in the study areas (over 95.6 percent) continue to engage in crop production. Second, push factors like land scarcity, seasonality of agricultural activities, uncertain agricultural performance, an increase in prices of agricultural input, and a decrease in agricultural productivity, drive livelihood diversification towards non-farm employment. Furthermore, because rural households engage in a variety of income-generating activities, the government's priority sectors may not produce the expected results due to the substitutability of resources for other purposes. For the reasons stated above, government policies should strive to integrate farm and non-farm activities. As a result, the traditional sector-based approach should be broadened by adopting and implementing a local development strategy that includes both farm and non-farm activities.

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