Analysis of Livelihood Diversification Practices of Crop Farmers in Selected Conflict-Affected Local Government Areas of Kaduna State, Nigeria

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Abstract: This study examined livelihood diversification among farming households in conflict-affected communities of Chikun and Zangon Kataf Local Government Areas, Kaduna State, Nigeria. Using a multistage sampling technique, 164 respondents were surveyed with structured questionnaires and interviews. Data were analyzed using descriptive statistics, the Simpson Index of Diversification, Tobit regression, and the Foster-Greer-Thorbecke (FGT) poverty measure. Results revealed that trade (72%), artisanship (27%), and salaried employment (23%) were the most common diversification strategies. The Simpson Index showed that 70% of households were low diversifiers, 22% moderate, and 8% highly diversified. Tobit regression identified age ($p < 0.05$), education ($p < 0.05$), and gender ($p < 0.001$) as significant determinants of diversification. Poverty analysis indicated an incidence of 56%, a poverty gap of 25%, and severity of 14%. Non-farm income accounted for 56.14% of total household income, highlighting its critical role in mitigating poverty. Key constraints included limited access to credit, unstable electricity, high operating costs, and insecurity. The study contributes to the literature by integrating livelihood diversification, its socio-economic determinants, and poverty outcomes in a conflict-affected rural context, demonstrating the central role of non-farm activities in household resilience. Policy implications include promoting gender-sensitive credit schemes, vocational training for older farmers, and rural infrastructure improvements to enhance diversification and reduce poverty.

Keywords: Conflict, Diversification, Kaduna State**,** Livelihood, Poverty

INTRODUCTION

In many developing countries, particularly in Africa, rural households rely heavily on agriculture as their primary source of livelihood. However, agricultural activities alone often fail to provide sufficient income to meet household needs throughout the year. To cope with this challenge, many rural families engage in multiple income-generating activities alongside farming, a practice referred to as livelihood diversification. This strategy allows households to reduce dependency on a single income source, manage risks, and enhance overall welfare (Michael *et al*., 2021).

The choice and extent of livelihood diversification are influenced by several factors, including access to productive resources, human capital, markets, infrastructure, and the broader economic environment (Dia *et al.,* 2022). While rural households have historically combined farming with other activities, patterns of diversification vary across communities due to differences in resource endowments, social networks, and local opportunities (Fabusoro *et al.,* 2010).

In conflict-affected areas, the imperative to diversify is heightened. In parts of Kaduna State, recurrent violent conflicts disrupt

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agricultural production, limit access to farmlands, restrict mobility, and threaten household food security. In these contexts, diversification often serves as both a reactive coping strategy and a proactive means of improving household welfare. Households engage in non-farm activities not only to survive during periods of instability but also to stabilize income and build resilience against future shocks. Understanding how households respond to such pressures requires examining both the types of activities they pursue and the factors influencing these choices.

Despite the importance of diversification in conflict-affected rural areas, there is limited empirical research on the extent of livelihood diversification, its determinants, and its contribution to poverty reduction in such contexts. This gap constrains the design of targeted interventions aimed at supporting household resilience and improving welfare. This study addresses this gap by analysing the pattern of livelihood diversification among farming households in Chikun and Zangon Kataf Local Government Areas of Kaduna State and assessing its contribution to poverty alleviation.

The study provides insights into how rural households navigate the dual challenges of limited agricultural returns and conflict-related disruptions. It highlights the socio-economic and demographic factors that influence diversification decisions and examines the role of non-farm activities in reducing poverty.

METHODOLOGY

Study location

The study was carried out in Kaduna State, located in the northern region of Nigeria. The state lies approximately between latitude 9°.19 and 11°.32 North and longitude 6°.22 and 8°.08 East (NBS, 2020). According to the 2006 census, the state has a population of over six million people and is made up of twenty-three Local Government Areas (NPC, 2006). The research focused on two Local Government Areas, Zangon Kataf and Chikun. These areas have experienced recurring conflict which has affected farming activities and livelihood patterns.

Zangon Kataf is situated around latitude 9° 50′ 28″ North and longitude 8° 15′ 18″ East, while Chikun is located around latitude 10° 16′ 0″ North and longitude 7° 6′ 0″ East (NBS, 2020). Agriculture is a major occupation in these areas, with households engaged in the production of both food and cash crops. However, frequent clashes between farmers and herders have resulted in displacement and reduced farming activities.

A multi stage sampling procedure was used to select respondents for the study. The first stage involved selecting Zangon Kataf and Chikun Local Government Areas because of their exposure to conflict and the resulting disruptions to farming activities. In the second stage, three districts were randomly selected from each Local Government Area. From each selected district, four villages were chosen through simple random sampling.

The sampling frame consisted of 750 farming households across the selected villages. This figure represents the total number of identifiable farming households based on records obtained from local extension offices

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and confirmed through consultations with community leaders. Using the Taro Yamane formula at a five percent level of significance, the required sample size was 264 households. Although 264 households were initially selected, insecurity, limited access to some communities at the time of fieldwork, and non response reduced the number of completed and usable questionnaires. After data cleaning and validation, 164 questionnaires were considered complete and consistent enough for analysis. This final figure constitutes the analytical sample used throughout the study.

Primary data formed the basis of the study. Structured questionnaires and oral interviews were used to collect information on household characteristics, livelihood activities, income sources, poverty indicators and constraints affecting farming households. Data collection covered the 2023 and 2024 farming seasons.

Data Collection Instruments

The questionnaire was designed to obtain information on the following:

Socio economic characteristics such as age, gender, marital status, level of education, farm size, credit access and household size. Types of farm and non-farm income generating activities. Income from various livelihood activities. Poverty related variables such as household expenditure. Challenges encountered in diversifying livelihood activities.

The interview guide was used to support and validate responses and to gain additional insight where necessary.

Analytical technique

The analytical tools used in this study include descriptive statistics, the Simpson Index of Diversity, the Tobit regression model and the Foster Greer Thorbecke (FGT) poverty measures. The Simpson Index was applied to quantify livelihood diversification. The Tobit model was used to examine the factors associated with diversification, while the FGT indices were used to assess the incidence, depth and severity of poverty. (Foster *et al.,* 1984).

Simpson index

Livelihood diversification was measured using the Simpson Index of Diversity (SID). The index captures both the number of livelihood activities and the distribution of income across them. It is expressed a

$$SID = 1 - \sum_{1}^{n} = 1 \quad S_i^2$$

where Si is the proportion of income obtained from the i-th livelihood activity and n is the total number of activities. The SID ranges from 0 to 1. A value of 0 indicates complete specialization, meaning the household depends on a single income source. As the number of income sources increases and income is more evenly distributed across these sources, the squared income shares (Si^2) become smaller. This causes the sum of the squared shares to decline and the SID moves toward 1, reflecting higher levels of diversification.

Tobit regression model

The Tobit regression model was used to identify the socio economic and institutional factors associated with household livelihood

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diversification. The dependent variable is the Simpson Index, which is continuous but naturally bounded between 0 and 1. Although the variable is not censored in the traditional sense, many empirical studies have applied Tobit models to bounded indices when observations cluster around the limits. The choice of the Tobit model in this study was motivated by the presence of several households with either very low or relatively high SID values, which created a concentration near the bounds. Given this pattern and the need to avoid predictions outside the admissible range of 0 to 1, the Tobit model was considered suitable for the analysis.

The general model is expressed as:

$$SID_i = \beta X_i + \varepsilon_i$$

$$SID_i = \begin{cases} > 0 \begin{cases} if\ SID_i^* \leq 0 \end{cases} \\ SID_i \begin{cases} if\ SID_i^* < 1 \end{cases} \\ > 1 \begin{cases} if\ SID_i^* \geq > \end{cases} \end{cases}$$

where Xi is a vector of farmer and household characteristics (age, education, farm size, conflict exposure, access to credit, extension contact), β is a vector of parameters to be estimated, and ε_i is an error term assumed to be normally distributed with mean zero and constant variance

The explicit functional form of the model is:

$$Z=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+e\ldots \quad (3)$$

Where:

Z = Livelihood diversification index (Simpson index)
X1 = Age (in years)
X2 = Sex (male = 1, Female = 0)
X3 = Household size (numbers)
X4 = Education (years)
X5 = Income (Naira)
X6 = Credit received (Naira)
X7 = Market distance (km)
β0 to β7 = regression coefficients
e = error term

Foster-Greer-Thorbecke (FGT) poverty measures

Poverty was assessed using the Foster Greer Thorbecke (FGT) class of poverty indices. This approach provides a detailed assessment of poverty by capturing the proportion of households that are poor, the average shortfall of the poor from the poverty line and the extent of inequality among the poor.

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The FGT index is expressed as:

$$P_{\propto} = \frac{1}{N}\sum_{i=1}^{q}(\frac{z-y_i}{z})^{\propto}$$

Where;
N is the total number of households,
q is the number of poor households,
z is the poverty line and
yi is the per capita income of the i-th household. The study reports three measures:
P0 (headcount index), which shows the incidence of poverty
P1 (poverty gap index), which indicates the depth of poverty
P2 (poverty severity index), which reflects inequality among the poor

The poverty gap index P1 measures how far, on average, poor households fall below the poverty line. Higher values indicate a deeper poverty situation, while lower values imply that poor households are closer to the poverty line.

RESULTS AND DISCUSSION

Nature of Livelihood Diversification

Households in the study area combined farming with a range of non-farm activities as a strategy to boost income and manage production risks. Table 1 presents the distribution of households by the non-farm activities they engaged in. Since respondents could report more than one activity, the percentages represent the share of households participating in each activity rather than proportions that sum to one hundred.

Table1. Distribution of farming Households According to the Nature of Livelihood Diversification

Livelihood Activities	Frequency	%of Respondent
Trade	118	72
Civil service and Private Salaried Job	37	23
Revenue From Leasing Out Land and Other Resources/Rent	7	04
Wage From Agricultural Labour Supply on Other People's Farm	12	07
Artisans :		
Barbing/hair dressing/platting	9	05
Brick laying	5	03
Carpentry	12	07
Tailoring	11	07
Other Sources	8	5

Multiple Response Allowed* Source: Survey 2025

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The results show that trade was the most common non-farm activity, reported by 72 percent of the households. Artisanship accounted for a combined 22 percent, drawn from barbing or hairdressing, bricklaying, carpentry and tailoring. Civil service and private salaried employment accounted for 23 percent. A smaller share of households earned income from agricultural wage labour or from leasing out land and other assets. This aligns with findings by Reardon *et al.* (2007) and Nigusse (2020), who observed that trade and informal enterprises dominate non-farm livelihoods in rural areas.

These patterns highlight the importance of non-farm income in the livelihood portfolios of households in the study area. Engagement in trade and artisan work appears to provide a buffer against fluctuations in agricultural production, a finding consistent with earlier studies that emphasise the role of non-farm activities in stabilising rural income.

Extent of Livelihood Diversification

This section examines the degree to which households combined multiple livelihood activities. The Simpson Index of Diversification was calculated for each household, and the resulting values were grouped into three categories based on tertiles of the actual index distribution. This approach avoids arbitrary cut off points and reflects standard practice in livelihood diversification studies.

Table 2. Distribution of Livelihood Diversification Index Among Farming Households

Diversification Category	SID Range	Frequency	Percent of Respondents
Low diversification	≤ 0.48	54	33
Medium diversification	0.49–0.60	62	38
High diversification	≥ 0.61	48	29
Total		**164**	**100**

Source: Survey 2025

The average Simpson Index across households was 0.55, indicating a generally modest level of diversification. Roughly one third of households fell within the low diversification group, while slightly more than one third were in the medium category. Only 29 percent achieved a high level of diversification, suggesting that although some households spread their income across several activities, most relied on one dominant non-farm activity in addition to farming. Similar trends were reported by Ayana *et al.* (2021), indicating uneven access to diversification opportunities due to capital, skills, and market constraints.

The pattern implies that diversification opportunities are unevenly distributed. Households in the higher diversification category are likely those with stronger access to capital, skills or markets, while others remain concentrated in a narrow set of activities, which may limit their ability to manage income risk.

Determinants of Livelihood Diversification

The Tobit regression model was used to identify socio economic and institutional factors associated with the extent of

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livelihood diversification. The results, presented in Table 3, show that only age, gender and education had statistically significant effects on the Simpson Index of Diversification.

Table 3. Tobit Regression Results on Factors Influencing Livelihood Diversification

Variable	Coefficient	Standard Error	Marginal Effect	t value
Age	0.3639	0.1688	0.0311	2.155 **
Gender (Male=1)	0.0179	0.0051	0.0004	3.515 ***
Household size	-0.0230	0.0689	-0.7382	-0.334
Education (years)	0.0691	0.0293	0.0184	2.358 **
Income	0.1782	0.2251	0.4285	0.792
Credit received	0.0000	0.0000	0.8166	0.232
Market distance	0.0000	0.7827	0.9090	-0.114
Sigma	0.6848	0.0379	—	18.055
Log likelihood	-169.5772			

***, **, * denote significance at 1 percent, 5 percent and 10 percent levels
Source: Survey 2025

Only age, gender and education had significant coefficients. Household size, income, credit received and market distance showed no statistically meaningful relationship with the diversification index, as seen from their low t values.

The log likelihood value of −169.57 suggests that the full model fits better than an intercept only (null) model, indicating that the included socio-economic variables provide explanatory power for differences in diversification levels.

Age

Age was positive and significant at the 5 percent level. The result suggests that older household heads are slightly more likely to diversify their income sources. This aligns with the idea that older farmers often accumulate experience, contacts and knowledge that help them branch into new livelihood activities. Some studies, however, have reported the opposite pattern, where younger farmers diversify more due to higher risk tolerance. This mixed evidence indicates that age effects may vary depending on local economic conditions and opportunities. Older household heads were more likely to diversify, consistent with Freeman *et al*. (2004) but contrasting findings in Khatun and Roy (2012), who reported younger farmers are more willing to take risks. Male-headed households had higher diversification, reflecting gender disparities in access to resources, aligning with Babatunde (2015).

Gender

Gender was strongly significant at the 1 percent level. Male headed households had a higher likelihood of diversifying compared to female headed ones. This reflects longstanding differences in access to productive resources, mobility and job opportunities. Women often face barriers in land ownership, capital access and participation in certain non-farm activities. Similar findings were reported by Babatunde (2010), who noted that male headed

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households tend to have more income sources and greater economic efficiency.

Education

Education showed a positive and significant effect at the 5 percent level. Households with more educated heads were more likely to diversify. Education enhances skills, improves access to information and widens the range of viable non-farm opportunities. This result agrees with earlier research by Babatunde *et al.* (2009) and Idowu et al. (2011), who also found that education is a strong driver of diversification.

Household size, income, credit access, and market distance were not significant, suggesting that these factors may be less constraining in the study context (Start & Johnson, 2004).

Table 4. Socio-economic features of the farming household head

Variable	Minimum	Maximum	Mean	Standard Deviation
Gender (Male=1)	0	1	0.8773	0.3291
Age (years)	25	73	50.760	11.169
Education level (0=None, 1=Primary, 2=Secondary, 3=Tertiary)	0	3	1.865	0.8037
Household size (number)	2	15	5.7852	2.0986

Survey data, 2025

The table shows that most households in the sample were headed by men, with a proportion of about 88 percent. This pattern is common in many rural farming communities where men usually take responsibility for land ownership, household decision making and participation in livelihood activities. Female headed households are fewer and sometimes face obstacles in accessing productive resources.

The average age of household heads was about 51 years. This suggests that most respondents were in their middle age, which is a period when individuals are still productive and actively involved in farming and other income related activities.

Education was measured as a categorical variable ranging from no formal schooling to tertiary level. The mean value of 1.865 implies that most respondents had between primary and secondary education. This level of schooling provides basic skills and exposure but may still limit access to high skill non-farm opportunities. It is important to note that this variable cannot be interpreted as years of schooling and should not be used as a continuous variable in regression without proper recoding.

Households had an average of about six members. Large household sizes are common in rural areas and can have mixed effects. On the one hand, they provide family labour for farming. On the other hand, more dependents increase pressure on household income due to food, health and education expenses.

Assessing the level of poverty among farming household

Poverty influences many facets of human conditions, including physical, moral, and psychological, making a succinct and widely

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recognized description difficult to come by. According to the most widely accepted theory, poverty results from not having enough money to purchase necessities.

Table 5. Poverty Indices of respondents

FGT Poverty Indices	Estimates
Poverty Incidence(P_0)	0.56
Poverty Depth(P_1)	0.25
Poverty Severity(P_2)	0.14
Poverty Lines	
Mean Per Capita Household Expenditure	₦169,362.3Per Annum
2/3 Mean Per Capita Household Expenditure	₦137,430Per Annum
1/3 Mean Per capita House Expenditure	₦56,454 Per Annum

Source: Survey data: 2025

In this study, poverty was measured using the Foster, Greer, and Thorbecke model. A standard baseline was constructed in order to assess the poverty level of farming households. The poverty line is the name for this baseline. The minimum or cut-off criterion of food expenditure or per capita income below which a person or household is classified as poor is known as the poverty line (Adekoya 2014). The two-thirds mean per capita household expenditure of farming households was used to calculate the poverty line. Based on the farming household's food and non-food expenditures, Table 5 established a relative poverty level of 112,908.2. This suggests that a household was classified as non-poor if its average annual expenditure was more than ₦137,430, moderately poor if it was between ₦56,454 and ₦137,430, and very poor if it was less than ₦56,454. As a result, the poverty incidence figure is 0.56, meaning that almost 56% of farming households were impoverished. This suggested that rural agricultural households were disproportionately poor, which may be because rural areas have less access to infrastructure and opportunities. In Nigeria's rural areas, infrastructure including roads, water and sanitation, universities, and electricity are rarely available (Omonona 2008). The results of the poverty gap index showed that there was a 25% difference between the impoverished and the poverty line. In order to become non-poor, the impoverished will need to increase their per capita spending by 25%, or ₦28,227.05. As an alternative, poverty reduction initiatives aimed at raising household spending will be necessary for the impoverished.

The farming households' poverty severity index was 0.14. With roughly 14% of farming households being the poorest among the respondents, this suggests that poverty is not severe among these households. To put it another way, squared poverty accounts for both the disparity among the poor and the distance between them and the poverty line.

Contributions of livelihood diversification among farming household

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Farm revenue is derived from the production of crops and livestock, whereas non-farm income is derived from all non-agricultural forms of income obtained off-farm, including wage jobs, trading, remittances, and other ventures.

Table 6. Contribution of livelihood diversification to poverty alleviation

Contributions source	Aggregate income(₦)	Percentage
Farm Income	35,023.510	43.86
Non-Farm Income	44,830.800	56.14
Total	**79,854.310**	**100.00**

Survey data, 2025

According to Table 6's findings, the majority of farming households rely on non-farm employment as their primary source of income as well as an additional one. Additionally, it showed that non-farming activities account for around 56.14% of the total household earned income in the research region, with an average of ₦44,830.800 annually, while farm activities account for roughly 43.86%, with an average of ₦35,023.510 annually. As a result, both farm and non-farm revenues make up a sizable amount of household income, and both are crucial to agricultural households. Because non-farm activities generate larger returns than agricultural activities in the research area, this suggests that revenue from non-farm activities contributed more to income inequality than any other livelihood strategy. This highlights the importance of non-farm income in mitigating poverty and stabilizing livelihoods, consistent with Igwe (2013) and Reardon et al. (2007).

Constraints to livelihood diversification among farming household

Findings on constraints of farming household was collected during the household survey are presented in Table 7. The aim was to understand the problems encountered in the study area in adopting livelihood activities.

Table 7. Constraints to Livelihood Diversification

Constraints	Frequency	Percentage	Rank
Lack of Access to Formal Loan	72	44	1st
Unstable Electricity	68	41.5	2nd
High Cost of Business Premises	53	32	3rd
Poor Access to Market	46	28	4th
Unavailable Skilled Labour Supply	34	21	5th
Gender Issues	32	20	6th
Others	27	16.5	7th

Multiple Response Allowed* *Survey data, 2025*

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It is believed that understanding community-based concerns could help one better comprehend family behaviour and the choices they make in order to pursue their livelihoods. The livelihood diversification of farming households is influenced by a number of factors. Among the elements thought to be the most significant barriers to diversity are the following. In two local governments (Chikun and Zango Kataf), 44% of households lack access to formal loans; 41% have inconsistent electricity; 32% have expensive company premises; and 28% have limited market access. The Simpson index of diversity and descriptive statistics were calculated to characterise the nature and extent of livelihood diversification activities. A censored Tobit regression model was used to investigate the factors influencing the adoption of various sources of livelihood activities. The degree of poverty among the 261 respondents in the research area was examined using the Foster Greer Thorbeck measure. Additionally, the contributions of livelihood diversification and the factors influencing livelihood diversification in the research area were examined using descriptive statistics.

The results revealed that, at roughly 72% of total income, trade is by far the most significant supplementary source of income for rural households, followed by artisanship at 27% and civil service/private salaried occupations at 44%. On the other hand, the majority of farming households (70%) rely on one source of income in addition to farming, according to the data of the extent of livelihood activities. About 25% of agricultural households are somewhat diversified (rely on two sources of income). Just 5% have more than two sources of income, making them highly diversified. Five (5) of the seven (7) independent variables had a positive relationship with the dependent variable (Simpson index of diversity), according to the Tobit regression model's findings. Additionally, age, gender, and education were shown to be statistically significant at $p<0.05$, $p<0.01\%$, and $p<0.05$, respectively. When evaluating the degree of poverty among farming households, the findings reveal that the poverty incidence is 0.56, meaning that there is almost 56% variation in the poverty of farming households among the poor. According to the poverty gap, the impoverished will need to increase their spending by 25% in order to escape poverty, which equates to ₦28,227.05. According to the farming households' poverty severity rating, 14% of them are the poorest. This suggests that low-income farming households do not experience extreme poverty. The contribution of livelihood diversification demonstrates that a significant portion of farming households' income diversification strategy came from non-farm sources. The income from farming and non-farm sources was 43.86% and 56.14%, respectively. Therefore, in addition to farming, which is the primary occupation, non-farm employment provides the majority of agricultural households with an additional source of income. The main obstacles to livelihood diversification in the research area were found to be, among other things, the high cost of company space (32%), inconsistent electricity (41%), and lack of financing availability (44%).

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Conclusion, Summary and Recommendation

The study highlights the continuing shift from purely farm-based livelihoods to more diversified income strategies among farming households in Kaduna State. Most households supplement agricultural income with trading and other non-farm ventures, although the extent of diversification remains low for the majority. Socio-economic factors such as age, gender, and education significantly influence the ability of households to diversify. Poverty remains widespread, yet not extremely severe, suggesting that targeted support to expand non-farm opportunities could lift many households above the poverty line. The overarching insight is that non-farm income now plays a central role in household welfare, especially in conflict-affected environments where farming conditions are unpredictable.

Contribution to knowledge

The insight gained from this study highlighted that:

This study provides several important contributions. First, it presents an integrated analysis of the determinants of livelihood diversification, the extent of diversification, and the poverty outcomes associated with these strategies within a conflict-affected rural setting. Second, it demonstrates that non-farm income accounts for the largest share of household earnings in the study area, highlighting its critical role in poverty reduction. Third, it identifies key structural and demographic constraints—lack of credit, unreliable electricity, high business costs, poor market access, and gender-related barriers—that shape households' diversification choices. Finally, the study adds evidence that education significantly increases the likelihood of adopting multiple livelihood activities, reinforcing the importance of human capital development in rural economic resilience.

Recommendation

Efforts to support livelihood diversification should start by improving access to credit for rural households. Many of the enterprises that households are willing to engage in require modest start-up capital, and credit schemes designed with flexible collateral requirements would allow more households, especially women, to participate. Strengthening rural infrastructure is also essential. Reliable electricity and better-quality roads would reduce operational costs for non-farm enterprises and improve market access. Expanding vocational and entrepreneurial training would equip both youth and older farmers with the skills needed to participate in higher-return non-farm activities. Finally, investments in education, including targeted support for girls and women, will help build the human capital necessary for effective diversification and sustained poverty reduction.

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