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Do Diversified Livelihoods Alleviate Poverty? Evidence From Settled Agropastoralists In Gombe State, Nigeria

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Abstract
Agropastoralism is still a major livelihood system in many semi-arid parts of sub-Saharan Africa due to existing challenges occasioned by resource constraints and climatic variability. In Gombe State, Nigeria, several settled agropastoralist communities engage in diversified livelihood strategies as a means of coping with mounting socioeconomic stressors, declining farm productivity, and environmental degradation. This study analysed livelihood diversification strategies among settled agropastoralists as they influence poverty status in Gombe State, Nigeria. Multistage sampling procedure was employed to select 316 settled agropastoralists through structured questionnaires. Descriptive statistics, Foster-Greer-Thorbecke (FGT) poverty measure, and an Ordered Logistic Regression Model were used for the analysis. The results revealed that 58.6% of the agropastoralists were classified as core poor, 21.8% as moderately poor, and 20.6% as non-poor, indicating that more than half of the population of agropastoralists in the study area live below the poverty line. The ordered logit regression model revealed that livelihood diversification strategies and related variables that significantly influence the probability that a household head will be core poor, moderately poor, or non-poor were farm size ($p< 0.10$), income from off-farm activities ($p< 0.10$), diversification index ($p< 0.05$), cooperative membership ($p< 0.05$), social support ($p< 0.10$) and livestock holdings ($p< 0.01$). The research concluded that livelihood diversification is a key strategy for alleviating poverty among agropastoralists. The study recommends that the government and relevant stakeholders identify and support non-farm and off-farm livelihood diversification strategies in addition to agriculture as part of the national job creation objectives.

Keywords: *Diversification strategies, Livelihood, Ordered logit regression, Poverty alleviation, Settled Agropastoralists*

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I. Introduction

Livelihood diversification is one of the survival strategies to come out of poverty in most developing countries (Ayele & Senepathy, 2022). Livelihood diversification is an active social process through which rural households construct diverse income source portfolios and find new paths of raising income and social support capabilities that enable them to struggle for survival, improve their standards of living and build resilience against environmental risks (Ellis 1999; Hussein & Nelson 1998). Diversification is becoming increasingly important given the growing challenges that traditional production systems in rural and agricultural areas face in meeting livelihood needs. Many developing nations have actively promoted livelihood diversification during the past 50 years with the overarching goal of reducing poverty (Maja & Oluwatayo, 2018; Abebe *et al*., 2021). The goal of livelihood diversification is income diversification, which serves as a stand-in for improving the food system, reducing poverty, and managing shock and stress. Many rural households rely heavily on livelihood diversification as a strategy for coping with the growing population and rapidly increasing poverty rate (Maja & Oluwatayo, 2018; Abebe *et al*., 2021).

Agropastoralism is a long-standing custom that integrates crop production and livestock production and is practiced amongst settled, nomadic, and transhumant communities (Olafadehan & Adewumi, 2010; Kimaro *et al*., 2018). Agropastoralism as a livelihood is regarded as a major component of agribusiness, which particularly supports the income streams of households in sub-Saharan Africa (SSA) and serves as an important strategy for reducing poverty (Ibrahim *et al*., 2018). It is one of the most important economies in the Sahel and the primary

economic activity on the fringes of the Sahara (De-Haan *et al*., 2016). This sector contributes between 10 and 44% of the Gross Domestic Product (GDP) of African nations (Brottem & McDonnell, 2020). However, because of problems like climate change, political unrest, agricultural growth, cattle rustling, and terrorist operations that have altered the rangelands where agropastoralism is practiced, it has recently come under increased external threats (Ibrahim *et al.,* 2020). It is estimated that about 50 million people rely on farming and livestock production for their livelihoods, the majority of whom are living in poverty (De-Haan *et al*., 2016). However, a quick resurgence of insurgency, other illicit activities, and climate risk have impeded agriculture in the northern Sahel and Sahara. Extremist groups, some of which are engaged in terrorism, now call some of these regions home.

With more than half of its people classed as multidimensionally poor, Nigeria, the most populous country in Africa, continues to struggle with poverty (Onoja *et al*., 2022). According to National Bureau of Statistics data in 2022, 133 million people are classified as multidimensionally poor, while around 71 million people (63%) live in extreme poverty, according to the model-based estimate provided by the World Poverty Clock (2023). About 72% of the people live in rural areas and 42% in urban areas, respectively, with multidimensional poverty being higher in rural areas. The distribution of extreme poverty by occupational group indicated that the poor were in agriculture. This could be explained by the continued use of the conventional agricultural production system, which is marked by small land holdings, low inputs, and low productivity. Unfavourable circumstances including variable rainfall in arid regions and poor soil fertility are also significant contributing factors.

Nigeria has implemented several policies and initiatives aimed at reducing or eliminating poverty. Many households appear to do well at first on the diversification rung before falling back to lower levels of poverty. In the same vein, government and intervention agencies' efforts to keep rural livelihoods viable frequently fail, and many people end up living on the margins again. An excessive number of sustainability initiatives are introduced from outside the household. In Nigeria, reducing poverty has remained an unrealistic dream despite this extensive range of initiatives (Onyekwere & Kanu, 2022).

In previous empirical literature, various studies examined livelihood diversification strategies of pastoral and agropastoral households and poverty situations at both international and national levels. However, very few appear to have focused on how livelihood diversification strategies affect the poverty status of agropastoralists in the study area. Understanding the relationship between diversified livelihoods and poverty alleviation can provide useful insights into the kind of interventions likely to be successful in reducing vulnerability to poverty in the context of the peculiar needs of agropastoral communities. This study, therefore, aims to examine the effects of livelihood diversification strategies on the poverty status of settled agropastoralists in Gombe State, Nigeria. Specifically, it seeks to describe livelihood strategies adopted by agropastoralists in relation to their socio-economic characteristics, estimate their poverty status, and analyze the effects of livelihood diversification strategies and related factors on poverty outcomes.

II. Materials And Methods

Description of the study area

The study was conducted in Gombe State, Nigeria. It is in the center of the Northeastern part of Nigeria, bordering virtually all other states in the region. The state borders Adamawa and Borno States to the east, Bauchi State to the west, Taraba State to the south, and Yobe State to the north (Figure 1). Gombe State lies between latitudes 9:30 and 11:30 North and Longitudes 10:30 and 12:00 East of the Equator with a total land area of 20,265km^2. Gombe has two distinct climates, the dry season, and the rainy season with an average rainfall of 850mm. The temperature ranges from 13.9^{0}C to 37.8^{0}C (Arawa, 2017; Nigerian Investment Promotion Commission [NIPC], 2022).

The National Population Commission [NPC] (2017) estimated the Gombe State's population to hover at around 3.26 million in 2016. Following the Commission's population growth rate of 2.5%, the state's population can be estimated to be 3.88 million in 2023. According to the 2018-19 Nigeria Living Standards Survey (NLSS) conducted by the National Bureau of Statistics (NBS) in collaboration with the World Bank, about 62.31% of the total population was classified as poor. This implies that over 2.2 million people in Gombe State are considered poor. Furthermore, while the poverty gap of 20.03% exists in the State, the level of economic inequality is of the magnitude of 31.54% (NBS, 2021). The inventory of the livelihood sources of the State categorically comprises agriculture and trade, which form the bedrock of all the economic activities (Budgit, 2022). Accordingly, 80% of the population is engaged in agriculture (crops and livstock), while 20% are involved in trading, rock excavation, rock crushing, mining and transportation, among others (Abdullah & Wakil, 2019; Development Agenda for Gombe State, 2021).

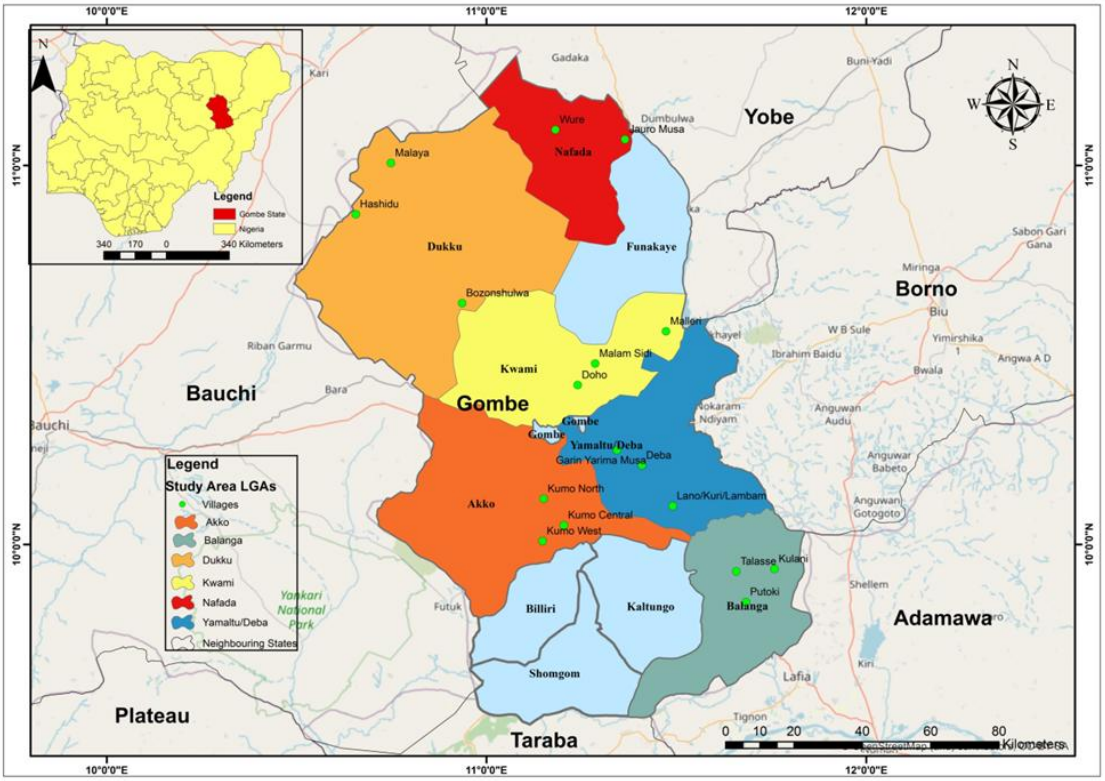

Figure 1: Map of Gombe State showing the selected LGAs and Communities

Sampling procedure and sample size

Multistage sampling procedure was used to select the respondents for the study. In the first stage, six (6) LGAs were randomly selected from Gombe State using a raffle-draw ballot-box method. These are Yamaltu Deba, Akko, Kwami, Balanga, Nafada and Dukku LGAs. In the second stage, three (3) villages/communities were randomly selected using the raffle-draw ballot-box method from each of the 6 sampled LGAs, making a total of 18 communities. The third and last stage involved the use of proportionate-random sampling to select a total sample size of three hundred and sixteen (316) agropastoralists.

Data collection

Primary data were used for this study. Data were obtained from sampled agropastoralists using a structured questionnaire administered by the researcher and experienced Agricultural Extension workers in the state using Computer Assisted Personal Interviewing (CAPI) programmed on Open Data Kit (ODK). The questionnaire was structured to comprehensively cover all the specific objectives of the study. Key areas addressed included the socioeconomic characteristics of agropastoralists, poverty status, and livelihood diversification strategies of the agropastoralists. The data collected relates to the 2023 agricultural season.

Methods of data analysis

Descriptive statistics, Foster-Greer-Thorbecke (FGT) weighted poverty measure and Ordered Logistic Regression Model were used for the research work.

The FGT index was used to was used for the quantitative poverty assessment as used by Foster *et al*. (1984) and Beyene *et al*. (2023) to estimate the poverty status of the agropastoralists in the study area. The FGT index was computed with the mathematical formula stated below:

$$P\alpha = \frac{1}{n}\sum_{i=1}^{q}\frac{(z-y_i)^{\propto}}{z} \quad \ldots\ldots\ldots\ldots (1)$$

Where

P = poverty index,

α = the FGT index, a non-negative parameter, which takes the values 0, 1, and 2,

n = total number of agropastoralists,

q = number of agropastoralists below the poverty line,

z = poverty line using 2/3 mean consumption expenditure of the agropastoralists in the study area,

y_i = the mean per adult equivalent household expenditure

Three members of FGT indices are:

i. Suppose α = 0: This equals the headcount ratio or the incidence of poverty which is the percentage of agropastoralists that are classified as core poor in the study area.

$$P_0 = \frac{1}{n}\sum_{i=0}^{q}\frac{(z-y_i)^0}{z} = \frac{q}{n} = H \quad \ldots\ldots (2)$$

ii. Suppose α = 1: This index measures the poverty depth (poverty gap index); it means the percentage shortfall of consumption below the poverty line. Here the P_α is the headcount times the average expenditure shortfall.

$$P_1 = \frac{1}{n}\sum_{i=0}^{q}\frac{(z-y_i)^i}{z} = HI \quad \ldots\ldots (3)$$

iii. Suppose that α ≥ 2, poverty index becomes poverty severity index (PSI). This weighs the poverty of the poorest individual more heavily than those just slightly below the poverty line. Squaring the gap between their expenditure and the poverty line to increase its weight in the overall poverty measure thus:

$$P_2 = \frac{1}{n}\sum_{i=0}^{q}\frac{(z-y_i)^2}{z} \quad \ldots\ldots (4)$$

Construction of the poverty line

The poverty line has been defined as the minimum or the cut-off standard of expenditure on food or per capita income below which an individual or household is described as poor (Anyanwu 1997). The use of an absolute poverty line, such as x dollars in Purchasing Power Parity (PPP), was not used due to frequent fluctuation in the country's exchange rate; hence, the study used and considered the relative poverty measurement. The advantage of this method over the dollar per day lies not only in its simplicity but in the fact that the poverty line is determined in relation to the general living standard of the whole target population and the ability to assess changes in the living standard of the people over time (Oladimeji *et al*., 2014). The household expenditure per adult equivalent was used as the poverty measure for this study because it is consistent and does not change over time when compared to income.

Agropastoralists were categorized into core poor, moderately poor and non-poor groups using the two-third (2/3) and one-third (1/3) mean per capita household expenditure as the poverty line. This approach has been used by many researchers and institutions (Oyakhilomen & Kehinde, 2016; NBS, 2020; Jatto *et al* 2021; Dia *et al*. 2023). Agropastoralists whose annual per capita expenditure was below two-thirds of the mean per capita expenditure were classified as being core poor, while moderate poor are those with per capita expenditure between one-third and two-thirds of the mean per capita expenditure. Non-poor agropastoralists were those whose annual per capita expenditure was above or equal to two-thirds of the mean per capita expenditure.

$$PCHE = \frac{Total\ Household\ Expenditure}{Total\ Member\ of\ the\ household\ (Adult\ Equivalent)} \ldots\ldots (5)$$

$$MPCHE = \frac{PCHE}{TNR} \ldots\ldots (6)$$

$$PL = \frac{2}{3} \times MPCHE \ldots\ldots (7)$$

Where:
PCHE = Per Capita Household Expenditure
THE = Total Household Expenditure
TMH = Total member of the Household (Adult Equivalent)
MPCHE = Mean Per Capita Household Expenditure
TNR = Total Number of Respondents (agropastoralists)
PL = Poverty Line

Ordered logistic regression model was used to examine the effects of livelihood diversification strategies and related variables on the poverty status of agropastoralists. This model allows for the estimation of how independent variables influence the probability of a household head falling into different poverty categories (Chatterjee & Hadi, 2006; Taye *et al*., 2024).

The ordered logistic regression model was specified as follows:

$$log\left(\frac{P(Y\leq j)}{P(Y>j)}\right) = \alpha_j - \beta_1 x_1 - \beta_2 x_2 - \cdots - \beta_k x_k \quad \ldots\ldots (8)$$

Where:

The dependent variable Y in this study is the poverty status of the household head, classified into three categories: (Core poor = 1, Moderately poor = 2, Non-poor = 3).

$P(Y \leq j)$ represents the probability that agropastoralists fall into the poverty category j or lower.

$P(Y > j)$ represents the probability that the agropastoralists are in a higher poverty category than j
α_j are threshold parameters distinguishing different poverty levels.
$\beta_1, \beta_2, \ldots, \beta_k$ are coefficients estimating the effect of independent variables on poverty status.
$x_1, x_2, \ldots, x_k$ represent the explanatory variables.

The independent variables were defined below:
X_1 = Farm size (ha)
X_2 = Annual income from crop production (₦)
X_3 = Income from livestock (₦)
X_4 = Income from non-farm activities (₦)
X_5 = Income from off-farm activities (₦)
X_6 = Diversification index (SID)
X_7 = Access to credit (the amount borrowed in ₦)
X_8 = Market access (distance from home/farm to market in Km)
X_9 = Access to Extension services (number of contacts in a year)
X_{10} = Membership of cooperative (years of membership)
X_{11} = Remittance from family/relatives (₦)
X_{12} = Income from social support programmes (₦)
X_{13} = Livestock holdings (total number of livestock in TLU)

III. Results And Discussion

Livelihood strategies adopted by agropastoralists

This study categorized the livelihood diversification strategies pursued by agropastoralists into on-farm, off-farm, and non-farm activities. On-farm strategies reported by the agropastoralists are income from the cultivation of crops (maize, sorghum, millet, rice, cowpea, ground nut, soybean, sesame, wheat, and sweet potato) and raising livestock (cattle, sheep, goat, horse, donkey, camel and poultry). Off-farm livelihood strategies identified are income generated from activities related to agriculture (outside the farm) like renting of assets (land, ox, donkey, horse cart), firewood/grass/charcoal sale, farm wage labour and sales of indigenous food and drinks. Non-farm livelihood strategies identified are income-generating activities unrelated to agriculture, like petty trade, trading of farm produce, livestock and products, construction, handcrafting and art, wage employment (skilled and unskilled) and remittances.

The result presented in Table 1 indicates that majority of the sampled agropastoralists were primarily engaged in on-farm activities, with 52% of them relying solely on this strategy. The combination of on-farm and non-farm strategies is the second most common livelihood diversification approach, with 30% of the agropastoralists adopting this method, 10% of respondents combine on-farm and off-farm activities, while 8% of the respondents were engaged in a highly diversified livelihood strategy that includes on-farm, off-farm, and non-farm activities. The high reliance on on-farm activities suggests that agriculture remains the cornerstone of livelihood for these communities. The trend is consistent with findings by Abera *et al.* (2021), who noted that in similar rural settings, on-farm activities continue to dominate due to the lack of viable alternatives and the communities' inherent reliance on agricultural production.

Table 1: Choice of livelihood diversification strategies adopted by the agropastoralists

Livelihood diversification strategies	Frequency	Percentage
On-farm	165	52
On-farm + non-farm	94	30
On-farm + off-farm	32	10
On-farm + off-farm + non-farm	25	8
Total	**316**	**100**

Source: Field survey, 2024

Distribution of agropastoralists socioeconomic characteristics in relation to their livelihood diversification strategies

Age distribution of the household head: The mean age of the agropastoralists, based on their livelihood strategies (Table 2), was 42 years, 47 years, 45 years and 45 years for on-farm, on-farm + off-farm, on-farm + non-farm and on-farm + off-farm + non-farm respectively. There is not much variation in the mean age of the agrospastoralists involved in the various categories of livelihood strategies. This implies that they are adults and within their active ages (39-59 years). This aligns with studies by Rigg *et al*. (2020) which revealed that farmers within their active ages are more open to innovation and diversification as a strategy to reduce dependence on traditional farming.

Marital status: Married household heads are predominantly involved in on-farm strategies (92%) and on-farm + non-farm strategies (97%), while only 7% of single household heads were engaged in on-farm activities. This implies that married agropastoralists diversified their livelihood activities more than others. The preference for on-farm activities among married individuals may reflect their need for stability and security in supporting their families, underscoring the importance of promoting stable and resilient farming practices in rural areas. This observation is supported by Mutua and Kamau (2020), who found that married household heads tend to prioritise stability in their income sources to meet household responsibilities.

Educational level: The results of the level of education revealed that agropastoralists with formal education were more involved in diversified livelihood strategies. Majority of those with tertiary education (59% and 48%) were involved in on-farm+off-farm and on-farm+off-farm+non-farm activities respectively. This implies that education increases the awareness of farmers in respect of the need to diversify their income towards improving their livelihoods. This is consistent with the study by Debele and Desta (2016); education is a very important variable that can help households to diversify the economy away from agriculture and increase off-farm and non-farm earnings.

Period of residence: The study revealed that agropastoralists who have settled in the area for 20-46 years were more involved in diversified livelihood strategies with mean residence periods of 33, 30, 31, and 29 years respectively. This implies that long-term residence in an area may contribute to better-established farming practices and stronger social networks that encourage continued investment in farming activities. This observation is supported by IFAD (2020) and Murken and Gornott (2022), which highlight the importance of land tenure security and social capital in sustaining agricultural livelihoods.

Household size: The distribution of household size reveals that larger households with 10 and above members were more inclined towards on-farm strategies (53%) with a mean of 12. This could be due to the availability of more household labour allowing for diversification across multiple income-generating activities. Larger households may need to diversify their livelihood strategies to meet the higher financial demands associated with their size. This assertion agrees with Ahmed (2012), who observed that households with more members tend to engage in multiple income-generating activities to mitigate risks and ensure food security. However, there is a notable engagement in on-farm activities across different household sizes, indicating that farming remains the core livelihood activity.

Table 2: Distribution of livelihood strategies among agropastoralists by socio-economic characteristics

Livelihood Diversification Strategies								
Variables	**On-farm activities**		**On-farm+off-farm**		**On-farm+non-farm**		**On-farm+off-farm+non-farm**	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Age								
18-38	64	39	7	22	25	27	9	36
39-59	88	53	22	69	59	63	13	52
60-80	13	8	3	9	10	11	3	12
Total	**165**	**100**	**32**	**100**	**94**	**100**	**25**	**100**
Mean	42		47		45		45	
Std. dev.	11.841		9.899		12.48		12.961	
Marital status								
Married	152	92	32	100	91	97	24	96
Single	11	7	-	-	3	3	1	4
Widowed	2	1	-	-	-	-	-	-
Total	**165**	**100**	**32**	**100**	**94**	**100**	**25**	**100**
Educational level								
No formal education	53	32	2	6	28	30	3	12
Primary education	21	13	1	3	12	13	3	12
Secondary education	53	32	10	31	35	37	7	28
Tertiary education	38	23	19	59	19	20	12	48
Total	**165**	**100**	**32**	**100**	**94**	**100**	**25**	**100**
Period of residence								
2-10	12	7	2	6	-	-	4	16
11-19	5	3	5	16	12	13	2	8
20-28	38	23	7	22	31	33	6	24
29-37	38	23	8	25	22	23	4	16
38-46	40	24	10	31	20	21	5	20
47-55	32	19	-	-	9	10	4	16
Total	**165**	**100**	**32**	**100**	**94**	**100**	**25**	**100**
Mean	33		30		31		29	

Std. dev.	12.768		11.924		10.631		14.365	
Household size								
1-3	13	3	1	3	4	4	4	16
4-6	39	23	13	41	24	26	4	16
7-9	26	16	8	25	20	21	4	16
10 and above	87	53	10	31	46	49	13	52
Total	**165**	**100**	**32**	**100**	**94**	**100**	**25**	**100**
Mean	12		9		11		12	
Std. dev.	7.906		4.885		6.703		8.288	

Source: Field survey, 2024

Poverty status of agropastoralists

From Table 3, the mean per capita household expenditure value of ₦88,459.25 gives a general sense of living standards in the agropastoral community. When compared with the poverty line, it suggests that a significant portion of the population might be struggling economically. The poverty line of ₦58,972.83 (two-third) is the threshold below which a person is considered core poor. Any household with a per capita expenditure below ₦58,972.83 is classified as living in poverty. The poverty incidence (P_o) value of 0.54 indicates that 54% of the agropastoralists are living below the poverty line. This means that more than half of the agropastoralists are classified as core poor. That is out of the 316 agropastoralists interviewed, 171 of them were poor. This indicates that poverty was predominant among the agropastoralists. The poverty gap index (P_1) value of 0.35 measures how far the average poor household is from the poverty line. A value of 35% means that, on average, core poor households will require a 35% rise in their per capita expenditure to become non-poor which translates into ₦20,640.49 increase in the per capital expenditure of the poor. This shows the extent of income shortfall among the poor. The poverty severity index (P_2) value of 0.27 reflects inequality among the poor. This indicates that out of 171 poor households interviewed 46 of those households were extremely poor. This implies that poverty is severe among core poor agropastoralists with about 27% of the households constituting the poorest among the agropastoralists. In other words, the squared poverty gap takes into account not only the distance separating the poor from the poverty line, but also the inequality among the poor. The result is similar to the findings of Morris *et al*. (2021) who reported a poverty severity of 17% among rural farmers and Asogwa *et al*. (2012) who also reported a poverty gap of 0.27 and poverty severity of 0.15 among farming households in Nigeria.

In addition, the core poor household value of 58.6%, moderately poor household value of 21.8% and the non-poor household value of 20.6% reiterate that 58.6% of the agropastoralists are classified as core poor, 21.8% as moderately poor and 20.6% as non-poor, indicating that only a small number of the respondents manages to live above the poverty line. The implications are that the high poverty incidence, with more than half of agropastoralists below the poverty line, means poverty is prevalent in the study area. Similarly, the depth and severity of poverty indices indicate that core poor households are considerably far from the poverty line, and inequality among them is pronounced, meaning efforts to alleviate poverty need to target not just poverty reduction but also income inequality.

Table 3: Poverty indices of agropastoralists

Poverty indices	Estimates
Mean per capita household expenditure	₦88459.25
2/3 Mean per capita household expenditure	₦58972.83
1/3 Mean per capita household expenditure	₦29486.42
Poverty incidence (P_o)	0.54
Poverty depth (P_1)	0.35
Poverty severity (P_2)	0.27
Core poor household	58.6%
Moderately Poor household	21.8%
Non-poor household	20.6%

Source: Field survey, 2024

Effects of livelihood diversification strategies on the poverty status of agropastoralists

Ordered logistic regression model was used to determine the effects of livelihood diversification strategies and related variables on the poverty status of agropastoralists. The result presented in Table 4 reveals an LR chi-square value of 115.933, with a corresponding p-value (Prob > chi^2 = 0.000) significant at the 1% level, indicating that the model is statistically significant and provides a good fit for the data. The Pseudo R-squared value of 0.513 suggests that the independent variables included in the model explain approximately 51.3% of the variation in the dependent variable (poverty status). Furthermore, the log-likelihood value of -211.001 indicates the model's convergence and adequacy in predicting the probabilities of the dependent variable categories (core poor, moderately poor and non-poor).

Farm size: The results of the ordered logistic regression model reveal that farm size has a significant negative (-0.161) effect on poverty status at a 10% significance level ($P < 0.10$). This implies that an increase in farm size reduces the likelihood of a household being poor. The negative coefficient aligns with previous studies, such as those by Ntu *et al*. (2024), which found that larger farm sizes often indicate subsistence-oriented agriculture with limited diversification into more profitable off-farm activities. The marginal effects further show that as farm size increases, the probability of being poor increases by 2.8%, probability of being moderately poor decreases by 1.8% while the likelihood of being non-poor decreases by 1.0%. This suggests that households with larger farms may face challenges in maximising productivity or diversifying their income sources.

Income from off-farm activities: Income from off-farm activities has a significant positive effect on poverty status at a 10% significance level ($P<0.10$), with a coefficient of 1.237. This suggests that income from off-farm activities increases the chances of a household head being in a better poverty category. The marginal effects further show that as income from off-farm activities increases, the probability of being poor decreases by 21.5%, the probability of being moderately poor increases by 13.6% while the likelihood of being non-poor increases by 7.9%. This implies that households with larger farms were able to maximise productivity or diversify their income sources. Off-farm income acts as a supplementary source of livelihood. This aligns with the report of the World Bank Group (2017), that income from off-farm activities plays a crucial role in poverty alleviation, particularly in rural areas.

Diversification index: It was found that the diversification index also has a significant negative effect on poverty status at the 5% significance level ($P < 0.05$), with a coefficient of -0.273. This indicates that households engaging in more diversified livelihood activities have a lower probability of being in a higher poverty category. This finding is consistent with studies by Wondem (2020) and Tizazu *et al*. (2018), which highlight the importance of multiple income streams in improving household welfare. The marginal effects show that as the diversification index increases, the probability of being poor rises by 4.8%, the probability of being moderately poor decreases by 3.0%, while the probability of being non-poor decreases by 1.7%. This suggests that excessive diversification without a focus on productivity-enhancing activities may not necessarily lead to poverty reduction.

Membership in cooperatives: Years of membership in cooperatives is another significant factor influencing poverty status at the 5% significance level ($P < 0.05$), with a positive coefficient of 0.534. This suggests that membership in cooperatives increases the chances of being in a higher poverty category. The marginal effects show that cooperative membership reduces the probability of being poor by 9.3%, the probability of being moderately poor increases by 5.9%, and the likelihood of being non-poor increases by 3.4%. This finding is in line with studies by Gidey (2020), which highlighted the role of cooperatives in providing access to credit, inputs, and market opportunities, thereby improving household welfare. Policies promoting cooperative participation can be an effective tool for poverty reduction.

Social support: It was found that social support significantly influences poverty status at a 10% significance level ($P < 0.10$), with a positive coefficient of 0.844. This implies that households receiving social support are more likely to be in better poverty categories. This finding is consistent with the works of Rockenbauch and Sakdapolrak (2017) who emphasised the role of social networks and community support in enhancing household resilience. The marginal effects show that social support reduces the probability of being poor by 14.7%, the probability of being moderately poor increases by 9.3%, and the likelihood of being non-poor increases by 5.4%. This underscores the importance of social capital in mitigating poverty.

Livestock holdings: Livestock ownership has a significant positive effect on poverty status at the 1% significance level ($P < 0.01$), with a coefficient of 43.528. This result suggests that a household with more extensive livestock holdings is more likely to be in a higher poverty category. The marginal effects show that as livestock ownership increases, the probability of being poor decreases by 7.6%, the probability of being moderately poor increases by 4.8%, while the probability of being non-poor increases by 2.8%. In rural areas, land and livestock size are the two significant bases of wealth, and household heads with many livestock and extensive farmland are respected in the area community. So, a large number of livestock owned by household heads has a positive association with poverty status. This observation is supported by Otte *et al.* (2012), that owning large livestock sizes created a better opportunity to earn more income from livestock and livestock products to fulfil necessities.

Table 4: Ordered logistic model of the effect of livelihood diversification and related variables on poverty status of agropastoralists

		Core Poor				Moderately Poor		
Variable	**Coef.**	**SE**	**P-Value**	**ME**	**SE**	**P-Value**	**ME**	
Farm size	-0.161*	0.015	0.062	0.028	0.009	0.057	-0.018	

Annual income from crop production	-0.222	0.068	0.568	0.039	0.043	0.569	-0.024	
Income from livestock	1.352	0.706	0.739	-0.235	0.446	0.739	0.149	
Income from non-farm activities	0.318	0.158	0.726	-0.055	0.101	0.728	0.035	
Income from off-farm activities	1.237*	0.127	0.090	-0.215	0.084	0.107	0.136	
Diversification index	-0.273**	0.023	0.043	0.048	0.014	0.036	-0.030	
Access to credit	-0.122	0.022	0.345	0.021	0.014	0.338	-0.013	
Access to market	0.206	0.025	0.156	-0.036	0.016	0.152	0.023	
Access to extension	0.048	0.025	0.739	-0.008	0.016	0.739	0.005	
Membership of cooperative	0.534**	0.041	0.023	-0.093	0.026	0.021	0.059	
Remittances	-0.492	0.052	0.104	0.085	0.034	0.114	-0.054	
Social support	0.844*	0.087	0.091	-0.147	0.056	0.099	0.093	
Livestock holdings (TLU)	43.528***	0.882	0.000	-7.563	0.776	0.000	4.787	
cut1	0.391							
cut2	2.285							
Pseudo R-squared	0.513							
Chi-square	115.933							
Number of obs.	316							
Prob > chi^2	0.000							
Wald chi^2 (13)	115.933							
Log pseudo likelihood	-211.001							
Conf. interval = 95%								

Source: Field survey, 2024 ****p < .01, **p < .05, *p < .1 indicate significance at less than 1% and 5% and 10% probability levels, respectively.*

Table 4: Ordered logistic model of the effect of livelihood diversification and related factors on poverty status of the agropastoralists (Contd)

	Non-Poor			
Variable	**Coef.**	**SE**	**P-Value**	**ME**
Farm size	-0.161*	0.006	0.086	-0.010
Annual income from crop production	-0.222	0.025	0.569	-0.014
Income from livestock	1.352	0.260	0.740	0.086
Income from non-farm activities	0.318	0.057	0.723	0.020
Income from off-farm activities	1.237*	0.044	0.076	0.079
Diversification index	-0.273**	0.010	0.070	-0.017
Access to credit	-0.122	0.009	0.362	-0.008
Access to market	0.206	0.010	0.175	0.013
Access to extension	0.048	0.009	0.739	0.003
Membership of cooperative	0.534**	0.016	0.039	0.034
Remittances	-0.492	0.019	0.101	-0.031
Social support	0.844*	0.032	0.093	0.054
Livestock holdings (TLU)	43.528***	0.445	0.000	2.776
Cut 1	0.391			
Cut 2	2.285			

Source: Field survey, 2024

****p < .01, **p < .05, *p < .1 indicate significance at less than 1% and 5% and 10% probability levels, respectively.*

IV. Conclusion And Recommendations

The study was designed to investigate livelihood diversification strategies' contribution to the poverty status of settled agropastoralists in Gombe State, Nigeria. The research revealed that more than half of the population of agropastoralists in the study area were engaged in on-farm activities as their sole source of household income and consequently lived below the poverty line. Livelihood diversification strategies and related variables such as farm size, income from off-farm activities, diversification index, cooperative membership, social support and livestock holdings significantly influence poverty status. Based on the findings of this study, it is recommended that since a large proportion of the agropastoralists' income is from on-farm activities, government and relevant stakeholders should identify and support non-farm and off-farm livelihood diversification strategies as part of the national job creation objectives. In addition, credit delivery mechanisms targeting the poor agropastoralists should be initiated by the government, donors (social support), and Non-Governmental Organisations (NGOs) to ensure prompt credit delivery to farmers at reduced interest rates and with longer repayment periods. This could increase their engagement in non-farm and off-farm activities that could generate more income for the households and thereby reduce poverty.

References

[1]. Abdullah, A. & Wakil, Z. A. (2019). Livelihood Resources Of Gombe Mountains: A Geographical Perspective. World Journal Of Innovative Research, 6(1): 7-10. ISSN: 2454-8236 Www.Wjir.Org

[2]. Abebe, T. Tamiru, C. & Adugna, E. (2021). The Impact Of Rural Livelihood Diversification On Household Poverty: Evidence From Jimma Zone, Oromia National Regional State, Southwest Ethiopia. The Scientific World Journal, 3(1):1-11. Https://Doi.Org/10.1155/2021/3894610. Retrieved On 31/10/2023.

[3]. Abera, A., Yirgu, T. & Uncha, A. (2021). Determinants Of Rural Livelihood Diversification Strategies Among Chewaka Resettlers' Communities Of Southwestern Ethiopia. Agriculture & Food Security 10(30): 1-10. Https://Doi.Org/10.1186/S40066-021-00305-W. Retrieved On 6/08/2021.

[4]. Ahmed, F. F. (2012). Income Diversification Determinants Among Farming Household In Konduga, Borno State, Nigeria. Academic Research International, 2(2): 555-561.0

[5]. Anyanwu, J. C. (1997). Poverty In Nigeria: Concepts, Measurement And Determinants. In: Proceedings Of The Nigerian Economic Society Annual Conference On Poverty Alleviation In Nigeria 1997. Nigerian Economic Society, Ibadan. PP. 93-120.

[6]. Arawa, A. A. (2017). The Eastern Origins Of Tangale, Bolewa, Waja And Tera Groups Of Gombe State: A Critique. Gombe Journal Of General Studies, 1(1), 41-50.

[7[. Asogwa, B. C., Umeh, J. C. & Okwoche, V. A. (2012). Poverty And Efficiency Among The Farming Households In Nigeria: A Guide For Poverty Eduction Policy. Journal Of Economic Theory 4: 6 – 10.

[8]. Ayele, T. & Senapathy, M. (2022). Livelihood Diversification Strategies By Farm Households In Southern Ethiopia. Dallas, USA: Primedia Elaunch LLC. 168 P. ISBN 979-8-88796-793-6 DOI 10.36074/Ldsbfhise-Monograph.2022

[9]. Beyene, B., Tilahun, M. & Alemu, M. (2023). The Impact Of Livelihood Diversification As A Climate Change Adaptation Strategy On Poverty Level Of Pastoral Households In Southeastern And Southern Ethiopia. Cogent Social Sciences, 9(2):1-14. DOI: 10.1080/23311886.2023.2277349.

[10]. Brottem, L. & Mcdonnell, A. (2020). Pastoralism And Conflict In The Sudano-Sahel: A Review Of The Literature. Washington, DC: Search For Common Ground. Https://Www.Sfcg.Org/Wpcontent/Uploads/2020/08/Pastoralism_And_Conflict_In_The_Sudano-Sahel_Jul_2020.Pdf. Accessed On 5/05/2021.

[11]. Budgit, State Of States (2022). The State Of States Report, Pages 98-100. <Https://Yourbudgit.Com/Wp-Content/Uploads/2022/10/2022-State-Of-States-Report.Pdf Accessed 1st December 2022.

[12]. Chatterjee, H. & Hadi, A. (2006). Regression Analysis By Example. Hoboken, NJ: Wiley.

[13]. Debele, B. & Desta, G. (2016). Livelihood Diversification: Strategies, Determinants And Challenges For Pastoral And Agro-Pastoral Communities Of Bale Zone, Ethiopia. International Review Of Social Sciences And Humanities, 11(2):37-51.

[14]. De-Haan, C., Etienne, D., Bernard, G. & Catalina, Q. (2016). Pastoralism Development In The Sahel: A Road To Stability? World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO.

[15]. Development Agenda For Gombe State (DEVAGOM) (2021). Gombe State Development Plan 2021 – 2030: Situation Analysis, Development And Sustainability Strategies. Available At: Https://Ngfrepository.Org.Ng:8443/Bitstream/123456789/3289/2/GOMBE%20DEVELOPMENT%20PLAN%202021-2030%20%28ABRIDGED%20VERSION%29.Pdf. Retrieved On 06/11/2024.

[16]. Dia, Y. Z., Oaya, D. S. & Joshua, J. (2023). Determinants Of Poverty Among Rural Farming Households In Maiha Local Government Area, Adamawa State, Nigeria. AGRICULTURA TROPICA ET SUBTROPICA, 56, 1-11, DOI: 10.2478/Ats-2023-0001. Retrieved On 6/11/2023.

[17]. Ellis, Frank. 1999. Rural Livelihood Diversity In Developing Countries: Evidence And Policy Implications. Overseas Development Institute London.

[18]. Foster, J., Greer, J. & Thorbecke, E. (1984). A Class Of Decomposable Poverty Measures. Econometrica, 52(3): 761-766.

[19]. Gidey, A. H. (2019). The Role Of Cooperatives In Improving Rural Livelihood: Evidence From Agricultural Marketing Cooperatives In The Eastern Zone Of Tigray, Ethiopia. Https://Api.Semanticscholar.Org/Corpusid:224801914

[20]. Hussein, K. & Nelson, J. (1998). Sustainable Livelihoods And Livelihood Diversification. Institute Of Development Studies. Working Paper Number 69. (Https://Www.Ids.Ac.Uk/Ids/Bookshop/Wp/Wp69.Pdf.

[21]. Ibrahim, A., Ibrahim, S. S., Amir, A. (2018). The Incidence And Impact Of Cattle Rustling In Some Rural Communities Of Katsina State, Nigeria. Federal University, Dutsin-MA Journal Of Sciences, 2(2), 288–296.

[22]. Ibrahim, S. S., Ozdeser, H., & Cavusoglu, B. (2020). Testing The Impact Of Environmental Hazards And Violent Conflicts On Sustainable Pastoral Development: Micro-Level Evidence From Nigeria. Environment, Development And Sustainability, 22(23), 4169–4190. DOI:10.1007/S10668-019-00377-6.

[23]. International Fund For Agricultural Development (IFAD) (2020). The Land Tenure Security Advantage: A Catalytic Asset For Sustainable And Inclusive Rural Transformation. Http://Ifad.Org/Documents/38714170/42014188/Landtenure_Security_Advantage.Pdf

[24]. Jatto, K. A., Akanbi, S. O., Adeoye, A. S., Oke, O. O. & Oyewole, O.O. (2021). Livelihood Diversification Among Arable Farm Households In The Forest Zone Of Oyo State, Nigeria. Nigerian Agricultural Journal, 52(2, 130-136. ISSN: 0300-368X Available Online At: Http://Www.Ajol.Info/Index.Php/Naj Https://Www.Naj.Asn.Org

[25]. Kimaro, E. G., Mor, S. M. & Toribio, J. L. M. L. (2018). Climate Change Perception And Impacts On Cattle Production In Pastoral Communities Of Northern Tanzania. Pastoralism: Research, Policy And Practice, 8(1), 1-16. Https://Doi.Org/10.1186/S13570-018-0125-5

[26]. Maja, T. & Oluwatayo, I. (2018). Livelihood Diversification And Poverty Among Rural Households In The Capricorn District, Limpopo, South Africa. The 56th Annual Conference Of Agricultural Econonomics. 25th-27th September 2018. Somerset West.

[27]. Morris, L., Onu, J. I. & Giroh, D. Y. (2021). Analysis Of Poverty Status And Coping Strategies Among Households In Michika Local Government Area Of Adamawa State, Nigeria. Journal Of Agripreneurship And Sustainable Development, 4:49 – 61.

[28]. Murken, L. & Gornott, C. (2022). The Importance Of Different Land Tenure Systems For Farmers' Response To Climate Change: A Systematic Review. Climate Risk Management, 35. Https://Doi.Org/10.1016/J.Crm.2022.100419

[29]. Mutua, J. M. & Kamau, P. M. (2020). The Influence Of Marital Status On Livelihood Strategies Among Smallholder Farmers In Kenya. African Journal Of Agricultural Research, 15(3), 452-459.

[30]. National Bureau Of Statistics (NBS) (2020). 2019 Poverty And Inequality In Nigeria: Executive Summary, May 2020. Https://Nationalpopulation. Gov.Ng

[31]. National Bureau Of Statistics (NBS) (2021). Living Standards Survey 2018-2019 [Data Set]. World Bank, Development Data Group. Https://Doi.Org/10.48529/8GBE-Z155

[32]. National Bureau Of Statistics (NBS) (2022). Nigeria Multidimensional Poverty Index. Https://Nigerianstat.Gov.Ng/News/78. Retrieved On 12/11/2023.

[33]. National Population Commission (NPC) (2017). National Population Estimates, NPC, Abuja.
[34]. Nigerian Investment Promotion Commission (NIPC) (2022). Nigerian States: Gombe State, NIPC, Abuja.
[35]. Ntu, S. L., Wonganya, C. N, & Leonard, K. (2024). The Implications Of Farm Production And Farmers' Characteristics On Poverty Reduction In Benue Division, Cameroon: A Multiple Correspondence Analysis Approach. Society And Sustainability, 6 (1), 35-46. Https://Doi.Org/10.38157/Ss.V6i1.630
[36]. Oladimeji, Y. U., Abdulsalam, Z, And Damisa, M. A. (2014). Determinants Of Poverty Among Rural Artisanal Fishery Households In Kwara State, Nigeria. Journal Of Sustainable Development In Africa, 16(3): 13-26.
[37]. Olafadehan O. A. & Adewumi M. K. (2010). Livestock Management And Production System Of Agropastoralists In The Derived Savanna Of South-West Nigeria. Tropical And Subtropical Agroecosystems, 12: 685 – 691.
[38]. Onoja, A. O., Onudorogu, C., Chagwiza, C. & Tagwi, A. (2022). Status And Determinants Of Farm Household Poverty In Southeast, Nigeria. The Journal Of Developing Areas, 56(2): 169-184. Project MUSE, Https://Doi.Org/10.1353/Jda.2022.0022. Retrieved On 6/11/2023.
[39]. Onyekwere, I. A. & Kanu, W. N. (2022). Rural Livelihood Diversification, Sustainable Poverty Reduction And Agency: A Study On Selected Communities In The Agricultural Zones Of Imo State, Nigeria. African Journal Of Social And Behavioural Sciences (AJSBS), 12 (1): 257-276.
[40]. Otte, J., Costales, A., Dijkman, J., Pica-Ciamarra, U., Robinson, T., Ahuja, V., Ly, C., & Roland-Holst, D. (2012). Livestock Sector Development For Poverty Reduction: An Economic And Policy Perspective – Livestock's Many Virtues (Pp. 161). Food And Agriculture Organization Of The United Nations. Https://Www.Fao.Org/3/I2780e/I2780e.Pdf
[41]. Oyakhilomen, O. & Kehinde, T. O. (2016) Farm Households Livelihood Diversification And Poverty Alleviation In Giwa Local Government Area Of Kaduna State, Nigeria. The Journal Of Sustainable Development, 15: 219 – 232.
[42]. Rigg, J., Phongsiri, M., Promphakping, B., Salamanca, A., & Sripun, M. (2020). Who Will Tend The Farm? Interrogating The Ageing Asian Farmer. Journal Of Peasant Studies, 47, 306–325. Doi: 10.1080/03066150.2019.157260.
[43]. Rockenbauch, T., & Sakdapolrak, P. (2017). Social Networks And The Resilience Of Rural Communities In The Global South: A Critical Review And Conceptual Reflections. Ecology And Society, 22(1).
[44]. Taye, A. T., Damtie, Y. A., & Kassie, T. A. (2024). Determinants Of Livelihood Diversification And Its Contribution To Food Security Of Rural Households In Gozamin Woreda, Ethiopia. Cogent Economics & Finance, 12(1), 2384962.
[45]. Tizazu, M. A., Ayele, G. M. & Ogato, G. S. (2019). Determinants Of Rural Household's Livelihood Diversification Strategies In Kuarit District, West Gojjam Zone Of, Amhara Region, Ethiopia. International Journal Of Economic Behaviour And Organisation, 6(3): 61-68. DOI: 10.11648/J.Ijebo.20180603.11.
[46]. Wondem, M. (2020). Livelihood Diversification Strategies In Rural Ethiopia. African Journal Of Development Studies, 32(4), 57-70. Retrieved From Https://Pdfs.Semanticscholar.Org/A1d7/A878c19753866d8cc51246b6e563f0f49e55.Pdf
[47]. World Bank Group. (2017, October 27). Growing The Rural Non-Farm Economy To Alleviate Poverty. Independent Evaluation Group. Https://Ieg.Worldbankgroup.Org/Sites/Default/Files/Data/Evaluation/Files/Ruralnonfarm.Pdf
[48]. World Poverty Clock (2023). Https://Worlddata.Io/Portfolio/World-Poverty-Clock/ Accessed On 12/11/2023.