



## ANALYSIS OF THE DRIVERS OF LIVELIHOOD DIVERSIFICATION STRATEGIES AMONG SETTLED AGROPASTORALISTS IN GOMBE STATE, NIGERIA

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### ABSTRACT

The study analysed the drivers of livelihood diversification strategies among settled agropastoralists in Gombe State, Nigeria. Multistage sampling procedure was employed to select 316 settled agropastoralists and data were collected through the administration of structured questionnaires. Descriptive statistics and Multinomial Logit regression were used to analyse the data. The results revealed that more than half (52%) of the respondents relied solely on on-farm activities, while 30%, 10% and 8% were engaged in a combination of on-farm and non-farm, on-farm and off-farm and on-farm, off-farm and non-farm activities, respectively, as livelihood diversifying strategies. The results also revealed that most (97%) of the respondents were male. The mean age of the agropastoralists based on their livelihood strategies was 42, 45, 45 and 47 years for the livelihood categories. Married individuals were more involved in the combination of on-farm and non-farm strategies (97%) and on-farm (92%). Those with formal education have greater involvement in diversified strategies. Agropastoralists with over 20 years of residence were more involved in diversified livelihood strategies, and larger households were more inclined towards on-farm strategies (53%), with a mean of 12 members. The result of the Multinomial Logit analysis showed that livelihood diversification strategies were determined by the age of household head ( $p < 0.05$ ), education status ( $p < 0.05$ ), period of residence ( $p < 0.10$ ), dependency ratio ( $p < 0.10$ ), extension contacts ( $p < 0.01$ ), membership of cooperative ( $p < 0.10$ ) and access to credit ( $p < 0.01$ ). The study concludes that agriculture remains the dominant livelihood source among the sampled agropastoralists. It is recommended that the government, non-government agencies and relevant stakeholders enhance agricultural extension services and develop quality education and vocational training programmes to encourage agropastoralists' participation in off-farm and non-farm livelihood diversification activities.

**Keywords:** Agropastoralists, Diversification, Livelihood, Multinomial, Logit, Model

### INTRODUCTION

In developing nations, rural households frequently employ diversification as a means of subsistence. Depending on the unique circumstances of each household, diversification may be required or voluntary (Musamba *et al.*, 2022). Livelihood diversification is the practice of creating a portfolio of various assets and activities to help households survive and raise their standard of living (Ellis, 1998). Household adoption of risk mitigation methods is intimately linked to the decision to diversify. Engaging in multiple livelihood activities aims to combat poverty and enhance livelihood quality by generating more revenue (Onyekwere & Kanu, 2022). To achieve a sustainable source of income, many rural households are diversifying their livelihoods into non-farm and off-farm activities, even while agriculture remains the major source of livelihood (Jatto *et al.*, 2021). Approximately 268 million people practice pastoralism across Africa, with over half practicing agropastoralism both as a way of life and a livelihood strategy (Brottem & McDonnell, 2020). Agropastoralism 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).

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. 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. An extremely diversified farm and non-farm organisation is an African household. Households in rural areas earn income through livelihood activities. Many rural households are said to 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). Experience demonstrates that while diversity benefits rural households, they typically do not retain a strong hold on the gains (Onyekwere & Kanu, 2022).

Traditional farming and livestock rearing alone may no longer provide sufficient means for sustenance, yet the factors that drive diversification efforts remain unclear (Nasa'i *et al.*, 2018). Understanding these drivers is critical for policymakers, development agencies, and rural stakeholders to design targeted interventions that enhance income security and improve living conditions. The broad objective of the study was to analyse the determinants of livelihood diversification strategies among settled agropastoralists in the study area. The specific objectives were to:

- i. identify livelihood strategies adopted by agropastoralists in the study area,
- ii. describe livelihood strategies of agropastoralists in relation to their socio-economic characteristics,
- iii. evaluate the drivers of livelihood diversification strategies among agropastoralists in the study area.

## **MATERIALS AND METHODS**

### **Description of the Study Area**

The study was conducted in Gombe State, Nigeria. It 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<sup>2</sup>. Gombe has two distinct climates, the dry season and the rainy season, with an average rainfall of 850mm. The temperature ranges from 13.9<sup>0</sup>C to 37.8<sup>0</sup>C (Arawa, 2017; Nigerian Investment Promotion Commission [NIPC], 2022). The population of Gombe State is projected to be around 4,355,000 in 2025, with a growth rate of approximately 9.8% from the estimated population of 3,960,100 in 2022. (Facts About Gombe State Population, 2025). The inventory of the livelihood sources of the State categorically comprises agriculture (80%) and trade (20%), which form the bedrock of all the economic activities (Development Agenda for Gombe State, 2021; Budgit, 2022).

### **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.

### **Method of Data Collection**

Data were obtained from sampled agropastoralists using a structured questionnaire. Key areas addressed included the socioeconomic characteristics of agropastoralists and livelihood diversification strategies. The data collected relates to the 2023 agricultural season.



### Methods of Data Analysis

Data for the study were analysed using descriptive statistics and Multinomial logistic (MNL) regression models. The descriptive statistics used were mean, frequency distribution, standard deviation, and percentages.

Multinomial logistic (MNL) regression model was used to evaluate the determinants of livelihood diversification strategies among agropastoralists. Agropastoralists were clustered into different categories. The basic assumption is that household heads in each category participate in some given livelihood strategies; hence, the goal is to predict the likelihood of a household head, with given characteristics, choosing a cluster representing an identifiable combination of livelihood activities. The probability associated with the choice of a livelihood strategy of agropastoralists is denoted by  $P_{ij}$  ( $j = 1, 2, 3, 4$ ), where  $i$  represents the household head;  $j = 1$  represents the household head choosing on-farm (Agriculture) only;  $j = 2$  represents the household head choosing on-farm and off-farm;  $j = 3$  represents the household head choosing on-farm and non-farm; and  $j = 4$  represents the household head choosing on-farm, off-farm, and non-farm income-generating activities. The estimation of the MNL model was made by normalizing on-farm (Agriculture) only livelihood strategy as a reference category for analysis. The multinomial logistic model was specified as follows, assuming that the unobserved portion of the utility ( $\epsilon_n$ ) is identically and independently distributed (iid) across alternatives (Tizazu *et al.*, 2019; Mudzielwana *et al.*, 2022):

$$P_{ij} = \frac{\exp(X_i'\beta_j)}{\sum_{j=1}^4 \exp(X_i'\beta_j)} \quad j = 1, 2, 3, 4 \quad (1)$$

With the requirement of  $\sum_{j=1}^4 P_{ij} = 1$  for any  $i$

where

$P_{ij}$  = probability representing  $i^{th}$  respondent's chance of falling into livelihood cluster  $j$ ,

$\beta_j$  = represents the covariate effects specific to the  $j^{th}$  response livelihood cluster,

$X_i$  = were the predictors of response probabilities. The predictors in this study were the livelihood assets and socio-economic factors ( $X_1 - X_{10}$ ).

Appropriate normalization that removes an indeterminacy in the model is to assume that  $\beta_1 = 0$  (this arises because the probabilities sum to 1, only  $J$  parameter vectors are needed to determine the  $J + 1$  probabilities), (Tizazu *et al.*, 2019; Mudzielwana *et al.*, 2022) so that  $\exp(X_i'\beta_j) = 1$ , implying that the generalized equation (1) above is equivalent to the following:

$$\Pr(y_i = j/X_i) = P_{ij}, j \neq 1 = \frac{\exp(X_i'\beta_j)}{1 + \sum_{j=2}^4 \exp(X_i'\beta_j)} \quad \text{for } j = (2, 3, \text{ and } 4) \quad (2)$$

and

$$\Pr(y_i = 1/X_i) = P_{i1} = \frac{1}{1 + \sum_{j=2}^4 \exp(X_i'\beta_j)} \quad (3)$$

where  $y$  = a polytomous outcome variable with categories coded from  $1 \dots J$ . The probability of  $P_{i1}$  is derived from the constraint that the  $J$  probabilities sum to 1. That is,  $P_{i1} = 1 - \sum P_{ij}$ .

The marginal effects of the explanatory variables on the choice of alternative livelihood diversification strategies are derived as follows:

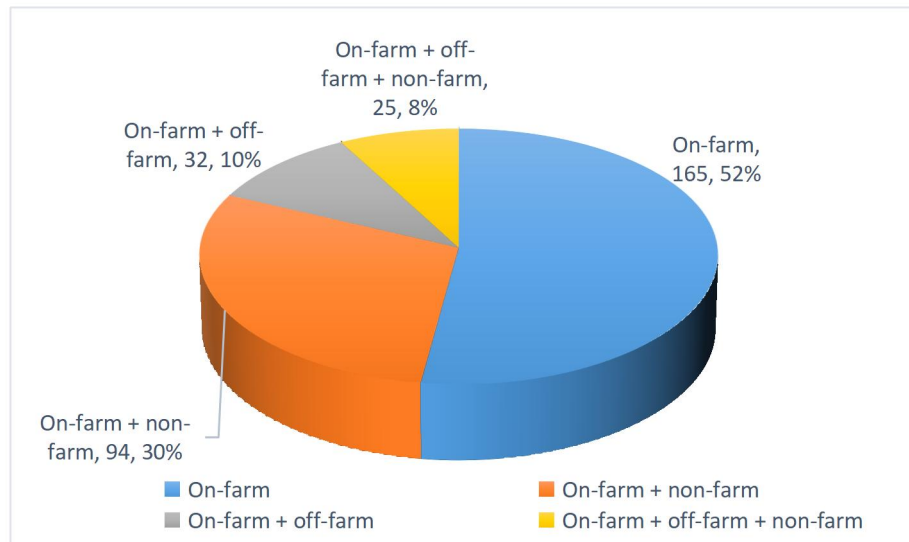
$$\frac{P_{ij}}{P_{i1}} = \frac{\eta_{ij}}{\eta_{i1}} \exp(X_i'\beta_j) \rightarrow \log \frac{P_{ij}}{P_{i1}} = X_i'\beta_j \quad (4)$$

## 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. The result presented in Figure 1 indicates that more than half 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.



**Figure 1:** Choice of Livelihood Diversification Strategies Adopted by the agropastoralis  
Source: Field survey, 2024

### **Socioeconomic Characteristics of Agropastoralists in Relation to their Livelihood Diversification Strategies**

The results in Table 1 revealed that men were predominantly engaged in the combination of on-farm and non-farm activities (97%) and on-farm activities alone (91%). In comparison, women also concentrated on on-farm activities (9%) but exhibited lower involvement in diversified livelihood strategies. This implies that men diversified their livelihood activities more than women. This finding is consistent with the studies by Quisumbing and Doss (2021), which reveal that men generally have greater access to resources, education, and capital, enabling them to diversify their livelihoods more effectively. The mean age of the agropastoralists, based on their livelihood strategies, was 42, 47, 45 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 agropastoralists involved in the various categories of livelihood strategies. This implies that in the study area agropastoralists within the active labour force (39-59 years) diversified their livelihood into different livelihood diversification activities. 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. Married household heads were predominantly involved in on-farm + non-farm strategies (97%) and on-farm strategies (92%), while only 7% of single household heads were engaged in on-farm activities. The preference for on-farm and non-farm activities among married individuals may be due to the additional income they generate from diverse livelihood activities that contribute to higher household income, enabling households to afford better food and other essential needs, potentially reducing poverty and enhancing food security. This observation is supported by Mutua and Kamau (2020), who found that married household heads tend to diversify their income sources to meet household responsibilities. Agropastoralists with formal education were more involved in diversified livelihood strategies, with individuals being notably involved in on-farm + non-farm activities (70%) and on-farm activities (68%). 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 diversify the economy away from agriculture and increase off-farm and non-farm earnings. Agropastoralists who have settled in the area for 20-46 years were more involved in diversified livelihood strategies with mean residence periods of 29, 30, 31, and 33 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. The distribution of household size revealed that larger households with 10 and above members were more inclined towards on-farm strategies (53%) and on-farm+off-farm+non-farm strategies (52%), with a mean of 12 members. This could be due to the availability of more household labour allowing for diversification across multiple income-generating activities. 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 all livelihood activities across different household sizes, indicating the need to diversify to meet households' needs.

**Table 1:** Distribution of Livelihood Strategies among Agropastoralists by Socio-Economic Characteristics

Variables	Livelihood Diversification Strategies							
	On-farm activities		On-farm+off-farm		On-farm+non-farm		On-farm+off-farm+non-farm	
	F (n=165)	%	F (n=32)	%	F (n=94)	%	F (n=25)	%
<b>Sex</b>								
Female	15	9	5	16	3	3	3	12
Male	150	91	27	84	91	97	22	88
<b>Age</b>								
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
<i>Mean/Std. dev.</i>	42/11.841		47/9.899		45/12.48		45/12.961	
<b>Marital status</b>								
Married	152	92	32	100	91	97	24	96
Single	11	7	-	-	3	3	1	4
Widowed	2	1	-	-	-	-	-	-
<b>Educational level</b>								
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
<b>Period of residence</b>								
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
<i>Mean/Std. dev.</i>	33/12.768		30/11.924		31/10.631		29/14.365	
<b>Household size</b>								
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
<i>Mean/Std. dev.</i>	12/7.906		9/4.885		11/6.703		12/8.288	

**Source:** Field survey, 2024





### **Determinants of Livelihood Diversification Strategies among Agropastoralists**

Multinomial logistic (MNL) regression was used to evaluate the determinants of livelihood diversification strategies pursued by agropastoralists with four alternative categories. The alternative “on farm” was used as a base category. The result of the MNL is presented in Table 2. The LR  $\chi^2$  value of 294.33 shows that the model is statistically significant. This means that the independent variables included in the model explained the differences in diversification strategies among the agropastoralists. Age of the household head influenced positively (0.033) and significantly the choice of on-farm + non-farm at ( $P < 0.05$ ). The result of the marginal effect implies that, if other factors are held constant, as the age of household heads increases, the chance that they would choose on-farm + non-farm increases by 3.1% relative to the on-farm category. The probable reason is that as the household heads get older, they are relatively better educated, have better access to technologies, and look for alternative livelihood opportunities. Educational level of household heads influences positively (1.288) and (1.092) and significantly on on-farm + off-farm and the combination of on-farm + non-farm + off-farm activities ( $P < 0.05$ ) and ( $P < 0.10$ ) compared to on-farm activities. The marginal effect depicts that the likelihood to choose on-farm + off-farm and combination of on-farm + non-farm + off-farm strategies increase by 18.6% and 5.9%, respectively. This indicates that educated agropastoralists may have better access to information and skills, enabling them to diversify livelihood strategies into all livelihood diversification activities. This finding is consistent with Adeyonu and Odozi (2022), who found that education equips farmers with knowledge and skills to exploit various income opportunities. The coefficient for the period of residence is negative (-0.070) and statistically significant ( $P < 0.10$ ) for choosing on-farm + non-farm strategy. Marginal effect of the model demonstrated that the likelihood of adopting the on-farm + non-farm strategy decreases by 0.9% as compared to the base category. This suggests that a longer period of residence is associated with a higher likelihood of not being able to diversify. This finding aligns with Rahman *et al.* (2018), who noted that prolonged residence without adequate support or resource renewal can lead to economic challenges. The dependency ratio was found to have a negative (-0.042) relationship with the choice of on-farm + non-farm strategies and was statistically significant ( $P < 0.10$ ). This implies that households with a high dependency ratio have a low probability level to participate in on-farm and non-farm activities. The marginal effect shows that an increase in the dependency ratio significantly leads to a 1.4% reduction in the adoption of on-farm + non-farm livelihood diversification activities. This finding aligns with Adeyanju *et al.* (2020), who reported that households with higher dependency ratios often face constraints in diversifying income due to limited labour and financial resources. The estimated coefficient of extension contacts showed a negative (-0.011) and (-0.024) and statistically significant relationship ( $P < 0.01$  and  $P < 0.05$ ) for choosing on-farm + non-farm and on-farm + off-farm + non-farm activities, respectively. The marginal effect shows that compared to the base category, an increase in extension contacts leads to a 0.6% and 0.2% reduction in the adoption of on-farm + non-farm and on-farm + off-farm + non-farm activities. This suggest that farmers who receive more agricultural extension support are better equipped or more focused on enhancing their primary farming activities, reducing the need or desire to diversify into non-farm or off-farm activities. The coefficient for membership of cooperative is negative (-0.030) and statistically significant ( $P < 0.10$ ) for choosing on-farm + off-farm + non-farm combination compared to the base category. The marginal effect shows that being a member of a cooperative society reduces the likelihood of engaging in multiple livelihood strategies by 0.9%. This implies that cooperative membership may provide a safety net or stable income, reducing the need for extensive diversification. Oladeji and Ojo (2021) also found that cooperative membership provides social and financial stability, discouraging additional livelihood diversification. As expected, access to credit was found to have a positive (3.288) and significant effect on on-farm + off-farm livelihood activities at a 1% probability level. This implies that households that get credit access are more likely to be engaged in different livelihood activities than those that do not. The marginal effect of the model revealed that the likelihood of choosing on-farm and off-farm activities increases by 32.9%.



**Table 2:** Factors Affecting Livelihood Diversification among Agropastoralists

Variables	On-farm+off-farm			On-farm+non-farm			On-farm+non-farm+off-farm		
	Coef.	SE	ME	Coef.	SE	ME	Coef.	SE	ME
Constant	22.222	501.897		-2.107	2.882		-17.249	4.81	
Marital Status	-11.678	501.882	0.0319	-1.193	0.744	0.007	-0.838	1.963	-0.0478
Age	0.014	0.036	0.0319	0.033**	0.014	-0.031	0.058	0.044	-0.0478
Educational level	1.288**	0.52	0.1857	0.005	0.137	-0.078	1.092*	0.557	0.0585
Dependency ratio	0.012	0.076	-0.0175	-0.042*	0.025	0.014	-0.069	0.086	-0.0075
Access to credit	3.288***	0.963	0.3291	-0.423	0.604	-0.057	-2.723	2.962	0.0095
Extension contacts	0.005	0.011	0.0084	-0.011***	0.003	-0.006	-0.024**	0.011	-0.002
Cooperative society	0.003	0.013	0.1279	0.002	0.004	0.096	-0.030*	0.018	-0.0094
Land ownership	-0.004	0.5	-0.3861	0.258	0.164	0.073	0.581	0.507	-0.0562
Market access	-0.005	0.02	-0.0347	-0.001	0.006	0.015	-0.006	0.018	0.0081
Period of residence	0.018	0.061	-0.0598	-0.070*	0.04	-0.009	0.032	0.025	0.02
The reference category is: 1 (On-farm only)									
Dependent variable	Livelihood diversification strategies								
Number of observations	316								
LR chi <sup>2</sup> (39)	294.33								
Prob > chi <sup>2</sup>	0.000								
Pseudo R <sup>2</sup>	0.413								
Log likelihood	-209.505								

**Source:** Field survey, 2024

*Note:* \*\*\*, \*\* and \* significant at 1%, 5% and 10% levels of probability

Coef, SE, ME (dy/dx) represents coefficient, standard error, and marginal effect, respectively.



## CONCLUSION AND RECOMMENDATIONS

The study concluded that agriculture remains the dominant livelihood source among the sampled agropastoralists. Also, livelihood diversification strategies were determined by the age of household head, education status, periods of residence, dependency ratio, extension contacts, cooperative membership and access to credit. Based on the findings of this study, education and poor access to extension services were important determinants of livelihood diversification strategy. It is therefore recommended that the government, non-government agencies, and relevant stakeholders enhance agricultural extension services and develop quality education and vocational training programmes to enhance agropastoralists' participation in off-farm and non-farm livelihood diversification activities.

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