NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 55, Number 3, December 2024, Page 269-284
Available online at: http://www.ajol.info/index.php/naj2
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Analysis of Livelihood Choices on the Economic Outcomes of Rural Households in Nasarawa State, Nigeria

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Abstract
This study analysed contributions of households' livelihood choices on their economic outcomes using income and poverty status as parameters with a view to investigating the determinants in Nasarawa State, Nigeria. A multistage sampling technique was adopted to select 390 households from the study area. The collected primary data were analyzed using frequencies, percentages, tables, bar charts, Multivariate Probit Model, Foster (MVP), Greer and Thorbecke (FGT). The empirical results of all practised livelihoods, which are farm-based, off-farm, and non-farm, accounted for 52.66%, 7.64%, and 39.70% with average incomes of N142, N157.24, N63, 523.35 and N89, 642.37 respectively. Farming was most practiced and contributed more to households' income, thereby reducing poverty. Overall average annual income amounted to N117,535.9. The pooled data of poverty status revealed 43.59% were poor, while 56.41% were non-poor. In addition, livelihood choices determinants included gender, education, market, credit, farmland, extension services, membership of a cooperative, and Climate Smart Agriculture.
Keywords: Livelihood choices, economic outcomes, rural households

Introduction

Living is having resources and the ability to sustain life. Living, necessary skills, assets, and activities are all represented by livelihood (Belonwu, Umeri, Moseri, Nwabeze, 2024). In Nigeria, farming is known to be the major livelihood activity engaged by occupants of rural areas (Mgbado, 2010; Ekong, 2005; Akpabio, 2005). Rural households participate in various activities to raise income and improve the level of living in their homes. In the study area, some rural dwellers work in small-scale industries such as handicrafts, construction, repairs, and petty commerce; very few of them pursue these as their primary jobs; instead, they combine these activities with farming, and a larger percentage of them are full-time farmers. According to Mgbada (2010), a lack of or insufficient social, physical, and institutional infrastructure is one of the main issues facing rural areas, which are also defined by their proximity to nature, farms, occupations related to farms, low population density, small and homogeneous communities, strong social control, low standard of living, and strong social cohesion. The idea of livelihoods has greatly advanced our understanding of the economic activities that households partake in and the role that capital and assets play in determining their capacity to do so (Scoones *et al*., 2018; Loison, 2015 and Niehof, 2004). The socioeconomic factors of a home,

particularly the talents available to its members, influence the livelihood strategy that the household chooses to employ (Jianchu, Fox, Vogler, Peifang, Yongshou, and Lixin, 2005 and Sen, 1981). Here, livelihood skills refer to the opportunities, resources, and talents for achieving household and individual economic objectives like revenue creation. Vocational and technical skills are examples of livelihood skills such as carpentry, sewing, weaving, and gardening, among others.

According to Ekong (2010), a settlement with 20,000 people or fewer and primarily agrarian professions is considered a rural region in Nigeria. He emphasized that these kinds of settlements are typically linked to the absence or insufficiency of fundamental amenities or infrastructure, such as piped water, electricity, hospitals, a good road system, industries, contemporary banking services, commercial/civic centers, recreational facilities, high-quality cuisine, and so forth. In this community, at least half of the working-age male population makes their living from agricultural activity. The livelihood of the rural dwellers can then be precisely said to comprise the activities, capabilities, and assets they require for their living and sustainability. The many sectors of the rural economy that farming households choose to pursue can be categorized as follows by Ellis (1998) and Barrett *et al*. (2001):

- Farm income: This sort of revenue comes from using land that has been inherited, bought, rented, or made accessible through share tenancy for agricultural purposes, such as raising crops, cattle, fisheries, and forests.
- Off-farm income: In the context of agriculture, this is the kind of money or wage obtained through the employment of one's labor on other farms.
- Non-farm income: This comprises revenue from non-agricultural sources, such as non-farm jobs, transfers, rents, rural wages, and money from distant family members to an agrarian household (Ellis, 2000). From the foregoing classification and following the works of Kassie *et al*. (2017) and Gebru *et al*. (2018), On-farm (agriculture alone), on-farm with off-farm (ONF-OF), on-farm with non-farm (ONF-NF), and on-farm, off-farm, and non-farm (ONF-OF-NF) are the four mutually exclusive livelihood choices that agricultural households are categorized into (Aboud *et al*., 2001). The income from the choices of livelihood activities in one way or the other reduces poverty. Danaan (2018) noted that there are divergent views on the nature of poverty, how to determine whether it is rising or falling, and the understanding of transition from being 'nonpoor' into the poverty trap. Poverty can be complex and multi-dimensional. Poverty, according to World Vision Canada, is also the inability to afford basic needs, including clothing, food, clean water, shelter, health care, education, and even transportation.

This study therefore seeks to provide information on the different livelihood activities of rural households in the study area. The study went as far as getting recent information on livelihood activities practised by the households, ranked the activities based on their choices, and then the percentage distribution of the choices within each livelihood category (farm-based, off-farm, non-farm) was determined. The analysis brought about the most preferred livelihood activity practised by the rural households in the study area. The study demonstrated that farm-based is the most practiced and has a significant effect on rural households' economic results (income and poverty status) in the study area. Rural households that are into farming had an average annual income of N142, 157.24 compared to non-farm and off-farm livelihood activities, which were N89, 642.37 and N63, 523.35, respectively.

This study contributes to the literature by evaluating rural households' income and poverty status, taking into consideration the diverse choices of activities engaged in by the households towards achieving their living goals. It is realized that the results of this study will contribute to the conception of an antipoverty drive in the study area and also in rural Nigeria, where the majority of the population is poor. The questions that are central to the study are: firstly, what are the livelihood activities of the rural households in the study area? Secondly, what is their choice(s) of livelihood and the contributions to households' economic results (income and poverty status), and

thirdly, what factor determines the choices of livelihoods?

Methodology

Study area

The study was carried out in Nasarawa State, North Central Nigeria. The State has Latitude 8^0- $9^0$30'N (approx.) and longitude 7^0- $9^0$30'E (approx) and has a population of 2.13 million (National Population Commission, 2016) and an average growth rate of 2.5 percent, occupying an area of roughly 32,500 km2 (Nasarawa State Ministry of Information, 2012). Agriculture is the mainstay of its economy, with the production of varieties of cash crops throughout the year. Some of the inhabitants of the State are into the sales of forest products, while most of them cultivate food crops such as grains and legumes, root and tubers, vegetables, and fruits.

Data collection and sampling procedure

Data used for this study were collected from primary sources through the administration of a well-structured questionnaire on rural households in the study area. A multistage sampling technique was adopted for the study. The thirteen (13) Local Government Areas (LGAs) of the state were selected. At the first stage, three (3) communities were randomly selected from each of the LGAs in the state, making a total of thirty-nine (39) communities. Thereafter, at the second stage, a random sampling technique was used to select 10 respondents from each community, which gave a total of 390 respondents.

Data analytical procedure

The different analytical techniques used to analyse the data for the study included: descriptive statistics such as tables, bar charts, Multivariate Probit Model (MVP), and Foster, Greer and Thorbecke (FGT).

Empirical specifications

A table comprising frequency and percentage was used to analyse the livelihood classification/category, which are farm-based, off-farm, and non-farm of the rural households, also, a bar chart was used to analyse the distribution of choice of livelihood activities within each category.

Multivariate Probit Model: **A** Multivariate probit model was used to analyze determinants of rural households' choice of livelihood activities in the study area. The multivariate probit model helped to account for the heterogeneities in the determinants of choices among different alternatives, and relationships between them; either they were complementary or competing (Kassie *et al*., 2009). Random utility for individual choice can be used to mimic the observed outcome of lifestyle choice (W.H. Greene, Citation 2012). Think about the ith rural household (i = 1, 2… N) that is faced with a choice dilemma regarding the possible livelihood strategies. Let U0 be the household's utility when choosing a farm-based livelihood, and Uj be the household's utility when selecting the Jth livelihood strategy, where J stands for any alternative strategy. Which one is more useful is revealed by the observed choice between the two. As a result, the family selects the J^{th} livelihood strategy if $U_j > U_o$. The multivariate probit model can be specified as:

$$y_{ij*} = x_i\beta_j + \varepsilon_i \quad \text{.....1}$$

Where;

y_{ij*} = The latent utility of selecting method j is represented by an unobserved variable.

x_i = Vector of explanatory variables determining the choice of livelihood strategy.

β_j = Error term vector ε is a vector of unknown coefficients that need to be estimated.

ε_i = Random error term

Yij* is an unobservable latent variable denoting the probability of choosing a j type of livelihood strategy by an individual, for j = 1 (farm-based), j = 2 (off-farm), j = 3 (non-farm). The model can be specified as follows:

$y_{i1} = x_1\beta_1 + \varepsilon_{i1}$ …… ..2

$y_{i2} = x_2\beta_2 + \varepsilon_{i2}$ ……..3

$y_{i3} = x_3\beta_3 + \varepsilon_{i3}$ ……..4

Where Xi is the vector of factors influencing the choice of livelihood strategy, β is the vector of unknown parameters, and εi is the error term. Yi1 is equal to 1 if the household chooses a farm-based livelihood (0 otherwise), Yi2 is equal to 1 if the household chooses a non-farm livelihood (0 otherwise), and Yi3 is equal to 1 if the farmer chooses an off-farm livelihood (0 otherwise).

explicitly;

$y_i = \beta_0 + x_1\beta_1 + x_2\beta_2 + x_3\beta_3 + x_4\beta_4 + x_5\beta_5 + x_6\beta_6 + x_7\beta_7 + \ldots\ldots + x_{12}\beta_{12} + \varepsilon_i$ ……..

where,

y_i = choice of livelihood options (farm-based, off-farm, and non-farm)

β_0 = constant term

X_1= Age of respondents (years)

X_2 = Gender of respondents (Male =1, female = 0)

X_3 = Level of education of household heads (No formal edu=1, primary edu.=2, senior sec.edu=3, post sec edu.=4)

X_4 = Household size (number of persons)

X_5 = Access to farmland (Yes=1, No=0)

X_6 = Access to market (Yes=1, No=0)

X_7 = Membership of cooperative (Yes =1, No = 0)

X_8 = Access to credit services (Yes =1, No = 0)

X_9 = Access to extension services (Yes =1, No = 0)

X_{10} = Entrepreneurial skills (Yes =1, No = 0)

X_{11} = Past erosion hazard (Yes =1, No = 0)

X_{12}= Adoption of Climate Smart Agriculture (CSA)

ε_i = error term

In the multivariate probit model with the possibility of choosing multiple income livelihood options, the error term jointly followed a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity,

i.e., $(u_m, u_c) \xrightarrow{MVN} (0, \Omega)$ and the covariance matrix (Ω) is given by:

$$\Omega = \begin{bmatrix} 1 & \rho CM & \rho CT \\ \rho MC & 1 & \rho MT \\ \rho TC & \rho TM & 1 \end{bmatrix} \text{……..6}$$

Where ρ denotes the pairwise correlation coefficient of the error term corresponding to the income livelihood options. The use of a multivariate probit rather than a univariate probit for each income livelihood option is justified if these correlations in the off-diagonal members of the covariance matrix become non-zero.

The Foster, Greer, and Thorbecke (FGT) Poverty Status Analysis*:* The Foster, Greer, and Thorbecke (FGT) poverty index was used to determine poverty levels among the respondents in the study area. It is generally given as:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{\varepsilon}\left[\frac{Z-Y_i}{Z}\right]\alpha \text{……..7}$$

where P = Foster, Greer and Thorbecke index (0≤ P≤ 1)

N = total number of respondents sampling the rural households

q = number of respondents below the poverty line that are poor people

z = the poverty line

Yi= per capita household expenditure of the ith respondent.

α = non-negative poverty aversion parameter (0, 1, or 2).

The analysis of the poverty status of the rural households was decomposed into the three indicators, i.e., prevalence of poverty (P_0), poverty depth (P_1), and severity of poverty (P_2). If α = 0, the index becomes P_0= q/n. This gives the head count ratio or the incidence of poverty, which is the percentage of respondents in poverty whose per capita expenditure is below the poverty line. If α = 1, it indicates the percentage of the poverty line that the average poor person will need to reach to reach the poverty line, or the incidence and depth of poverty. The index, which is the mean square percentage of the poverty gap, measures the severity of poverty if α = 2. It provides the percentage that a poor household's per capita spending should rise by to lift them out of poverty when multiplied by 100.

Results and Discussion

Livelihood Activities of Rural Households in the Study Area

Farm-based Livelihood Activities Practised by the Rural Households

As presented in Table 1, grains, legumes, root crops, and vegetable production accounted for 100%, 97.69%, 91.54%, and 90.77% of rural households' sources of income. This indicates that most of the respondents majorly cultivated crops. Grains and legumes ranked 1st and 2nd overall income source of the respondents in the study area. The major source of income of the rural farmers comes from the production of grains and legumes. According to Mhango (2011), Grain legumes are crucial to the livelihoods of smallholder farmers. From a producer's perspective, adding legumes to the farm improves soil fertility and increases the quantity and

consistency of household revenue sources. Legumes are regarded by customers as one of the most affordable protein sources for vegetarians and as a way to meet their vitamin and mineral needs. (Joshi *et al*., 2000). The root crops grown in the study area are cassava and sweet potato. Vegetable farming has been ongoing for decades in Nigeria, contributing to income and serving as a means of employment for the growing population, especially dry season vegetable farming (Mukaila *et al*., 2021; Sabo and Zira, 2009). Thus, vegetable production has a great tendency to curb the problem of malnutrition and the high poverty rate among rural people (Imathiu, 2021; Schreinemachers *et al*., 2018).

Further analysis showed that the respondents were also involved in tuber, fruit, and oil crop production. All the farm-based activities of the respondents ranked from 1st to 10th among the overall activities, respectively. This shows that the rural households are mainly into farming activities for survival. Despite complaints of the worsening security and farmer-herder conflicts situation that made many rural farmers in the study area fled their farmlands for safety and fear of being kidnapped. A lot of them, especially farmers from Tatara, Angwan Barao, and Kokona Communities, still tried to cultivate for commercial and consumption purposes. This confirmed the report of Yusuf (2020) that food production has not been growing in the past few years due to insecurity.

Off-farm Livelihood Activities Practised by Rural Households in the Study Area

As presented in Table 1, it was revealed that the gathering and selling of non-farm timber products and hunting were responsible for 31.79% and 20.77%, ranking 14th and 17th of the farmers' sources of income. Further analysis showed that the respondents were involved in other off-farm activities like livestock, poultry, and fish farming. This corroborates Devereux (2001), who asserted that low-income households that are at risk during uncertain times adopt a variety of coping strategies, including cutting back on spending. This implies that most of the rural farmers maximize profits and minimize costs by sourcing the products they sell from the forest and bushes, where they do not have to pay.

Non-farm Livelihood Activities Practised by Rural Households in the Study Area

The Non-farm category presented in Table 1 showed that rural households in the study area are involved in non-farm activities. According to the source, farming as a principal source of income for most rural households in the study area is been augmented with non-farm activities. Hence, non-farm activities have become an additional survival strategy for most rural farm holders. The results revealed that the majority, 94.87% and 93.08% of the respondents, were into petty trading and processing, which ranked 3rd and 4th most practiced livelihood activity of the respondents in the study area. Further analysis showed that some of the respondents were engaged in farm labouring jobs, manufacturing, community services, and so on. Previous studies on rural livelihoods demonstrated that, in emerging nations, the rural economy no longer relies exclusively on agriculture but rather on the idea of livelihood diversification as a means of addressing their fundamental requirements (Ellis, 1999). This is following Maniriho and Nilsson (2018), who concluded that rural farming households are able to spread risk and improve revenue creation by diversifying their sources of income.

Choices of Livelihood Activities of the Rural Households

Distribution of Choice of Livelihood Activities within Farm-based Category

An engagement with selected household heads in the study area revealed that crop farming is still upheld as a livelihood activity in the area, though cultivation of some crops is not as dominant as it used to be during the initial years of resettlement due to insecurity. According to Krantz (2001) and Ellis & Allison (2004), the term "livelihood" describes how individuals pool and utilize their resources, skills, and activities to ensure a standard of living.

The results in Figure 1 showed that grains and legumes accounted for 16.93% and 16.54% of

household choice within farm-based activities, followed by root crops and vegetables, which accounted for 15.49% and 15.36%, while tuber crops, fruits production, and oil crops accounted for a lesser percentage. In many parts of Asia and sub-Saharan Africa, grain legumes are nutrient-dense parts of smallholder farming systems. Their capacity to fix nitrogen enhances soil health, and their higher protein and micronutrient contents enrich diets. (Ojiewo *et al*., 2018). The households' heads in the study areas where fruit production is dominant confirmed the low production as a result of the pest and disease rampage. According to FAO (2020), many harmful insects cause economic losses in fruit growing. Makita (2016) found that in areas with favourable conditions for agricultural output, such as minimal danger of extended drought, land degradation, flooding, and catastrophic weather events, people are more likely to specialize in agriculture (on-farm) as a means of subsistence.

Distribution of Choice of Livelihood Activities Within Off-farm Category

The distributions presented in Figure 2 explained that the most chosen livelihood activity within off-farm was gathering and selling of non-timber forest products, which accounted for 36.9%. The report also revealed that within off-farm activities, the respondents were found to be more involved in hunting and livestock production.

This unique market for the off-farm products found outside agricultural holdings in the study area was mainly due to cushioning the effect of failures from rain-fed agricultural production. This is in agreement with Khatiwada, Zhang, Paudel, and Deng (2017), who said that rural people build a portfolio of livelihood activities to meet and perhaps improve livelihood outcomes by combining a variety of income-generating activities, including off-farm work.

Distribution of Choice of Livelihood Activities within Non-Farm Category

Non-farm livelihood activities are predominantly relied upon for household expenditures, so the proceeds from the farm are used to promote and expand farm production. The distribution of respondents by activities within non-farm livelihoods, as indicated in Figure 3, showed that trading (21.2%) accounted for the highest choice of livelihood activity within the non-farm category. The respondents were also much engaged in the processing of farm produce (20.8%) and farm labouring jobs (15.9%). The other non-farm activities accounted for a smaller percentage distribution in respondents' choice of livelihood activities. This suggests that the respondents are taking their livelihood pursuits seriously to support themselves on the farm. The respondents' participation in the various activities proved to the fact that rural households support agriculture, the backbone of their economy, with the money they earn from their endeavours. This result is consistent with a similar study conducted in Ogun State by Fabusoro *et al*. (2010), who found that rural households varied their sources of income during the year's rainy and dry seasons.

Distribution of Rural Households' Choices across the Major Livelihood Activities

Figure 4 presents the result of the overall choice of livelihood activities of the households in the study area. Farm-based activities accounted for 52.66%, followed by non-farm (39.70%), and off-farm, which was the least accounted for (7.64%).

Therefore, farm-based livelihood activities made the highest choice of rural households, followed by non-farm livelihood activities, while off-farm activities were found to contribute the least to rural households' choice of activities in the study area. This shows that despite the various livelihood activities of the respondents in the study area, agriculture is the major source of their income. This result agrees with the findings of Wondim (2019), who stated that the rural people diversify into farm activities to explore opportunities through which they increase and stabilize their incomes in order to improve the welfare or living standard of their households.

Contributions of Livelihood Activities to Households' Income

According to IFAD (2014), rural people have always been known to source their income from economic activities that are the bedrock of Nigeria's economic development. An increase in the number of livelihood activities has contributed to rural households' income, and this study also described rural households with insufficient income to acquire the necessities of life to be poor. It is therefore imperative that the focus of this study be on the contributions of choices of activities to rural households' income and poverty status. Rural areas' varied economic activity makes it possible to accumulate capital investments in small businesses. Additionally, it provides rural households with a wider range of economic options (Lay *et al.*, 2008) and also reduces the incidence of poverty. World Bank (2014) stated that historical trends of poverty can be analysed using the poverty line and the three Foster, Greer, Thorbecke (FGT) measures of poverty.

The average annual income presented in Table 2 gave a summary of the average annual income of farm-based, off-farm, and non-farm livelihood activities of the rural households in the study area. The results from the Table indicated that the overall average annual income of the rural households, which was a combination of income from farm-based, off-farm, and non-farm, amounted to N117,535.9. Livelihood activities from farm-based, off-farm, and non-farm contributed 52.55%, 7.66%, and 39.79% to rural households' income with averages of N142, N157.24, N63,523.35, and N89,642.37, respectively, in the study area. This showed that the majority of the rural households' livelihood relied solely on farm-based activities. According to Olowa (2012), Nigeria is mostly known for its rural settlements with high poverty indices. Accordingly, farming continues to be the primary occupation of the populace. However, non-farm activities are equally important because agriculture alone cannot lower the high level of poverty. Since the agricultural sector continues to be the biggest supplier of intermediate production inputs to other economic sectors, growth in rural non-farm employment is frequently closely related to growth in the agricultural sector (Briones, 2017).

Due to the fact that farm labor can be used in non-farm sectors for production, processing, distribution, and marketing, Odoh (2015) believes that agriculture has an impact on non-farm activities. As a result, it is impossible to overlook the role that non-farm revenue sources play in the rural economy. As earlier stated, a lot of rural farmers in the study area reported they did not cultivate in places where they usually grow crops because of insecurity and destruction of farmlands. According to earlier research (Awoyemi, 2004; Jonasson, 2005), non-farm economic activity plays a significant role in the rural economy. In this regard, rural households' actions toward diversifying their sources of income and employment in favor of non-agricultural pursuits may be viewed as a crucial prerequisite for the country's rural poverty alleviation. The result is in line with Ovwigho (2014) findings which stated that, to make up for the income shortage caused by the seasonality of primary agricultural production and to establish a steady flow of income to meet the diverse demands of the household, farmers, and rural farm families in particular, typically participate in a variety of non-farm income-generating activities.

Analysis of Poverty Status (Headcount)

The Foster, Greer, and Thorbecke (FGT) measures of poverty of the rural households in the study area, presented in Table 3, showed that the poverty line was ₦9,768.28. This means that any household spending below this amount (per capita) was categorized as being poor, and, household with expenditure above the amount was classified as non-poor. The poverty line was computed from the pooled data and used as a benchmark for the rural households per capita in the study area. The percentage of spending needed to get impoverished households from below the poverty line to above it is known as the poverty gap, and it was determined to be 0.181. The poorest rural households that need assistance with income-generating activities are represented by the severity of poverty index, which was 0.109.

The pooled data revealed that 43.59% of the rural households were poor while 56.41% were non-poor in the whole study area. The result shows that less than half of the rural households were poor due to their involvement in the agricultural drive. The findings aligned with the work of Oyakhilome and Kehinde (2016), who found poverty prevalence in the rural areas to be below 50.0%. In their research, Abubakar and Abubakar (2023) came to the conclusion that a strategy centered on agriculture, which employs more than 70% of Nigerians and more than 80% of Nasarawa State's population, could be a way to alleviate the current economic downturn in both Nasarawa State and Nigeria overall.

Determinants of Rural Households' Choices of Livelihood Activities

In order to survive, rural households in the study area had to choose between three main sources of income. The Multivariate Probit (MVP) model was used to analyse the determinants of households' choices of livelihood activities, as households were more likely to choose different livelihood activities simultaneously. The model was estimated jointly for three categorical dependent variables, namely: (1) farm-based, (2) off-farm, and (3) non-farm livelihood activities. The signs of correlation coefficients indicated the complementary and competitive nature of different livelihood strategies. The outcome of the MVP model operation in the study area explained that some of the explanatory variables were statistically significant on most independent variables, as observed in Table 4. The MVP model results revealed that a number of variables are significant in rural households' choice of farm-based option as below.

Gender: Gender of households' heads was positively and significantly associated with the likelihood of choosing farm-based activities at a 5% level but negatively and significantly associated with the likelihood of choosing non-farm activities at a 5% level of significance. The results explained that male-headed households are more likely to choose farm-based activities as their livelihood strategies than female household heads, who are more likely to combine farm-based and non-farm activities as their livelihood strategy. This suggests that men are more willing to work on farms. However, in the study area, women also participate in farm activities like weeding, harvesting, winnowing, and so on. Reports from other studies, for instance, that agree with this study, Kassie (2017), reported that being a male household head has significantly influenced agriculture.

Age: Age had a negative coefficient, which significantly decreases rural households' likelihood (5%) of choosing farm-based activities. From the results, the likely reason is that the younger household heads tend to be more productive and, most especially, accept new farming innovations, hence they get more skillful returns from specializing in on-farm livelihoods than a choice to diversify into off/non-farm activities with low remuneration. Ojo and Baiyegunhi (2018) have also expressed that the age of the household head exhibited a negative relationship in influencing rural households' decision to embrace change. This could probably be associated with older rural households being unaware of recent innovations due to apprehensions.

Household Size: Household size positively and significantly affected the likelihood of choosing non-farm activities at a 5% significance level, effectively reducing rural households' efforts in pursuing on-farm livelihood activities at a 10% level of significance. This implies that as household numbers rise, so does the necessity for rural household heads to provide for their families and the opportunity for additional sources of income. The ability of households to cover the subsistence demands of their families is diminished when the number of economically inactive household agricultural members' rises. This result is in line with the findings of Amevenku, Asravor, and Kuwornu (2019), who indicated that those households with a high dependent ratio are more likely to choose non-farm over farm-based.

Level of Education: Education had a positive coefficient with rural households' decisions on

agricultural innovation and significantly increases their likelihood of choosing on-farm income livelihood alternatives at 5%. This result shows the important role of formal education in the pursuit of on-farm livelihood activities, perhaps they have access to better information and some training that gives them have edge over those with less education. Ahmed (2015) likewise found that education influences rural choices and decisions of farmers, while Brick and Visser (2015) further underscored the finding that educated people tend to be less risk-averse, and so they have a higher tendency of exploring new changes.

Access to Market: Market access positively and significantly influenced the likelihood of choosing a farm-based livelihood strategy at a 1% significance level. Households whose residences are close to markets are more likely to engage in farming as it is easy to take their produce to market, which affects productivity and income level. This is in agreement with the findings of Asfaw, Simane, Hassen, and Bantider (2017), who stated that farmers are less inclined to engage in agricultural activities if they reside farther from the market centers.

Membership of Cooperatives: Membership of cooperatives had a positive coefficient with rural households' choice and significantly increases the likelihood (1%) of choosing farm-based, and also positively significant with the choice of off-farm and non-farm at 10%. This showed that rural households benefitting from cooperative societies expand their livelihood activities, especially farmers who get agricultural input for farming. This result is consistent with the findings of Mulwa, Marenya, and Kassie (2017), who found a relationship between membership of cooperatives and engaging in new practices.

Access to Credit: Access to credit had a positive coefficient and significantly increased rural households' probability of choosing non-farm activities by 5% and positively choosing farm-based and off-farm livelihood activities by 10%, respectively. This showed that access to credit supports all households' livelihood activities. If rural households have access to loans and perhaps a measure of investment protection, the possibility of increasing the activities of farm-based off-farm and non-farm income options is very certain. It also agrees with the finding by Fabusoro, Omotayo, Apantaku, and Okunneye (2010) and Adetayo (2014) who reported that access to credit has a positive influence on livelihood.

Access to Farmland: There was a positive and significant coefficient (1%) with rural households' choice that increased the likelihood of selecting farm-based income livelihood activities, but negative for non-farm income livelihood activities at a 5% level of significance. The cultivation of farmlands that can be accessed easily gives rural households a measure of confidence to stay back in farm-based income livelihood activities without the fear of sanction or quit notice that may arise with a community or rented farmlands. Having a secured land title promotes a rural household's investment in farm-based income engagement but does not encourage non-farm income livelihood alternatives.

Entrepreneurial Skills: Access to entrepreneurial skills had a positive and significant coefficient for the choice of non-farm income alternative livelihoods at 1% and was negatively significant (5%) for the choice of farm-based livelihood activities in the study area, thereby jeopardizing their full-time participation in farm-based income livelihoods. This is following Ihejiamaizu (2019), who described rural entrepreneurship as that which emphasises rural on providing for the needs of the rural dwellers through employment generation and rural development.

Extension Services: It was found that extension services had a positive and significant coefficient with rural households' choice of farm-based and off-farm income livelihood alternatives at 1% and 5% respectively, but had a negative relationship with the choice of non-farm (5%) livelihood activities. Access to extension services, particularly for rural populations, is an ongoing process of sharing information about the most recent advancements in agricultural technology for field application and feedback to identify issues that arise for future technological advancements. It

increases the number of opportunities for small-scale businesses through innovations.

Erosion Hazard: Experience of erosion hazard had a negative coefficient with rural households' choice of farm-based activities and significantly decreased the likelihood by 1% and increased the likelihood of off-farm and non-farm activities by 1%. Soil erosion has an enormous negative impact on farming. In the study area, after the experience of erosion hazard, the rural farmers adopted Climate Smart Agriculture (CSA) to help revive the soil for sustaining agricultural growth. This is following Lipper *et al*. (2014), Tambo and Kirui (2021), in the face of climate change, climate-smart agriculture (CSA) techniques have been suggested as a useful instrument for boosting and maintaining agricultural productivity in rain-fed production systems.

Climate Smart Agriculture: Practice of CSA in the study area after experience of erosion hazard had a significant and positive coefficient with rural households' choice of farm-based activities at 1% and a negatively significant to non-farm choice of activities at 1%. According to FAO (2016), climate-smart agriculture (CSA) practices are farm management technologies that sustainably boost resilience, productivity, and greenhouse gas reductions in order to better meet national food security and development objectives.

Conclusion

The empirical findings revealed that farm-based livelihood activity is the most practiced in the study area. Livelihood activities from farm-based, off-farm, and non-farm contributed 52.55%, 7.66%, and 39.79% to rural households' income with averages of N142, N157.24, N63,523.35, and N89,642.37, respectively, in the study area. The overall average annual income of the rural households, which was a combination of income from farm-based, off-farm, and non-farm, amounted to N117,535.9. The Multivariate Probit Model results revealed that a number of variables were significant in rural household choice of farm-based livelihood activities. The Government, in collaboration with Research Institutions and stakeholders, should conduct capacity building and training programs for rural dwellers and active actors (input suppliers, primary producers, also referred to as farmers, wholesalers (agents or traders), and processors) in the agricultural value chain at the grassroots level. The solutions will improve the living standards in rural areas of developing countries, reduce the price of food, and cut the cost of living, which will sustain their income and reduce poverty. The Government, in partnership with Stakeholders and the Private sector, should invest in the rural areas to bridge the gap of underdevelopment. Extension services and cooperative societies should be introduced for training and easy assessment of funds and farm inputs.

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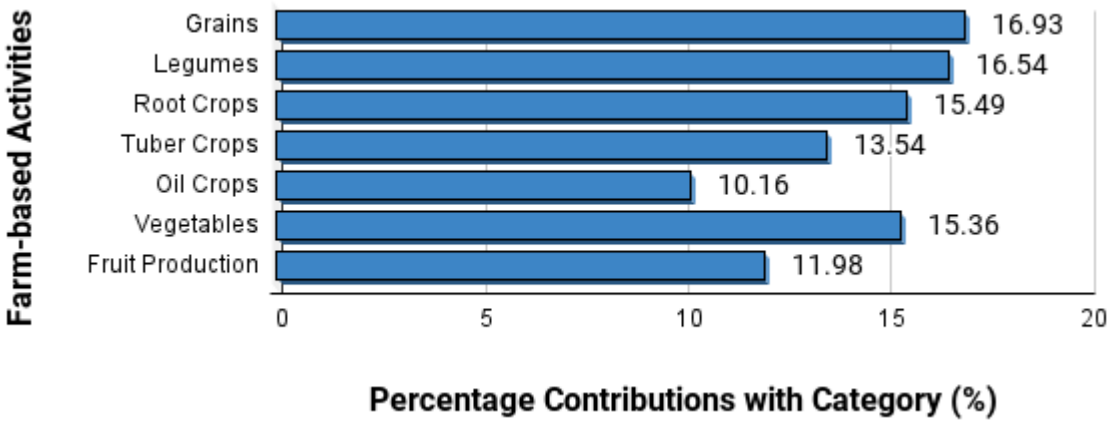
Table 1: Identification and Classification of Farm-based, Off-farm and Non-farm Livelihood Activities

Livelihood Classification	Frequency (%)*	Rating
Farm-based Activities		
Grain crops	390 (100.0)	1st
Legumes crops	381 (97.69)	2nd
Roots crops	357 (91.54)	5th
Tuber crops	312 (80.0)	7th
Oil crop	234 (60.0)	10th
Vegetables	354 (90.77)	6th
Fruits production	276 (70.77)	9th
Off-Farm Activities		
Livestock	72 (18.46)	19th
Fish farming	20 (5.13)	22nd
Gathering and selling Non-Timber Forest Products	124 (31.79)	14th
Poultry farming	30 (8.93)	20th
Hunting	81 (20.77)	17th
Milling farm products	5 (1.28)	22nd
Palm wine tapping	4 (1.03)	23rd
Non-Farm Activities		
Trading	370 (94.87)	3rd
Processing	363 (93.08)	4th
Constructions	90 (23.08)	16th
Farm labourer	277 (71.03)	8th
Tailoring	14 (3.59)	21st
Manufacturing	173 (44.36)	11th
Transportation	30 (1.72)	20th
Handicrafts	129 (33.08)	13th
Community service	132 (33.85)	12th
Security/vigilante	73 (18.72)	18th
Repairs	94(24.10)	15th

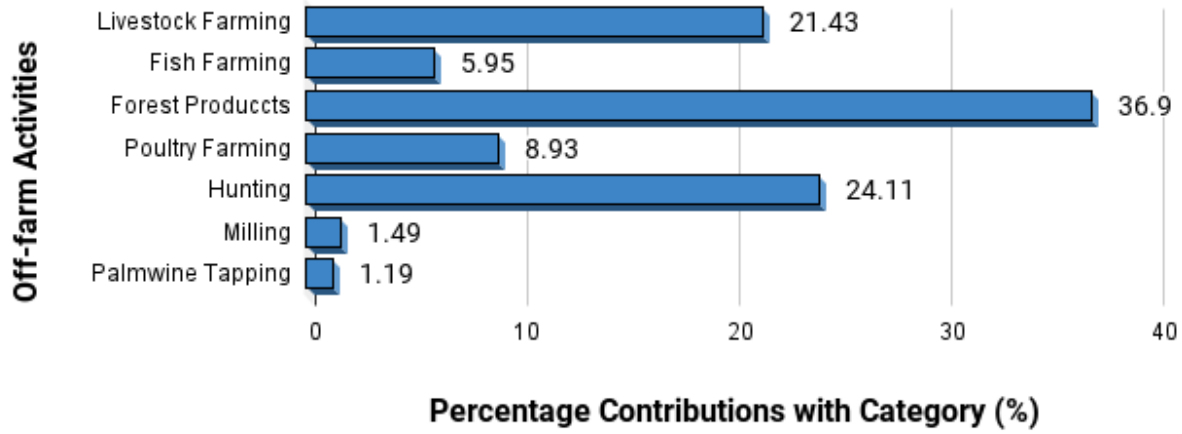
Multiple Responses

Source: Own processing



Source: Own processing

Figure 1: Distribution of Choice of Farm-based Livelihood Activities



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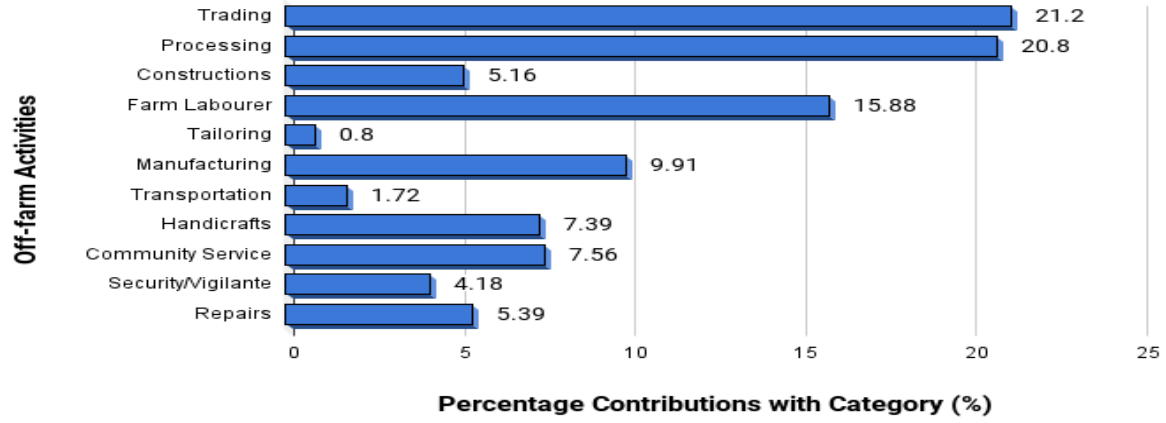
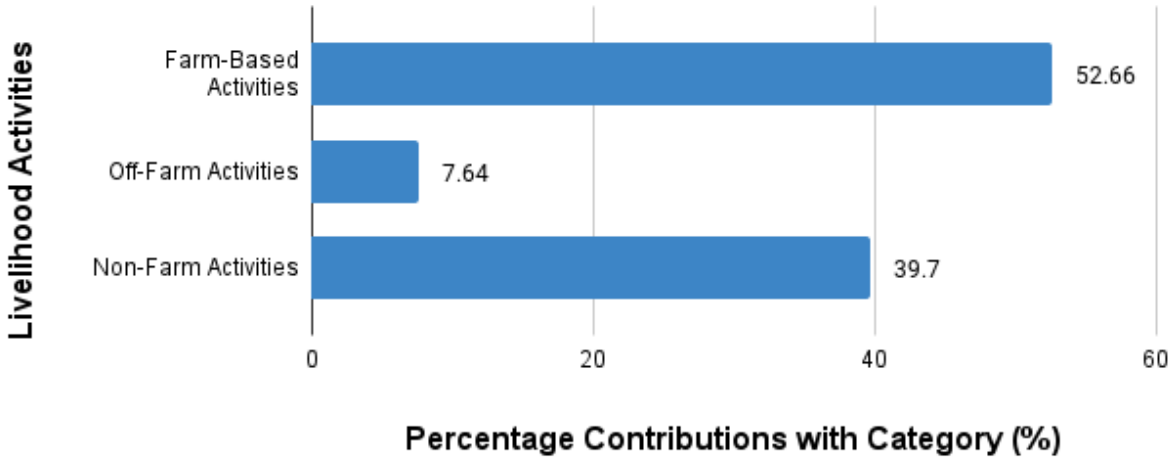
Source: Own processing

Figure 2: Distribution of Choice of Off-farm Livelihood Activities



Source: Own processing

Figure 3: Distribution of Choice of Non-farm Livelihood Activities



Source: Own processing

Figure 4: Distribution of Rural Households' Choices of the Major Livelihood Activities

Table 2: Average Annual Income of Respondents based on their Categories

Major Livelihood Activities	Frequency	Percentage (%)	Average Annual Income
Farm-based	2304	52.55	142,157.24
Off-farm	336	7.66	63,523.35
Non-farm	1745	39.79	89,642.37
Total	**390**	**100**	**117,535.9**

****Multiple Responses***

Source: Own processing

Table 3: Distribution of Respondents by Poverty Status (Headcount)

Poverty Status	Rural Households Pooled Data	
	Frequency	Percentage (%)
Poor	170	43.59
Non-Poor	220	56.41
Total	**390**	**100.0**

Source: Own processing

Summary statistics of poverty indices

Poverty incidence = 0.436

Poverty gap = 0.181

Poverty severity = 0.109

Poverty line = N9, 768.28

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Table 4: Estimation results of the multivariate probit model

Variables	Farm-based Activities			Off-farm Activities			Non-farm Activities		
	Coeff.	Std. Err	Marginal Effects	Coeff.	Std. Err	Marginal Effects	Coeff.	Std. Err	Marginal Effects
Gender	0.076**	0.074	0.076	0.006	0.095	0.006	-0.013**	0.073	-0.013
Age	-0.005**	0.003	-0.005	0.001	0.005	0.001	0.003	0.094	0.003
Household size	-0.010*	0.016	- 0.010	0.011*	0.021	0.011	0.015**	0.066	0.015
Level of education	0.004**	0.008	0.004	0.001	0.006	0.001	0.005	0.077	0.005
Access to market	0.005***	0.094	0.005	0.001	0.005	0.001	0.007	0.024	0.007
Membership of Cooperative Societies	0.134***	0.099	0.134	0.006*	0.088	0.006	0.017*	0.099	0.017
Access to credit	0.004*	0.089	0.004	0.003*	0.029	0.003	0.059**	0.074	0.059
Access to farmland	0.022***	0.087	0.022	0.010	0.026	0.010	-0.014**	0.068	-0.014
Entrepreneurial skills	-0.011**	0.092	-0.011	0.001	0.002	0.000	0.055***	0.095	0.055
Extension services	0.011***	0.084	0.011	0.002*	0.064	0.002	-0.074**	0.184	-0.074
Past Erosion hazard	-0.228***	0.109	-0.228	0.013**	0.087	0.013	0.071***	0.097	0.071
Access to Climate Smart Agriculture	0.310***	0.056	0.310	0.034	0.006	0.034	-0.006***	0.056	-0.006
Constant	0.677	0.197	-	0.717	0.254	-	0.005	0.197	-

******, **,* means significant at 1%, 5% and 10% respectively***

Source: Own processing