

Livelihood Strategies of Maize Farmers Under Climate Change Adaptation and Agribusiness Support Programme in Jigawa State, Nigeria

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Abstract

The study determines the livelihood strategies of maize farmers under Climate Change Adaptation and Agribusiness Support Programme (CASP) in Jigawa State, Nigeria, using sustainable livelihood analysis. A multistage sampling procedure was used to select 242 participating maize farmers and primary data were collected using structured questionnaires. Descriptive statistics and Multivariate Probit models were used for data analysis. The results discovered that the major livelihood strategies adopted by maize farmers under CASP were on-farm, such as food and cash crop production 86% and livestock, dairy and poultry production 79%, off-farm such as crop and livestock marketing 98% and non-farm such as trades/trading 34% and pottery, weaving and handicraft 33%. The Multivariate Probit regression analysis indicated that age, farm size, extension visits and Community Development Associations (CDAs) membership significantly influenced maize farmers under CASP on the on-farm livelihood strategies at different levels of significance, age and CDAs membership significantly influenced maize farmers under CASP on the off-farm livelihood strategies and household size, extension visits, CDAs membership and farm size significantly influenced maize farmers under CASP on the non-farm livelihood strategies. The study recommended that the maize farmers under CASP should gather money through CDAs for private extension services and the government should raise funding for extension programmes, train more agents and confirm systematic visits to rural farming communities. The government should offer capacity building grants and legal support to Community Development Associations to boost their role in on-farm activities development.

Keywords: Sustainable Livelihood, Maize Farmers, Jigawa State, Climate Change Adaptation, Agribusiness Support Programme.

Introduction

The agricultural sector has been a prominent and essential part of national development, improving human livelihoods and living standards, as well as the economic sector, through the production of crops and livestock (Samuel et al., 2022). The livelihoods of rural communities depend largely on their access to the natural resources, including water and land, and they are challenged with limited livelihood opportunities due to their remoteness in rural areas (Abdulsalam et al., 2023). Livelihood patterns in urban and rural areas are

predominantly dependent on natural resources, traditional occupations, diverse employment opportunities and a higher degree of economic specialisation (Singh & Mishra, 2025). Singh & Mishra (2025) explained that livelihoods are shaped by various factors, including economic policies, environmental conditions, technological advancements, and social structures. It is increasingly vulnerable to climate change, leading to effects on food availability, resource competition and others. According to Singh & Mishra (2025) indicated that the livelihood patterns in rural areas were predominantly dependent on natural resources and traditional occupation, while urban livelihood patterns were characterised by diverse employment opportunities and a higher degree of economic specialisation.

Living is having properties and the capability to sustain life. Living, necessary skills, assets, and activities are all signified by livelihood. Improved participation in several economic activities that create revenue for the use of household welfare and livelihood is what is meant by "livelihood diversification" (Belonwu et al., 2020). All economic activities are involved apart from conventional agricultural cultivation and animal rearing (Agbarevo et al., 2019). Loison (2019) states that livelihood diversification is vital for increasing the economy and reducing poverty in developing nations, especially Nigeria.

According to Price Waterhouse Coopers [PWC] (2021), maize is one of the major planted crops in Nigeria, and it accounts for a major share of the country's coarse grain production. It is produced in nearly all the geographical regions in Nigeria. Onumah et al. (2021) indicated that maize is the major cereal crop in terms of area and production volume and is the most consumed staple food in Nigeria. It is usually used for human consumption, animal feed, pharmaceutical industries, food manufacturers, breweries, flour mills and other industries. Almost 80% of the maize grain is utilised for human consumption and animal feed, with the other 20% utilised for industrial processing of diverse products (Onumah et al., 2021).

The International Fund for Agricultural Development (IFAD, 2020) indicated that the Climate Change Adaptation and Agribusiness Support Programme (CASP) was launched on 25th March 2015 and ended on 31st September 2021 in seven States of Northern Nigeria, where poverty is prevalent. The States include Jigawa, Katsina, Kebbi, Sokoto and Zamfara in the North-west and were aimed to support the Government's Agricultural Transformation Agenda (ATA). CASP's objective is to increase incomes, enhance food security and reduce the vulnerability of smallholder farmers in the North, particularly women and youth. CASP emphasises agricultural productivity enhancement as the main driver for sustainable development, including measures supporting climate change resilience and adaptation. Farmers are producing at a subsistence level, with barely enough yield to last them through the year to reach the next harvesting period. Data revealed that rural households in the Northern States are more vulnerable and have better experience of climate-induced environmental threats and low adaptive capacity (IFAD, 2020).

Problem Statement

Large populations depend heavily on agriculture for their livelihood. Ibrahim et al. (2025), stated that Jigawa State has experienced floods and twenty people have died in the State as a result of the disastrous floods, which damaged thousands of households and farmlands. A heavy rainstorm in 2020 destroyed various crops in the State, including maize, rice, millet and guinea corn, across the majority of Local Government Areas (Ibrahim et al., 2025).

However, in growing nations' like Jigawa State, yearly climatic changes make people more vulnerable and less resilient to poverty and food insecurity. According to the International Labour Organization (ILO, 2018), it is believed that unemployment is extremely high in developing nation and household livelihood strategies and entrepreneurship can help increase the standard of living for unemployed, poor and marginalized (Alemu, 2012; United Nations Food and Agriculture Organization [UN-FAO] 2013). According to Ellis (1998), to achieve their livelihood objectives, households are involved in a variety of activities including commerce, entrepreneurship, informal employment, agriculture and migration.

Evidence suggests that between 40 – 45% of average household income in rural Africa derives from off-farm activities (Ibrahim et al., 2025) and agriculture is the pillar of developing nations, but due to the geometric nature of population, climatic variability and land scarcity for agricultural purposes, it cannot adequately support rural communities. Despite the fact that much research was conducted on the livelihood strategies in the study area, there appears to be a scarcity of empirical data on the impact of agricultural programmes on the livelihood strategies of participants in Jigawa State. Based on the above statement, this study was conducted to analyse the livelihood strategies under CASP among maize farmers in Jigawa State, Nigeria.

Objectives of the Study

The major objective of the study was to assess the livelihood strategies of maize farmers under the Climate Change Adaptation and Agribusiness Support Programme (CASP) in Jigawa State, Nigeria. However, the specific objectives were to:

- i. describe the socio-economic characteristics of maize farmers under CASP;
- ii. describe the livelihood strategies of maize farmers under CASP; and
- iii. determine the factors influencing livelihood strategies among maize farmers that participated in the programme.

Significance of the Study

This study provided information on the livelihood strategies under CASP among maize farmers in Jigawa State. The findings will be useful to CASP, States and Local Government Areas, extension agencies and policy makers in designing and improving programmes and policies towards livelihoods through targeted diversification strategies. Therefore, this study contributes to a bottomless understanding of how diversification of livelihoods can

be utilized to build resilience, enhanced food security, increased income and reduced poverty among maize farmers in Jigawa State and participated in LGAs. The findings of the study will also serve as reference material in carrying out similar study and provide relevant information for the positive execution of the programme by policymakers, planners and other specialists. This work will contribute to the present body of literature on the impact assessment of agricultural programmes.

Literature Review

Livelihood Diversification in Nigeria

Livelihood diversification, according to Afodu et al. (2019), is the process of increasing income sources outside traditional agricultural activities and is a vital approach for handling risk and ensuring economic constancy. In Northern Nigeria, many rural peoples face imperative challenges due to climate variability, economic gaps, and unstable market conditions. Abera et al. (2021), believed that unpredictable nature of rainfall patterns, and frequent droughts severely influence agricultural productivity, forcing farmers to look for alternative sources of income to sustain their livelihoods. Belonwu (2024), describes livelihood diversification strategies among smallholder farmers in South-Western Nigeria comprises a variety of activities designed to mitigate the risk associated with agricultural production and improved household income. Bamidele (2024), these strategies can be divided into agriculture-based and non-agriculture-based diversification.

Climate Change Adaptation

According to Sabiu & Magaji (2024), climate change refers to continuing changes in temperature, precipitation, wind patterns, and other mechanisms of the earth's climate system. The Intergovernmental Panel on Climate Change (IPCC, 2022) characterises climate change as a statistically important deviation in either the average state of the climate or in its changeability over a long period, typically decades or more. In agricultural settings, climate change offers more frequent droughts, irregular rainfall patterns, extreme heat, and decreased water availability for crops.

Adaptation to climate change is defined by the United Nations Framework Convention on Climate Change (UNFCCC) as alterations made to ecological, social, or economic systems in response to actual or expected climatic stimuli and their consequences or impacts (UNFCCC, 2022). In relationships to agriculture, adaptation includes changes to farming methods, technological advancements, crop selection, and water management techniques designed at reducing the risks related with climate changeability (Magaji & Musa, 2024).

Role of Climate Change Adaptation and Agribusiness Support Programme (CASP)

Diversification in farming systems is a crucial plan for handling risks from climatic variability, pests, diseases, and market fluctuations, as it increases resilience by spreading risks across diverse agricultural activities, thereby calming income and confirming food

security. Indication from Sub-Saharan Africa and South Asia shows that diversified systems withstand shocks better than specialized ones, with crop diversification – through spatial, temporal, genetic, and intercropping strategies – improving soil health, pest management, and climate adaptability, as realised in integrated rice-fish farming and agroforestry that boost productivity and sustainability (Raphael, 2024).

Agriculture serves as the backbone of Jigawa State's economy, through provision of livelihoods for rural areas. According to Jigawa State Ministry of Agriculture and Natural Resources (MANR, 2024), stated that agriculture contributes over 60% to its Gross Domestic Product (GDP) and offers livelihoods to nearly 90% of its populace. The State benefits from favourable climate fertile land, facilitating the production of different crops, both rainfed and irrigated agriculture are practiced with projects/programmes like CASP, ABP, Hadejia Valley Irrigation Projects/Programmes. The State holds significant leverage and sustainability potential through various projects/programmes such as CASP, Fadama III, J-CARES, and TRIMMING, all aimed at enhancing productivity, diversification of economy and strengthening infrastructure across different agricultural value chains. The CASP engages directly with farming families, farmers organizations, value chain actors, extension agents and other stakeholders (MANR, 2024).

However, key components like productivity enhancement, and climate resilience, and institutional development play a crucial role in boosting productivity, income and food security in the State, while enterprise development, project coordination and management fosters enterprise support and business development, offering households diversification alternatives. Generally, CASP in Jigawa State strengthens the capacity of farmers to use climate information for planning and promotion of climate-resilient farming techniques. This promotes the adoption of climate smart agricultural practices to ensure resilience for improved livelihoods (MANR, 2024).

Sustainable Livelihood Approach Application

The livelihood approach successfully underscores the several mechanisms influencing people's livelihoods and critically regulates the association among these factors in this study (socio-economic factors, livelihood strategies and observed outcomes) (Figure 1). This approach is influential in highlighting vital matters and placing emphasis on the essential impacts and interactions between the elements involved. There are different livelihood approaches available, the Department for International Development (DFID) livelihood approach stands out as one of the most generally used.

By understanding this context, stakeholders can better identify the specific challenges, and opportunities present in the study. Livelihood assets comprise community members' diverse forms of capitals and capabilities, including physical, human, natural and social capital. Recognizing these capitals allows for a more targeted approach in developing initiatives that influence existing strengths. According to DFID (2001), transforming structures and processes refer to the institution, organizations, and legislation that can be harnessed to enhance livelihood strategies. Through improving these structures,

communities can create more effective pathways toward improved economic conditions. Livelihood strategies involve community members' specific activities to achieve their goals, while livelihood outcomes represent the desired achievements such as enhanced food security, increased income and reduced poverty. Sustainable livelihood among maize farmers participating in CASP presents an important opportunity to create diverse livelihood prospects that can foster the whole development of local communities.

Using the livelihood approach enables a structured analysis of the steps needed to capitalize on this potential fully. Starting with the capital context allows for an in-depth understanding of the factors influencing livelihoods, establishing a solid foundation for crafting an effective action plan to promote new livelihood opportunities among maize farmers participating in the CASP programme.

The DFID (2001), defines social capital as a critical web of community relationships providing crucial access to opportunities and resources for sustainable livelihoods. Communities must pull these connections to create self-help groups and cooperatives, empowering individuals' maize farmers to initiate small-scale businesses and livelihood activities. Alam (2025), believed that the focus of livelihood strategies is to achieve positive livelihood outcomes. However, increased income, enhanced food security, and reduced poverty in this study were the livelihood outcomes. It is important to balance these goals when conflicts arise (Serrat, 2017). The livelihood approach provides a valuable lens for discovering the convolutions of people's livelihoods particularly those of people experiencing poverty in rural and urban settings (Alam, 2025). It aims to understand the diverse aspects of an individual's livelihood, including the strategies they adopted, their objectives, the opportunities, and the constraints they face.

Though agricultural strategies have been commonly identified as a key livelihood strategy, there are leftovers in understanding how agricultural programmes impact participants in other livelihood strategies in their everyday lives. The research conducted in the study area pays more attention to statistical correlations between livelihood diversification particularly on-farm diversification strategies and income or productivity, while less studies consider the impact of agricultural programmes behind livelihood strategies. This research addresses this gap by using a quantitative approach to capture the livelihood strategies adopted by maize farmers participating in CASP by providing direct and indirect relationships, and the magnitude of the covariate's effect between livelihood strategies and socio-economic and institutional characteristics.

Sustainable Livelihoods in Sub-Saharan Africa

Sustainable livelihoods have been broadly studied across diverse regions of the world, with varying frameworks and results. Globally, sustainable livelihoods are recognized as a vital strategy to earn income, enhance food security and reduce poverty for their household living. In regions such as Sub-Saharan Africa, studies have highlighted the role of livelihoods. Liu et al. (2020), see livelihood as the adequate movement and stock of food

and nutrition for households to sufficiently satisfy their desires. However, a livelihood is said to be sustainable when it can deal with and get well from stress and shocks, sustain or boost its abilities and assets, and deliver sustainable livelihood chances for the next generation, and which contributes net benefits to other livelihoods at the local and international level in the short and short-term (Ibrahim et al., 2025). In SSA countries, most households from both on-farm and off-farm sectors depend on agriculture for the livelihood enhancement (Okoth et al., 2024).

Madzivhandila (2023), studies livelihood activities in Sub-Saharan Africa (SSA): Applying entrepreneurship and innovation for climate change. The study revealed that, in the majority of SSA countries, agriculture remains the way of life and stays to be the central source of livelihood and employment for majority people. Similarly, Olutegbe (2021), studies the livelihood and well-being of rural households around Oyan Dam, Nigeria: The sustainable livelihood approach. The study from Tobit regression analysis showed that dam-related livelihood threats, natural assets and financial assets as the most significant predators of well-being of households around Oyan dam. While inverse consequences of ecological, social, health and economic orientation ($\beta = 1.703$) influenced well-being inversely. The natural, physical and financial assets components had positive impacts. This shows that for dam-related livelihood-threats, the greater the magnitude, the lower the well-being of the people. The more possessed of natural, physical and financial assets, the better the well-being of household members.

Abdulsalam et al. (2023), conducted research titled 'an application of sustainable livelihood approach to fishing households in Jigawa State, Nigeria. The results from the study indicated an average livelihood status index value of 0.53 and the respondents were concentrated (67%) in the medium livelihood strategy. A breakdown showed that natural capital (0.77) and social capital were the most endowed capital and Tobit regression analysis showed that membership of association, level of education, and household size significantly influenced the livelihood of the households. Okoth et al. (2024), assess sustainable agriculture and livelihoods of smallholder farmers in Uganda. Likewise, Shillingi & Sakinoi (2025), on the strategizing resilience: economics diversification as a catalyst for sustainable livelihood among the Maasai in Kilosa and Mvomero, Tanzania. The study identified that households engaged in diversified economic activities such as small-scale agriculture, petty trade, artisan crafts and tourism and all these are more likely to participate in community-based structures that promote mutual support, resources pooling and learning.

From the above reviewed on sustainable livelihood in SSA, it showed that households used several livelihood activities such on-farm, off-farm and non-farm to sustain their living for survival but failed to assess the impact of livelihood strategies and agricultural programmes among participants, their direct and indirect relationships among livelihood strategies with socio-economic and institutional factors, hence the need for this study to bridge the gap.

Theoretical Framework

This research practises the Sustainable Livelihoods Analysis (SLA) as theoretical basics, providing valuable perspectives for examining the livelihood strategies used by maize farmers participating in CASP. The SLA framework developed by the UK Department for International Development (DFID) in 2003 is the most widely recognised framework by scholars (Su & Yin, 2020). The SLA covers livelihood assets, transforming structure and processes, livelihood strategies and livelihood outcomes. However, the livelihood assets such as human capital (household size, educational level, farming experience), social capital (CDAs membership and extension visits), natural capital (farm size), financial capital (access to capital) and physical capital shape the farmers ability to engage in different livelihood strategies. The model includes institutional characteristics such as credit access and extension visit which align with SLA's focus on how institutions and policies influence access to assets and decision-making are transforming structure and processes.

However, the livelihood strategies in this study were classed into on-farm, non-farm, and off-farm activities which represent the diverse pathways farmers take to secure their livelihoods. SLA encourages examining how people engage in these livelihood strategies to reduce risk and increase resilience. The outcomes which are enhanced food security, increased income, and reduced poverty are the core goals of sustainable livelihood. The figure 1 display the socio-economic and institutional characteristics (age, sex, educational level, farm size, farming experience, access to credit, household size, extension contact, and Community Development Association membership) influence the livelihood strategies of maize farmers participated in CASP which are categorized into on-farm, non-farm and off-farm activities. However, these strategies then lead to observed outcomes which comprise enhanced food security, increased income, and reduced poverty.

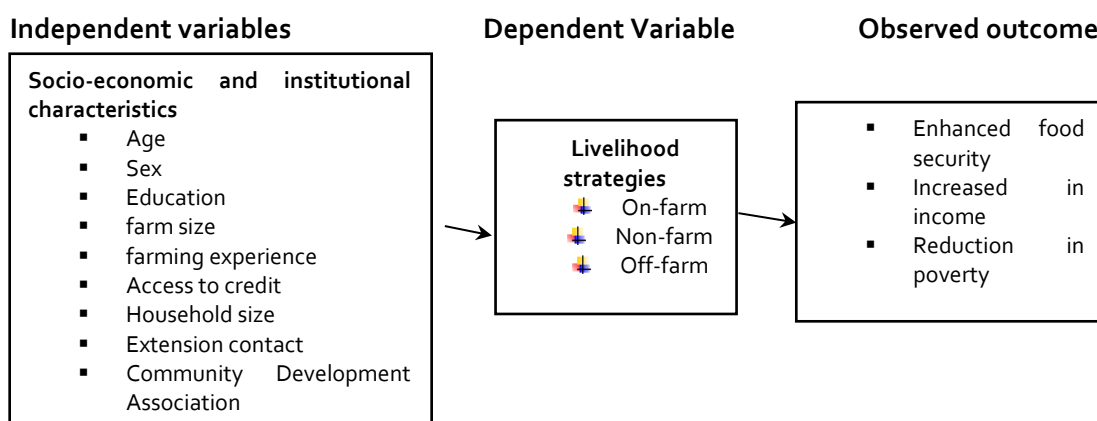


Figure 1: Conceptual model of the factors influencing livelihood strategies among maize farmers that participated in the CASP in Jigawa State, Nigeria.

Methodology

Study Area

This study was conducted in Jigawa State, Nigeria. The State was situated between the latitudes 11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E with a total land area of 22,410 km². It has a projected population of 4.37 million in 2025, and the State has an average maximum and minimum temperature of 35°C and 28°C, respectively. The State has two distinct kinds of weather – the dry season, which spans from November to May, and the rainy season that lasts from June to October. In addition, the State's annual rainfall ranges from 700 to 1000 mm. The major cereal crops grown in the State were millet, sorghum, maize and rice (Abdulumuni *et al.*, 2019).

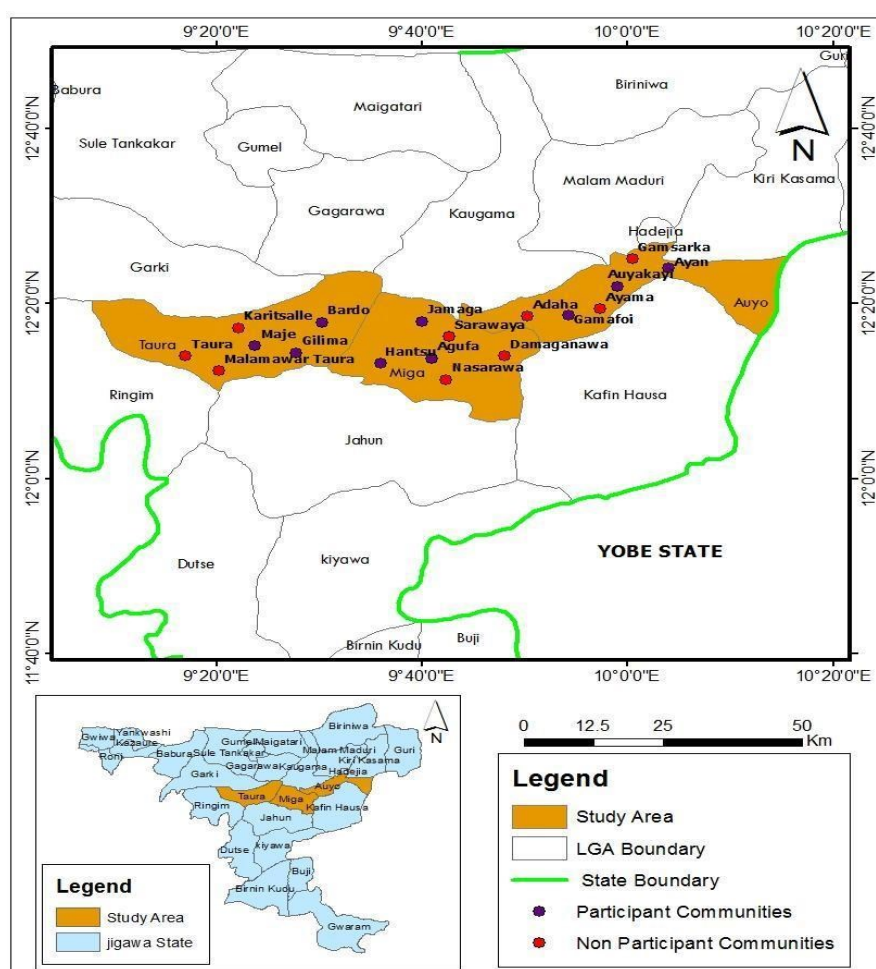


Figure II: Map of Jigawa State Showing Participant and Non-Participant Communities in Some Selected LGAs.

Source: GIS Lab Department of Geography ABU Zaria, Using ArcGIS 10.3 Software.

Sampling Procedure and Sample Size

This study adopted a multi-stage sampling procedure in the selection of maize farmers for data collection. In the first stage, simple random sampling was adopted to select three

zones (I, II and III) out of four zones in Jigawa State. In the second stage, Auyo Local Government Area (LGA) was selected from zone III and Taura LGA from zone II, while Miga LGA was selected from zone I. Auyo, Miga and Taura LGAs were purposively selected, respectively, based on the volume of maize cultivation and where maize was chosen as a value chain crop under the CASP. In the third stage, the communities in the three LGAs were selected according to the highest number of maize farmers given by the Local Government Support Offices of CASP. Thereafter, three communities from each of the LGAs were purposely selected to make a total of nine communities based on a fully funded community by the CASP. The communities selected were Auyakayi, Ayan and Gamafoi from Auyo LGA, Hantsu, Agufa and Jamaga from Miga LGA and Bardo, Gilima and Maje from Taura LGA. The last stage, included the use of proportionate sampling technique to select 25% of the sampling frame of 965 maize farmers to diminish sampling error and increase assurance in estimates, particularly in a diverse population. This gave a total of 242 maize farmers who served as the sample size of the study.

Method of Data Collection

Primary data were obtained through the structured questionnaire. The information collected from the maize farmers includes socio-economic characteristics of maize farmers and livelihood strategies of maize farmers under CASP.

Validity Test of the Research Instrument

The validity of the questions on livelihood strategies were checked by a team of supervisors/specialists in the field of Agricultural Economics, Extension and Rural Development in Nigeria and asked their inputs to authenticate the instrument. Using pre-test, the questionnaire was checked for clarity and comprehensibility of the questions within the target group, some questions were modified to increase simplicity and understanding.

Reliability of the Survey Instrument

This was determined using a test-retest comparison and calculation of Cronbach's alpha and a Cronbach's alpha value of 0.7 and above was to imply that the survey instrument is acceptable for the study.

Method of Data Analysis

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to achieve objectives (i) and (ii), while inferential statistics (Multivariate Probit Regression) were used to achieve objective (iii).

Multivariate Probit Regression

The multivariate probit model is adopted to determine the factors influencing livelihood strategies among maize farmers that participated in the programme. In earlier research, the Multinomial Logit model, which adopts that rural household's livelihood diversification strategies are jointly select, was used to study the determinants of livelihood diversification strategies (Bezu & Holden, 2014; Gebru et al., 2018; Matsumoto et al., 2006). However, rural households may use multiple livelihood strategies; thus, a multivariate probit model is used to determine the factors influencing livelihood strategies among maize farmers that participated in the programme. Because multivariate probit uses maximum chances to estimate probit regression parameters and the probabilities of livelihood diversification strategy combinations (Bock & Gibbons, 1996). Moreover, multivariate accommodates direct and indirect relationships, and the magnitude of the covariate's effect is dependent on the status of the covariant and the magnitude of the estimator coefficient (Hill & Kau, 1973). This is consistent with several economic theories, such as the theory of economic scale. For instance, the percentage change in resource endowment- specified as household farm size - affects the household's initial resource endowment (Abebaw et al., 2024).

Thus, multivariate probit was used to determine the factors influencing livelihood strategies among maize farmers that participated in the programme. Multivariate probit is specified (Chib & Greenberg, 1998; Hill & Kau, 1973) as:

$$Y_i = 1 \text{ if } \beta_i x_i + \varepsilon_i > 0 \dots\dots\dots (1)$$

$$Y_i = 0 \text{ if } \beta_i x_i + \varepsilon_i \geq 0 \text{ } i = 1, 2, 3, 4, 5, 6, 7 \dots\dots\dots (2)$$

$$Y_i = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \varepsilon_i \dots\dots\dots (3)$$

Where, $Y_{i1} = 1$, if maize farmers choose on-farm (o otherwise), $Y_{i2} = 1$, if maize farmers choose non-farm (o otherwise), $Y_{i3} = 1$, if maize farmers choose Off-farm (o otherwise), X_i = vector of factors influencing livelihood strategies among maize farmers that participated in the programme,

x_i is a vector of explanatory variables.

$\beta_1 - \beta_7$ are parameter vectors.

ε_i are random errors distributed as a multivariate normal distribution with zero mean, unitary variance and $n \times n$ correlation matrix. The method can be specified as follows:

Where:

$Y_i^* =$ Unobserved variable representing the utility of choosing strategy k.

x_i = a vector of observed characteristics determining the choice of livelihood strategy.

x_1 = sex (male = 1 and female = 0);

x_2 = age in years;

x_3 = marital status (married=1, single=0);

x_4 = household size in numbers;

x_5 = education in years;

x_6 = farmers' experience (years of rice production);

x_7 = extension contact (number of visits);

β = signifies a vector of indefinite coefficients to be estimated, and

ϵ = is a vector of error terms.

Results and Discussion

The results in Table 1 showed the description of continuous variables of respondents in the study area. The average age of respondents was 41 years, and the standard deviation of 10, with the minimum and maximum of 18 and 65 years, respectively. This indicates that the maize production in the study area is dominated by middle-aged farmers and are at productive age and have capabilities to engage in many income generating activities. The finding is in line with the finding of Abdulmumini et al. (2024) which found the maize farmers were in their active age and believed that age of farmers influenced the level of participation in the programme.

The result showed that respondents had an average household size of 9 persons, with an average farm size and number of credits of 2 ha and N106,634, respectively. This implies that households with larger sizes would be highly involved in more livelihood income-generating activities, and also, large farm size would lead to more engagement in on-farm income-generating activities. This result is similar to that of Onuwa et al. (2022) and Abdulmumini et al. (2024) which revealed that more hand was available to carry out farm activities for the new technologies among participating maize farmers in the study and the farm size help in the participation of maize farmers in agricultural programme by given the land for trial and demonstration of new technologies. The findings in Table 1 revealed that the average extension visits were 3 visits with a maximum of 12 visits, and respondents spent an average of 7 years in CDAs.

Table 1

Description of Continuous Variables of the Respondents

Variables	Minimum	Maximum	Mean	Std. Deviation
Age (Years)	18	65	41	10.107
Household size (Number)	00	28	9	6.838
Farm size (Hectare)	0.3	5.0	2	1.0927
Amount of credits (Naira)	00	900000	106634	179182
Extension visits (Frequency)	00	12	3	2.299
CDAs membership (Years)	00	20	7	2.534

Note: n = 242

Source: Field Survey, 2024

Table 2 shows the description of the nominal variables of the respondents. As shown in Table 2, the distribution of respondents in CASP skewed towards males (91%). This implies that male farmers play dominant roles in agriculture, have more access to productive resources and highly engage in income generating activities than female counterparts. This aligned with the findings of Abdulmumini et al. (2023) who reported similar results. The result of the study also shows that a larger proportion (86%) of respondents were married.

This implies that married maize farmers have more need for income than single maize farmers as a result of basic needs of the family and this would make the married farmers to be highly engaged in income generating activities. The result is in line with findings of Onuwa et al. (2022) who reported similar results in their study on the socioeconomic determinants of livelihood diversification among arable crop farmers.

Table 2

Description of Nominal Variables of the Respondents

Variables	Frequency	Percentage
Sex		
Male	221	91
Female	21	09
Marital status		
Single	23	10
Married	210	86
Divorced	03	01
Widow/widower	06	03

n = 242

Source: Field Survey, 2024

The livelihood strategies adopted by the maize farmers are presented in Table 3. The findings revealed that maize farmers in the study area engaged in on-farm, off-farm and non-farm livelihood strategies. Most maize farmers (86%) engaged in food and cash crop production, while about 79% engaged in livestock, dairy and poultry production as on-farm livelihood strategies. However, a few maize farmers indicated their involvement in other on-farm livelihood strategies, such as fruits and vegetables production (27%) and fish and aquaculture (7%). The results on off-farm livelihood strategies showed that most (98%) of maize farmers engaged in crop and livestock marketing, while about 29% of maize farmers were involved in agricultural processing, and 2% engaged in input trading as an off-farm livelihood strategy. It corroborates with the Ahmed et al. (2025) who stated similar results in their study on livelihood strategies adopted among respondents in the study area.

However, the non-farm livelihood strategies were trades/trading (34%) and weaving, pottery and handicraft among respondents in the study area. This implies that food and cash crop production, crop and livestock marketing and trades/trading were the major on-farm, off-farm and non-farm livelihood strategies, respectively, among maize farmers under CASP in the study area. The results are similar to the findings of Belonwu et al. (2024), who revealed that all respondents engaged in crop farming, more than half were involved in trading, and a few of them engaged in oil processing, artisan, pottery and hunting as income-generating activities in Edo State, Nigeria.

Table 3*Livelihood strategies adopted by the respondents in the study area*

Livelihood strategies	Frequency*	Percentage
On-farm		
Food and cash crop production	207	86
Livestock, dairy and poultry production	192	79
Fisheries and aquaculture production	16	07
Fruits and vegetables production	65	27
Off-farm		
Agricultural processing	71	29
Crop and livestock marketing	236	98
Post-harvest handling	01	00
Input trading	04	02
Forest-based business	01	00
Non-farm		
Driving	17	07
Tailoring	12	05
Trades/Trading	82	34
Salary/wage	21	09
Weaving, pottery and handicraft	80	33

Note: n = 242

* Multiple responses allowed

Source: Field Survey, 2024

Factors Influencing Livelihood Strategies Among Maize Farmers that Participated in the Programme

The study used a Multivariate Probit model to determine the factors influencing livelihood strategies among maize farmers that participated in the CASP. It focused on livelihood strategies like on-farm, off-farm and non-farm activities. However, the key factors that influenced livelihood strategies among maize farmers participating in CASP include age, household size, farm size, extension visits, and CDAs membership. The results in Table 4 show that out of nine factors tested, five significantly influenced at least one of these livelihood strategies among maize farmers participating in CASP.

Table 4*Factors influencing livelihood strategies among maize farmers that participated in the programme*

Livelihood strategies	Coefficient	Standard Error	Z	P> z
On-farm				
Age	- 0.0406***	0.0136	- 2.99	0.003
Sex	0.2437	0.4556	0.53	0.2437

Livelihood strategies	Coefficient	Standard Error	Z	P> z
Marital status	- 0.2091	0.1967	- 1.06	0.287
Household size	0.0181	0.0187	0.97	0.332
Educational level	- 0.0660	0.0686	- 0.96	0.336
Farm size	0.3017**	0.1254	2.41	0.016
Amount of credits	-3.43e-07	3.53e-07	- 0.97	0.332
Extension visits	0.1549***	0.0472	3.28	0.001
CDAs membership	0.7854*	0.0449	1.75	0.080
Off-farm				
Age	0.0336***	0.0123	2.73	0.006
Sex	- 0.3519	0.3589	- 0.98	0.327
Marital status	0.0291	0.1726	0.17	0.866
Household size	0.0001	0.0152	0.01	0.951
Educational level	0.0034	0.0549	0.06	0.951
Farm size	0.0040	0.0631	0.06	0.950
Amount of credits	- 2.44e-07	3.52e-07	- 0.69	0.489
Extension visits	0.0412	0.0392	1.05	0.293
CDAs membership	- 0.0950**	0.0401	- 2.37	0.018
Non-farm				
Age	0.0172	0.0135	1.27	0.203
Sex	- 0.2900	0.3813	- 0.76	0.447
Marital status	0.0205	0.2062	0.10	0.921
Household size	- 0.0287*	0.0168	- 1.71	0.087
Educational level	- 0.0186	0.0640	- 0.29	0.771
Farm size	0.23062**	0.0976	2.36	0.018
Amount of credits	- 3.80e-07	3.61e-07	- 1.05	0.293
Extension visits	0.0823*	0.0442	1.86	0.062
CDAs membership	- 0.0754*	0.0384	- 1.97	0.049
/atr _{ho21}	- 0.4228	0.1306	- 3.24	0.001
/atr _{ho31}	- 0.8117	0.2137	- 3.80	0.000
/atr _{ho32}	0.47403	0.1240	3.82	0.000
rho ₂₁	- 0.3993	0.1098	- 3.64	0.000
rho ₃₁	- 0.6705	0.1176	- 5.70	0.000
rho ₃₂	0.4415	0.4414	4.42	0.000
Log likelihood	- 343.28			
Wald Chi ²	63.58			
Prob > Chi ²	0.0001			
Number of observations	242			
Likelihood ratio test of	rho ₂₁ =	rho ₃₁ =	rho ₃₂ =	0
Chi ² (3) = 39.97	Prob > Chi ²	= 0.0000		

Source: Field Survey, 2024

Age: Older age are more likely to participate in off-farm livelihood strategies by 3.36%, as a result of benefiting from their experience and knowledge. This is aligned with the findings of Onuwa et al. (2022) who revealed that likelihood participation in on-farm activities among farmers decreases with increases in age. However, their age inversely affects participation in on-farm livelihood strategies, reducing the likelihood by 4.06% on account of physical limitation. This is because older household heads have better farmland holding size and other physical assets, and this limits rural households' participation in survival-oriented strategies (Abebaw et al., 2024).

Household size: Higher household size among maize farmers participating in the CASP reduced participation in the non-farm livelihood strategies by 2.87% in the study area. This implies that as the household size increases, participating in off-farm livelihood strategies among maize farmers under CASP decreases. This is contrary to the findings of Ahmed et al. (2025), who revealed that dependency ratio is increases, then participation in the on-farm activities increases and corroborate with the findings of Chinalurum et al (2024) who discovered that increased household had a declining influence on livelihood diversification.

Farm size: The farm size plays a crucial role in livelihood strategies among maize farmers participating in CASP. A higher farm size increases the likelihood participation in on-farm livelihood strategies such as food and cash crop production, fruits and vegetables production, livestock, dairy and poultry production, and fisheries and aquaculture production by 30.17% and this lead to enhance food security, increase income and reduce poverty of maize farmers participated in CASP. This is supported by the findings of Kasseng & Abdinasir (2023), who show that the likelihood of choosing off-farm activity was negative and significantly influenced the total livestock size. Furthermore, farm size positively influences involvement in non-farm livelihood strategies by 23.062%.

Extension Visits: This is important for the on-farm livelihood strategies. Having frequent extension visits, significantly enhances the participation of the on-farm livelihood strategies by 15.49%. This implies that frequent extension visits can improve food security, increase income, and reduce poverty as a result of high involvement in on-farm livelihood strategies. Likewise, extension visits also significantly influenced non-farm livelihood strategies by 8.23%.

CDAs membership: Community Development Associations help farmers with social information which is vital for on-farm livelihood strategies. CDAs members have more likelihood to participate in the on-farm livelihood strategies by 78.54% than non-members of CDAs. However, CDAs membership significantly reduced maize farmers' involvement in the non-farm livelihood strategies by 7.54% in the study area.

Conclusion and Recommendations

Based on the findings of the study, it can be concluded that food and cash crop production, livestock, dairy and poultry production and crop and livestock marketing were the major livelihood strategies adopted among maize farmers participating in Climate Change

Adaptation and Agribusiness Support Programme in the study area. The factors that influenced livelihood strategies among maize farmers participating under Climate Change Adaptation and Agribusiness Support Programme were age, farm size, extension visits, household size and Community Development Associations (CDAs) in the study area. Based on the findings of the study, it is recommended that the maize farmers should gather money through CDAs for private extension services and the government should raise funding for extension programmes, train more agents and confirm systematic visits to rural farming communities. The government should offer capacity building grants and legal support to Community Development Associations to boost their role in on-farm activities development.

Suggested for Further Research

However, based on the findings of this study, there is need to further research on the assessment of gendered livelihood strategies impact under Climate Change Adaptation and Agribusiness Support Programme.

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