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Assessing the food security status of rice farming households: A case study of Oyo State, Nigeria

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Abstract. *Objective: Precise assessment and monitoring of food security circumstances could assist governments, lawmakers, suppliers of services, including the general public in identifying changing support needs and the efficacy of current programs. This study examined the factors that influence the food security of rice-producing households in Oyo State. Method: a structured questionnaire was used to gather data from 120 participants through a multistage sampling procedure. The study employed descriptive statistics, binary logistic regression model and food security index to analyze the data. Results: According to the study's findings, age, household size, access to finance, access to extension service and farm size, remain the drivers of food security status among rice farming households. The results also revealed that most rice farmers were small-scale farmers who were food insecure, implying hunger and poverty, which could potentially lead to mortality if proper actions are not taken to improve availability of food to farmers in the research area. Results revealed that rice farmers' key restrictions included poor soil, inadequate storage, high production costs, and transportation costs. The study suggests that future government initiatives in food security should focus on these drivers and barriers in order to enhance food security among rice-producing households in the study area.*

Keywords*: Determinant, Food security, Rice farming, Households, and Nigeria*
JEL classification*: B21; B23; B41; C02; C21; C31; C81; C83; D00; D12*

Introduction

Nigerian agriculture has enabled the availability of a wide range of staple crops for food, which are critical to family well-being. They include a variety of vegetables, legumes (cowpea, soy bean, groundnut, etc.), roots and tubers (cassava and yam), and cereals (rice, maize, sorghum, wheat, millet, etc.). Rice has assumed the lead as a major source of household calories in recent years, outperforming all other staple crops (Gona and Maikasuwa, 2020). Rice (Oryza sativa L.) constitutes an essential diet for the majority of West Africans, particularly Nigerians. It can thereby significantly increase the GDP as a whole, produce export revenue, and create jobs. In the second quarter of 2019,

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Nigeria's agricultural GDP increased from 3597916.08 NGN to 3857705.59 NGN (National Bureau of Statistics, 2019). As of the first quarter of 2020, agriculture contributed around 22% of GDP; the agricultural industry continues to be Nigeria's largest employer (36% of the working force) (Oyeniran and Olajide, 2023).

Rice (Oryza spp.) remains a major staple food eaten in all geographical and economic strata in Nigeria (Oyedepo and Adekambi, 2017; Kamai et al., 2020), owing to its widespread consumption by households and use in religious and cultural festivals (Amaechina and Eboh, 2017; Bitrus et al., 2021). After sorghum, millet, and maize, rice, which is part of the graminae family, is the fourth major vital cereal crop in Nigeria. Because of its high nutritious content, it is farmed and eaten all over the nation (Omotosho et al., 2010). An estimated 3.7 million hectares of fertile land, or about 10.6 percent of the 35 million hectares of land under production, are used for rice cultivation out of Nigeria's 70 million hectares of arable land (Cadoni and Angelucci, 2013). Upland, lowland, watered, and mangrove/deep water cultivation methods are among Nigeria's rice methods of production (Africa Development Bank, 2014). Because of its high acceptability, rice is recognized as an essential food and cash crop that generates more money for Nigerian farmers than any other cash crop in the country; as a result, demand for it continues to climb. The Rice Farmers Association of Nigeria (RIFAN) estimated that Nigeria's yearly output of rice grew to 5.8 million tons in 2017 (Punch Newspaper, 2019). This growth is attributable to the Central Bank of Nigeria's (CBN) Anchor Borrower Intervention Fund for Rice Producers, which has increased domestic rice output while saving the country approximately $800 million in foreign exchange (Leadership Newspaper, 2019). Despite being West Africa's largest rice producer, Nigeria is still failing to close the supply gap and meet rising demand. The annual rice consumption rate is anticipated to be 7.9 million metric tonnes, with imports accounting for around 2.1 million metric tonnes (Punch Newspaper, 2019). Nigeria is currently one of the world's major rice importers, as well as the largest in Africa, buying over 2.6 million tonnes annually (FAO, 2018). The high import of rice is ascribed to fast population growth, poor methods of cultivation, shortages and elevated input costs, poor resource utilization, low-level mechanization, and primitive post-harvest and processing technologies (Daramola, 2017).

Insufficient food supply is a big issue throughout the globe. According to FAO (2017), roughly one billion individuals worldwide suffer from persistent hunger and lack of food. The vast majority of those exist in emerging nations, particularly Asia and Africa. Food scarcity is a global concern, as evidenced by the Sustainable Development Goals (SDGs), which seek to eliminate starvation, guarantee sufficient supply of food, and enhance nutritional outcomes by 2030. Fawole, Ilbasmis, and Ozkan (2015) defined food security as “a lack of sustained physical or financial inclusion in enough secure, nourishing, and culturally appropriate food that allows individuals to live wholesome and productive lives." However, Rice is perhaps the world’s most significant staple food crop and prominent food grain; it is grown and produced in Nigeria utilizing a variety of rice production techniques and technological levels that coexist. Male and female smallholder farmers engage in a series of tasks related to production such as land clearing and performing post-harvest operations like winnowing and threshing, among others. These tasks are completed manually using traditional methods that are characterized by low productivity (World Bank, 2013). Although the utilization of rice has been rising recently, domestic supply is yet to meet the populace's needs. The International Fund for Agricultural Development (IFAD) ranked Nigeria as the top supplier of several staple foods, but the country continued to be highly import-dependent and food insecure (Ayinde et al., 2020). A vast majority of the household population still rely on subsistence farming which can barely feed their own families. Food insecurity has increased as a result of poor infrastructural facilities such as poor roads (FAOSTAT, 2019; Otekunrin and Sawicka 2019). Despite their contribution towards feeding the rest of the population, most small-scale producers and farming households are disproportionately affected (Kuku-Shittu et al., 2013). This research, therefore, examines what

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variables are impacting the food security status of rice-producing households in the research area. This research intends to provide the answer to the following research questions:

- What are the demographic features of rice producers in the research area?
- What is the food security situation for rice producers in the research area?
- What factors influence the food security of rice producers in the research area?
- What are the constraints militating against rice producers in the research area?

The study's broad goal is to examine factors influencing the food security status of rice farming households in Oyo State, Nigeria. Specifically, the objectives were to:

i. describe the demographic features of rice producers in the research area
ii. determine the food security of rice farmers
iii. examine factors affecting rice producers' food security status
iv. identify the obstacles faced by farmers in rice production

1. Literature review

1.1. Theoretical review

Food security is known as people's having access to enough food for a healthy, active existence, that involves, at minimum, a supply of adequate nutrition and secure food, and also the assurance of being able to get sufficient nourishment in a manner that is socially acceptable with no turning to urgent food supplies, salvaging, theft, or other methods of coping. This is often referred to as the accessibility and security of food that can be eaten from its production and storage stages to the point of use. Food security is described as accessibility to food, safety, and utilization on an individual, family, subnational, and global scale (Akukwe, 2020). Food security was initially introduced during the 1974 World Food Conference with the sole purpose of ensuring enough food supply on a national scale (Emenuga, 2019). Presently, it is regarded as a situation whereby everybody lacks the nutrients required for a healthy and active existence (Ogundari, 2017). According to Oloyede et al. (2020), food security is proportional to agricultural output level, meaning that high food output equals the availability of food. Four dimensions of food security have been identified based on various degrees. 1) Availability: national. 2) Household accessibility. 3) Individual utilization. 4) Stability - can be thought of having an ongoing element that affects every tier. To attain full food security, all four aspects must be maintained. More recent improvements have highlighted the significance of long-term viability which can be considered as the fifth (long-term) aspect in food security. Food security is best regarded as a related, connected route through supply to use, transportation to preparation, identified in a range of industries, rather than four "foundations". Food security and food insecurity are changing, mutually beneficial, and dependent on time phenomena, with the result decided by the interaction between food insecurity stresses and coping strategies. It's tough to create universal food security indicators. Different measures can be used to evaluate various levels of food security. Food security at the household level is assessed using five types of indicators: variety of diets and meal rate, meal expenditure, consumption behaviors, experience indicators, and self-assessment tools. A range of factors have been used to calculate food availability indices worldwide which include access to food insecurity scale, food spending per capita, score of food expenditure, food share intake, score of method of coping and food expenditure per capita (Ogundari, 2017). Despite extensive study on food safety metrics, no agreement has been reached on the basic criteria required to effectively quantify household food security circumstances at both the small and large scales worldwide (Akukwe, 2020).

In Africa, due to production failures, drought, and desert encroachment, the shortage of food in the beginning of 1970s stimulated the international donor community to become extremely concerned about supply shortfalls (Maxwell, 1992). A more sophisticated definition was agreed upon and endorsed by 182 countries at the World Food Summit. The focus of the 1996 World Food Summit was "Food security, at the individual, national, regional, and international levels". Food security is attained if everyone can have consistent physical and financial access to enough supply of safe and nutritious food that fits the dietary needs and tastes which ensures a lifestyle that is healthy and active. (FAO, 1998). This notion encompasses bodily stability, food consumption, food access, and the accessibility of nutritionally sufficient food. Consequently, a merging of these definitions along with a primary focus on accessibility, presence, and use serve as a functional definition for international organizations' projects. Food security components include;

Availability: The actual presence of food, whether it comes from its production or from the markets, is referred to as availability in this context.

Access: This highlights how important it is to have resources to get the right foods for a balanced diet. It is the means through which various individuals have access to the provision of food. Typically, individuals and households access food through a variety of means such as bartering, borrowing, purchases, stocks, gifts, and food aid.

Utilization: Despite the availability and accessibility to nutritious and sufficient food, the family must decide on both the selection of food consumed and the distribution of food within the household.

Stability: This relates to the time dimension of nutritional security, considering the timeframe during which food security is observed.

Food security is impacted by a variety of social, environmental, and political variables. Makombe et al. (2010) take into account factors such as income, education, age, infrastructural accessibility, services related to extension, trade regulations, cultivated land for agriculture area, and social security systems. According to FAO (2010), food insecurity is caused by insufficient intake of healthy foods, taking into account the physiological effects associated with food that the body uses, which are associated with health and well-being. Inadequate nutrition also causes bad health, making it difficult for individual household heads to feed their households. When untreated, starvation sets off a chain reaction of events that sustains motion, perpetuates malnutrition, lowers adults' capacity for work and childbirth, and inhibits the capacity of kids from learning and living healthy, fruitful, and joyful lives. The stifling of individual growth weakens the capacity of a nation to succeed economically in the future. Food insecurity can be described as being permanent or temporary. Persistent food insecurity is defined as an extended or ongoing failure to achieve recommended daily dietary needs, which increases susceptibility to famine and hunger. While temporary, food insecurity refers to a brief or short-term shortage of food, which results in modifications in food security status. Most Nigerians now consume food that is significantly less than what is considered normal globally. Attempts in the past to improve food supply through agricultural production have been unsuccessful. The newly implemented programs only helped to alienate themain food producers in Nigeria, which are the peasant farmers.

1.2. Review of past studies

Adeshina et al. (2018) conducted research on productivity analysis among rice producers in Oyo State, Nigeria. A sampling method with multiple stages approach was used to choose 128 rice growers for the research. Primary data were acquired using a well-organized survey and schedule of interviews. Stochastic frontier model and descriptive statistics were used to analyze the data. The age

range of rice farmers was between 25 and 78 years with a mean age of 47.0 years, and most (78.1%) had some type of schooling. Farm yield grows with size, hired labor, and fertilizer, but declines with herbicides according to the result of stochastic frontier. In addition, formal education, farming expertise, size of household, contact with extension, and proximity of farm to market all improve producers' technical efficiency. With the current technology, allocative, economic and technical efficiencies can be increased by 33%, 41% and 11% respectively. 88 percent, 66 percent and 58 percent were their averages for technical, allocative and economic efficiency respectively.

Kosemani and Bamgboye (2020) conducted an energy input-output relationship of the cultivation of rice in Nigeria. The research investigates energy inputs and consumption trends in Nigeria's rice-production system. Field questionnaires, physical metrics, farmer interviews, and organized surveys were used to collect energy-related data from nine (9) rice farms across two growing seasons, with three small, medium, and big farms. The analysis of variance and the comparative average were used to compare the data from three farm types. The energy requirements for preparing the soil, planting, crop care (fertilizer application and weed management), shredding, and reaping were determined utilizing conventional formulas. With a mean yield of 6695, 7060, and 7364 kg ha-1, little, moderate, and big farms used an average of 14813.0, 14543.0, and 14067.0 MJ/ha to cultivate rice, respectively. The three farm groups varied significantly in terms of energy consumption and agronomical administration, including replanting timing and preparation of the site. The largest energy consumption was attributed to fertilizer administrations, which accounted for 73 percent of total energy input on small, 75 percent on medium, and 76 percent on large farms. The study showed that large farms had higher energy efficiency because they managed their energy resources more effectively.

Oloyede et al. (2020) examined the financial viability of rice cultivation strategies among rice producers in Kwara State, Nigeria. A three-stage method of random sample approach was employed to choose 120 rice growers to whom a predetermined organized survey was distributed. The data were assessed using multinomial logistic regression model and descriptive statistics. According to the findings, 48 percent of farmers cultivate rice using upland techniques, 35 percent use lowland techniques, and 16 percent use a combination of these methods. The research indicates that the farming systems differ in terms of revenue, profit, and output. The lowland, upland and combined rice production techniques had N65.735. 73, N67.900. 89 and N78.015. 57 per hectare as their gross margins respectively.

The preference for an uphill farming method over a combined production system was significantly impacted by household size, age, extension visits and farming years, while income influenced the preference for a mixed cultivation method over lowland cultivation of rice. Rice producers in the upland, lowland, and combination production systems confront difficulties such as insufficient financing for input purchases, insect and disease problems, and unfavorable weather circumstances. The combined use of two rice cultivation strategies has been shown as the most profitable, which offers the potential to help rice farmers better their livelihoods. The study concluded that the combination (lowland and upland) rice farming system is the most profitable.

Mamun et al. (2021) examined trends in the cultivation of rice indexes in Bangladesh during the preceding thirty-six year timeframe to anticipate potential rice production. This study examined rice acreage, output, output trends, and expansion rate from 1984-1985 to 2019-20, with regions precisely defined based on rice cultivation performance. High-yielding cultivars acclimated at different rates during the study period: 98.4 percent for Boro, 73.5 percent for Aman, and 72 percent for Australia. Between 1969–1970 and 2019–20, Boro rice production rose by 0.97 percent annually, while Aus and Aman season shares decreased by 0.48 and 0.49 percent annually, respectively. Using Bangladesh's average proportion of rice output, the leading contributors to the national rice reservoir

were determined to be Mymensingh (13.9 percent), Rangpur (9.8 percent), Bogura (8.6 percent), Jashore (8.6 percent), and Rajshahi (8.2 percent). In separated times of year, the research discovered a variety of cluster regions, with minimal evidence of shared characteristics among rice-cultivating areas. The study advocated for a more deliberate approach, focusing on specific qualities that could boost rice productivity at the regional and national levels. Kunyanga et al. (2023) investigated the expanding innovations in rice production-related research, to determine the way the literature-supported suggestions forecast the pattern of output in 2030.

Otto et al. (2021) explored the relationship between Nigeria's economic growth and rice consumption and cultivation. The information was taken from the Statistical Bulletin of the Central Bank of Nigeria. To determine a theoretical connection among cultivation of rice, usage, and economic growth in Nigeria, the following econometric analysis methods were used: Unit root test, OLS, Vector Error Correction Model and Johansen Cointegration. The results of the research show a substantial association between rice cultivation, consumption, and economic growth in Nigeria. Furthermore, OLS results revealed a statistically significant association among rice imports and Nigeria's GDP. All of the predictive factors exhibited unstable at level but were stationary following the initial variation as shown by the unit root test's results. The Johansen Cointegration test validated long-run convergence among the model's variables, but the VECM result showed that the model factors work together to elicit long-run equilibrium.

Ibrahim et al. (2021) examined the costs and benefits of growing rice (Oryza sativa) in Birnin-Gwari Local Government Area, Kaduna State, Nigeria, during the rainy season. A two-step random approach was used to choose forty-eight (48) participants for the purpose of the research. Primary data were gathered utilizing a standard survey administered by well-trained enumerators. The gathered data were analyzed using profitability ratios, profit margin analysis and descriptive statistics. According to the findings, the majority of those surveyed (52.1 percent) were married, and the majority (60.4 percent) were men. Twenty-five percent had completed elementary school, forty-five percent had completed secondary school, and twelve percent had completed university. The average household size was seven members, and the average age of the head of the household was thirty-three. Respondents' average farming experience was 17 years, and their average farming income was ₦32,238 per year. The overall cost of production was determined to be N139,309, with the mean variable expense per hectare being N122,988. There was a net income from agriculture of N117,691, a profit margin of N134,012 and a total revenue of N257,000. BCR=1.84, ESR=0.13, ROR=0.84, and GR=0.5 profitability ratios demonstrated how profitable rainy-season rice farming is in the research region. The research concluded that rainy season rice cultivation is a good venture in the Brinin-Gwari local government area that can be used to alleviate poverty among poor people if supported financially through the provision of credit by the government and financial institutions.

The economic efficiency of rice producers in Nigeria's Kano State's Kura Local Government Area was examined by Gama et al. (2022). To collect data for the study, 115 respondents selected by random sampling were given standardized surveys and scheduled interviews. The data were evaluated via statistical analysis, budgeting approaches, and multiple regression analysis. Farmers' average age was 31 years, with the majority being male, educated, and with 8 years of agricultural experience. Rice production generated an overall farm income of N176922.2, with a 2.7-naira return on investment. This suggests that 1N spent on rice farming will yield N1.7 in income. Regression analysis revealed that labor, agrochemicals, and farm size all significantly affected yield. The result of the return to scale analysis was 4.5. This implies that as input resources are used more, the return to scale increases. Agrochemicals, labour, farm size and seed quantities were all underutilized, according to the resource efficiency findings. Further investigation revealed that insufficient funding and inadequate extension service delivery reduced rice output.

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The technical efficiency of rice producers in the Dadinkowa irrigation project area in Nigeria's Gombe and Borno States was examined by Mohamadou et al. (2022). Four hundred (400) rice producers engaged in irrigation-based agriculture were recruited utilizing a multiple stages sample approach to gather data through organized interviews. Descriptive statistical methods were used to describe participants' socioeconomic backgrounds, while rice producers' technical efficiency was evaluated by a stochastic frontier model. As shown by the stochastic production function, technical inefficiency increases with rental cost (0.0095) and transportation (0.0011) and reduces with education (-0.49). In contrast, technical efficiency increases with labour (0.36) and farm size (0.25). In the Integrated Savanna Vegetables and Fruits Canning Factory (VEGFRU), rice growers' technical inefficiency is increased by the cost of transportation (0.003), while the farm's size (0.45) enhances technical efficiency. According to the National Institute of Horticultural Research and Training (NIHORT) and College of Horticulture (NIHORT and CoH), family size reduces technical efficiency (-0.025), whereas non-farm income (3.3) increases it. Lastly, under local land authority, technical efficiency is improved by the amount of seed (0.16) and fertilizer (0.38), while technical inefficiency increases with transportation cost (0.0001) and reduces with household size (-0.014) and education (-0.04). Additionally, the study discovered that farmers' average technical efficiencies for DKIS, VEGFRU, NIHORT/CoH, and local authority were, respectively, 0.88, 0.94, 0.86, and 0.65. Considering the current level of technology in both the public and private sectors, this implies that farmers were technically efficient. Technically, farmers operating under VEGFRU's land management authority outperformed DKIS, NIHORT/CoH, and local government. The study found that rice growers were at the rational phase of production (diminishing returns).

Oyetoro et al. (2023) looked at how the COVID-19 epidemic affected the cultivation of rice in Nigeria's South West. The study outlined the participant's socioeconomic characteristics, rice cultivation rates prior to and throughout the COVID-19 pandemic, and the pandemic's consequences on the cultivation of rice. Information was gathered from 240 registered rice producers in the research area using a structured interview schedule. Findings were presented using inferential tools (T-test analysis), while the collected data were reported using descriptive statistical methods (percentages, frequency distribution and weighted mean score). Average household size was 7, average annual income was ₦1,308,750.00, average age was 42.94, average year of education was 10.29, and average rice farm size was 4.60 hectares. Low income was found to have the most significant impact on rice production from the COVID-19 pandemic, with an average weighted score of 2.75. The second-highest ranking was spoilage of harvested rice (WMS of 2.72), while the lowest ranking was poor/loss of quality of produce (WMS of 2.37). The Paired T-test analysis showed a significant difference in rice cultivation levels before and during the Covid-19 pandemic ($t=13.285$, $p=0.001$). In the research area, COVID-19 significantly reduced the amount of rice produced by affecting the levels of rice cultivation, according to the study.

2. Methodology

The research was conducted in Oyo State. Ibadan serves as the capital of Oyo State, an inland state in southwest Nigeria. It borders Kwara State to the north, Osun State to the east, Ogun State to the south, and a part of the Republic of Benin to the west. Oyo State has an estimated population of 7,840,864 as of 2016, making it the sixth most populous state in Nigeria. It is situated between 8°00 N and 4°00 E. The bulk of the population is Yoruba, and the Yoruba language is still widely spoken. This study used primary data collected by a well-designed questionnaire in the Ibarapa Northeast and Ibarapa East Local Government Areas and the Ogbomosho North and Ogbomosho South Local Government Areas in Oyo State. Participants were chosen from the area using a multistage sampling

procedure. The initial stage necessitated deliberate choosing of four major rice-producing local government areas in Oyo State. Ibarapa Northeast, Ibarapa East, Ogbomosho North, and Ogbomosho South Local Government Areas are well-known for their significant rice agriculture. The following step was a random selection of three villages from the local government districts. The third phase involved choosing at random ten rice growers in each of the designated settlements in the area from a list compiled by the state's Agricultural Development Programme (ADP) office, making one hundred and twenty respondents that were used for the study. Relevant data on respondents' socioeconomic characteristics were collected and analyzed utilizing inferential and descriptive statistics, the food security index, and a logit regression model**.** There are 33 local government areas in Oyo state, seventeen (17) of which cultivate rice, and only 255 rice producers have filed under the Oyo State Agricultural Development Programme, from which the respondents (120) were selected. The four local government areas, which were purposely selected, represent about twenty-five percent of the total number of local government areas involved in rice production and the 120 sample size that was used for the study represented 50% of the total rice farmers in the State excluding about 8 void questionnaires.

There are several formulas for computing the number of samples. Yamane's formula is one of the most generally used: n = N/(1+N(e)2).

This formula includes the following variables:

- n represents the sample size.
- N refers to the study's population, whereas e represents the calculation's margin of error.

Let's assume a desired margin of error of 6%.

Yamane's formula is:

$$n = \frac{N}{1 + N(e)^2}$$

n = 255/(1+255*0.06^2) =132.9

n = 133

2.1. Household Food Expenditure Approach

The family food expenditure technique was used to divide rice farming households into two food security statuses. Food security categories are (1) food-secure households and (2) food-insecure households.

To determine each household's food security status, those surveyed were divided into food-secure and food-insecure households using the expenditure technique developed by Omonona et al. (2007).

The formula is provided as follows:

$$FSI = \frac{\text{Per capita monthly food expenditure for the ith household}}{\frac{2}{3}\text{mean per capita monthly food expenditure of all households}} \quad (1)$$

FSI stands for Food Security Index.

When FSI ≥ 1, the ith household is food secure, while FSI < 1 indicates food insecurity.

A food-secure household has a per capita monthly food expenditure that is at least two-thirds of the average monthly meal consumption. A food-insecure household spends less than two-thirds of

the average monthly food spending. The structure of household consumption is one indication of household welfare (Purwaningsih, 2021). Increased wealth will lead to higher food consumption due to increased purchasing power.

The average expenditure of each household on food products was estimated. The average of each class was calculated and added together to get the overall mean per capita spending on food (MPCFE) for all families. In order to assess the proportion of food-secured versus food-insecure families, two-thirds (2/3) of total average per capita food expense (MPCFE) were calculated.

Table 1. Food products consumed by the households

Food Products	**Individual Food Products Expenditure**
Cereals and Legumes	Mean expenditure of all households on cereals and legumes
Roots and Tuber	Mean expenditure of all households on roots and tuber
Fruits and Vegetables	Mean expenditure of all households on fruits and vegetables
Animal Protein	Mean expenditure of all households on animal protein
Fats and Oil	Mean expenditure of all households on fats and oil
Spices/Condiments	Mean expenditure of all households on spices/condiments
Total	Total
2/3 MPCFE	2/3 of the sum of their means

2.2. Binary Logistic Regression

Binary logistic regression was used to investigate the variables influencing food security in households that produce rice. The dependent variable in this instance, food security, is a binary variable; its value is one, if a household is food secure; if not, it is zero. There are several ways to evaluate the causal relationship between food security and putative variables. The logit model was used in the investigation, as previously reported. According to Bogale and Shimelis (2009), the logistic probability model can be expressed implicitly as thus;

$$p_i\left(Y=\frac{1}{X_i}\right)=f\left(Z_i\right) \tag{2}$$

The model is transcribed in the expression of odds and log of odds formats to make the coefficients easier to see. Consequently, the ratio of a household's food security P_i to its lack of it $\left(1-P_i\right)$ is known as the probability ratio.

Thus,

$$\ell^{z_i}=\frac{P_i}{1-P_i} \tag{3}$$

$$\ln\left(\frac{P_i}{1-P_i}\right)=z_i \tag{4}$$

$$Z_i=\alpha+\sum_{1=0}^{n}\beta_i X_i+\varepsilon_i \tag{5}$$

Where:

P_i = The likelihood that a household is food secure in the face of exogenous factors (X_i), and P_i goes from 0 to 1. The observable binary (1, 0) for whether the household is food secure or not is assumed in the standard binary logit model.

ℓ = The natural logarithm base, X_i represents a vector of predictor variables.

α and β_i = The regression factors are to be predicted, while the random error term ε_i is included.

Explanatory variables (X_i) are:

X_1 = Respondent's age (years)
X_2 = Respondent's gender (male = 1, female = 0).
X_3 = Household size of respondent (in numbers)
X_4 = Education level of the household head (number of years)
X_5 = Farm size (Hectares)
X_6 = Experience in farming (number of years spent farming).
X_7= Credit access (if yes =1, otherwise= 0)
X_8 = Extension service access (if yes =1, otherwise= 0)

3. Results and discussion

Age of respondents

The age distribution of the respondents is displayed in Table 2. According to the findings, most (40.8%) of those surveyed were between the ages of 36 and 45, while only a small percentage (20.8%) were between the ages of 25 and 35. About (25%) were between the ages of 46 and 55, with 13.3% being 56 years or older. Those surveyed were 42 years old on average. This suggests that rice producers in the research area are still in their prime and capable of making independent decisions that could increase farm productivity. This discovery aligns with Ozor's (2009) research, which indicates that people older than 55 years do not engage in farming anymore.

Gender of respondents

Findings from the study from Table 2 display the breakdown of respondents by gender. The findings indicate that most (60%) of those surveyed were female, with around 40% being male. It suggests that women are dominant in rice farming compared to men in the research area. This supports the result of Yadeta and Fojo (2019) who showed that the majority of practicing farmers are female, and only a few males engaged in farming.

Level of education of respondents

Table 2 illustrates how respondents were distributed based on level of education. The findings indicated that most (49.2%) of the participants possessed tertiary education while about (43.3%) had secondary education and a few (7.5%) had primary education. This result indicates that rice farmers had what it takes to understand information such as improved crop variety when introduced to them which would improve their production.

Years of experience of respondents

The information according to Table 2 illustrates how respondents were distributed based on years of experience. The result revealed that most (38.5%) of those surveyed had at least 5 years of experience while about (27.5%) had between 6 and 15 years of experience, and few (32.5%) had

about 16 years and above. The average years of experience of respondents was approximately 13 years. This result implies that the respondents had enough experience in rice farming to make an informed decision which would lead to an increase in the productive capacity.

Farm size of respondents

Table 2 also displays the distribution of participants based on farm size. The findings revealed that that the majority (85.8%) of respondents had at most 5ha, while a small minority (5.8%) had between 6 and 10 hectares. The average size of a farm among those surveyed in the research area was 3.7 ha. This result shows that rice farmers have a large area of land to cultivate, which, if well managed, would yield a large profit for the farmers.

Access to credit by respondents

Table 2 illustrates how respondents were distributed based on access to credit. The findings found that the majority of respondents (60.8%) did not have access to credit, while approximately 39.2% did. This suggests that rice producers in the research area have limited access to loans, which may impair their productivity.

Table 2. Respondents' distribution according to socio-economic characteristics

Variables	Frequency (N=120)	Percentage (%=100)	Mean
Age (years)			
25-35	25	20.8	42.3
36-45	49	40.8	
46-55	30	25	
≥56	16	13.3	
Gender			
Male	48	40	
Female	72	60	
Education level			
Primary	9	7.5	
Secondary	52	43.3	
Tertiary	59	49.2	
Years off experience			
≤5	15	38.5	12.6
6-10	33	27.5	
11-15	33	27.5	
≥16	39	32.5	
Farm size (Ha)			
≤5	103	85.8	3.7
6-10	7	5.8	
Access to credit			
Yes	47	39.2	
No	73	60.8	
Membership of Cooperative			
Yes	38	31.7	
No	82	78.3	
Access to extension service			
Yes	50	41.7	
No	70	58.3	

Source: Field Survey, 2021

Membership of cooperative society

Findings from the study from Table 2 display the breakdown of respondents by cooperative membership. Findings revealed that the majority (78.3%) did not belong to cooperative society while only about 31.7% were members of cooperative society. This result revealed that an appreciable number of respondents were not members of cooperative societies. This might be part of the reasons for not being able to access credit to assist their rice farming operations. The implication here is that only a few farmers would have access to information and loan acquisition that can help farmers in their agribusiness enterprises.

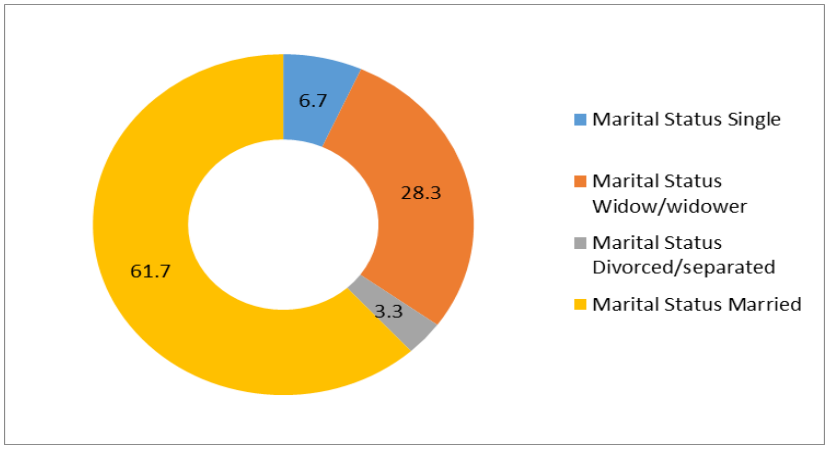
Access to extension service

Table 2 also displays the distribution of responses according to access to the extension service. The results showed that most (58.3%) of respondents did not have access to extension services while about 41.7% had access. This suggests that extension visits to rice producers were infrequent in the research area. As a result, this could be an important contributor to the respondents' failure to remain food secure. This result was in line with Obisesan et al. (2023)'s findings.

Marital status of respondents

The data in Figure 1 depicts the distribution of respondents by marital status. Findings showed that most (61.7%) of those surveyed were married, while a small proportion (6.7%) were single, and approximately 28.3% and 3.3% were widowed/widower and divorced/separated, respectively. This finding suggests that married individuals performed rice cultivation in the research area, which could increase the quantity of family labor available during the production process, lowering production costs.

Figure 1. Distribution of respondents according to marital status



Source: Field survey, 2021.

Household size of respondents

Figure 2 depicts the allocation of respondents based on household size. The findings revealed that the majority (60.8%) of respondents' household sizes ranged from 6 to 10, while about (32.5%) had 5 or less individuals and only a handful (6.7%) had 11 or more. The average household size among responders was eight. This finding suggests that there are many farming households with big household sizes that can function as family labor and cut labor costs.

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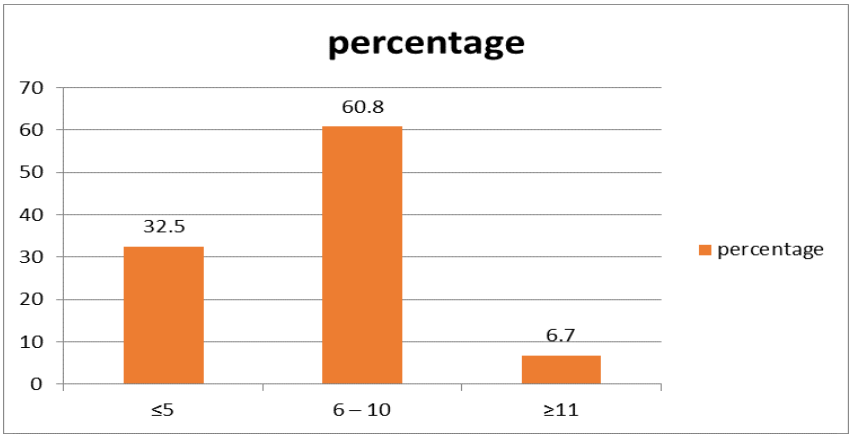
Figure 2. Distribution of respondents according to household size

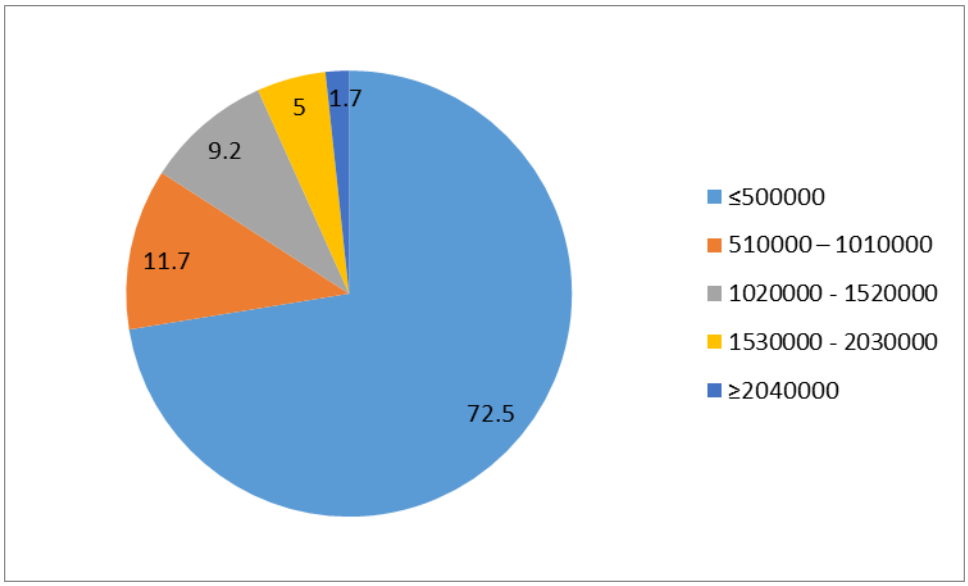


Source: Field survey, 2021

Annual income of respondents

Figure 3 depicts the distribution of respondents according to annual income. The findings revealed that the vast majority (72.5%) of respondents had an annual income of at least N500,000, with only a handful (11.7%) earning between N510,000 and N101,0000. Approximately 9.2% had between N1,020,000 and N1,520,000; 5% had between N1,530,000 and N2,030,000; and 1.7% had N2040000 or more. The respondents' average annual income was N791,000. It means that rice producers in the research area get their revenue after sales, implying that the business is profitable, and rice producers in the research area are increasing their investment in rice cultivation for future expansion.

Figure 3. Distribution of respondents according to annual income in Naira



Source: Field survey, 2021

Household food security status

Table 3 displays how respondents were distributed based on their food security level. The findings revealed that most (66.7%) of those surveyed were food insecure, while 33.3% were food secure, implying that households in the study area lack adequate access, availability, and affordability to food, which could be attributed to the low income and financial situation of the country. This is congruent with the results of Oduntan and Akinro (2021), who found that the majority of respondents in the Akure South Local Government Area of Ondo State, Nigeria, experienced food insecurity.

Table 3. Respondents' distribution according to food security status

Food security status	Frequency	Percent
Food secured	40	33.3
Food insecured	80	66.7
Total	120	100

Source: Field survey, 2021

Factors influencing food security status of rice farmers

Table 4 displays the binary logistic regression estimates for the variables affecting rice farmers' food security status. The results showed the following relationship between each explanatory variable and rice producers' food security. According to the study's results, age, household size, farm size, financing availability, and access to extension services were the primary variables influencing rice farmers' food security. However, age, farm size, financing availability, and access to extension services all have a favorable correlation with food security. This implies that boosting any of these factors increases the likelihood of being food secure. Household size is negatively correlated with food security, hence increasing this variable reduces the likelihood of being food secure. Age positively correlates with households' food security status (0.0503), which has significance at 1%. This implies that the older the family head, the greater the likelihood of being food secure. This result was in line with Otekunrin et al. (2021)'s findings, who stated that a rise in the age of the family head increased the likelihood of the family having food security among peasant farming families in rural Oyo State, Nigeria.

Furthermore, there exists a positive and significant (1.1031) association between access to financing and rice producers' food security status. This link suggests that increased access to financing will result in improved food security for rice growers. This does not come as a surprise as access to credit empowers the farmer thereby increasing the output from their operation. Consequently, there is an increase in domestic food availability and an increase in marketable surplus leading to more income and a higher standard of living. This result is congruent with that of Suharyanto and Indrasti (2017), who found that household size and access to finance are the most important socioeconomic drivers of farmers' food security status. Farm size exhibited a substantial positive association (0.1796) to food security (1%). This suggests that the larger the farm, the greater the likelihood of being food secure. This conclusion is in line with the previous belief that farm size is positively correlated with food availability, as well as the findings of Otekunrin et al. (2021). Access to extension service had a positive association (1.0330) with food security, which is significant at 5%. This implies that the greater the availability to extension service, the higher the probability of being food secure.

There is a substantial negative connection (-0.1544) between the number of households and rice farmers' food security status at 5%. This means that the bigger the household, the lower the probability of becoming food secured. This was expected because as the number of farmers' children

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grows, farmers' ability to cater to a large number of youngsters and meet their nutritional needs may decline. This is consistent with Oduntan and Akinro's (2021) findings, which claim that household size has a detrimental impact on food security.

Table 4. Estimates of Binary Logistic Regression Model

Variables	Coef.	Std. Err.	Z	P>|z|
_cons	-2.659828	1.171802	-2.27	0.023
Age	0.0503799***	0.0137302	3.67	0.000
Household size	-0.1544235**	0.0794196	-1.94	0.052
Farm size	0.179674***	0.0667541	2.69	0.007
Access to credit	1.103171***	0.428855	2.57	0.010
Access to extension agents	1.033076 **	0.4469345	2.31	0.021
Pseudo R^2	0.7396			
Log likelihood	-0.6781			
Prob > chi^2	0.0000			

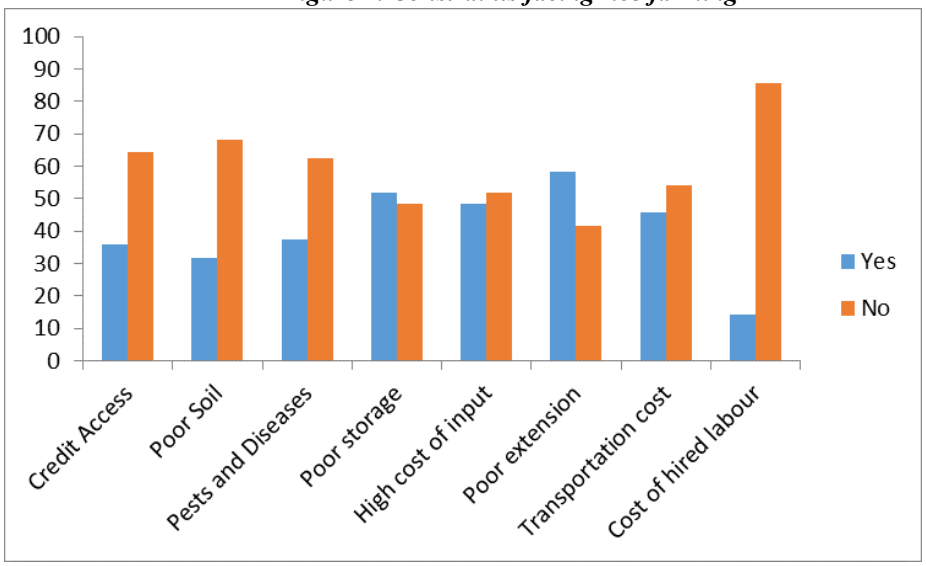
***** = sign. @ 1%, ** = sign @ 5%**

Source: Field survey, 2021

Constraints facing rice farming

Figure 4 depicts the allocation of respondents based on limitations encountered by rice producers. According to the order of impact, rice farmers' major constraints were poor extension services (58.3%), poor storage (51.7%), high input costs (48.3%), transportation costs (45.8%), lack of access to credit (35.8%), pest and disease (37.5%), poor soil (31.7%), and cost of hired labour (14.2%).

Figure 4. Constraints facing rice farming



Source: Field survey, 2021

Conclusions

This study investigated the elements that determine the food security status of rice farming households in Oyo State, Nigeria. According to the research data provided by descriptive statistics, it is possible to deduce that rice farmers are typically small-scale, have extensive agricultural

experience, and are of an economically active age. Most of the respondents were female and this suggests that women are dominant in rice farming compared to men in the research area. The findings indicated that most of those surveyed possessed tertiary school education. The research also found that most of those surveyed had not been members of cooperatives and lacked accessibility to finance or extension services. The majority of them were married and most had household sizes of six to ten members. The findings revealed that most of those surveyed had a yearly income of at least N500,000 with an average annual income of N791,000. The findings of the food security index indicated that most of the respondents were food insecure, while only a few were food secure. Implying that there is hunger and poverty in the land, which might potentially lead to mortality if proper actions are not taken to enhance the food security of rice producers in the research region.

The logistic regression model's findings showed that age, size of farm, availability of financing, size of household, and access to extension service were the main drivers of food security status among rice producers. Household size correlated negatively with respondents' food security status. This implies that the greater the size of the household, the lesser the probability of having food security. There is a beneficial and statistically significant association between farm size, age, access to extension service, access to credit, and rice farmers' food security status. This signifies that as these variables increase, the likelihood of being food secure increases. The findings revealed that rice producers in the research area experienced significant challenges due to insufficient extension service, inadequate storage facilities, high input costs, lack of finance, and transportation costs. These could directly have a detrimental consequence on rice producers' food security.

Policy recommendations

The policy implication of this research is that extension agents should expand their service network to all areas that are into agriculture for improved agricultural practices. It is critical that the government expand the supply of extension personnel on farms so that farmers have better access to extension services. Extension personnel should be scheduled to visit rice producers no less than twice a month to provide agricultural guidance such as meteorological information, as well as answers to cultivation difficulties. The government should develop a policy to minimize market input costs in order to increase agricultural output while enhancing rice farmers' livelihoods. It is advised that the government give subsidies for the cultivation of rice inputs such as manure and agrochemicals like herbicides and insecticides to minimize underutilization owing to rising costs, and guarantee that small-scale rice producers may obtain such at a reasonable cost. In light of the empirical findings, size of the household had a negative coefficient, implying that increasing this factor will reduce food security. It is critical for the government to disseminate information on reproductive well-being to allow heads of families to take rational decisions about the number of their families, guaranteeing that modest family size remains intact by establishing health facilities that provide free fertility assistance to parents or partners. Furthermore, it was shown that access to finance is a critical component in improving household food security; the government should implement measures to make it easier for farmers to obtain credit. Furthermore, farm size has a vital component in improving food security of households; the government should encourage rice farmers to engage in large-scale rice production in order to maximize profits. In addition, government, farmers, and any supporting agencies should put in place adequate mitigating measures to curb the constraints of rice farming.

References

Adeshina, W. O., Ologbon, O. A.C., and Idowu, A. O. (2018). Analysis of Efficiency among Rice Farmers in Oyo State, Nigeria. *African Journal of Science and Nature*, 6, 54- 65.

Africa Development Bank (2014). Africa Development Bank and Nigeria: Leveraging Partnerships for Economic Transformation and Inclusive Growth 2014; 1-64.

Akukwe, T. I. (2020). Household Food Security and its Determinants in Agrarian Communities of Southeastern Nigeria. *Agro-Science* 19, 54–60. doi 10.4314/as.v19i1.9.

Amaechina, E. C. and Eboh, E. C. (2017). Resource-Use Efficiency in Rice Production in the Lower Anambra Irrigation Project, Nigeria. *Journal of Development and Agricultural Economics*, 9(8): 234-242.

Ayinde, I.A., Otekunrin, O.A., Akinbode, F.O., and Otekunrin, O.A. (2020). Food security in Nigeria: Impetus for Growth and Development. *Journal of Agricultural Economics* 6, 808– 820.

Bitrus, A., Yakubu, H., Patrick, T. & Stephen, S.F. (2021). Economics of Rice Production among Beneficiaries of Anchor Borrowers Programme in Gerie Local Government Area of Adamawa State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*, 39(1): 82-95.

Bogale, A. and Shimelis, A. (2009): Household-level determinants of food insecurity in rural areas of Dire Dawa, Eastern Ethiopia. *African Journal of Food and Agriculture, Nutrition and Development*, 9(9):131-142.

Cadoni P. and Angelucci F. (2013). Analysis of Incentives and Disincentives for Rice in Nigeria. Technical Notes Series, Monitoring African Food and Agricultural Policies, Food and Agriculture Organization, Rome, Italy 2013; 1- 42.

Daramola B. (2017). Government Policies and Competitiveness of Nigerian Rice Economy. Paper presented at the `Workshop on Rice Policy & Food Security in Sub-Saharan African' organized by WARDA, Cotonou, Republic of Benin, Available at http://www.warda.org/workshop/ricepolicy/Biyi/Biyi.D.Nigeria.Paper.pd.

Emenuga, P. E. (2019). Effect of Commercial Banks' Credit on Agricultural Productivity in Nigeria. Acta Universitatis Danubius, 15(3), 417-428.

Food and Agriculture Organization of the United Nations (FAO) (Trade and Markets Division) (2018). Accessed 12 May 2024. Available at: http://www.fao.org/economic/est/ publications/rice-publications/rice market-monitor mm/en

FAO (1998). Food and Agricultural Organization of the United Nations. Energy for Sustainable Development and Food Security in Africa. Food and Agricultural Organization of the United Nations, Rome, Italy.

FAO, 2010. Guidelines for Measuring Household and Individual Dietary Diversity. FAO, Rome.

FAO. (2017). The State of Food Security and Nutrition in the World. Http:www.fao.org/3/a-17695e.pdf

FAO. FAOSTAT (2019). Statistical Database, Statistical Division. Rome. Retrieved from: http://www.fao.org/faostat/en/#data/

Fawole, W. O., Ilbasmis, E. and Ozkan, B. (2015). Food Insecurity in Africa in Terms of Causes, Effects and Solutions: A Case Study of Nigeria. ResearchGate. Conference Paper: International Conference on Sustainable Agriculture and Environment.

Gama, E. N., Umar, M. and Djomo, C. R. F. (2022). Resource-use Efficiency of Rice Production in Kura Local Government Area of Kano State, Nigeria. *FUDMA Journal of Agriculture and Agricultural Technology,* 8 (1), 131-141. DOI: https://doi.org/10.33003/jaat.2022.0801.036

Gona, A., Mahmud, A. and Maikasuwa, M.A. (2020) . Effect of Anchor Borrowers Program on Technical Efficiency of Beneficiary Rice Farmers in Kebbi State, Nigeria. *International Journal of Agricultural Economics,* 5(4):106 – 113.

Ibrahim, S., Yusuf, A. A., Mohammed, K. O., and Audu, Z. O. (2021). Costs and Returns Analysis of Rice (Oryza Sativa) Production Under Rainy Season in Birnin-Gwari Local Government Area, Kaduna State, Nigeria. *Journal of Agricultural Economics, Environment and Social Science*, 7(2): 201-210.

Kamai, N., Omoigui, L.O., Kamara, A.Y., and Ekeleme, F. (2020). Guide to Rice Production in Northern Nigeria. *International Institute of Tropical Agriculture*, Ibadan, Nigeria.27pp.

Kosemani, B. S. and Bamgboye, A. I. (2020). Energy Input-Output Analysis of Rice Production in Nigeria, Energy, doi: https://doi.org/10.1016/j.energy.2020.118258

Kuku-Shittu, O., Mathiassen, A., Wadhwa, A., Myles, L., and Ajibola, A. (2013). Comprehensive Food Security and Vulnerability Analysis-Nigeria. IFPRI Discussion Paper 01275. Washington, DC: IFPRI.

Kunyanga, C. N., Byskov, M. F., Hyams, K., Mburu, S., Werikhe, G., and Bett, R. (2023). Influence of COVID-19 Pandemic on Food Market Prices and Food Supply in Urban Markets in Nairobi, Kenya. *Sustainability,* 15(2), 1304.

Leadership Newspaper. Rice production in Nigeria increases to 5.8 million tonnes. Retrieved 2024-05-10. DOI: http://dx.doi.org/10.1787/641266387173

Makombe, T., LewinP and Fisher M. (2010). "The determinants of food insecurity in rural Malawi: Implications for Agricultural Policy". IFPRI Policy.

Mamun, M. A. A., Nihad, S. A. I., Sarkar, M. A. R., Aziz, M. A., Qayum, M. A., Ahmed, R., and Kabir, M.S. (2021). Growth and Trend Analysis of Area, Production, and Yield of Rice: A Scenario of Rice Security in Bangladesh. *PLOS ONE*, 16(12), 1-18.

Maxwell, D. (1992) Measuring Food Insecurity: The Frequency and Severity of "Coping Strategies", FCND Discussion Paper, No 8, IFPRI.

Mohamadou, S., Josephine, B. A., Joseph, C. U., Benjamin, C. A., Gbolagade, B. A., Godwin, A. A. and Rabiu, M. S. (2022). Technical Efficiency of Rice Farmers Under Public and Private Land Administration in Dadinkowa Irrigation Scheme Area of Gombe and Borno States, Nigeria. *European Journal of Agriculture and Food Sciences*, 5(1): 32-39.

DOI: http://dx.doi.org/10.24018/ejfood.2023.5.1.523.

Obisesan, A. A., Oduntan, O. and Adetola, E. L. (2023). ICT-enabled Agribusiness: Case of Female Fresh Fish Marketers in Coastal Area of Ogun State, Southwest Nigeria. *Ghana Journal of Agricultural Science*, 58 (2): 158-166.

Oduntan, O. and Akinro, A. O. (2021). Determinants of Households' Food Security in Akure South Local Government Area of Ondo State, Nigeria. *Journal of Economics and Sustainable Development*, 12(22): 30-36.

Ogundari, K. (2017). Categorizing Households into Different Food Security States in Nigeria: The Socio-economic and Demographic Determinants. *Agric. Food Econ*. 5, 1-20. doi: 10.1186/s40100-017-0076-y.

Oloyede, W.O., Muhammad-Lawal, A., Amolegbe, K. B., Olaghere, I. L. and Joseph, I.A. (2020). Comparative Analysis of the Profitability of Rice Production Systems in Kwara State, Nigeria. *Agrosearch*, 20(2), 82-101 https://dx.doi.org/10.4314/agrosh.v20i2.7

Omonona, B., Agoi, T. and Adetokunbo, G. (2007). An Analysis of Food Security Situation among Nigerian Urban Households: Evidence from Lagos State, Nigeria. *Journal of Central of European Agriculture*. 8 (3), 399-406.

Omotosho, A. O., Muhammad-Lawal, A. and Yusuf, Y.K. (2010). Economics of Small-Scale Rice Production in Patigi and Edu Local Government Areas of Kwara State, Nigeria. *African Journal of Agricultural Research 2010;* 5(4). www.nigerstate.gov.ng/about.

Otekunrin, O. A and Sawicka, B. (2019). Cassava, a 21st Century Crop: How can Nigeria Harness its Enormous Trade Potential? Acta Scientific Agriculture 3(8), 194-202. https://doi.org/10.31080/ASAG.2019.03.0586.

Otekunrin, O. A., Otekunrin, O. A., Sawicka, B. and Pszczółkowski, P. (2021). Assessing Food Insecurity and Its Drivers among Smallholder Farming Households in Rural Oyo State, Nigeria: The HFIAS Approach. *Agriculture*, 11, 1189.
https://doi.org/10.3390/agriculture11121189

Otto, G., Okpe, A. and Ukpere, W. (2021). Rice Production, Consumption and Economic Development in Nigeria, *Annals of Spiru Haret University, Economic Series*, Universitatea Spiru Haret, 21(2), 181-217.

Oyedepo, E.O. and Adekambi, A.A. (2017). Profitability Analysis of Ofada Rice Production in Ogun State, Nigeria. *Journal of Agric. Science and Environment*, 18(1&2): 97-106.

Oyeniran, I.O. and Olajide, O.A. (2023). Assessing food security status of rural households in North Eastern Nigeria: A Comparison of Methodologies. *Afr. J. Food Agric. Nutr. Dev. 23(1)*, 22513–22533.

Oyetoro, J. O., Jolayemi, J. O., Afolayan, F. O., and Yahaya, A. (2023). Effects of Covid-19 Pandemic on Rice Production Levels in South West, Nigeria. *Greener Journal of Social Sciences*, 13(1): 15-20.

Ozor, N.O. (2009). Climate Change and the Uncertainties Facing Farming Communities in the Middle Belt Region of West Africa. Paper presented at the 7th *International Science Conference on the Human Dimensions of Global Environmental Change* (IHDP Open Meeting 2009) held at the United Nations University, Bonn, Germany between 26 April and 1 May 2009.

Punch Newspaper. Rice production in Nigeria increased to 5.8 million tonnes in 2019. Accessed 2024-05-12. DOI: http://dx.doi.org/10.1787/9789282108000-graph29-en.

Purwaningsih, T. V. (2021). Can Assets Determine Family Happiness? *Journal of Economics Research and Social Sciences*. 5(2).

Suharyanto & Indrasti, R. (2017), Assessment of food security determinants among rice farming households in Bali Province" in 2nd *International Conference on Sustainable Agriculture and Food Security:* A Comprehensive Approach, KnE Life Sciences, pages 658–669. DOI 10.18502/kls.v2i6.1088.

World Bank, (2013). Risk and opportunity, managing risk for development. World Development Report (available at http://siteresources.worldbank.org/EXTNWDR2013/ Resources/8258024-1352909193861/8936935-1356011448215/8986901 1380046989056/WDR-2014_ Complete_Report.pdf).

Yadeta, G. and Fojo, G. A. (2019). Gender differences: Participation in agricultural production in Ethiopia. *Harmoni Sosial: Jurnal Pendidikan IPS*, 6(2): 183-194.

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