Article

Rising Food Prices and Farming Households Food Insecurity during the COVID-19 Pandemic: Policy Implications from SouthWest Nigeria

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Abstract: The government's lockdown and restriction measures on the COVID-19 pandemic adversely altered livelihoods, commodity/food prices as well as food security status in Nigeria, especially for rural farming households. A multistage sampling technique was used to collect data from 480 rural farming households across three selected states of the SouthWest geopolitical zone of Nigeria. This research entailed rapid evaluation of the determining factors of rising food expenditure, implications for food security as well as households' coping strategies during the COVID-19 pandemic. A structured questionnaire was used to obtain data that were analyzed using the following descriptive and inferential statistics: double-logarithmic analysis, Foster–Greer–Thorbecke (FGT) and probit regression analysis. The results showed that 60% of respondents were married, mean years spent in school was 17, mean age was 49 years, household size was 7 people and monthly income less than $200. The FGT model results for head count ratio showed that 78% of households were food insecure. The depth of food insecurity and severity before COVID-19 were 18.4% and 9.9% respectively, and 27.1% and 13.0% during the pandemic. The double-logarithmic regression revealed that household income, size, age and occupation significantly influenced the household's food expenditure. Probit regression showed that households' income, size, amount spent on food, and the household's head, gender and educational level influenced its food security status. The research concluded that food security was indeed influenced by the COVID-19 pandemic among rural farming households in Nigeria. Intervention policies are needed to promote and enable sustainable livelihoods to eradicate hunger and food insecurity due to high food prices and high household sizes in relation to their low average income to enable rural farming households to economically recover and have the capacity to sustain themselves against future shocks.

Keywords: coping mechanism; economic policy; food access; food prices; food insecurity; quantitative technique

1. Introduction

Food provision for households is a daily necessity, with approximately 820 million individuals globally being faced with the challenge of hunger, while over two-thirds of the world population were lacking essential nutrients, thus influencing their diet, well-being and life expectancy [1,2]. It was projected by the United Nations (UN) World Food Programme that by the end of 2020, approximately 300 million people could face food insecurity specifically due to the COVID-19 pandemic [3,4]. African economies have

been severely affected by the pandemic, with an approximate 9% decrease in economic activities [5]. This decrease has brought about a negative impact on food security due to poor farm productivity, infrastructural facilities and market access, resulting in food price increases, which translates into reduced food purchases due to the lack of adequate purchasing power, and therefore, food insufficiency. This was further buttressed by [6] that people in Sub-Saharan Africa are rural dwellers engaged in subsistence agriculture to meet their daily survival needs. Such that food availability all year around and food security are functions of their various physically, socially and economically projected state which will bring about a shoot in price of food produced if these states of equilibrium are adversely affected. The causes of food shortages and food insecurity have been observed as being multi-dimensional and complex, being affected by other various indicators, such as inadequate policies and basic social services, as well as poverty [1,3].

Households' spending capacity determines their expenditure patterns, with the law of expenditure proposed by Engel contending that the total income of an individual or household is inversely proportional to their food expenditure [6–9], while the nature and patterns of food expenditure reflects their socio-economic characteristics [10,11]. Most households that experienced severe poverty were unable to produce or purchase food due to a lack of funds, being characterized by low income as well as many dependents, with this situation resulting in their being exposed to economic shocks [9].

Vulnerable households are typically characterized by spending in excess of 65% of their total expenditure on food, the high percentage showing that they either had to drastically reduce the consumption of non-food items for food or vice versa [12–16]. Approximately 73 million people in Nigeria are faced with severe food insecurity annually, with many being in dire need of assistance, this number increasing with the COVID-19 pandemic [17,18]. Global food insecurity has been aggravated by the consequences of the coronavirus pandemic that was first officially reported in Hubei Province of China in December 2019 [19–24]. So far, it has become a pandemic that has resulted to social as well as economic crises across the globe [25,26].

In West Africa, the index case of the coronavirus disease was officially reported in Nigeria on 27 February 2020, after which the cases of infection escalated in the region [27,28]. As outlined with the guidelines of the World Health Organization [29] and global practices, various restrictions were instituted by West African governments to curb the transmission of the coronavirus. The adopted strategies included closing borders and non-essential services, quarantine, movement restrictions and social distancing [30–32]. Inadvertently, these strict precautionary measures affected many people's standard of living, which significantly impacted on food security and economies [1] and had a profound effect in West Africa, a region already facing intense hunger, malnutrition and poverty as a result of multiple shocks.

It was anticipated that West Africa would experience three main interruptions due to the COVID-19-related restrictions, these being: income loss for informal sector workers who live from hand-to-mouth on a daily basis with little income, a decrease in remittances income, and shortage of food systems [1,33], thus causing challenges in addition to food security risks. Many informal workers, weak health systems and less diversified income streams are other factors that have been reported to amplify the situation in Nigeria [34]. McKibbin and Fernado [35] opined that a pandemic is the result of an infectious disease that affects households, businesses as well as governments factors, such as health care expenditure increases, business costs, and changes in the supply of labor due to increased morbidity and mortality. In Nigeria, restrictions related to COVID-19 have caused obstructions at all stages of the food value chain (i.e., production, distribution, processing and consumption) [36,37]. System delays also caused agricultural products such as vegetables, fruit and meat to perish before they could reach their markets [38,39].

In situations where the shock resulted in food shortages or gluts, an increase in food prices usually occurred, with the highest hike being in the most demanded foods [1]. The WHO [40] reported an increase in food price of 8–10% in West Africa at the early stage

of the COVID-19 pandemic (April 2020). Although its potential effects on global as well as national economy, as seen in government budget deficits/expenditures, national food expenditure and gross domestic product (GDP) growth have been examined [1,33,41–45], little information exists on the influence of government lockdown policies on individuals at the household level, especially on their food expenditure patterns. The economic impact of a pandemic can affect members of society disproportionately, based on their livelihood strategies and socio-economic status, with access to basic infrastructure making it a necessity to itemize the impact at the household level in order to identify the support mechanisms required to mitigate them [1,46,47].

Nigeria's farming households have been severely affected, with the existing food insecurity situation having worsened. Rural households have become more food insecure, as the disruptions due to the pandemic have affected the food prices, access and supply chains, yet with little understanding of the extent of the problems related to this shock. In addition, while there are national level data on food security, food vulnerability and other challenges, data that represents sub-national or the rural household level are largely missing in Nigeria. Therefore, this study intends to add to the existing knowledge about the effects of the COVID-19 pandemic by studying its influence on households' food expenditure pattern and their food security status, as well as their coping strategies to mitigate its effects in SouthWestern Nigeria. The study aimed to examine the determinants of food expenditure patterns and food security among rural households during the COVID-19 pandemic. The results presented are based on a rapid evaluation, and provides empirical information that is in line with the literatures to guide policy discussions on food expenditure and coping strategies during the COVID-19 pandemic, as well as to help in decision-making on the preservation of the household's livelihoods in Nigeria.

2. Household's Food Expenditure Pattern in Nigeria (Pre-COVID-19 Era)

Income and consumption are the main determinant of living standards [48], the former being the earning obtained from productive activities by an individual, group or organization(s). Consumption measurements over a week or month give an indication of household's habits over time, as they are regarded as being in a steady state over time [49–52]. A household's food expenditure pattern are a function acts to qualify the community's use of resources for comfort, survival and enjoyment [49,53,54]. The expenditure patterns within a household contributes to the economic, social and fiscal policies of the country [55,56].

In developing countries such as Nigeria, the households tend to spend large amounts of their disposable income on food, while in many developed countries, which are characterized with more disposable income, households expenditure patterns are skewed towards non-food items [57,58]. The amount a society spends on non-food items is a function of how developed they are, examples being found in the city of Lagos, Nigeria, which is a state with an emerging economy that accounted for about one tenth of the total household's expenditure in Nigeria. Table 1 shows that Nigeria's total household's expenditure on food and non-food for 2019 was $95,731,877,284.21 compared to $51,477,622,722.89 in year 2009/10. Of this, 56.65% of total household's expenditure in 2019 (60.2% in 2009/10) was on food, with the balance of approximately 43.35% (39.80% in 2009/10) being spent on non-food items. Furthermore, the monetary value of food consumed away from home, transportation costs as well as starchy food, tubers and plantains were responsible for the largest proportion of household expenditure, representing a combined 24.16% in 2019.

Further analysis of food expenditure within the households in 2019 reveals that various food items, such as starchy food, tubers, plantains, rice, vegetables, fish and sea food, grains and flours, in that order were the top food items households spent their disposable income on in 2019, accounting for a combined 59.19% of food expenditure. Household expenditure on non-food items was directed at transport, health, education and services, rent, fueling as well as electricity, which accounted for about 79.40% of amount spent on non-food expenditure.

Table 1. Aggregate households in Nigeria expenditure by type of commodity: National 2019.

Group	Expenditure ($)	Share in Food Expenditure (%)	Share in Total Expenditure (%)
Food consumed away from home	10,946,694,398	20.19	11.43
Food consumed at home			
Starchy roots, tubers and plantain	610,114,603	11.09	6.28
Rice	4,710,641,878	8.69	4.92
Vegetables	4,191,860,922	7.73	4.38
Fish and seafood	3,176,789,938	5.86	3.32
Grains and flours	3,056,092,445	5.64	3.19
Meat	2,835,564,411	5.23	2.97
Coffee, tea, cocoa, other beverages	706,181,167	1.30	0.74
Other miscellaneous foods	12,991,594,738	22.90	13.02
Non-food consumed both at home and away from home			
Transport	6,164,050,083	14.85	6.44
Health	5,857,776,520	14.12	6.12
Education	5,783,316,793	13.94	6.04
Fuel/Light	4,800,437,573	11.57	5.01
Other miscellaneous non-foods	16,373,251,029	25.87	11.71

Source: NBS = consumption expenditure pattern in Nigeria—2019.

2.1. COVID-19 in Nigeria and Policy Implication

To protect her citizens from the severe economic effects of the pandemic, the Nigerian government announced various financial stimulus packages and policy guidelines. The Federal Government of Nigeria (FGN) announced a decrease in Pay As You Earn Tax (income tax), resident income tax (Corporation Tax), turnover tax rate, Value Added Tax and the provision of a relief package for state governments. In addition, FGN in July 2020 announced a post-COVID-19 economic stimulus package to support and relieve private businesses that had been adversely affected by the pandemic. In its Monetary Policy, the Central Bank of Nigeria (CBN) made use of a measure called credit relief to alleviate the severe impacts of the pandemic, ensure the stability of the financial sector and reduce its lending rate during this period [59–61].

It was also announced by the FGN that food relief packages and stipends would be provided to helpless and less privileged people, especially those whose livelihood activities were affected by the national lockdown. While these measures would minimize the economic impact of COVID-19 on citizens to some extent, they are in no way a panacea for their traditional food expenditure patterns. Ozili [59] suggested that social assistance programs, such as a waiver of utility fees, direct and indirect cash transfer to households, could have produced more favorable outcomes, especially for the wage earners, whose earning(s) were adversely influenced by the lockdown restrictions. Moreover, the relief measures were provided as a result of loss of livelihood income generating activities by the citizens, while the social protection measures faced serious setbacks for various reasons, such as logistical challenges and poor implementation, which resulted in minimal or no relief [1].

Studies on household expenditure and food consumption patterns have always been the focal point of research in developing as well as developed countries [62,63]. These go a long way to providing inputs into nutritional policy initiatives related to food, by updating food consumption patterns with changes in the commodity prices, disposable incomes and taxation. National expenditure data in Nigeria has shown an increase in the proportion of food expenditure of the total households' expenditure [64,65]. The data provides evidences of a growing number of people joining the ranks of those who are hungry, starving and malnourished, suggesting that the country is characterized by high levels of food insecurity.

The national food expenditure data showed that approximately two thirds of total expenditure in 2004 was on food, but decreased from 2004 to 2006. The food expenditure figures thereafter were 63.4% in 2007, 74.1% in 2008, 72.8% in 2009 and 63.6% in 2010, by which time this food share had risen by approximately 10%. The proportion of disposal income of households with total expenditure on food indicates its vulnerability to food security, including in the future, with a household being at risk if over 70% of its income is spent on food [64,66].

Surveys of household's income and expenditure are used to elicit data on specific conditions, indicating the seriousness of the condition in question [32]. These surveys provide relevant inferences that serves as a source of information that can be measured/monitored to target regional or national food insecurity.

2.2. The Effect of the COVID-19 Pandemic on Food Prices and Food Security in Nigeria

The impact of the COVID-19 pandemic is becoming very tangible as the virus spreads across the world, with multiple strains emerging periodically. In some cases, this resulted in interruptions occurring simultaneously to multiple stages of the food supply chain. In other cases, the impact generated served as a pressure wave ahead of the cases, causing second-order impacts following shifts in trade [67–69]. Disruptions in Nigeria were magnified by existing structural issues, where the small-scale food producers and suppliers operate under extremely difficult conditions, including inadequate infrastructures, such as roads, irrigation facilities, power supply and wholesale markets. This results in economic and geographic isolation, little opportunity to develop business, a lack of sufficient access to services, such as credit, training and supplies, and a high dependence on weather conditions [70].

These associated problems in Nigeria directly reflect the inability of the local food systems to respond and recover rapidly from the effects of the multi-dimensional shocks and stressors [71–73]. When shocks (e.g., drought, flood, climate change, natural hazards), local insecurity and stressor (e.g., corruption, seasonal road inaccessibility) occur, they can adversely affect the food supply chains as well as the food producers, retailers and transporters, and prevent farmers and other producers from operating efficiently [72]. Economic and physical interruption of food supply operations leads to food shortage, losses and price volatility in urban and rural areas [70].

As with other nations, a number of overlapping and reinforcing dynamics have emerged that have influenced food systems and food security in Nigeria, including altering food supply chains, thereby disrupting social protection programmes, losing income and livelihoods, altering food environments, and increasing food prices [71–73]. Other challenges to food security in Nigeria are recurrent drought, traditional agricultural practices, unstable weather, pests and diseases, weak institutional capacity, population pressure, as well as inadequate infrastructures and social services. Moreover, food insecurity is one of the defining features of rural poverty, affecting millions of people, specifically in rural areas [70]. Given the high degree of uncertainty surrounding the coronavirus, and its evolution and resolution, there is and may be future threats to food production and prices as well as food security in Nigeria. Figure 1 gives a brief overview of these dynamics and the policy's needs and the pandemic's effects having been shown in diver's ways in Nigeria as it has unfolded.
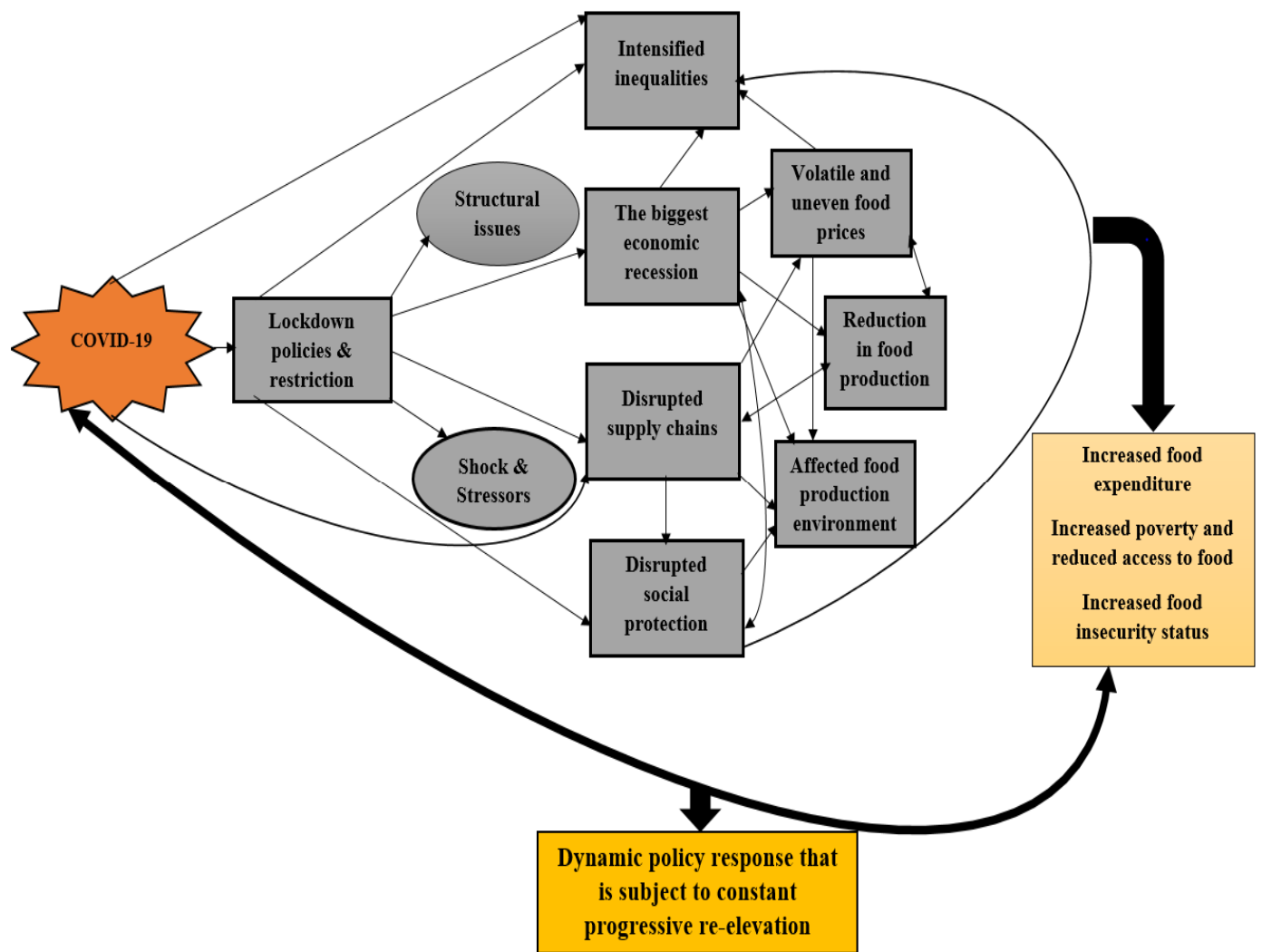
Figure 1. Dynamics of COVID-19 as it threatens food expenses and food security in Nigeria.

3. Methods

3.1. Study Area

This study was conducted in the rural SouthWestern geopolitical zone of Nigeria (Figure 2) [74,75], which consists of six states, namely: Ekiti, Lagos, Osun, Ogun, Ondo, and Oyo, and from which three were randomly selected. The major occupation is farming, in which maize, cassava, yam, oil palm, cocoa and timber are equally produced comercially. Most rural families in the zone survive on subsistence farming, with supplementary income from employment outside the home, which was adversely disrupted by the COVID-19 pandemic restrictions and regulation, as people were required to stay at home for long periods. This resulted in rural households dropping into increasingly poor categories, resulting in the majority having to depend on savings and help from relatives. The natural vegetation consists of rain forest in the south and Guinea savannah in the north, with the soil being fertile enough for subsistence farming activities.
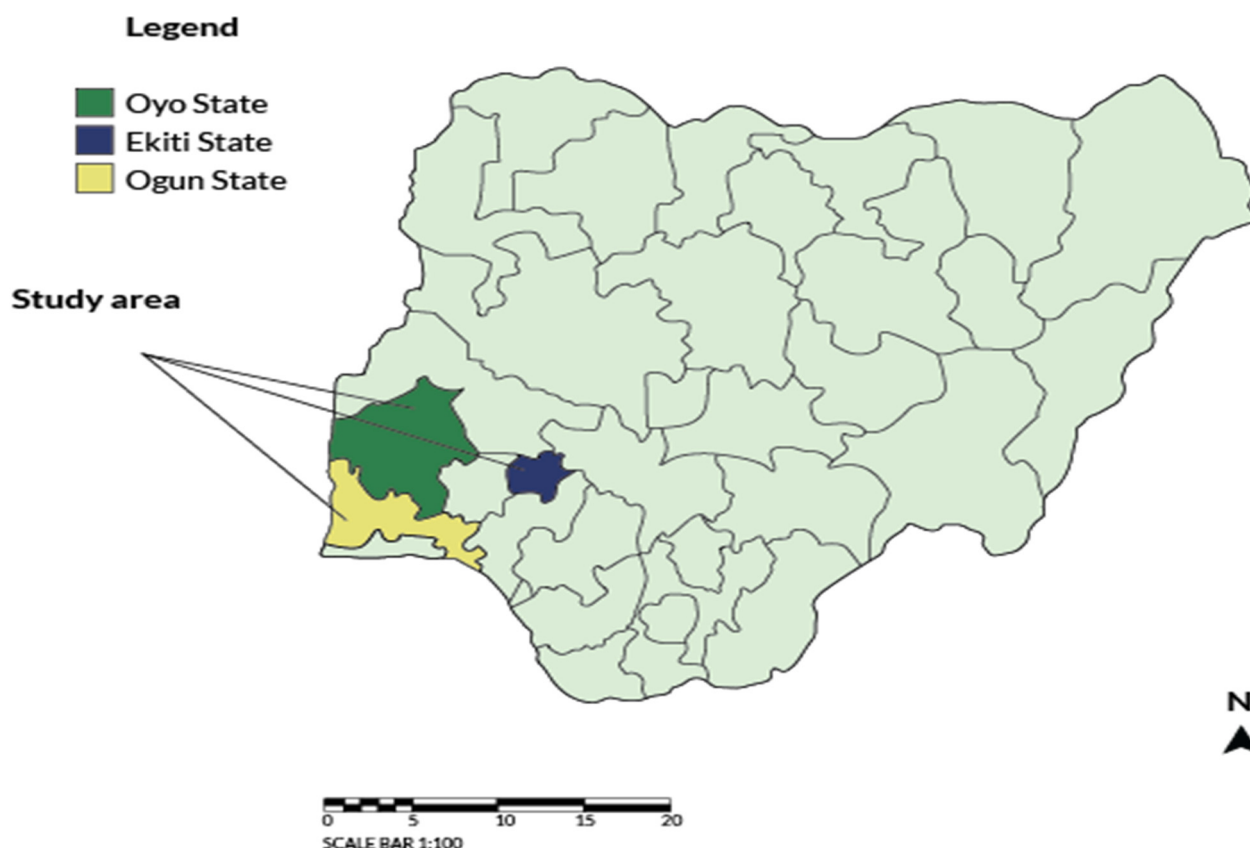
Figure 2. Study areas located within the identified states in the SouthWestern geopolitical zone of Nigeria.

3.2. Sampling Techniques and Data Analysis

A multi-stage sampling procedure was applied to select 480 rural farming households using primary data from structured interviews across three (Oyo, Ekiti and Ogun) of the six states that made up SouthWestern Nigeria (Figure 3). A multi-stage sampling procedure was used due to the fact that the sampling population is so vast, whereby reaching every individual is impossible. Likewise, it is a cost and time effective sampling procedure which helps to slim down the population into a smaller group. The data were collected across the study locations in the year 2020. In the first stage of the multi-stage sampling, three states were selected due to the extent of their small-scale farming activities, prominence of poverty among the rural inhabitants, and scarcity of data on rural farming households COVID-19 implications on food security. The states consist of a number of sub-administrative delineations, these being zones, blocks and cells, which were used in this study.

The second stage involved selecting two zones from each state, making six zones, based on the extent of rural farming enterprises. The third stage involved randomly selecting 2 blocks from each of the 6 Agricultural Development Programme (ADP) zones, making 12 blocks. Stage 4 involved randomly selecting 4 cells from each of the 12 blocks, making 48 cells, with 45 households being selected from each, equating to 540. Within each cell, 45 questionnaires were administered, which resulted in 540 interviews being conducted, while the last stage involved randomly selecting 10 properly completed questionnaires from each of the 48 cells, which totaled 480 from the rural farming households.

The questionnaire consisted of four sections: (1) socioeconomic details; (2) food expenditure patterns; (3) food security indicator before and during COVID-19; and (4) adopted coping strategies for food insecurity. The data was initially analyzed using descriptive statistics, which includes means, frequencies, standard deviations and a t-test. Statistical

modeling analyses were then applied using the double-logarithmic method to estimate the determinants of their food expenditure patterns. The probit regression model was used to determine the factors affecting their food security status during COVID-19, while the Foster–Greer–Thorbecke (FGT) index was used to classify the farming households into food secure and insecure.
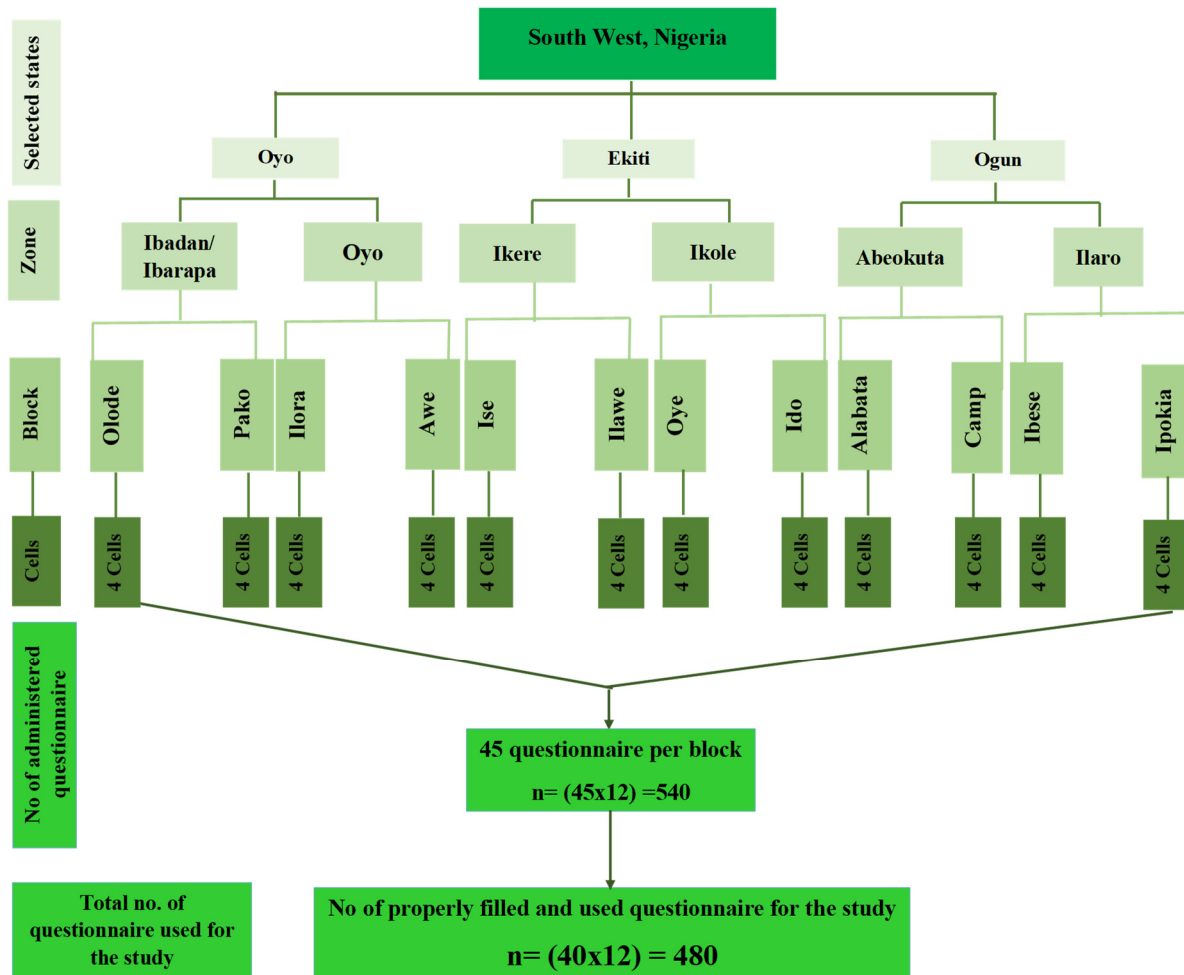
Figure 3. Framework used for sampling method and sample size for the study.

3.3. Model Specifications

Three main analytical techniques were used in the current study, the first being the Foster–Greer–Thorbecke (FGT) index, which was used to disaggregate the households into food secure and insecure categories. The second analytical tool was a double-logarithmic regression analysis, which was used to determine the factors affecting the food expenditure pattern of the rural farming households, while the third was the probit regression, which was used to determine the factors affecting the food security status of the respondents.

3.3.1. Foster, Greer and Thorbecke Index

The procedure of Foster et al. [76] was adopted to compute the incidence, depth and severity of food insecurity within the rural farming households in the study area. The FGT index measure is given as:

$$FGT\,(\alpha) = \left[\frac{1}{n} \right] \sum_{i=1}^{p} \left(\frac{C - Yi}{c} \right)^{\alpha} \tag{1}$$

where n represents the number of sample households; Y_i is the measure per adult of equivalent food calorie intake of the ith household; c is the cut-off between food secure and insecure households (expressed in terms of caloric requirements as 2100 kcal); p depicts the number of households that are food-insecure; and α is the weight attached to the severity of food insecurity. In the FGT index, $y_i \geq c$ showed that the specified household is food secure.

Within this FGT index, the three most frequently employed computed indices are head count ratio, food insecurity gap and severe food insecurity gap [77]. Head count ratio depicts the percentage of sampled households whose food consumption rate is below the predetermined subsistence level of energy (2100 kcal) and means FGT ($\alpha = 0$) = q/n. The food insecurity gap, FGT ($\alpha = 1$), measures how far the food insecurity of households, on average, are below the subsistence level. This index characterizes the amount of resources that will be required to bring all the food insecurity of the households to this subsistence level, and creates the possibility of estimating the resources required to eradicate food insecurity through proper and adequate targeting. Finally, severe food insecurity (squared food insecurity gap), FGT ($\alpha = 2$), is a measure of the severity of those who are furthest away from the subsistence level, with a higher weight in aggregation than those closer to the subsistence level.

3.3.2. Double-Logarithmic Regression Analysis

The regression analysis was used to determine the factors affecting food expenditure pattern of the rural farming house in the study area.

$$\text{LnY} = B_1 \text{In } X_1 + B_2 \text{In } X_2 + \ldots \ldots \ldots B_n \text{InX}_n \tag{2}$$

Y is the dependent variable where B_1, B_2, B_3, B_4 and B_n represents the regression coefficients of X_1, X_2, X_3, X_4 and X_n which are the predictor variables, shown in Table 2, are the independent variables used in the analysis. Pearson–Fisher X^2 test was used to test goodness of fit of the model

Table 2. Variable descriptions for factors affecting food expenditure pattern.

Variables	Description
Dependent Variable	
Amount spend on food by the respondents	Actual amount in $ (Continuous)
Independent Variables	
Age	Number of years (Continuous)
Gender	Dummy: 1 if head is male and 0 if otherwise
Marital status	Dummy: 1 if head is married, 0 otherwise
Source of income	Dummy: 1 if farming, 0 otherwise
Income	Number in $ (Continuous)
Educational status	Years of academic education (Continuous)
Household size	Actual Numbers (Continuous)

3.3.3. Probit Regression Analysis

The probit regression analysis was used to determine the factors affecting the food security status of the respondents [78–82]. The binary probit model was used to estimate the effects of the explanatory variables on household food security status. In this model, household food security (HFS) is the dependent variable that is dichotomous, taking a value of 1 if the household is food secure and 0 if otherwise. The cumulative probit model is specified as follows [78].

$$P = E (Y_i = 1/X_i) \beta X_i + \varepsilon_i \tag{3}$$

P is a probability of dependent variable Y (1 = food secure, 0 = food insecure);
X = vector of explanatory variables (age, income, sex, marital, educational status (See Table 3);
β = coefficients;
ε_i = random error.

Table 3. Variable descriptions for factors affecting food security status of the households.

Variable	Description
Dependent Variable	
Food security status	Dummy: 1 if food secure, 0 if otherwise
Independent Variables	
Age	Number of years (Continuous)
Gender	Dummy: 1 if head is male and 0 if otherwise
Marital status	Dummy: 1 if head is married, 0 otherwise
Educational level	Years of academic education (Continuous)
Household income	Amount in $ (Continuous)
Main source of income	Dummy: 1 if farming, 0 if otherwise
Amount spend on food from home	Amount in $ (Continuous)
Amount spend on food away from home	Amount in $ (Continuous)
Household size	Number (Continuous)

3.4. Ethics Considerations

A household survey was used to collect data that were analyzed anonymously, with the participants being selected randomly, all being given a clear explanation of the study objectives and providing verbal consent to participate willingly. If the respondents declined to be interviewed, the reasons for their refusal were recorded. Before the study was conducted, the Faculty of Natural and Agricultural Sciences research ethics committee (FNAS-REC) of the North-West University, Nigeria, approved the study (Ethical clearance no: NWU-01243-19-S9), which was ranked as having a negligible risk to human participants.

4. Results and Discussion

4.1. Socio-Economic Characteristics

Table 4 presents the socio-economic characteristics, with more than two-thirds of the households being male-headed, their mean age being 49 years, the food secure household headings being 44 years old while insecure households were 54 years in mean age. This was in line with Andem [79], who reported that the mean age of the respondents in rural areas of Nigeria was estimated to be 47–55 years. The result indicated that the majority of respondents in the study area are still economically active and expected to be productive with the available resources, irrespective of their food security status. Of the 480 respondents, 60.00% were married and 62.00% had farming as their main source of livelihood activities. The majority (65.00%) earned less than $200.00 a day, the mean years spent in school by members in food secure and insecure households being estimated at 10 years and 18 years respectively, while 76.00% were members of saving groups. It could be deduced from the result that the majority of the farmers were small-scale farmers who worked with implements such as hoes and cutlasses to carry out their farming activities. The use of these handheld implements hampers the potentials of the farmers to produce massively as well as the ability to earn more income. Approximately 90.00% confirmed that the COVID-19 pandemic had impacted their regular households' food expenditure pattern. This was in line with the study by Mahmud and Enriquez [80,81] on the widespread perceptions about the negative effects of the coronavirus on jobs and incomes, which complicated and negatively influenced the amount of income and money spent on food from within and outside of the households of their respondents.

4.2. Food Security Status by Households' Annual Income ($) and Sources of Income before and during COVID-19

Household income is important for achieving food security [77,82,83], with Table 5 showing the result of the household annual income per adult equivalent (AE) and sources of the income in the study area. The most significant source of income was food/arable crop production followed by livestock and off-farm activities before and during COVID-19. The overall mean income per adult equivalent of the sample households before and during COVID-19 were $96.32 and $77.78, respectively. The mean annual income per AE of food

secure and insecure households before COVID-19 were $72.45 and $23.87, respectively, while during COVID-19 they were $56.63 and $21.15, respectively. It can be deduced from the result that the majority of the respondents lived on less than $1 a day, which is well below the UN [21] threshold for a standard of living. The result showcases the agrarian nature of rural households in the study area.

Table 4. Summary statistics of the socio-economic characteristics of respondents (n = 480).

Variable	Food Insecure (0.78) n = 374		Food Secure (0.22) n = 106		Total n = 480	
Gender of respondent (1 = male)	0.70	0.13	0.82	0.17	0.78	0.23
Age group (1 = adult; 0 = youth)	53.8	0.21	44.5	0.18	49.1	0.12
Education level of respondent (Years of education)	9.6	0.33	18.4	0.27	16.5	0.31
Household size (number)	10.2	0.18	4.7	0.11	7.2	0.11
Marital status (1 = Married; 0 = otherwise)	0.72	0.28	0.51	0.16	0.60	0.42
Respondent is household head (1 = yes, 0 = otherwise)	0.62	0.22	0.96	0.31	0.87	0.29
Membership in savings group (1 = yes, 0 = otherwise)	0.48	0.11	0.96	0.37	0.76	0.26
Membership in social security group (1 = yes, 0 = otherwise)	0.12	0.18	0.19	0.16	0.23	0.22
Main source of income: (1 = Farming, 0 = otherwise)	0.66	0.17	0.58	0.10	0.62	0.11
Farm Size (hectares)	4.5	0.08	7.8	0.11	6.2	0.12
Monthly household income: <200 USD	75.0	0.31	16.0	0.11	0.65	0.24
200–500 USD	10.0	0.15	14.0	0.10	0.25	0.31
>500 USD	15.0	0.18	70.0	0.30	0.10	0.17
Perceived impact of COVID_19 on food expenditure pattern	No	%				
Yes	432	90.00				
No	48	10.00				

Table 5. Food security status by household annual income ($) and income sources.

Income Source	During COVID-19 ($)		Before COVID-19 ($)	
	Food secure (n = 106)	Food insecure (n = 374)	Food secure (n = 254)	Food insecure (n = 226)
Food Crop/Arable crop farming	41.80	13.43	55.45	15.10
Cash Crop Farming	5.60	2.51	6.45	2.56
Livestock Farming	6.42	3.90	5.10	4.10
Non-Farm/Off Farm	6.81	1.31	5.45	2.11
Sub-Total	**56.63**	**21.15**	**72.45**	**23.87**
Total	**77.78**		**96.32**	

4.3. Food Security Status of the Respondents

Head count index, food insecurity gap and severity of food insecurity were the three FGT measures used (Table 6). The food insecurity parameters used were P_0 (food insecurity incidence (headcount)), P_1 (depth food insecurity) and P_2 (severity food insecurity) [77,84–86]. The results showed that the head count ratio or incidence of food insecurity within the households before and during COVID-19 were 0.47 and 0.78, respectively. This implies that 47.0% and 78.0% of the sampled farming households are unable to meet the daily recommended food security threshold (kilocalorie requirement), while 53.0% and 22.0% of the sampled farming households were food secure before and during COVID-19, respectively. The result indicated that the majority of respondents were better-off pre COVID-19 than during the pandemic due to many facts, such as the loss of the source of income or livelihood. This posed a serious threat to the amount of available disposable income for consumption or expenditure purposes, and the restriction of movement imposed

by the government limited food availability and the prices of those available being higher than normal, which made consumptions or expenditure difficult. To identify the extent to which the food insecure households are below the recommended food security threshold, the food insecurity gap was calculated. This gap illustrates the various categories of the food insecurity situation experienced by the respondents before and during the pandemic.

Table 6. Food insecurity indices among the farming households.

Food Insecurity Status	Before COVID-19 %	During COVID-19 %
Incidence of food insecurity (P_0)	0.47	0.78
Depth food insecure (P_1)	0.18	0.27
Severe food insecure (P_2)	0.10	0.13

The P_1 (depth food insecure) among the sampled farming households before and during COVID-19 were 0.1835 and 0.2709, respectively. The result showed that if resources could be mobilized to meet 18.35% and 27.09% of caloric requirement of every food insecure households before and during COVID-19 period, then theoretically, food insecurity can be eliminated with respective to the available resources (referencing total household disposal income). The value P_2 (severe food insecure) of the farming households before and during COVID-19 were 0.0997 and 0.1301, respectively, indicating that the food insecurity severity of the respondents before and during COVID-19 were 9.97% and 13.01, respectively.

4.4. Food Expenditure Pattern of Rural Farming Households before and during COVID-19

Table 7 revealed the comparative distribution of respondents based on food expenditure pattern before and during COVID-19 in the study area. Before COVID-19, the average amount spent on food within the households (foods gathered or produced from their farms included) and away from home were estimated at $245.35 and $300.80, respectively, with the majority (75.00%) consuming food away from home thrice a week (Table 7). The distribution of respondents based on food expenditure during COVID-19, showed that the majority (66.67%) spent less than $100.00 on food, with the mean amount spent at home and away from home estimated at $75.60 and $76.55, respectively. The categorization of respondents based on frequency of food purchased/consumed away from home during COVID-19 revealed that the majority (75.83%) did so either on daily basis or at weekends, as against approximately 1.00%, who did so once a week. The result showed that the households are doing better in term of amount spent on food and the pattern of food consumption both within and away from home before COVID-19 compared to during COVID-19 era.

Table 7. Food expenditure pattern of the households before and during COVID-19.

Variables	Before COVID-19			During COVID-19		
	No.	%	Mean	No.	%	Mean
Amount spent on food at home ($)						
Less 100	68	14.17		320	66.67	75.60
101–200	52	10.83		88	18.33	
Above 200	380	75.00	245.35	72	15.00	
Amount spent on food away from home ($)						
Less than 100	25	5.21		380	75.00	76.55
101–200	55	11.46		52	10.83	
Above 200	400	83.33	300.80	68	14.17	
Frequency of food purchases/consumes away from home						
Once a week	0	0.00		4	0.83	
Twice a week	55	11.46		12	2.50	
Thrice a week	380	75.00		100	20.83	
Only weekends	25	5.21		124	25.83	
Everyday	20	4.16		240	50.00	
Total	480	100		480	100	

N.B: No. = number; % = percentage.

4.5. Implications of the COVID-19 on the Perceived Food Insecurity Situations

Figure 4 illustrates the various categories of food insecurity experienced by the farming households before and during the COVID-19 pandemic in the study area. The result revealed that food insecurity was worse during COVID-19 compared to the pre-pandemic period. The majority (above 60.00%) of respondents did not have access to nutritious/healthy food, ate only a few kinds of food and skipped meals during the pandemic, whereas less than 50.00% experienced this kind of food insecurity situation beforehand. Furthermore, almost 50.00% of the respondents went without eating for a day, as well as having no enough food to feed the family during COVID-19, while less than 20.00% experienced this before the pandemic. The discrepancy may be due to the various disruptions caused by the pandemic conditions, such as income shocks, which limited the disposable amount spent on food, as well as disruptions in food supply chains, resulting in possible food shortages and spikes in food prices [1,33,73,84–87]. The result showed that rural households have become more food insecure, as the disruptions due to the pandemic have affected the food supply chains, food prices and access to food.
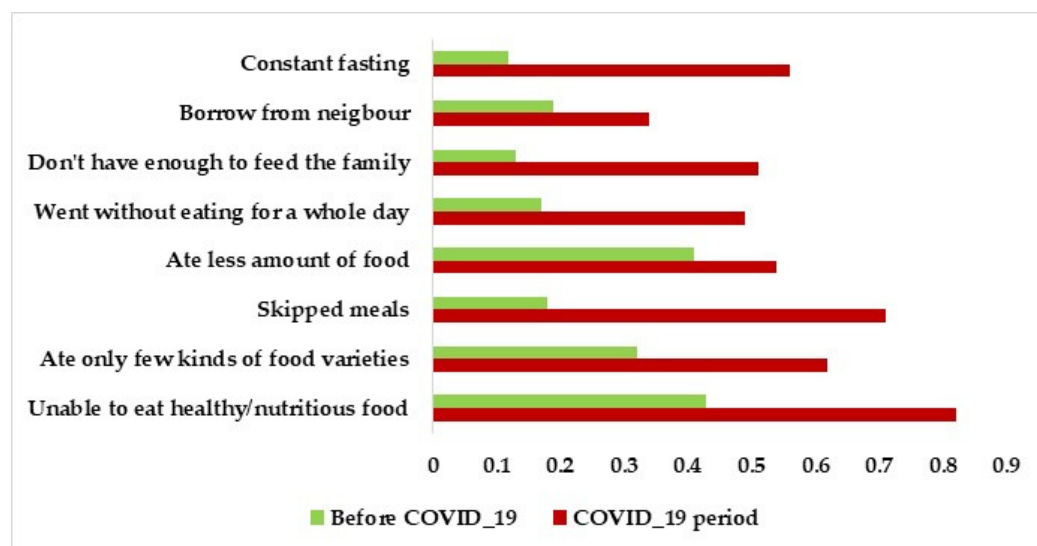
Figure 4. Percentage distribution based on perceived food security before and during COVID-19.

4.6. Coping Strategies against Food Insecurity by the Households during COVID-19

The various coping strategies adopted by the households to mitigate their food insecurity situation during COVID-19 are presented in Table 8. The majority (85.90%) changed their food pattern to mitigate their food insecurity, with 72.60% obtaining a loan for food from various financial source, 55.00% relying on help from relatives/friends, 61.90% sending some of their household members to live with someone else, and 34.60% engaging in the distress sale of livestock [74].

Table 8. Distribution of respondents based of coping strategies adopted against food insecurity during COVID-19 (%).

S/N	Coping Strategies	Percentage
1.	Change dietary food pattern	85.90
2.	Relied on savings/thrift	22.45
3.	Obtained loan	72.60
4.	Unconditional help provided by relatives/friends	55.00
5.	Sold households assets	43.32
6.	Sent household members to live elsewhere	61.90
7.	Distress sale of livestock	34.60
8.	Unconditional help from religious centers	15.75

4.7. Determinants of Food Expenditure in Rural Farming Households

The data on the determinants of household food expenditure was analyzed using the double-logarithmic regression equation as the lead equation, which was chosen based on theoretical and statistical criteria. Food expenditure was the dependent variable, while the explanatory variables included household size, income and composition, as well as household head age, marital status, level of education and sex. The result of the regression analysis (Table 9) revealed that household income ($p < 0.01$), age of the household head ($p < 0.05$), household size ($p < 0.01$) and main source of income ($p < 0.01$) positively and significantly influenced the food expenditure of the households. This result shows that households spent more on food with rising household income and size, as well as the presence of dependents and risk groups (infants and pregnant women). The result further support A-prior expectation that the more the household income the more their propensity to consume increases.

Table 9. Determinants of food expenditure in rural farming households.

Variables	Coefficients	Robust Standard Error	T-Value	VIF
Constant	3.18 ***	0.53	6.04	
Household income	0.55 ***	0.24	2.31	1.14
Age of household head	0.62 **	0.32	1.91	1.18
Marital status	0.28	0.51	0.55	1.06
Education level of respondent	0.70	0.50	1.36	1.12
Gender of household head	0.14	0.23	0.58	1.04
Household size	1.35 ***	0.27	4.95	1.16
Main source of income	2.36 ***	0.72	3.26	1.08
Adjusted R^2	0.52			
F-ratio	23.89 ***			
Number of Observation	480			

Note: *** and ** represent 1% and 5% significance level, respectively.

In addition, the relatively low income and high household size in the rural study area calls attention to the need for intervening policies with respect to the nutritional status of the target population, especially considering the high cost of food items in these rural communities. The results are in line with that of Dankwa et al. [88], who reported that household size has a combination of two effects on their expenditure pattern, these being 'a specific effect' and an 'income effect'. These translate into the fact that lower household size and higher income level increases the chance of the households buying more nutrition and healthy food for food security.

The adjusted R^2 measures the ability of the explanatory variables to explain all the variation in the dependent variable for the equation, being 0.5201, which shows that the combined effect of the independent variables accounted for 52.01% of the variations in the household expenditure on food items. The F–ratio provides an overall test of significance of the whole function of the regression line, and shows that it is statistically significant at the 1% level of significance (Table 9).

4.8. Maximum Likelihood Estimate of Probit Regression of the Determinants of Food Security

The result of probit regression analysis showing the effects of the independent variables, such as the selected socio-economic characteristics of the respondents, coupled with amount of money spent on food (both at home and away from home) on the food security status of the respondents, are in Table 10. The statistically significant variables affecting the food security status of the respondents were household head's gender ($p < 0.01$), household's income ($p < 0.01$), age of household head ($p < 0.05$), educational level of household head ($p < 0.01$), household size ($p < 0.01$) as well as amount spent on food at home ($p < 0.05$).

Table 10. Maximum likelihood estimates of probit regression.

Variables	Coefficient	Robust Stand Error	Z	Marginal Effect	VIF
Constant	1.70	0.80	2.12	0.15	
Household income	0.59 ***	0.18	3.23	0.09	1.12
Age of household head	0.47 ***	0.19	2.42	0.01	1.01
Marital status	0.17	0.91	0.19	0.09	1.43
Education level of respondent	0.35 ***	0.12	2.88	0.21	1.55
Sex of household head	0.36 ***	0.10	3.56	0.01	1.68
Household size	−0.30 ***	0.10	-2.93	0.11	1.42
Main source of income	−0.09	0.07	1.37	-0.08	2.01
Amount spend on food at home	0.10 **	0.07	1.87	0.33	1.22
Amount spend on food away from home	0.13	0.20	0.68	0.22	1.71
Likelihood =	−103.791				
Pseudo R^2	0.5812				
Chi square	64.04 ***				
Number of observation	480				

Note: *** and ** represent 1% and 5% significance level, respectively.

The gender of household's head was positively significant (0.36, $p < 0.01$), which implies that there is higher probability of being food secure by male-headed household compared to their female counterparts, which might also be as a result of the fact that males have higher income generating activities than their female counterpart in the study area. Omotayo [82] posited that food secure male-headed households are more food secure than female headed households. Furthermore, the effect of the amount spent on food at home was positive (0.10) and significant ($p < 0.05$), which influences the probability of being food secure in the study location. The coefficient of the education status of the household's head was positive (0.35) and significant ($p < 0.01$), an indication that their higher educational level had a greater probability of leading to a food secure status.

The negative parameter estimate (−0.59) of household income was significant ($p < 0.01$), which showed that it exhibits an inverse relationship with the food security status of the rural farming households. This was in conformity with Amzat et al. [27], who reported that the lockdown policies during the pandemic jeopardized the food security status of low-income households, due to their income determining the amount spent on food at home and the level of food consumption. Furthermore, the positive parameter estimates of marital status and household size denoted that there were positive correlations between these variables and the food insecurity status of the respondents. This shows that the higher these variables, the more insecure the households tend to be.

5. Conclusions

This study assessed the implications of the COVID-19 pandemic on rural households' food security and expenditure pattern in the SouthWestern states of Nigeria. The results indicate that food security was indeed affected by the COVID-19 pandemic, the rural farming households being the most affected, with 78% being food insecure. The majority of respondents were young, married, with an average household size of seven persons and an estimated monthly income of less than $200.00. In addition, the majority purchases/consumed food away from home on a daily basis, with weekly expenditure on food before and after COVID-19 estimated at $245.35 and $75.60, respective. The study revealed that 47.0% and 78.0% of the households were unable to meet the daily recommended caloric requirement before and during COVID-19, respectively. Furthermore, 18.4 % and 27.1% of the households before and during COVID-19 were below the poverty line, while approximately 10.0% and 13.0% of the sample households were in the most severe food insecure group in the study area before and during COVID-19, respectively. This may be attributed to the reduction or total loss of income, markets accessibility as a result of restrictions imposed on traveling as well as low purchasing power. The inferential statistical

results further show that household will spend more on food with rising household income and increase household size (including the presence of dependents and risk group such as infants and pregnant women), while the major factors influencing food security status of rural farming households were total household's income, household head age, education level and sex, and the amount spent on food at home by the farming households.

6. Recommendation

Based on the findings, the following recommendations were made:

1. Rural farming communities need to be made aware of the need for family planning to be able to reduce their family sizes in order to sustain their families, specifically in difficult times, such as that of the ongoing COVID-19 pandemic era;
2. Farmers should be encouraged to increase their household's income sources to promote sustainable crop and livestock management practices, commercialization and diversification of farm products;
3. Providing subsidies on basic household food items should be explored by the government as part of the measures to eradicate hunger;
4. Accessible and affordable education needs to be provided with subjects relevant to ensuring food security and income generation in rural areas;
5. More flexible and rural focused policies on the rural food expenditure analysis needs to be encouraged by government and private sectors so as to address the factors affecting food expenditure pattern in rural areas of Nigeria;
6. The government needs to implement structural changes in social security schemes that will consider packages that are responsive to members' needs during such crises (COVID-19). This would be an immediate fallback position to improve the standard of living, food expenditure pattern and security of the populace, as there was a severe discrepancy in food expenditure pattern and security of the populace before and during COVID-19 pandemic;
7. Promoting and enabling saving and borrowing capacity, especially for low-income earners and rural households, would provide opportunities for borrowing and mitigating the problems experienced by households and businesses during a crisis, such as the COVID-19 pandemic;
8. Government and NGOs should encourage and motivate people about the importance of vaccination against COVID-19, which will at the long-run improve their wellbeing, protect them against further severe infection and therefore enable them to be economically active, increase their disposable income and enable healthier and cost effective expenditure/consumption pattern both at home and away from home.

7. Limitation of Study

The required time, financial resources, technical skills, data collection and computation costs were high during the time of this study as a result of COVID-19, which might have influenced the efficacy of data gathering and response from the respondents. The household is only examined at the time of the interview, and as changes may well occur, the estimates may be biased through systematic non-sampling errors. In addition, social desirability problems may occur with the responses, as respondents do not want to look bad in front of the interviewers, and may over- or under-report their data. There was serious price growth as a result of inflation during COVID-19 period, which makes it difficult in calculating the economic variables before and during the pandemic.

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