DETERMINANTS INFLUENCING FOOD INSECURITY IN WARRI DELTA STATE

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APPROVAL PAGE

This research has been supervised and approved after meeting the requirement of the faculty of Education, University of Benin, Benin City.

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Dr. E. Iyamu
(Project Supervisor)

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DATE

CERTIFICATION

This is to certify that this project tithled, DETERMINANT OF FOOD INSECURITY IN WARRI DELTA STATE was carried out by vera ese OJOMI with matriculation number **EDU1904671 i**n the Department of Vocational and Technical Education, University of Benin, Benin City.

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DEDICATION

This project is dedicated to God Almighty, who gave me the strength and opportunity to carry out this research work.

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TABLE OF CONTENTS

	PAGE
TITLE	i
APPROVAL PAGE	ii
CERTIFICATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
ABSTRACT	ix
CHAPTER ONE: INTRODUCTION	
Background of Study	1
Statement of the Problem	7
Research Questions	9
Hypotheses	9
Purpose of Study	9
Significance of Study	10
Scope of the Study	11
CHAPTER TWO: REVIEW OF RELATED LITERATURE	
Theoretical Framework	12
Concept of Food Security	16
Food Security and Food Insecurity Situations in Nigeria	17
Determinants of Food Insecurity in Nigeria	22

Perceived Causes of Food Insecurity in Nigeria 34

Summary of Reviewed Literature 46

CHAPTER THREE: METHODOLOGY

Design of the Study 49

Population of the Study 50

Sample and Sampling Techniques 50

Research Instrument 51

Validity of the Instrument 51

Reliability of the Instrument 51

Method of Data Collection 52

Method of Data Analysis 52

CHAPTER FOUR: PRESENTATION OF RESULTSAND DISCUSSION FINDINGS

Presentation of Results 53

Discussion of Findings 60

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary 65

Conclusion 66

Recommendations 68

REFERENCE 70

APPENDIX 76

ABSTRACT

The study investigated the determinants of food insecurity in Warri. In order to attain the objectives of the study, three research questions were raised to guide the study. Descriptive survey research design guided the study. The population of this study comprised of all the Warri metropolis is divided into three quarters namely Onicha-ugbo, Obomkpa, and Obodo.

The population of the study was purposively drawn from respondents who are basically traders/merchants artisans, and civil/public servant of Warri, Delta State. The total population of traders/merchants artisans both male and female was found to be One Hundred and Ninety Two (192) in total. The sample size of the study was a total of 120 respondents. The respondents was 40 for the traders/merchants artisans and 80 for the civil/public servant respectively. The sample will be selected using a stratified and a simple random sampling technique. A structured questionnaire titled: Determinants of Food Insecurity Questionnaire (DIFQ) will be used for data collection. The instrument was validated by the project supervisor and two other lecturers in the faculty. For the determination of the instrument, copies of the instrument were administered to 13 male and 7 female civil servants who were not part of the sample. The Cronbach Alpha was used to ascertain the reliability using test-retest method which yields 0.83. This result implies that the instrument was reliable. The collected data was analyzed using descriptive statistics. The descriptive statistics was used involved frequency count; simple percentages mean score analysis and standard deviation. Furthermore a criterion mean of 2.50 was be adopted for decision making.

The study found that the study has found that majority of the farmers were found to be food insecure during the period of the survey and several determining factors were identified for the deteriorating food security situation of the study area. They include the shortage of farmland caused by population pressure, recurrent drought, poverty, climate change, shortage of rainfall, and land degradation. Based on the findings of the study, Expand the family planning education to limit the family size of the rural population, which could ease the problem of overpopulation and acute farmland scarcity and design a strategy to diversify the livelihoods of the rural community so as to complement their food gap, Complementarities such as steady electric power and water supplies, good transportation/information and communication technology network, and housing units that will enhance the business ventures of the metropolitan poor be provided since most of the household heads are at the plateau of their lifecycle (age range within the labour force bracket), according to the dictates of lifecycle hypothesis amongst others.

CHAPTER ONE

INTRODUCTION

Background to the Study

One of the most critical problems facing Nigeria today is that of securing already produced food. Food security is deemed to exist when all people at all times have the food needed for an active and healthy life. Food security is a complex phenomenon attributable to a range of factors that vary in importance across geographic and social boundaries and the concept is multi-dimensional, providing valuable insights into the nature and extent of a population's food situation. The World Bank (2018) has identified three pillars under-pinning food security to include food availability, food accessibility, and food utilization. Food availability means ensuring that sufficient food is available through own production. Food accessibility means poverty reduction: simply making food available is not enough because low income households must also be able to purchase it. Food utilization means ensuring a good nutritional outcome, which can be termed nutrition security. Having sufficient food would not ensure a good nutritional outcome if poor health results in frequent sickness.

The National Food Security Programme in Nigeria defines food security as the physical availability and ability of individuals to have or afford the food at a reasonable cost (NFSP, 2019). These definitional frameworks imply that four major elements constitute food security and they include food availability, adequacy, accessibility, and sustainability of access. Discussions about the perceived causes of food insecurity in

Nigeria have seemingly been complex given that multiple factors affect food security. However, drought risk seems to remain one of the key drivers of food insecurity in Nigeria. Since 1950, 12 major drought-induced food security crises have occurred, highlighting the sensitivity of food security to climate-related risks. Woldeamlak (2019) alleged that once every 3 or 4 years is a drought year in Nigeria. Environmental degradation is perceived to also be a critical factor which exacerbates soil loss, deforestation, and pest incidence—all of which affect food security.

The perceived impact of drought in Nigeria is seemingly severe due to the backlog in infrastructure development. In a study in Delta State, the researcher observed that the vulnerability to drought due to the declining access to inputs and infrastructure as a result of population growth and density. This seems to have resulted in the reduced cultivation of high-yielding varieties of maize and low yields of staple crops. Numerous studies relevant to drought risks emphasize the importance of infrastructure development in reducing vulnerability to drought

Government policy on climate adaptation seem to have affected farmers, assuming that insufficient government support constrained farmers' initiatives blamed food shortages in rural areas of Nigeria on poor economic policies and the violent land seizure in 2018. This researcher further claims that during the drought, politically connected people would buy grain from the Grain Marketing Board and then resell it on the market at higher prices, thereby gaining financially from food insecurity in the country, meanwhile, identifies the souring of donor–government relations as the cause of

donors' slow response to the 2019/2002 drought in Nigeria, with food aid arriving late and which led to severe malnutrition and a high mortality rate.

The perceived adverse impacts evidenced have been experienced in the first decade of the 20th century. The perceived challenges of food insecurity, which are seemingly created politically and exacerbated by faulty analysis and actions, a failure to understand the interventions of the World Food Summit News of 2002, political interference, victimization, discrimination by government and a lack of political power and will. This has been prevalent in some African countries, which include Eritrea, Nigeria, Angola, Sudan, and sub-Saharan countries, where the highest prevalence of undernourishment has been experienced. Moreover, the previous authors contend that countries such as Malawi and Zambia have experienced a decline in food availability during years of drought. This was perceived to be attributed to a lack of transparency concerning government policy on trading.

Poverty according to the researcher's observation seems to have resulted in the unsustainable use of natural resources and the overall deterioration of the environment. The researcher observed that during a severe drought in Ekiti State in Nigeria, many of the poor people were forced to leave pastoralism and migrate to towns in search of paid jobs. An increase in farming and non-farming income seemingly improved the use of water and soil conservation measures and the likelihood of mixed farming. The researcher observed that the main problem encountered by farmers and which leaves them extremely vulnerable and unable to plan is the inadequate weather and made

similar observations in the Northern region of Nigeria where a significant proportion of farmers seem to have no access to early weather forecasting information.

According to Feleke et al. (2019), seven factors affect household food security in Nigeria but this study would be delimited to only three of those drivers. These are the labour, farming experience, relief support (food aid).

Labor is a key asset for smallholder households in rural Nigeria . In Nigeria where farm mechanization seem to be non-existent and all farm work is done manually, having access to necessary labor force for agricultural production directly affects the status of rural household's food security. In addition to working on a household's own farm, labor force may also be engaged in off-farm economic activities, thus providing additional income to the household, which could be used for food purchases in times of food shortage. There seems to be a lack of labor force would have an intense impact on agricultural production and household food security. This seems to be attributed low mechanization in Nigeria n agriculture, human labor is crucial for land preparation, weeding, and harvesting processes.

Farming experience is an important factor in determining both productivity and the production level in farming. The mean year of sample household heads farming experience is about 19 years. It ranges from 2 to 60 years having a standard deviation of 12.08. The positive association could be attributed to the fact that farmers who have many years of experience in agricultural activities are more likely to be food secure than their counterparts. This means that as farmers' agricultural experience is increased, their

knowledge and skills about sustainable land management and effective utilization of the available small farmlands will be increased as a result able to produce more food crops.

In this study, relief support (food aid) means the provision of food grains or cash for food-related purposes to chronically food insecure farm households. This is provided on grant bases to address critical food needs arising from natural and man-made disasters. Food aid is frequently part of the international response to a national or economy-wide extreme crisis. These crises pose an immediate or imminent threat to the lives, livelihoods, short-term stability, and longer-term development. In Nigeria suggests that food aid displaces domestic production and commercial trade by depressing prices in the recipient countries; it affects the labor supply negatively, enhances market imperfections and information asymmetries, and this, in turn, affects economic development.

Government support includes agricultural extension services, technology transfer (such as advice on food crop production, cash cropping, livestock production, and soil and water conservation), irrigation and water harvesting schemes, the education of women and children, provision of clean water and healthcare, and a stable functioning market system. Agofure (2018) observed that households farmers in Delta State do not seem to receive adequate government support to alleviate food security problems, respectively. He revealed that food aid decreased government support to agriculture in the long run and caused distortion in the local price of food items.

A host of strategies have been considered as being effective against drought, which includes gender, age, adaptive farming, race, community involvement, governance,

traditional knowledge blended with scientific knowledge, understanding and learning from risk, gap identification, resilience standards, and evaluation. Some of these authors further suggest that responsive interventions should take place, with plans developed, implemented, and measured with a clear view to strengthen resilience capabilities in rural communities. Accordingly, the Southern African bloc has been seen as cyclical regarding drought response and contrary to various frameworks that were aimed at strengthening resilience. Abayomi (2018) recommends formal or informal institutional arrangements, models, and platforms—such as farming communities and civic groups—that could encourage participation and enhance drought resilience

This researcher suggested a solution that included formal and informal trading and innovative programs. Meanwhile, unscientific adaptation strategies observed by smallholder farmers in Nigeria on changes in rainfall, including seed network and maize producers, had been disputed by accurate meteorological data. Open communication channels and dialogue among stakeholders (including scientists) is perceived to be an effective tool in providing accurate data to local farmers. Local farmers in South Africa were found not to have received early warning information on a drought in a study by Recommendations were made that farmers needed to be trained on drought mitigation strategies, alongside the establishment of warning systems. Strengthening community capacity in managing the effects of drought through preparedness and adaptation strategies would help to reduce the possible threat of food insecurity, as well as an investment in Drought Early Warning Systems (DEWS). In addition, it has been observed

that DEWS add value to households' food security: The available and reliable information would assist farmers in timely planting, the diversification of crops, drought management, purchasing the right farm equipment, and planting crops that are drought-tolerant.

The **UN0s Office for Disaster Risk Reduction** proposes an investment in agricultural infrastructure and technologies such as the construction of dams, communications infrastructure, and irrigation infrastructure. Irrigation strategy was seen as a viable method that could help to improve crop production in places prone to drought. Also, farm yields in poor climatic conditions could be supplemented by the availability of dams and wells, which can contribute significantly to reducing hunger and assisting in vegetable gardening.

Statement of the Problem

In this layer, more than half seem to suffer from food insecurity. Similarly, poverty and food insecurity appear to be endemic and seems to have been exacerbated by the frequent droughts that plague the region, wars, and lack of public policy. In response to the threat of declining crop yield and food security, farmers appears to have reacted in a number of ways by adopting several land management technologies. Normally, they appear to concentrate their conservation efforts on soils which are susceptible to high rates of erosion.

Rural food insecurity is perceived to be one of the defining features of rural poverty, particularly in the moisture-deficit northeast highland plateaus and some pastoral

areas of Warri, Delta State. The study area, the sub-watershed, is among these areas, which is seemingly affected by food insecurity, land degradation in the form of soil erosion and nutrient depletion. Moreover, the area seem to be prone to low and erratic rainfall and frequent droughts. Most cultivated lands in the sub-watershed appear to be suffering from loss of topsoil leaving bare stones behind. Such a loss is perceived to be linked with reduced crop and livestock productivity and forces farmers to move to native and intact ecosystems of the landscape and marginal lands to develop new farmlands. Thus, to establish the full picture of food security, land degradation, and economic benefits of sustainable land management, a greater understanding of food insecurity drivers and impacts at the sub-watershed level is needed.

Most of the studies that have been done so far on the issues of food security in Nigeria are very general and consider the problem from national, regional, and district points of view. While aggregate data are generally available at the national level, little work has been done to understand the food security problems at the household level in specific sub-watershed. Having national food balance data is not sufficient to understand determinants of food insecurity in rural farm households in the country. Most agricultural production comes from millions of rural households. Despite the increasing global concern of improving food security, the nature and extent of food security at the household level in rural areas are not well documented. Therefore, this study is conducted in order to fill this gap by sharing robust empirical evidence on determinants of food insecurity in the Warri, Delta State.

Research Questions

The following research questions will guide the study:

1. What are the food security status of the rural households in Warri Delta State
2. What are the perceived causes of food insecurity in Warri Delta State
3. What are the strategies for enhancing food security in Warri Delta State

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

$H0_1$: There will be no significant relationship in the food security level of farmers in Warri Local Government Area based on gender

$H0_2$: There will be no significant relationship in the food security level of farmers in Warri Local Government Area based on household size

$H0_3$: There is no significant difference between food security level and farmers level of education in Warri Local Government Area

Purpose of the Study

The main purpose of the study is to ascertain food insecurity in Warri, Delta State. Specifically, the study intends to:

1. ascertain the food security level of the rural households
2. Assess the perceived determinants of food insecurity in Warri Delta State
3. Examine the strategies for enhancing food security in Warri Delta State

Significance of the Study

The findings of the study would be of immense benefit to the following stakeholders: Policy makers, Land use planners, Development practitioners, Farmers, researchers to mention but a few.

The findings of this study would be useful for policy-makers, land use planners, and development practitioners in Nigeria in general and in the study area in particular, who are seeking to understand how best to respond to the problems of food insecurity by identifying their major determinants. As a result, the findings will allow them to redesign better land use and land management practices that could motivate farmers to produce more food crops to improve their food supply.

Moreover, the findings of the study would awaken the consciousness of farmers by enabling them to gain adequate knowledge in understanding the best ways of alleviating the problems of food security.

This finding of the study would be beneficial to policymaker as it has the potential to contribute in theory, concept, policy, and practice regarding best practices, resilience, and climate change adaptation strategies that can be harnessed by rural people.

Furthermore, this finding of the study has the potential to shed light on the role played by traditional leadership and policy improvements in ensuring there is sufficient food during periods of drought.

Scope of the Study

This study investigated the determinants of food insecurity in Warri Delta State. Specifically, the study covers variables on: food security status of the rural households, extent and magnitude of rural farm household's food insecurity, perceived causes of food insecurity, strategies for enhancing food security. The study will be delimited to the peasant household farmers in Warri Delta State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter deals with the related literature and shall be discussed under the under the following sub-headings:

- Theoretical Framework
- Concept of Food Insecurity
- Food Security and Food Insecurity Situations in Nigeria
- Determinants of Food Insecurity in Nigeria
- Perceived Causes of Food Insecurity in Nigeria
- Strategies for Enhancing Food Security in Nigeria
- Summary of Reviewed Literature

Theoretical Framework

The theoretical framework for this study is hinged on Population-Driven Theory propounded by Malthus. The cause of food insecurity in underdeveloped countries is explained by Population-Driven Theory. This model is based on the Malthusian work. According to this approach, the cause of food insecurity was a tendency for population to outstrip resources particularly land, over a long period of time. Population pressure pushed production into more labour-intensive techniques and eroded the surplus that would be needed to fund innovation and growth.

Malthus's model is an example of a model with one *variable* and one *parameter.* In the model, the variable is the population and the parameter are the population growth rate. Malthusian population model is given as:

$X(i+1) = (1+r)X(i)$

Where $X(i)$ = the population size during time period i

r = the population growth rate per unit time

A model in this form is said to be a difference equation model.

Currently, population growth and productivity are long term challenges associated with food scarcity the world over. Therefore, employing Neo Malthusian and Access theories and their perspectives is a significant contribution to build further synthesis on global food security challenges particularly the case of Nigeria where population growth, violent conflict food prices among other challenges have become threat to food security sustainability. Thus, food security sustainability can be achieved ultimately through a sustainable society that meet their current food consumption without compromising the abilities of their future generations to meet their food necessities.

The Neo Malthusian theory (Gross, Schultink & Kliemmann, 2018) extended the classical hypothesis developed by (Gross, Schultink & Kliemmann, 2018) that population growth will grow more than the agricultural production. Therefore, the society is going to fail in its ability to address hunger challenges. In this case, Neo Malthusian have a pessimistic perspective on agricultural production because they assert that the society cannot meet its ability to produce subsistence for its inhabitants. Although, some societal

shifts are put in place (i.e., in existence), for example, the fertility statistics in most developed economies have significantly reduced to a barest minimum level with the Green Revolution having a significant impact above expectation (Gross, Schultink & Kliemmann, 2018). Similarly, (Gross, Schultink & Kliemmann, 2018) assert that increase in food supply is associated with population growth.

Although, the developed economies have strongly addressed their fertility issues and (Gross, Schultink & Kliemmann, 2018)assertions have robust biological basis, these remedies are yet to be realized in continent like Africa, particularly Nigeria where population size has continued to increase despite declining food production in the country as projected by Neo Malthusian theory. Currently, Nigeria is among the first 20 economies with the highest population growth rate (Gross, Schultink & Kliemmann, 2018). Thus, the most pressing challenge to food sustainability is shortage in food availability, worsened by challenges of access and utilization of food items intensified by the increasing scarcity. Food availability is significant for conserving resources to maintain sustainable methods of food production and economic development (Gross, Schultink & Kliemmann, 2018)

The theory of Access hypothesizes that “access” must be understood beyond the classical concept of “the right to benefit from things” but to the notion of “the ability to derive benefits from things. The theory stresses the fact that individuals may have the right to access certain resources. However, they may not certainly have the ability to benefit productively from the use of such resources because of inadequate knowledge,

capital, market connections, technology, identity, access to authority, access to labour and social relations (Gross, Schultink & Kliemmann, 2018)

However, we incorporate this theory due to its inclusive basis for investigating the significance of access in addressing household food security issues through right to access private property (i.e., bundle of rights) and bundle of powers to access resources. The bundles of right covers all forms of formal and informal rules or norms. However, bundle of power intercedes in analogous to right-based access mechanism to figure how resources users gain control and eventually claim benefits (Gross, Schultink & Kliemmann, 2018) For example, accessing land and water for irrigation are the most significant resource in agricultural production. Therefore, having access to production can improve productivity and sustainable livelihoods of smallholder farmers which can inevitably help to achieve food security sustainability (Gross, Schultink & Kliemmann, 2018). However, inadequate access to productive resources can certainly expose the smallholder farmers to food insecurity and become vulnerable to unsustainable livelihoods (Gross, Schultink & Kliemmann, 2018)

Previous studies have failed to incorporate the full prospect of Neo Malthusian and Access theories complementary application since resourceful smallholder farmers that have access to production can positively induce increase in productivity, sustainable livelihood of the smallholder farmers and food security sustainability.

Although these two theories are not identical, but are more connected than studies have acknowledged thus far. However, the method we employed in this investigation are

able to capture the changes that are essential to the sequential procedures of analysis. Uncovering the trends from a point of global attention to a new and specific point of attention can definitely offers an idea of how food security has been affected by population growth, food prices value addition, GDP per capital, internal displacement and currency fluctuations in Nigeria. Therefore, problems associated with food security distribution should be addressed with immediate effect.

Concept of Food Security

Food security and food insecurity situations of Nigeria. The concept of food security has been defined on numerous occasions by the international community, and it has evolved considerably over time. The consensus that has emerged from the global debate is that: "Food security, at the individual, household, national, regional, and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 2016). In contrast, food insecurity exists when all people at all times have no physical and economic access to sufficient or adequate, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Phillips and Taylor 2019). Food security is a concept that encompasses four main dimensions, namely availability in sufficient quantity of food of an appropriate nature and quality in all parts of the national territory, irrespective of its origin (local production, imports, or food aid), access by all people to the resources required to be able to acquire the food needed by them for an nutritionally adequate diet. These resources

include not only financial resources but also rights of access to the resources required to produce food or to receive it from others; stability of access to food, i.e., the assurance of access by people to food even in the face of natural or economic shocks; and a satisfactory utilization of food by people that is not inhibited by health or hygiene problems (safe drinking water, sanitation or medical services, etc.).

Food Security and Food Insecurity Situations in Nigeria

Food security has different aspects depending on the focus, ranging from global, regional, national, community and household to individual levels. Food security is defined as the condition in which all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (Food and Agriculture Organisation [FAO], 2002). Attaining this level of food security requires the availability of food supply, adequate access to food supply, appropriate utilization of food and stability of food supply (Gross, Schultink & Kliemmann, 2018). Food availability for farm households in rural areas means ensuring that sufficient food is available for them through their own production or through sufficient purchasing power to purchase food from markets.

Access by households and individuals to appropriate foods for a nutritious diet depends on income available to the household, on the distribution of income within the household and on the price of food. Food utilization depends on optimal uptake of nourishment, which is a function of a sustaining diet, child care, clean water, adequate

sanitation and healthcare (United Nations Environment Programme [UNEP], 2002). Stability of food supplies means that households should not risk losing access to food as a consequence of sudden shocks such as climatic crisis or cyclical events such as seasonal food insecurity (IFPRI, 2019). Food insecurity on the other hand connotes a situation in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives.

Concerns over the food security situation in the world are reflected in the Millennium Development Goal (MDG) of eradicating extreme poverty and hunger, including reducing by half the proportion of people who suffer from hunger between 2018 and 2015. However, the number of undernourished people in the world has been increasing annually by 4 million malnourished people such that in 2016 the number of hungry people in the world was estimated at 925 million. This increase has been attributed to neglect of agriculture relevant to very poor people by governments and international agencies, the current worldwide economic crisis, and the significant increase of food prices (FAO, 2016; 2017a). The world population was estimated to be 7 billion people in 2017 (United States Census Bureau [USCB], 2012). Thus, 13 percent of the world's population, or almost 1 in 7, is hungry. According to the World Hunger Education Service [WHES] (2017), nearly all those who are undernourished are in developing countries with the worst scenarios in Asia (578 million) and sub-Saharan Africa (239 million).

The prevalence of under-nutrition in sub-Saharan Africa (SSA) declined slightly from 31 percent between 2018 and 2018 to 29 percent in 2018/2002 and decreased again to 27 percent between 2019 and 2008 (FAO, 2017b). However, even with the decline, about 239 million people in SSA continue to face chronic hunger (WHES, 2017). This is largely because of a high level of poverty resulting from overdependence on subsistence agriculture, limited access to off-farm employment, sluggish development in urban areas and skewed income distribution (FAO, 2019). As a result, more than one in every four Africans is undernourished, and the inability to consistently acquire enough calories and nutrients for a healthy and productive life is pervasive (United Nations Development Programme [UNDP], 2012). This is in spite of ample agricultural land, plenty of water and a generally favourable climate for growing food in Nigeria for example.

The food security situation in Nigeria has improved slightly, though the progress is slow. The FAO (2017b) monitoring report on progress towards hunger reduction targets of the World Food Summit (WFS) and the Nigeria Millennium Development Goals (MDGs) indicate that there was slight increase in per capita daily calorie intake of Nigerians from 2310 kcal between 2018 and2018 to 2560 kcal in 2018/2002 and it increased again to 2710 kcal between 2019 and 2008. Similarly, the number of undernourished people decreased from 16.3 million people between 2018 and 2018 to 11.9 million in 2018/2002 and further declined to 9.4 million people between 2019 and 2008. Furthermore, the report on Nigeria MDGs by the Federal Government of Nigeria (2016) indicates that the proportion of underweight children reduced from 35.7 percent in

2018 to 23.1 percent in 2008, which is less than the regional average of 28 percent for SSA countries.

Despite the improved statistics, Nigeria faces a challenge in meeting the basic food needs of its population. This has been attributed to the neglect of the agricultural sector following the discovery of oil in commercial quantity (Akpan, 2019). Agriculture is the principal source of food and livelihood in Nigeria, and employs nearly three quarters of the nation's work force (Dayo, Nkonya, Pender & Oni, 2008) but about 90 percent of the produce comes from inefficient small scale rain-fed subsistence farms, constrained by poor infrastructure and little access to credit (IFPRI, 2019). Many of these farms are unable to meet their own subsistence requirements, thereby exposing families to volatile prices in the market.

Since 2019, however, Nigeria's agricultural sector consistently contributed over 40 percent of the nation's GDP, with a growth rate of 7.4, 7.1 and 6.3, 5.9 and 5.7 percent in 2019, 2018, 2008, 2019 and 2016, respectively.

Agriculture also accounted for the greatest share of the GDP growth rate, as it contributed 3.1, 3.0, 2.8, 2.5 and 2.4 percentage points in 2019, 2018, 2008, 2019 and 2016, respectively (Central Bank of Nigeria [CBN], 2016).

However, while growth did take place, it did not really lead to improved food security. This could be attributed to the fact that the poverty situation in Nigeria is worsening despite the fact that the country's economy is paradoxically growing. The incidence of poverty in Nigeria using the absolute poverty measure increased from 54.7

percent in 2018 to 60.9 percent in 2016. Nationally, the food energy poverty incidence was higher among the poor (52 percent) than the non-poor (48 percent). It was also higher among the rural poor (66.1 percent) than the non-poor (33.9 percent). Overall, the food energy poverty was higher in the northern part of the country than in the south (National Bureau of Statistics [NBS], 2012). Moreover, Nigeria's population was estimated at 168 million people in 2017 (NBS, 2012) making it the eighth most populous nation in the world and is projected to reach about 208 million people by 2025 (USCB, 2012; United Nations Population Division [UNPD], 2017). This has dire consequences for food security in the country, making poverty reduction and hunger a key development challenge in Nigeria.

During periods of food shortages and restricted access to food, households change their daily behaviour to adapt to critical problems (Arimond & Ruel, 2018; Maxwell, 2003). By capturing the different coping strategies that households employ to deal with poor access to food, it is possible to assess and monitor behaviour changes in relation to food shortages.

A number of studies have been carried out in different parts of Nigeria to measure household food (in) security and its determinants, using various methodologies. (Babatunde, Ometesho & Sholotan, 2018; Amaza, Umeh, Helsen & Adejobi, 2019; Obamiro, Droppler & Kormawa, 2019; Ziervogel, Nyong, Osman, Conde & Downing, 2019). These studies showed that between 31% and 52 % of the populations studied was food secure. The studies identified the major determinants of household food security as

age, gender, total household income, household size, educational level of household heads, quantity of food obtained from own production, farm size, cash crop grower/non-grower, number of days lost to illness, income group, amount spent on illness, accessibility to market, type of household farm enterprise and labour availability. To our knowledge, no similar studies have been conducted among ethnic groups in North Central Nigeria.

Determinants of Food Insecurity in Nigeria

The mean age of sample household heads is 43 years, ranging from 22 to 75 with a standard deviation of 12.09. The result of the regression analysis for the household head age (HHA) was found to be statistically significant at 1% level of significance. It is negatively associated with food security status of the rural household. The negative association can be explained by the fact that older farmers are less likely to be food secure. It may be due to the fact that older farmers do not have the required labor force to produce more food crops than their counterparts. This result is in line with the study carried out by Bashir et al. (2012) in Pakistan. They found that an increase of 1 year in the age of household head decreases the chances of a household to become food secure by 3%. Similarly, a study conducted by Omonoma and Agoi (2017) in Nigeria found an inverse relationship between the age of household head and food security.

A study carried out by Funmilola and Patricia (2018) in Nigeria also found the same result. They revealed that as the household head advances in age, the probability of being food secure decreases. In contrast, a study done in the USA by Onianwa and

Wheelock (2019) revealed that increasing age of household head by 1 year reduces the chances of food insecurity by 2%. A study conducted in Nigeria by Arene and Anyaeji (2017) also come up with similar results. They conclude that the increased age of the household head had a positive effect on food security status.

Family size

The average family size of the sample households was found to be 4.3 ranging from 2 to 10 persons with a standard deviation of 1.3. Based on the result of the regression analysis, family size (FS) is statistically significant at 1%. It is negatively associated with rural farm household food security status. The coefficient of this variable explains that an increase in family size by one member decreases the chances of household food security by 42.8%. This result is in line with the results of Bashir et al. (2012), who found that an increase of one member in the household decreases the chances of food security by 31%. This indicates that households with larger family size are more likely to be food insecure than their counterparts. The negative association could be due to an increase in the number of family dependency ratio. This means that households having many children and old age groups may lack sufficient manpower, which eventually results in overdependence on limited family resources hence food insecurity. By taking into account the negative impact of large family size on the food security situation of rural households, farming households should be educated on the importance of family planning and the burden that it causes on their livelihood so that

they may bear the number of children which their resources can support. This result is also in agreement with the study conducted in Nigeria by Funmilola and Patricia (2018).

They reported that households with large size have a higher possibility of being food insecure than those with smaller size, and vice versa. A study carried out by Robert et al. (2019) in the Sekyere-Afram Plains District of Ghana also came up with similar results. They revealed that the probability of food security decreases with the increase in household size.

Number of agricultural labor forces

Labor is a key asset for smallholder households in rural Nigeria . In Nigeria where farm mechanization is almost non-existent and all farm work is done manually, having access to necessary labor force for agricultural production directly affects the status of rural household's food security. In addition to working on a household's own farm, labor force may also be engaged in off-farm economic activities, thus providing additional income to the household, which could be used for food purchases in times of food shortage.

The mean household members who participated in the agricultural labor force are 2.2 persons ranging from 1 to 5 with a standard deviation of 0.9. The analysis of this study indicated that the number of the agricultural labor force (NALF) is statistically significant at 5%. The number of the agricultural labor force is one of the major predictors of the causes of rural household food insecurity. It has a positive correlation with food security status of the rural households. This indicates that households with a

large number of the agricultural labor force are more likely food secure than their counterparts. Lack of labor force will have an intense impact on agricultural production and household food security. Because of low mechanization in Nigeria n agriculture, human labor is crucial for land preparation, weeding, and harvesting processes.

However, in the study area, there are substantial households, whose family members are used to migrate to Arab countries because they thought that it is the best way that brought wealth to rural areas as a form of remittance within a short period of time. There is also temporary migration to nearby towns for daily labor wage benefit. Both of these migration trends can affect agricultural labor force availability. It is thus important for the policy-makers and local government administrators to take into account the diversity of rural livelihoods including the provision of credit access at a lower interest rate and job creation so as to improve the food security of the local community in particular and in the region in general. This result is in line with the study done in Nigeria by Funmilola and Patricia (2018). They stated that the higher the participation of the family members in farming activities, the higher the possibility of food security and vice versa.

Off-farm income

As shown in Table 6, the coefficient of off-farm income (OFI) was statistically significant at 10% level of significance and exhibited a negative association with food security status of the rural households. The negative association could be due to lack of nonfarm job opportunities and start-up capital constraints. This result is in conformity

with the findings of Mitik and Legesse (2018). In their study conducted in southwestern Nigeria , they indicated that off-farm income is negatively related to household vulnerability and to food insecurity. But the result of this study is inconsistent with the study conducted by Robert et al. (2019) in the Sekyere-Afram Plains District of Ghana. They stated that the coefficient of the off-farm income was positive indicating that there is a positive relationship between off-farm work and food security. Studies conducted by Reardon (2017), Barrett et al. (2019), and Meles et al. (2016) also confirmed similar results. They reported that the success of households and their members in managing food insecurity is largely dependent on their ability to get access to off-farm job opportunities, which could aid as livelihood diversification strategies.

Relief support (food aid)

In this study, relief support (food aid) means the provision of food grains or cash for food-related purposes to chronically food insecure farm households. This is provided on grant bases to address critical food needs arising from natural and man-made disasters. Food aid is frequently part of the international response to a national or economy-wide extreme crisis. These crises pose an immediate or imminent threat to the lives, livelihoods, short-term stability, and longer-term development.

The survey result of this variable revealed that 34.9 and 65.1% of the sample households have and do not have received relief support, respectively. The result of the binary logistic regression model indicates that relief support (RS) is statistically significant at 1% level of significance. It shows a positive association between relief

support and food security status of the rural farm households. This result is in line with the findings of Barrett and Maxwell (2018). They argued that food aid contributes to economic development and protects basic human rights, where the aid fills a severe food gap. Food aid transfers play a safety net role by reducing vulnerability and protecting productive assets. In contrast, a study conducted in Niger by Seydou et al. (2018) revealed that food aid influences negatively and significantly the household food security. Similarly, a study done by Demeke et al. (2019) and Gelan (2019) in Nigeria suggests that food aid displaces domestic production and commercial trade by depressing prices in the recipient countries; it affects the labor supply negatively, enhances market imperfections and information asymmetries, and this, in turn, affects economic development.

Farming experience

Farming experience is an important factor in determining both productivity and the production level in farming. The mean year of sample household heads farming experience is about 19 years. It ranges from 2 to 60 years having a standard deviation of 12.08. The result of the binary logistic regression model indicates that farming experience (FE) is statistically significant at 5% level of significance. Therefore, there is a positive association between farming experience and food security status of the rural households.

The positive association could be attributed to the fact that farmers who have many years of experience in agricultural activities are more likely to be food secure than their counterparts. This means that as farmers' agricultural experience is increased, their

knowledge and skills about sustainable land management and effective utilization of the available small farmlands will be increased as a result able to produce more food crops. This result is in line with the study conducted in Ghana by Kuwornu et al. (2012). They indicated that an experienced farmer is expected to have more insight and ability to diversify his or her production and minimize the risk of food shortage. In addition, an experienced farmer is more likely to have an adequate knowledge of the pest, disease management, and weather.

Therefore, the effect of farming experience on food security is likely to be positive. According to Amaza (2019), farming experience on productivity and production may have either a positive or negative effect on agricultural production. This means that up to a certain number of years, the farming experience would have a positive effect on agricultural production; after that period, farming experience may have a negative effect.

Agro-ecological zone

Practices based on agro-ecological principles include agro-forestry (agricultural systems that combine trees, crops, and animals in order to promote intensification and synergies), water harvesting, livestock integration into farming systems, reduced tillage, composting, and green manure.

As indicated in Table 6, the coefficient of the agro-ecological zone (AEZ) was statistically significant at 10% level of significance and revealed a negative correlation with food security status of the rural farm households. Therefore, there is no correlation between agro-ecological zone in which sample households farmland is located and their

food security status. The negative correlation could be due to lack of adequate information on agro-ecological practices, which can give farmers greater control and enable them to meet their own food needs and boost their incomes. This result is in line with the study done in Jigjiga district of Nigeria by Hussein and Janekarnkij (2019). They revealed that the agro-ecology stratum in which household's farmland was located found to have a negative and statistically significant impact on food security. However, the integration of trees into annual food crop systems has been adopted by tens of thousands of farmers in Malawi, Zambia, Burkina Faso, and Niger, leading to the increases in household and national food security (Garrity 2016). A recent review of 286 projects in 57 countries found that crop productivity rose by 79% where farmers had adopted agro-ecological practices (Pretty et al. 2019), while an older study conducted by Pretty and Hine (2019) reported food production rising by 73% for 4.42 million small-scale farmers growing cereals and root crops.

Gender of the household heads

A majority (80%) of the sample households were male-headed, while 20% were female headed. This indicates that there are more male-headed sample households than female-headed households. The chi-square result of this variable indicates that 84.4 and 15.6% of male-headed and female-headed sample households, respectively, are food secure, whereas 78.8 and 21.2% of male-headed and female-headed households, respectively, are food insecure. In general, male-headed households are more food secure (22.09%) than female-headed households (16.09%). However, the chi-square result of

this variable was found to be insignificant at 95% level of significance. Hence, there is no correlation between gender of the household head and food security status of the rural farm households. This may be because of the empowerment of rural women in land ownership right and family planning issues because historically, they were marginalized from agricultural investment and family planning activities despite the work they do. This situation has been supported by the study done in India by FAO (2012). It reported that despite rapid economic growth in India, thousands of women and girls still lack food and nutrition security, largely because of deep-rooted gender inequalities in many areas. These deep gender inequalities in food security exist even though women constitute the majority of food producers in the world and are often managing their families' nutritional needs.

Access to Productive Safety Net Program

In 2018, the government of Ethiopia launched the Food Security Program (FSP), with the Productive Safety Net Program (PSNP) at its center. The PSNP provides transfers (cash or food) to 6–8 million chronically food insecure Ethiopians for 6 months each year, 85% of whom receive transfers as wages for labor on small-scale public works projects (which are selected by the community and contribute to environmental rehabilitation and local economic development), while 15% are "direct support" beneficiaries (disabled, elderly, pregnant, or lactating women) who receive unconditional transfers (DFID 2018). This program is expected to enhance sustainable land management by supporting farm households in constructing soil and water conservation

practices and increasing farmers' investment capacities in sustainable land management and other public works to ensure the long-term food security of the country.

The statistical analysis result revealed that 21.9 and 78.1% of the sample households have access and have no access to PSNP, respectively. In this regard, 22.2 and 77.8% of the food secure households have access to PSNP and have no access to PSNP, respectively. While 21.8 and 78.2% of the food insecure households have access and have no access to PSNP, respectively. The chi-square result of this variable is statistically insignificant at 95% level of significance. Therefore, there is no association between access to PSNP and food security status of the rural farm households. This could be due to the negligence of the program by the rural farm households because of the insufficient budget allocated for it. This means that instead of participating in PSNP, farmers prefer to work as a daily laborer by migrating to the nearby towns. As a result, PSNP may not help much to improve the food security status of their households.

Access to credit services

This is the ability of households to obtain credit both in cash and kind for either consumption or to support production from lending institutions. The survey result of this study revealed that 77.2 and 22.8% of the sample households have and do not have access to credit service, respectively. Among these households, 68.9 and 79.4% were food secure and food insecure, respectively, whereas 31.1 and 20.6% of the households did not have access to credit service and become food secure and food insecure, respectively. The chi-square result of this variable is statistically insignificant at 95%

level of significance. Therefore, there is no association between access to credit service and food security status of the rural households. This could be because of high-interest rates and farmer's inability to use the credit received for the intended purpose. This result is in line with the report of IFPRI (2019a) that many smallholder farmers in Nigeria are unable to access credit due to the issues of collateral and high-interest rates as well as the short-term and fixed repayment periods for agricultural loans by lending institutions. On the contrary, a study carried out by Pappoe (2017) found that access to credit improves the food security status of farming households among biofuel producers in the central region of Ghana.

Rainfall Reliability

The statistical result of this variable showed that 4.7% of the sample households replied as rainfall was reliable in the area for the last 10 years, whereas the remaining 95.3% replied as it was not reliable. The chi-square result of this variable is statistically insignificant at 95% level of significance. Therefore, there is no relation between rainfall reliability and food security status of the rural farm households. This could be due to the inability of farmer's to predict the long-term negative effects of rainfall variability on their food security status.

Access to off-farm Income

Off-farm income includes non-agricultural wages, self-employed income, petty trading, weaving, remittances, charcoal and firewood selling, and handicraft. The survey result of this variable revealed that 18.1 and 81.9% of the sample households are with and

without access to off-farm income, respectively. Of these households, 13.3 and 19.4% were food secure and food insecure, respectively. While 86.7 and 80.6% of the households do not have access to off-farm income and become food secure and food insecure, respectively. The chi-square result of this variable is statistically insignificant at 95% level of significance. Therefore, there is no relationship between access to off-farm income and food security status of the rural households. This could be attributed to the fact that income generated through off-farm activities may not ease the liquidity constraint needed for food security investments or purchase of food crops for bridging the food deficiency of their households. The result of this study is in conformity with the study conducted by Kilic et al. (2019), Goodwin and Mishra (2018), and Chang and Wen (2017). Their findings showed that off-farm income impacted negatively on-farm efficiency in different settings. On the contrary, Frankenberger (2018) noted that participation in off-farm activities enables households to modernize their production by giving them an opportunity to apply the necessary inputs and reduces the risk of food shortage during periods of unexpected crop failures through food purchases.

Government Support

Government support includes agricultural extension services, technology transfer (such as advice on food crop production, cash cropping, livestock production, and soil and water conservation), irrigation and water harvesting schemes, the education of women and children, provision of clean water and healthcare, and a stable functioning market system. The survey result of this discrete variable revealed that 34.4 and 65.6% of

the sample households receive and do not receive adequate government support to alleviate food security problems, respectively. Of these households, 35.6 and 34.1% were food secure and food insecure, respectively. While 64.4 and 65.9% of the households do not receive government support and become food secure and food insecure, respectively.

The chi-square result of this variable is statistically insignificant at 95% level of significance. Therefore, there is no association between government support and food security status of the rural farm households. This could be attributed to the fact that almost all farmers believed that agricultural production is dependent on natural conditions (climate change and rainfall variability), thereby the analysis of influencing factors of food security is concentrated mainly on such factors than government support. Their idea is supported by a study done in Niger by Barrett (2016). He revealed that food aid decreased government support to agriculture in the long run and caused distortion in the local price of food items.

Perceived Causes of Food Insecurity: Vulnerable Groups

Philipose (2018) cites the indirect impacts of drought on the most vulnerable groups, including female-headed households, whose income is derived mostly from agriculture. This has been compounded by low education and literacy and poor health among women, exacerbated by HIV/AIDS (Philipose, 2018). Philipose has also stated that in the 19th century, environmental changes in Africa have directly a*ff*ected vulnerable groups, including children, people living with disabilities, ethnic minorities, and the aged, all of whom depend solely on nature for their daily survival (Anosike, Philipose, & Chukwuma,

2018).

Numerous authors Anosike, Philipose, & Chukwuma (2018) reveal the impact of drought on rural households and livelihoods. These authors attribute such challenges to erratic climatic variations, rising temperatures, and floods. The rural poor in Africa are considered to be dependent on semi-subsistence agriculture for their survival, which is sensitive to changes in weather patterns. According to Itiveh (2017) the agricultural sector is mostly affected by the adverse effects of climate change, with the highest number of rural inhabitants prone to chronic hunger and malnutrition. The magnitude of poverty limits the ability of those affected to adapt to climate variability and natural disasters (Nwachukwu, 2019). Consequently, a number of authors Nwachuwu, Nwabueze, Chukwuma & Bamidele, (2018) cite rural households and communities in sub-Saharan Africa as having battled with socio-economic challenges due to climate change and variability. The adverse impacts evidenced in this article have been experienced in the first decade of the 20th century. Clover (2018) cites the challenges of food insecurity, which are created politically and exacerbated by faulty analysis and actions, a failure to understand the interventions of the World Food Summit News of 2002, political interference, victimization, discrimination by government and a lack of political power and will. This has been prevalent in some African countries, which include Eritrea, Nigeria , Angola, Sudan, and sub-Saharan countries, where the highest prevalence of undernourishment has been experienced. Moreover, the previous authors contend that countries such as Malawi and Zambia have experienced a decline in food availability

during years of drought. This was mostly attributed to a lack of transparency concerning government policy on trading. Anosike (2018) mention a host of direct impacts of drought on farmers due to a loss of crop production and maize.

Sutcliffe, Dougill, and Quinn (2019) examined how government policy on climate adaptation affected farmers, concluding that insufficient government support constrained farmers' initiatives. Agofure (2019) blamed food shortages in rural areas of Zimbabwe on poor economic policies and the violent land seizure in 2018. This author further claims that during the drought, politically connected people would buy grain from the Grain Marketing Board and then resell it on the market at higher prices, thereby gaining financially from food insecurity in the country., Meanwhile, identifies the souring of donor–government relations as the cause of donors' slow response to the 2019/2002 drought in Malawi, with food aid arriving late and which led to severe malnutrition and a high mortality rate. According to other researchers, poverty results in the unsustainable use of natural resources and the overall deterioration of the environment. These authors noted that during a severe drought in Ekiti State in Nigeria, many of the poor people were forced to leave pastoralism and migrate to towns in search of paid jobs. An increase in farming and non-farming income improved the use of water and soil conservation measures and the likelihood of mixed farming.

According to Agofure (2018), the main problem encountered by farmers and which leaves them extremely vulnerable and unable to plan is the inadequate weather. Osato (2017) made similar observations in Zimbabwe's Seke and Murewa Districts

where a significant proportion of farmers had no access to early weather forecasting information. Six studies identified drought as adversely affecting small-scale farmers and government response strategies Philipose (2018) examined how food security had been influenced by drought in selected countries with similar characteristics (Malawi and Zambia) that make them vulnerable to food insecurity, with the designated groups mostly affected by HIV/AIDS. This researcher suggested a solution that included formal and informal trading and innovative programs. Meanwhile, unscientific adaptation strategies observed by smallholder farmers in Malawi on changes in rainfall, including seed network and maize producers [23], had been disputed by accurate meteorological data.

Open communication channels and dialogue among stakeholders (including scientists) was recommended in providing accurate data to local farmers. Local farmers in South Africa were found not to have received early warning information on a drought in a study by (Francis, 2018). Recommendations were made that farmers needed to be trained on drought mitigation strategies, alongside the establishment of warning systems. Strengthening community capacity in managing the effects of drought through preparedness and adaptation strategies would help to reduce the possible threat of food insecurity, as well as an investment in Drought Early Warning Systems (DEWS). In addition, Francis, (2018)argued that DEWS add value to households' food security: The available and reliable information assisted them in timely planting, the diversification of crops, drought management, purchasing the right farm equipment, and planting crops that are drought-tolerant (Agofure & Chukwuma, 2018)

The impact of drought in Africa is severe due to the backlog in infrastructure development (Anosike, 2018). In a study in Malawi, emphasized the vulnerability to drought due to the declining access to inputs and infrastructure as a result of population growth and density. This resulted in the reduced cultivation of high-yielding varieties of maize and low yields of staple crops. Numerous articles relevant to drought risks emphasize the importance of infrastructure development in reducing vulnerability to drought (Akabueze, 2018).

The UNjs Office for Disaster Risk Reduction (2019) proposes an investment in agricultural infrastructure and technologies such as the construction of dams, communications infrastructure, and irrigation infrastructure. Irrigation strategy was seen as a viable method that could help to improve crop production in places prone to drought. Abiodun, (2018) posit that farm yields in poor climatic conditions can be supplemented by the availability of dams and wells, which can contribute significantly to reducing hunger and assisting in vegetable gardening.

The adverse effects of climatic change variations in African countries are exacerbated by political interference and will and less transparent and responsive government policies. Such geographies that are prone to drought directly and negatively affected vulnerable and indigent groups in rural areas—mostly illiterate, women-headed households that are affected by slow-onset disasters such as HIV/AIDS. The combination of the negative effects of climate change and governments' incapability has reduced agricultural output and crop production, which has exacerbated chronic hunger and

malnutrition, food insecurity, and prevalent undernourishment among poor rural communities. However, there is also limited and compelling empirical evidence to ascertain the impacts of adverse climate change, reactionary strategies by government, and political interference as well as a lack of political will in indigent and vulnerable rural communities in drought and poverty-stricken rural communities. In a similar vein, there are gaps in the previously published data on the extent to which droughts have affected the food security of women, the elderly, and children in disaster-prone areas.

Strategies for Enhancing Food Security in Nigeria

Chukwuma, Adeyemi, Osato & Nwabueze, (2019) enumerated on fifteen (15) strategies for enhancing the security of food in Nigeria and these are outline in the following order:

Resilience Strategies

A host of strategies have been considered as being effective against drought, which include gender, age, adaptive farming, race, community involvement, governance, traditional knowledge blended with scientific knowledge, understanding and learning from risk, gap identification, resilience standards, and evaluation. Some of these authors further suggest that responsive interventions should take place, with plans developed, implemented, and measured with a clear view to strengthen resilience capabilities in rural communities. Accordingly, the Southern African bloc has been seen as cyclical regarding drought response and contrary to various frameworks that were aimed at strengthening resilience (Chukwuma, Adeyemi, Osato & Nwabueze, 2019) Adeyemi, (2019)

recommends formal or informal institutional arrangements, models, and platforms—such as farming communities and civic groups—that could encourage participation and enhance drought resilience (Chukwuma, Adeyemi, Osato & Nwabueze, 2019)

A plethora of challenges have been highlighted in the Southern African Development Community (SADC) countries, which diminishes opportunities for the implementation of resilience interventions and make it difficult for humanitarian responses to focus on resilience. These mostly include political interference, environmental degradation, institutional incapacity, poverty, and a lack of poverty alleviation policies with humanitarian responses to drought focusing on emergency needs, which are critical in rural communities (Chukwuma, Adeyemi, Osato & Nwabueze, 2019). While drought resilience strategies have been sparsely observed in countries such as Lesotho, Namibia, and South Africa negative repercussions brought about by droughts show that there are inadequate resilience measures to inform policies and interventions (Chukwuma, Adeyemi, Osato & Nwabueze, 2019). However, the previous mishaps can be rectified by building resilient capabilities among farmers and enacting agricultural policies such as funding: Providing farmers with agricultural equipment and educating them on the effective and efficient use of such equipment, thereby assisting them in matters where they may be vulnerable. A number of these innovative policies have failed due to inefficient management (Osato, 2019] with less influence of tribal leaders being factored into such resilience strategies (Nwabueze, 2017). Despite being considered to be corrupt, rural communities still trust and value these leaders more than elected officials.

Nwabueze (2017) argue that this situation is worsened by the lack of a contextually and culturally appropriate resilience framework. With community resilience remaining poorly understood, there is little success in attempts to develop local resilience frameworks. This is perpetuated in countries such as Lesotho and Swaziland where the structures of resilience are poorly understood, despite such countries being prone to the recurrence of drought, which adversely affects rural subsistence communities (Adeyemi & Malik, 2019).

In Lesotho, the resilience framework is non-operational and remains in a draft form. Unlike the research on the impact of droughts on agricultural production and the commercialization of farms, little attention has been paid to measurement, standards, and strategies to counteract the negative impacts of food insecurity on rural communities and subsistence farmers in drought-prone areas. In addition, the integration of traditional and scientific knowledge and its effectiveness and impact have not been tested empirically in areas affected by drought and food insecurity in all regions in Africa. Furthermore, there is a research gap in the published data on capacity levels of governments' workforces in dealing with the implementation of resilience strategies in rural communities.

The Effects of Adaptation Strategies on Local Farmers in Africa

A total of 19 studies out of 26 assessed local farmers' and communities' adaptation strategies in the event of adverse climatic changes.

The word count generated from the NVivo program clearly depicts an association between climate change and its effects on food security in Africa. Figure 1 further reveals

that farmers and communities are adversely affected by drought with the adaptation and resilient strategies lacking to avert such crisis. For instance, local farmers were assessed in two Niger districts (Diffa and Aguie, 2019) on their knowledge of climate variables as compared to meteorological events and adaptations. The researchers found discrepancies on the meteorological observations from the farmers and suggested that they needed to be equipped with agricultural technological skills and reliable information and have access to crops that are resistant to high temperatures. Selected papers analyzed and evaluated the role of drought-resistant crops and breeds in reducing the effects of drought in rural areas. Crop variety diversification and drought-resistant crops or breeds are highlighted as coping strategies.

For example, in a study in Malawi, researchers found that Malawians increasingly prefer short-season maize as a strategy for adapting to drought. They, therefore, suggested the adoption of maize cultivars that are tolerant to climatic extremes and variability as one possible solution. A similar perception study was conducted by [Francis, 2018]. They targeted subsistence farmers regarding climatic variations and the socio-economic changes that influenced their agricultural livelihoods. They needed adaptation strategies to overcome extreme and unpredictable temperatures, rainy seasons, unfavorable transportation networks, diseases, and the lack of irrigation infrastructure. These authors concluded that the subsistence farmers had no adaptation strategies in their farming system although there were hidden resilience strategies that could be harnessed. A synthesized literature review on farmers' perception on climate change [Francis, 2018]

and their adaptation strategies found fascinating and unique factors that influence farmers to adapt to climate change in the sub-Saharan region.

These include gender, age of the head of the household, experience in farming, household size, education level, and access to credit facilities. This interesting study had implications regarding the public–private partnership policy on farmers, and recommended climate change adaptation policies be included in governments' development programs, investments in resilience programs, and monitoring and reporting systems. In addition, farmers with a higher level of education and years of formal education have been found by a plethora of researchers (Chukwuma, Adeyemi, 2017 Osato, 2019 & Nwabueze, 2019) to be able to adapt better to climate change, to be able to diversify to non-farming activities, to adjust planting periods, and to easily utilize agricultural technologies as compared to their counterparts who are less educated.

Consequently, in countries such as Namibia, a study by Khedira (2018) examined subsistence farmers' adaptation abilities to climate risks threatening crop production. The community members were found to be dependent on their indigenous knowledge of rainfall prediction. Meanwhile, the same author in 2016 examined the effects of the scarcity of rainfall on the subsistence crop production and the significance of religious rituals as adaptation measures where cultural knowledge was used by women as an adaptation strategy. As a drought mitigation strategy, farmers have been recommended to rely on indigenous knowledge. Indigenous knowledge systems in countries such as Zimbabwe are used to predict weather and in farming practices to reduce disaster risks

In the Niger Republic, Malik, (2019) observed that crop diversification strategies have mostly been used traditionally to reduce risks and adapt to climate change as a result of the prolonged rainfall variability. In addition, another researcher , Chukwuma (2019) found that northeastern Ghana farmers planted multiple indigenous drought-resilient crop varieties to cope with drought and, subsequently, food insecurity. The reviewed literature above shows a significant gap in adaptation strategies to climate change because its effects have not been felt by local farmers. Researchers have not yet been able to espouse the strengths of indigenous strategies as they have not been harnessed.

Figure 1. Word cloud. Source: Authors' own creation.

Drought Influences on Food Insecurity in Africa

The impacts of drought go beyond agriculture into related sectors, a*ff*ecting major food supply chains and resulting in episodes of price spikes. This is because of the reliance of these sectors on agriculture for raw material so as to increase food production, which is needed to provide for the ever-increasing population (Friedel, 2018)]. According to Kebede, Atlin, and Melchinger [2018], it was drought thatled to the shortage of supplies, which dramatically increased food prices and substantial reliance on imports. This had a direct and severe e*ff*ect on the more vulnerable and poor communities.

The combination of the socio-economic and environmental issues has resulted in food insecurity that negatively impacted the well-being of the people, the economy, and the environment (Solanke, 2018). For instance, in Southern Africa, dam levels have reduced severely, leading to a reduced water supply and poor quality of water. This, in turn, led to crop failure, a reduction in production and diminished power generation (Francis, Charis & Malik, 2018). Hailea et al. [2018] found that in East Africa and in the Great Lakes Region, the availability and quality of water suffered as a result of drought, affecting socio-economic activities such as agriculture. In a study in Ghana, researchers Francis, Chukwuma & Malik, (2018) established that most farmers experienced the adverse impact of drought, which included a shortage in the water supply for both humans and livestock. Various researchers have shown the adverse consequences of drought; for instance, Sutcliffe, Dougill, and Quinn [2018] highlighted the fact that drought has a negative effect on unemployment as farmers lose their alternative source of

income. In addition, there is a reduction in growing seasons and in agricultural yields due to the reduction in the area suitable for agriculture (Lemade, 2019). Meanwhile, Kebede, Atlin, and Melchinger [2017] noticed people's inability to grow food and rear livestock. Numerous authors have recommended strategies to reverse the above, such as farmers diversifying in the dry season, for example, beekeeping, rearing livestock, weaving, and dry season gardening (Samuel, 2018]. Instead of the temporal rural–urban migration in search for non-existent jobs, the sale of fuel, wood, and charcoal could be considered to be diversification adaptation strategies for their livelihoods, as suggested by Kumasi, Antwi-Agyei, and Obiri-Danso (2019) The reviewed literature above on the effects of drought in Africa depicts anecdotal information that is not supported or validated by empirical evidence. The majority of the studies are qualitative and focus on the country in general rather than the most affected areas. These tend to be rural communities and, therefore, the well-being of the poor is most affected, increasing food insecurity.

Summary of Reviewed Literature

This study considered the literature of the past two decades on the influence of drought on food insecurity in rural areas in Africa and which espoused four fascinating themes: (1) Climate change adaptation strategies, (2) the effects of drought on food insecurity in Africa, (3) the vulnerability to food insecurity due to drought, and (4) local resilience strategies. The literature reviewed in this literature review highlighted a number of gaps in the existing data published between the years 2018 and 2020.

However, significant gaps have also been observed in this review. These include the fact that rural households and subsistence farmers' indigenous knowledge as adaptation and resilience strategies has been overlooked as a solution to persistent and recurring droughts and the effects on food insecurity, as well as the potential benefits of blending traditional and scientific knowledge. In addition, anecdotal evidence has been observed on the effect of drought on the designated groups in rural communities, with minimal empirical studies conducted to ascertain and determine the local resilience strategies used by them. Lastly, interventions with multiple stakeholders, including governments, have not been evaluated by researchers, which is a significant void in the literature.

Consequently, mitigation against the effects of drought requires a multi-strategy and multi-stakeholder framework in order to ensure resilience in food security. The strong cooperation among key stakeholders—including indigenous leaders, communities, civil society groups, and government—is a valuable asset in monitoring and evaluating drought. Based on this literature review, a conceptual framework is suggested that integrates the collaboration of stakeholders and all the different strategies in order to mitigate the effects of drought on food security. In addition, this synthesized literature review highlights the effect of drought on the rural poorest of the poor. It poses a serious threat, adversely and consistently affecting people's nutritious food security, a situation which is prevalent in sub-Saharan Africa. Moreover, rural communities and farmers' survival strategies and their effectiveness on food security during and in the aftermath of

drought periods, which are informed by communities' cultural and indigenous knowledge, have not been empirically tested and assessed by scholars, which suggests future exploration. There is also a significant gap in knowledge on the effects of drought on individual households and designated groups' adaptation and resilience strategies on food security, which focuses mostly on small- and large-scale farmers. Nonetheless, researchers and scholars have paid limited attention to blending traditional knowledge, local resilience strategies, and scientific knowledge. Most of the rural farmers believed in the traditional structures and systems as adaptation strategies, which necessitates future researchers to explore these untapped strengths and weaknesses. The measurement and evaluation of the impacts of government interventions provides a significant gap for future researchers to explore. This includes the communication with, and training of, small-scale farmers and rural householders on drought adaptation and resilience strategies in order to ensure abundant food security.

CHAPTER THREE

METHODOLOGY

This chapter presents the procedures the researcher used in gathering and analyzing data for the study. It is discussed under the following subheadings:

- Design of the Study
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validity of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Design of the Study

The study will use a descriptive survey research design.

A descriptive survey research design according to Nworgu (2018) is one in which a group of people or items are studied by collecting and analyzing data in a systematic manner from only a few people or items considered to be the representative of the entire group. The researcher adopted this design because the study involves studying and describing certain variables in relation to the population to ascertain the determinants of food insecurity in Warri.

Population of the Study

The population of this study comprised of all the Warri metropolis is divided into three quarters namely Onicha-ugbo, Obomkpa, and Obodo. The population of the study was purposively drawn from respondents who are basically traders/merchants artisans, and civil/public servant of Warri, Delta State. The total population of traders/merchants artisans both male and female was found to be One Hundred and Ninety Two (192) in total. (Planning Division, Warri North Local Government, as at April, 2024). Furthermore, the population of the civil/public servant was found to be 7575 in total at the beginning of the 2024 farming season. Source: (Warri, Pocket Statistics). The estimated number was added by 3% (7575 X 0.03) to add to the 2019/2020 session to make up the update being the average annual population change of civil/public servant to total it to 7803 both male and female civil/public servant

Sample and Sampling Technique

The sample size of the study will be a total of 120 respondents. The respondents will be 40 for the traders/merchants artisans and 80 for the civil/public servant respectively. The sample will be selected using a stratified and a simple random sampling technique. Whereby the Warri was initially stratified into 8 wards for both staff and civil/public servant and thereafter 5 civil/public servants were randomly selected from each department bringing it to a total of 40 traders/merchants artisans and 10 civil/public servants from each department bringing it to a total of 80 students. The breakdown of the sample of the study is presented in table 1.

Table 1: Breakdown of the sample of the studies

No	Wards	Selected traders/merchants artisans	Selected civil/public servant	Total
1	Onicha-ugbo	5	10	15
2	Obomkpa	5	10	15
3	Gbonozoa	5	10	15
4	Obodo	5	10	15
5	Omadino	5	10	15
6	Ogunu	5	10	15
7	Ekurede-urhobo	5	10	15
8	Urhobo	5	10	15
	Total	**40**	**80**	**120**

Source: Field Survey, (2024).

Research Instrument

A structured questionnaire titled: Determinants of Food Insecurity Questionnaire (DIFQ) will be used for data collection. The questionnaire would be designed using a 4 point rating scale. The response categories of Strongly Agree (SA); Agree (A); Disagree (D); Strongly Disagree (SD) will be adopted. The rating scale will used for clusters A through B.

Validity of the Instrument

The instrument will be validated by the project supervisor and two other lecturers in the faculty. The first draft of instrument would be presented for scrutiny for necessary observation and correction and thereafter the documentation.

Reliability of the Instrument

For the determination of the instrument, copies of the instrument were administered to 13 male and 7 female civil servants who were not part of the sample. The

Cronbach Alpha was used to ascertain the reliability using test-retest method which yields 0.83. This result implies that the instrument was reliable.

Method of Data Collection

The instrument will be personally administered by the researcher to each respondent through direct delivery and retrieval method. This method is to reduce any form of accident that may arise.

Method of Data Analysis

The collected data will be analyzed using descriptive statistics. The descriptive statistics will be used involved frequency count; simple percentages mean score analysis and standard deviation. Furthermore a criterion mean of 2.50 will be adopted for decision making.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter deals with presentation of results and discussion of findings. The results of the analysis are presented in the order of the research questions and hypotheses that guided the study. The research questions and hypotheses were answered under the following sub-headings:

- Presentation of Results
- Discussion of Findings

Presentation of Bio data Information

Table 1: Distribution of Respondents by Sex

Variable	Frequency	Percentage
Male	90	75
Female	30	25
Total	120	100.0

In table 1, 90 representing (75%) of the respondents were males while 30 representing 25% of the respondents were females. From the foregoing, it could be deduced that majority of the respondents were males.

Table 2: Distribution of Respondents by Years of Experience

Variable	Frequency	Percentage
Below 10 years	112	93.3
11 years and above	8	6.6
Total	120	100.0

In table 3, 112 representing (93.3%) of the respondents were below 10 years while 8 representing 6.6% of the respondents were from 11 years and above. From the foregoing, it could be deduced that majority of the respondents were below 10 years of experience.

Table 3: Distribution of Respondents by Professional Qualification

Variable	Frequency	Percentage
B.ed	103	65.3
PGDE	10	8.3
M.ed	4	3.3
Ph.D	3	1.6
Total	120	100.0

In table 3, 103 representing (65.3%) of the respondents were B.ED holders school. 10 (8.3%) of the respondents were PGDE holders while 4 representing 3.3% of the respondents were M.ED holders while 3 representing (1.6%) were HND holders. From the foregoing, it could be deduced that majority of the respondents were B.ed holders.

Answers to the Research Questions

Data collected for the research question was answered using mean and standard deviation. The result was shown in Table 2-5.

Research Question 1

What are the food security status of the rural households in Warri Delta State?

Table 2: Mean and Standard Deviation showing the Food Security Status of the Rural Households

S/N	Item	N	Mean	SD	Remarks
1	My prospects of being food secured is strengthened by the fact that I am gainfully employed	120	2.92	.823	High Extent
2	My educational background gives me insight on how to store my harvested crops from pesticides and rodents	120	2.52	.992	High Extent
3	My high paying job increases my financial power of procuring sophisticated implements needed for farming	120	2.54	.986	High Extent
4	My prospect of being food secured is hindered by the fact that I come from a polygamous family	120	2.93	.787	High Extent
5	My experience in the farming system awakens my consciousness on the techniques on improving the quality of the soil for planting	120	2.64	.934	High Extent
	Cluster		**2.57**	**0.09**	**High Extent**

Note: SD (Standard Deviation), N (Sample Size)

In response to research question one, Table 2 showed that the respondents rated item one to five as high extent with a mean of 2.92 and 2.93. The standard deviation also ranges from .787 to .992. The aggregate mean showed a mean of 3.19. With these results, the above mean score shows that farmers's level of education, financial status, level of experience, family size in Warri to a high extent influences their food status.

Research Question 2

What are the perceived causes of food insecurity in Warri Delta State?

Table 3: Mean and Standard Deviation Showing the Perceived Causes of Food Insecurity

S/N	Item	N	Mean	SD	Remarks
1	Low purchasing power of farmers is a cause of food insecurity	120	2.52	1.008	High Extent
2	Seasonal Food price fluctuation is a cause of food insecurity	120	2.55	.984	High Extent
3	Epileptic electric power/water supplies is a cause of food insecurity	120	2.57	.995	High Extent
4	Inefficient tax system for urban development is a cause of food insecurity	120	3.09	.806	High Extent
5	The shortage of drainage system in the farm networks fosters food insecurity in rural communities	120	2.58	.998	High Extent
	Cluster		**2.58**	**0.08**	**High Extent**

Note: SD (Standard Deviation), N (Sample Size)

The data analysis presented in Table 3 depicted that the respondents' rated item one, four and five as high extent with a mean rating ranging from 2.52 to 3.08 while item two and three were rated as low extent with a mean of 2.25 and 2.47. The standard deviation also ranges from .804 to 1.008. The cluster mean depicted a mean of 2.58. With these results, the above mean score shows that low purchasing power, shortage drainage system in the farm networks, inefficient tax system for urban development, epileptic powers supply seasonal food price fluctuation are the causes of food insecurity in Warri.

Research Question 3

What are the strategies for enhancing food security in Warri Delta State?

Table 4: Mean and Standard Deviation Showing Strategies for Enhancing Food Security

S/N	Item	N	Mean	SD	Remarks
1	Improving the quality of farm implements of farmers is a tool for enhancing food security	120	2.55	1.011	High Extent
2	Increasing farmers access to credit facilities is a tool for enhancing food security	120	2.51	.925	High Extent
3	The rehabilitation of drainage system in farms is a tool for enhancing food security	120	2.72	.836	High Extent
4	Frequent and regular access to interest free loans to farmers by government for the purchase of farm implements enhances food security	120	2.51	.868	High Extent
5	Regular and periodic review of farmers storage system is a veritable tool for enhancing food security	120	2.31	.820	High Extent
	Cluster		**2.44**	**0.07**	**High Extent**

Note: SD (Standard Deviation), N (Sample Size)

Research question three depicted that the respondents rated item one, two, three four and five as high extent with a mean rating ranging from 2.51 to 2.55. The standard deviation also ranges from .820 to 1.011. The aggregate mean indicated a mean of 2.44. With these results, the above mean score shows that improving the quality of farm implements of farmers, increasing farmer's access to credit facilities, rehabilitation of drainage system, frequent and regular access to invest free loans to farmers are strategies for enhancing food security.

Hypothesis One

There will be no significant relationship in the food security level of farmers in Warri Local Government Area based on gender

Table 2: Fisher z Analysis Result of food security level in Warri Local Government Area Based on Gender

Sex	N	Fisher z	Fisher 2	2-Score	Decision
Male	108	-.186			No
Female	12	-.008	-0.11	$\pm$1.96	significant relationship

Table 2 displayed that Fisher z of -1.86 is a very weak and negative relationship in the food security level in Warri Local Government Area with female gender. It was also shown that a small or weak strength of Fisher z correlation of -.008 existed in the class of teachers with female gender. Since there were two groups, their Fisher z was transposed to 2-scores to test the hypothesis. The result indicated a non -significant relationship since -1.96> 2 observed of -0.11<1.96. The hypothesis is retained. It implies that sex did not indicate any difference between food security level and gender in Warri Local Government Area.

Hypothesis Two

There will be no significant relationship in the food security level of farmers in Warri Local Government Area based on household size

Table 3: Fisher z Analysis Result of food security level in Warri Local Government Area Based on Household size

School size	N	Fisher z	Fisher 2	2-Score	Decision
Large	89	-.1.53			No
Small	31	-.1.00	-0.285	$\pm$1.07	significant relationship

Table 4 displayed that Fisher z of -1.53 is a very weak and negative relationship in the level of food security with large family size. It was also shown that a small or weak strength of Fisher z correlation of -.1.00 existed in the class of farmers with large family size. Since there were two groups, their Fisher z was transposed to 2-scores to test the hypothesis. The result indicated a non -significant relationship since -1.96> 2 observed of -0.11<1.96. The hypothesis is retained. It implies that school size did not indicate any difference between food security level of farmers and household family size in Warri Local Government Area.

Hypothesis Three

There will be no significant relationship in the food security level of farmers in Warri Local Government Area based on farmers level of education.

Table 4: Fisher z (Analysis Result of the Relationship between and Facility Maintenance)

Variable	N		Fisher z	2-Score critical	Decision
Educated	91	-1.37			No significant
Uneducated	29		-0.932	±0.362	relationship
	120				

Table 4 displayed that Fisher z of -.1.37 is a very weak and negative relationship between food security level and food security level in Warri Local Government Area. It was also shown that a small or weak strength of Fisher z correlation of -.0.932 existed in the food security level. Since there were two groups, their Fisher z was transposed to z-scores to test the hypothesis. The result indicated a non- significant relationship since -1.96>z observed of -0<1.96. The hypothesis is retained. It implies that there is no significant difference between the food security level and farmers' level of education.in Warri Local Government Area.

Discussion of Findings

The findings of research question one revealed the food security status of the rural households in Warri Delta State. The findings of the study found that farmers level of education, level of experience, family size are factors determining the food security status. This findings is in line with Koffio-Tessio et al. (2015). They reported that in rural areas, education improves agricultural productivity, leading to food security.

Similarly, the findings of the study is in line with Urassa (2018) argues that households with more education or other forms of human capital stand a better chance of engaging in nonfarm income or credit, and they, therefore, could be more able to afford inputs and thereby becomes more efficient in their farming practices. Hence, farming households with more education had the possibility of obtaining higher yields and become food secure.

The findings of the study in research question two revealed the perceived causes of food insecurity in Warri Delta State? The findings of the study found that t low purchasing power, shortage drainage system in the farm networks, inefficient tax system for urban development, epileptic powers supply seasonal food price fluctuation are the causes of food insecurity in Warri. This is in line with Adegbite (2019) that the insufficient rainfall along with drought usually causes agricultural productivity losses in the sub-watershed.

Relatedly, the findings of the study is also in consonance with Chukwuma (2018) reported that food insecurity is closely related to land degradation. Hence, because of soil fertility and soil erosion problems, agricultural productivity has lowered to the unexpected rate.

Similarly, the findings of the study is in line with Anumudu (2017) that Irregular rainfall and low precipitation are the main limiting factors of food crop production. Anumudu further buttressed that rainfall is very low and erratic, with periods of drought often followed by devastating flash floods. There are very limited and unevenly

distributed water resources in the sub-watershed. Moreover, they are not easily accessible. On the other hand, drought often results in increases in the prices of food crops, and most households who depend only on their own production lack purchasing power to buy food crops to satisfy the needs of their family members.

The findings of the study the strategies for enhancing food security in Warri Delta State. The study found that improving the quality of farm implements of farmers, increasing farmer's access to credit facilities, rehabilitation of drainage system, frequent and regular access to invest free loans to farmers are strategies for enhancing food security. This is in line with Adegbite (2018) that family planning education to limit the family size of the rural population, which could ease the problem of overpopulation and acute farmland scarcity and design a strategy to diversify the livelihoods of the rural community so as to complement their food gap.

Similarly, the findings of the study is in line with Chukwuma (2019) that complementarities such as steady electric power and water supplies, good transportation/information and communication technology network, and housing units that will enhance the business ventures of the metropolitan poor be provided since most of the household heads are at the plateau of their lifecycle (age range within the labour force bracket), according to the dictates of lifecycle hypothesis. This calls for appropriate tax management policies that will generate sufficient internal revenue to sustain these complementary infra-structures.

The findings of the study in hypothesis one revealed that there will be no significant relationship in the food security level of farmers in Warri Local Government Area based on gender. This is consistent with the findings of Adegoke, John & Corneille (2017) who found that female farmers were more effective were less effective and efficient in farm administration because they extended their motherhood roles to the farm environment.

The findings of the study also showed that size of family had significant relationship with farmers' effectiveness in in cultivation of crops, farm irrigation and food storage management. Farmers whose farms were large were more effective in cultivation of crops, farm irrigation and food storage management. These findings agreed with that of Akiri and Ugborugbo (2018) that performance of farmers was significantly influenced by family size. Farmers in large polygamous families performed less better than those in small nuclear families. The results of their study further revealed that the performance of female farmers was significantly influenced by family size. Female farmers performed best in large polygamous families and worst in small nuclear families.

The findings of the study in hypothesis three revealed that there is no significant difference between food security level and farmers level of education in Warri Local Government Area. This is consonance with the findings of Chukwuma (2019) that area of specialty had significant relationship with farmers' performance in relation to accessibility of loans, building of food storage system. Farmers who were highly

educated specialize in farm administration and planning were more effective in providing incentives to access loans from agricultural boards to increase their food production

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter focuses on summary, conclusion and recommendations

Summary

This study investigated the determinants of food insecurity in Warri. Three research questions were raised to guide the study. The study employed a descriptive survey research design. The population of this study will consist of all the Warri metropolis is divided into three quarters namely Onicha-ugbo, Obomkpa, and Obodo. The population of the study was purposively drawn from respondents who are basically traders/merchants artisans, and civil/public servant of Warri, Delta State. The total population of traders/merchants artisans both male and female was found to be One Hundred and Ninety Two (192) in total. A structured questionnaire titled: Determinants of Food Insecurity Questionnaire (DIFQ) was used for data collection. The questionnaire would be designed using a 4 point rating scale. The reliability was determined using the internal consistency method which was measured using Cronbach alpha statistic.

For the determination of the instrument, copies of the instrument were administered to 13 male and 7 female civil servants who were not part of the sample. The Cronbach Alpha was used to ascertain the reliability using test-retest method which yields 0.83. This result implies that the instrument was reliable. Data collected were analyzed using descriptive statistics such as frequency counts, simple percentages and mean and standard deviation.

The major findings of the study were as follows:

1. The study has found that majority of the farmers were found to be food insecure during the period of the survey.
2. Several determining factors were identified for the deteriorating food security situation of the study area. They include the shortage of farmland caused by population pressure, recurrent drought, poverty, climate change, shortage of rainfall, and land degradation.
3. The farmers were financially handicapped to procure mechanized tools for their farming enterprise.
4. Farmers inability to cultivate crops at a fast pace was short changed by their inaccessibility to interest free loans from agricultural boards
5. Regular and periodic review of farmers storage system is a veritable tool for enhancing food security

Conclusion

This study examined the determinants of food insecurity in Nigeria sub-watershed case study in Ethiopia. Accordingly, the findings obtained from the study revealed that food insecurity continues to affect the Ethiopian population in general and the sub-watershed communities in particular. The food insecurity situation of the study area is extremely difficult and alarming and needs an urgent response. Similar tendency is observed from the descriptive statistics of calorie intake. Several determining factors were identified for the deteriorating food security situation of the study area. They

include the shortage of farmland caused by population pressure, recurrent drought, poverty, climate change, shortage of rainfall, and land degradation.

The findings of the study confirm that the variables such as age of household head, family size, number of agricultural labor force, off-farm income, relief support/food aid, farming experience, and agro-ecological zone were key determinant causes of rural household food insecurity. Especially, the age of household head, family size, off-farm income, relief support (food aid), and agro-climatic zone had a negative influence on food security of the rural households.

Other variables of significance, namely number of the agricultural labor force and farm experience, were found to exert a positive impact. This result is also supported by the data obtained from the surveys of the interview and focus group discussions. Accordingly, shortage of water, shortage of farmland, drought, poverty, population pressure, and the shortage of rainfall were identified as possible causes of food insecurity. Irregular rainfall and low precipitation are the main limiting factors of food crop production. Rainfall is very low and erratic, with periods of drought often followed by devastating flash floods. On the other hand, drought often results in increases in the prices of food crops, and most households who depend only on their own production lack purchasing power to buy food crops to satisfy the needs of their family members thereby forced to transitory migration in search of wage labor as a daily laborer in the nearby towns.

Besides, unreliable spring rainfall aggravates the problem of food security of the area. Most of the time, the summer rainfall starts late and stops early and never resumed. Consequently, such an uneven distribution rainfall gives rise to a serious shortage of water during the dry season particularly in the midland agro-ecological zone of Warri.

Recommendations

Based on the findings of the study, it was recommended amongst others:

1. Expand the family planning education to limit the family size of the rural population, which could ease the problem of overpopulation and acute farmland scarcity and design a strategy to diversify the livelihoods of the rural community so as to complement their food gap.
2. Complementarities such as steady electric power and water supplies, good transportation/information and communication technology network, and housing units that will enhance the business ventures of the metropolitan poor be provided since most of the household heads are at the plateau of their lifecycle (age range within the labour force bracket), according to the dictates of lifecycle hypothesis. This calls for appropriate tax management policies that will generate sufficient internal revenue to sustain these complementary infra-structures.
3. As a matter of policy, the government should increase her annual budgetary allocation to the agricultural sector to facilitate the procurement of mechanised tools as tractors, bulldozers, fertilizers etc as this would help in enhancing food production in the long run.

4. All the farms should be connected to the drainage system to facilitate the flow of water farming activities by farmers. This would go a long way in enhancing as flow water and farming activities during the duration of farming season by farmers thereby enhancing food production.
5. The Agricultural Credit Board where loans are given out should be strengthened to accelerate the access of interest free loans to farmers to facilitate the procurement of fertilizers and other farm implements to farmers at the end of each farming year.

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DEPARTMENT OF ADULT AND NON FORMAL EDUCATION
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Determinants of Food Insecurity in Warri" Questionnaire (SIEQ)

Dear Respondents

I am a final year student of the above named institution. I am carrying out a study titled: **"An *Assessment of the Determinants of Food Insecurity in Warri*"**.

Please endeavor to respond to every item. The information obtained from the questionnaire will be kept strictly confidential and used only for research work.

Thank you for your anticipated co-operation.

Vera Ese Ojomi
Researcher

Section A: Personal Information of Respondents

Instructions:

Please fill in the blank spaces or tick (√) as applicable

1. **Sex:** Male [ ] Female [ ]
2. **Age:** 25-35 [ ] 35-45 [ ] 45-55 [ ] 65-75 [ ] 75 Years and above [ ]
3. **Educational level:** No Formal Education [ ] Primary Education [ ] Secondary Education [ ] Tertiary education [ ]
4. **Farm size:** 1 -4 [ ] 5-8 [ ] 9 and above [ ]

Section B

Kindly use the following key to indicate your chosen response to the following questionnaire items:

Key: Strongly Agree (SA); Agree (A); Disagree (D); Strongly Disagree (SD).

S/N	**What are the food security status of the rural households in Warri Delta State?**	**SA**	**A**	**D**	**SD**
1	The more gainfully employed a household head is, the greater his or her chances of being food secure.				
2	farming households with more education had the possibility of obtaining higher yields and become food secure.				
3	The more gainfully employed a household head is, the greater his or her chances of being food secure.				
4	Household size				
5	The older household heads have higher probability of being food secure.				
C	**What are the perceived causes of food insecurity in Warri Delta State**				
6	Low purchasing power of farmers is a cause of food insecurity				
7	Seasonal Food price fluctuation is a cause of food insecurity				
8	Epileptic electric power/water supplies is a cause of food insecurity				
9	Inefficient tax system for urban development is a cause of food insecurity				
10	The shortage of drainage system in the farm networks fosters food insecurity in rural communities				

	What are the strategies for enhancing food security in Warri Delta State?	**SA**	**A**	**D**	**SD**
11	Improving the quality of farm implements of farmers is a tool for enhancing food security				
12	Increasing farmers access to credit facilities is a tool for enhancing food security				
13	The rehabilitation of drainage system in farms is a tool for enhancing food security				
14	Frequent and regular access to interest free loans to farmers by government for the purchase of farm implements enhances food security				
15	The rate of food insecurity in rural areas is caused by inaccessibility of food storage systems by farmers				