ANALYSIS OF THE DETERMINANTS OF FOOD SECURITY AND COPING STRATEGIES OF RURAL HOUSEHOLDS IN KADUNA STATE, NIGERIA

BY

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JANUARY, 2020

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN RURAL DEVELOPMENT

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JANUARY, 2020

Declaration

I hereby declare thatthis thesistitled **"Analysis of Determinants of Food Security and Coping Strategies among Rural Households in Kaduna State, Nigeria"** has been carried out by me in the Department of Geography and Environmental Management under the supervision of Prof. J. O. Adefila, Dr. R. O. Yusuf, and Dr. B. Akpu. No part of thisthesis has been previously presented for another degree or diploma at this or any other institution. The information derived from literature has been duly acknowledged in the text and a list of references provided.

Emmanuel Duniyo LAAH ---------- _____

Signature Date

Certification

This thesis titled **"Analysis of Determinants of Food Security and Coping Strategies among Rural Households in Kaduna State, Nigeria"** by Emmanuel Duniyo LAAH meets the requirements governing the award of Doctor of Philosophy in Rural Development of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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Dedication

Thisthesis is dedicated to my beloved parents Mr Augustine Laah Adams and Late Mrs Christiana Augustine Laah Adams, who laid the foundation of my education which made me what I am today.

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Special thanks to my supervisors Prof. J.O Adefila; Dr. R. O. Yusuf and Dr. B. Akpu for their constructive criticisms and tireless guidance. I owe them debt of gratitude for their intellectual guidance and for the personal and friendly interest they took in my academic progress. In addition, I am grateful to the Head of Department in person of Dr A. K. Usmanand the entire staff of the Department of Geography and Environmental Management of Ahmadu Bello University Zaria for imparting practical knowledge on me throughout my study. I wish to appreciate my external examiner in the person of Prof. G.D Baklit and my internal examiners, Dr. S. Abbas and Dr. Y.M. Abdullahi for their contributions to this work.

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Abstract

In recent times, the global focus has been on food security and poverty alleviation. This is in response to increasing food insecurity as a result of rapid growth in the world population without a corresponding increase in food production at all levels. The study analysed the determinants of food security and coping strategies of rural households in Kaduna State Nigeria, with specific focus on the types of food crops grown, food culture and practices, determinants of food security, constraints affecting food security, and households coping strategies adopted. Both primary and secondary sources of data were used and 384 sampled size was used to collect data randomly from purposively selected rural communities. The study used both quantitative and qualitative data obtained from sampled households across purposively selected Local Governments Areas in the State, using questionnaire, Focus Group Discussions (FGDs) and Observations. Data was analysed using descriptive statistics; Principal Component Analysis (PCA) was used in estimating the factors constraining achievement of household food security. Also, Coping Strategies Index (CSI) and HFIAS model were adopted to determine the food security status of the population, while Tobit and Probit regressions were used to assess the factors influencing the achievement of food security status in the study area. The findings revealed that maize (96%) and rice (72%) were majorly produced staple crops; vegetables like okra (45%), tomatoes (44%) and pepper (37%) ranked high in production; while poultry (69%) was found to be majorly reared in the study area. The result of the HFIAS model and CSI indicated that most of the households investigated were food secure with 64% and 84% respectively; while the Tobit model revealed that socio-economic characteristics of the farming households such as sex (-2.368) and education (2.636) were significant factors at 1% influencing

the food security status of the farming households in the study area. Moreover, the perceived coping strategies adopted in cushioning the effects of food insecurity include reducing the size of meals, swapping consumption to less preferred cheaper foods and reducing the number of meals per day with mean values of 1.675, 1.7593, 1.476 and 1.0263 respectively. Further, the study revealed that reduced availability of labour (out migration) (3.009), flooding (2.990), rapid population growth (2.968), draught (2.817) and pest and diseases (2.696) ranked 1st, 2nd, 3rd, 4th, and 5th respectively as leading constraints to food security among rural households in Kaduna State. As such, three factors retained through factor analysis with eigenvalues >1 with a total variance 63.5% are social and human capital deficiency accounts for 40.6% of the variance, the second environmental capital deficiency (9.7%) and the third weak economic and production resources (7.2%). The hypothesis tested using the tobit model revealed a 55%) variation in the level of food security is explained by variations in the specified explanatory variables. Therefore, the null hypothesis was rejected and it was concluded that socio-economic variables such as household size (3.664), level of education (4.125) and occupation (-2.540) were found to be important correlates which affect food security level. Based on the findings, the study recommends that rural households should embrace improved food production technologies; adopt family planning measures to cope with the increasing population. Government and the civil society should encourage income and occupational diversification and value chain in primary products; establish training centres and improve the people access to research innovations in order to equip and update them with basic skills for the better running of their farms and intensify support for appropriate food storage and preservation techniques at the household and village levels to ensure food availability throughout the year.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

One of the major challenges facing the world today is that of feeding the ever-increasing population of over 7 billion people subject to climate change and natural resource constraints. Food and Agricultural Organization (FAO, 2012) asserted that, the global demand for food is expected to increase by 60 percent between 2005/2007 and 2050. The global food demand is further compounded by the production of biofuels in the industrialized countries; this alone posed a major stress to agriculture and food systems. Though food insecurity is widespread in developing countries, it is actually a worldwide problem that has attracted the attention of academia, scientific community and governments. More than one billion people worldwide are malnourished out of which 98% are found in developing countries and the rest (2%) in developed countries (Svedberg, 2013; Zerihun & Getachew, 2013).

Food security, which can be explained by the physical and economic access to the food needs of human beings, is often associated with food availability, accessibility and utilization (Agada & Igbokwe, 2016). According to World Bank (2006), food security has three components. These are food availability, food accessibility and food affordability. At the 1996 World Food Summit, food security was said to exist 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, 1996). This definition integrates access to food, availability of food, and the biological utilization of food as well as the stability of all these. In the same vein, Akinyele (2009) cited in FAO (2011) supported the view of World Bank (2006) by

noting that food availability, stability of supplies and food access are related determinants of food security.

Nigeria is listed among the 42 countries tagged as "low-income food deficit countries" and available evidence indicate that on almost every indicator such as deficit in per capita calorific intake, export earnings, per capita income and food imports, Nigeria exhibits high levels of food insecurity (Akpan, 2009). The federal Government of Nigeria in collaboration with States and Local Governments as well as external agencies such as World Bank, International Fund for Agricultural Development (IFAD) and African Development Bank (ADB) initiated several programmes and projects. These include Agricultural Development Project (ADP), National Special Programme on Food Security (NSPFS), National Fadama Development Programme (NFDP) and Root and Tubers Expansion Programmes (RTEP) in order to assist farmers by providing an enabling environment for their production activities. However, the Federal Ministry of Agriculture and Rural Development [FMARD] revealed that the persistent farmers and herds men conflicts have also led to farmers' growing fears of insecurity over the past few years (FMARD and FAO, 2016). In September 2013, the Food and Agricultural Organisation (FAO) of the United Nations warned that Sahel States in Northern Nigeria are faced with severe food insecurity. According to the release, poor families were indicated to have used up their food stocks thereby facing high food prices awaiting the next harvest. Alarmingly, it pointed out that over 1.4 million children in the region were at risk of severe malnutrition (FAO, 2013).

Though, Nigeria has great agricultural potentials and abundant natural resources for all round development, most indicators of the economic well-being are still very low. Food insecurity and poverty are still widespread across different parts of the

country. Food insecurity situation in Nigeria is worsening with the passage of time due to the wide gap between the national supply and demand for food which is seen in the increase in percentage of food insecure households from 18% in 1986 to over 40% in 2005 (Sanusi, Adebukola, & Oyindamola, 2006). Akinyele (2009) reported that there are overwhelmingly large proportions of Nigerians who are food insecure across urban and rural communities, though most of them are found in the rural areas.

Households also resort to a number of strategies for coping with food insecurity and these strategies differ in several aspects, that is, within the household and between households (Maxwell, Caldwell & Langworthy, 2008). Coping strategies can be divided into ex-ante and ex-post strategies (Dercon, 2002). Ex-ante strategies are protective risk-management actions by households before an eventual shock, while ex-post strategies are actions taken by households to mitigate the consequences of an adverse event (Aquiar & Hurst, 2005). Such strategies may have short-term or long-term impacts. Usually, households first implement coping mechanisms with short-term effect such as using up savings or selling assets, and when those mechanisms fall short, households may resort to other strategies with more long term effects such as withdrawing children from schools (Cameron, 2001). However, some coping strategies are common to all households although the extent to which such strategies enable a household to remain afloat depends on the assets at their disposal (Devereux, 2001).

Attaining food security in its entirety poses a huge challenge in a country like Nigeria, as a result of a wide spectrum of problems. More than 90% of agricultural production in Nigeria is rain-fed with about 79 million hectares of arable land, of which 32 million hectares are cultivated(Nwajiuba, 2012). Both crop and livestock production remain below potentials. Global food prices have risen dramatically in the last few years and are forecasted to rise further or become more volatile (Nelson *et al.,* 2011, cited in,

FAO, 2011). However, the rural poor who are the active stakeholders in food availability account for 33.4% and are mainly involved in subsistence farming (Nwajiuba, 2012).

Agriculture is the main stay of the economy of Kaduna State with the majority of the people actively engaged in farming. Cash and food crops are cultivated and the produce includes: yam, cotton, groundnut, tobacco, maize, beans, guinea corn, millet, ginger, rice and cassava. A significant number of families are also involved in livestock production. In 2010, the Commercial Agriculture Development Project [CADP] puts Kaduna State as the largest producer of rice in Nigeria and it exports substantial quantities to other Nigerian States and other African countries (CADP, 2010). Agriculture accounts for an estimated 56 percent of Kaduna's GDP and employs approximately 4 million people (CADP, 2010). The FAO in November 2016 raised an alarm over the low food consumption level and malnutrition in 16 states of the country, with Kaduna State inclusive (Nnabuife, 2016).

Therefore, the poor performance of agricultural sector directly creates supply shortages and indirectly creates demand shortages in the market by denying the rural farming households access to sufficient income to buy.

This study is concerned with the determinants of food security as well as the coping strategies at household level in Kauna State, Nigeria, since most of the decisions in rural areas are made at household level (Rashid, Langworthy & Aradhyula, 2006). Analysis of food security at household level enables identification of appropriate combination of interventions, which is imperative because national and regional levels of food security analyses can obscure important differences at household levels.

1.2 Statement of the Research Problem

Food insecurity has been an intractable problem that affect many countries all over the world. The apparent inconsistency in government's targeted policy intervention and implementation strategies further compound the problem of food security.

The food security status of Nigeria is seen from the fact that small holder farmers are the major producers of the food consumed in the country and these farmers have inadequate capacity to produce enough for the country's need (International Food Policy Research Institute, 2009). The nexus between low food production capacity, rising food prices, over reliance on food importation and food insecurity need not be over emphasised.

The Kaduna State Government has been providing support to farmers in terms of extension advisory services, inputs at subsidized rates and irrigation facilities through Fadama Programme to ensure food security. Despite all these efforts, households are faced with food security challenges as a result of instability of agricultural produce prices; inadequate preservation, processing and storage facilities to reduce on – farm and off – farm losses (Kaduna State Development Plan, 2013).

Adebayo, Sanni, and Baiyegunhi (2012) examined the impact of microcredit scheme on food security status of farming households in three Local Government Areas of Kaduna State, Nigeria. The study employed Food Security Index (FSI) and Propensity Score Matching (PSM). About 38% of beneficiary's households were food insecure, with a FSI of 1.83. The Propensity Score Matching showed that the UNDP micro credit scheme had no significant impact on the food security status of beneficiaries, while the calculated average impact of treatment on the treated (ATT) was negative (-60.68), indicating that the UNDP micro credit scheme in the study area had not contributed significantly to the food security status of the beneficiaries. If the UNDP

microcredit scheme has not contributed to food security, what then determines food security in the study area?

Ahmed (2014) examined issues of food security among smallholder irrigation and non-irrigation farmers in Kaduna State, Nigeria. Logit regression model and T-test of significance were used to determine factors affecting the food security status of households. Using the recommended calorie required approach; comparatively, the study revealed that 57% and 43% of the households engaging in irrigation farming were food secured and food unsecured respectively, while 42% and 58% of the non-irrigation households were food secure and food insecure respectively, indicating a lower percentage of food security and a higher percentage of food insecurity among the non-irrigation households.

In the same vein, Ojeleye, Adebisi and Fadiji (2014) assessed farm household food security and consumption indices in Kaduna State, Nigeria. They employed descriptive statistics and food security index for analysis. The study revealed that about one third of the rural farm households were food insecure and that the average farm size of the farm households was 2.05ha as food secure and insecure households cultivated 2.09ha and 1.96ha respectively. Average farm and non-farm income were $1,130.7 and $810.3 per annum respectively as the food security indices for the food secure and insecure households were found to be 1.462 and 0.852 respectively. Large family size was found to lower available calorie intake of households.

The 2016 Food Security and Vulnerability Studies (FSVS) was conducted in the 16 Northern Nigeria states of Adamawa, Bauchi, Benue, Borno, Gombe, Jigawa, Kaduna, Kano, Katsina, Kebbi, Niger, Plateau, Sokoto, Taraba, Yobe, and Zamfara. These states include all the states in the North East and North West geopolitical zones of Nigeria, and three states in the North Central geopolitical zone. It is important to

emphasize that the FSVS was designed to reflect the food security and livelihoods situation in senatorial districts and states, and not the situation of any particular population group within the districts and states like the rural households. The findings indicated that in Benue, Kaduna, Kano, Katsina, and Plateau States, there appeared to be no change in the average land area cultivated per household (FSVS, 2016). Jigawa, Kaduna, Kebbi, Niger, and Taraba all had acceptable Food Consumption Score (FCS) of between 74% and 79%, implying Jigawa, Kaduna, and Kebbi were other states with at least crises level of poor FCS (≥10%).

Most of these studies focused on measuring food security using the consumption expenditure, analysing food security among urban poor households, population groups and suggesting ways of solving the food problem. However, the major shortcoming of these studies by Adebayo *et al*, (2012); Ahmed, (2014) and Ojeleye, *et al*, (2014) that provided a gap centred on the non-inclusion of the vulnerability aspect of food security, which according to Maxwell (1996) is the most important element of the definition of food security. Vulnerability is a forward-looking concept based on the notion that the food security outcome of households is the realisation of a random process, conditional on a number of risk factors at different levels. An appropriate notion of vulnerability should consider all these aspects of food security such as availability, access and stability as they allow for more precise description and appropriate targeting of populations vulnerable to food insecurity. More so, the Sustainable Development Goals (SDG 2) addresses food security or, more precisely, sets out to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (UN, 2015). A new indicator that is included in the SDG2 is the qualitative assessment of how people themselves perceive their food security situation. Indicator 2.1.2 assesses the prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity

Experience Scale (FIES), which is a qualitative measure of how people perceive their food security situation.

Therefore, the study adopted a combination of two models which are, the United State Department of Agriculture (USDA) Household Food Insecurity Access Scale (HFIAS) approach and the Coping Strategy Index (CSI) to go beyond nutritional assessment of food insecurity by accommodating the components of accessibility and availability as well as coping strategies. It is against this backdrop that the study addressed the following research questions:

1. Whatare the types of food are produced and what are the food culture and practices in rural areas of Kaduna State?
2. What is the status of food security among rural households in the study area?
3. What factors determine households' food security in the study area?
4. Why are households unable to achieve food security?
5. What are the coping strategies to food insecurity among households in the study area?

1.3 Aim and Objectives of the Study

The aim of this study is to analyse the determinants of food security and coping strategies among rural households in Kaduna State Nigeria. However, the specific objectives are to:-

i. determine the type of food crops that are grown and the food culture practiced in the study area;
ii. determine the food security status of rural households in the study area;
iii. assess the determinants of households food security in the study area;

iv. ascertain the constraints affecting food security among rural household in the study area;

v. establish the coping strategies employed by rural households for food insecurity.

Hypothesis

H_0 There is no significant relationship between rural households' socio-economic characteristics and their level of food security.

1.4 Scope of the Study

The study is concerned with the analysis of determinants of food security and coping strategies among rural households in Kaduna State. The State has three Senatorial Districts namely, Kaduna North; Kaduna Central; and Kaduna South. The study covers the level of food security among the rural population and the factors that determine households' food security as well. The study also looked at the major coping strategies employed during food insecurity and the constraints households face in ensuring they are food secured. The temporal scope covers 2002 - 2017 because the New National Policy Thrust on Agriculture, consequent to the national programme for food security was launched in August 2001. National Special Programme for Food Security (NSPFS) established principally to curb the high incidence of food scarcity in the country, isby implication assumed access to food supply at household, sub national and national levels was located in every senatorial district of Nigeria. The federal government and the Food and Agricultural Organization (FAO) of the United Nations handled the programme, which involved food crop production, irrigation, livestock and food processing (Prisicilla & Obioma, 2015).

1.5 Significance of the Study

One important component of national security is food security. Food security has become a very crucial aspect of policy making for decades and it is a core element of the Sustainable Development Goals (SDGs), specifically in Sustainable Development Goal number 2. Over the past two decades, efforts have been made by the international community and various national governments to reduce food insecurity and hunger and assure food security. However, the problem still persists with the number of malnourished people exceeding 1billion (FAO, 2010). The international community has long been concerned about eradication of hunger and undernourishment especially of vulnerable groups. This led to its inclusion as one of the two targets of the first Millennium Development Goal (MDG). Despite the global resolution to curb the food insecurity menace, the recent report on world food insecurity highlighted that the number of people suffering from hunger has increased every year since 1996. Also, about 925 million people worldwide still suffer from chronic hunger, in which 235 million hunger sufferers are from sub - Sahara Africa (FAO, 2010). This brings to the fore, the fact that the right to food is still one of the most often violated right in the world today (Clover, 2010).

In 2016, the food security situation deteriorated sharply in parts of sub-Saharan Africa, South-Eastern Asia and Western Asia. This was most notable in situations of conflict, in particular where the food security impacts of conflict were compounded by droughts or flood phenomenon. However, worsening food security conditions have also been observed in more peaceful settings, especially where economic slowdown has drained foreign exchange and fiscal revenues, affecting both food availability through reduced import capacity and food access through reduced fiscal space to protect poor

households against rising domestic food prices. In some parts of the world, this recent surge in hunger reached an extreme level, with a famine declared in areas of South Sudan in early 2017 and alerts of high risk of famine issued for three other contries (Northeast Nigeria, Somalia and Yemen) [FAO 2017].

Combating food insecurity has been the primary concern of successive administrations in Nigeria. The situation is aggravated by the low agricultural production, which is due to backward production technologies, poor infrastructure as well as unsuitable government policies and strategies. For policy responses, it is crucial to understand how different socio-economic groups especially the poorest segment of the population are affected by chronic hunger and food insecurity. This needs a thorough investigation of the problems associated with household food security. In other words, identifying the determinants of food security of rural households along with their coping and survival strategies may help the government and non-governmental organizations to design appropriate sustainable development activities. Moreover, food security analysis at the household level can facilitate identification of the most appropriate strategies that can be taken either by the government or development partners or by the communities. The findings of the study may be useful for policy makers to deal with underlying factors affecting household food security particularly in the rural areas.

Accurate assessment of food security situations is of immense help to public officials, policy makers, service providers and the public at large to appreciate the changing complex needs for assistance and the effectiveness of existing programmes. While the determination of the food security situation of the households can provide a framework for assessment and planning, monitoring food security situation of a

particular population may afford comparison of food security situation at local, subnational and national levels. This will enable decision makers to track the effect of changing policies or economic conditions. The findings of this study would produce baseline information for long-term planning in order to promote taking appropriate decisions as well as choices in Kaduna State or the country at large to address food security.

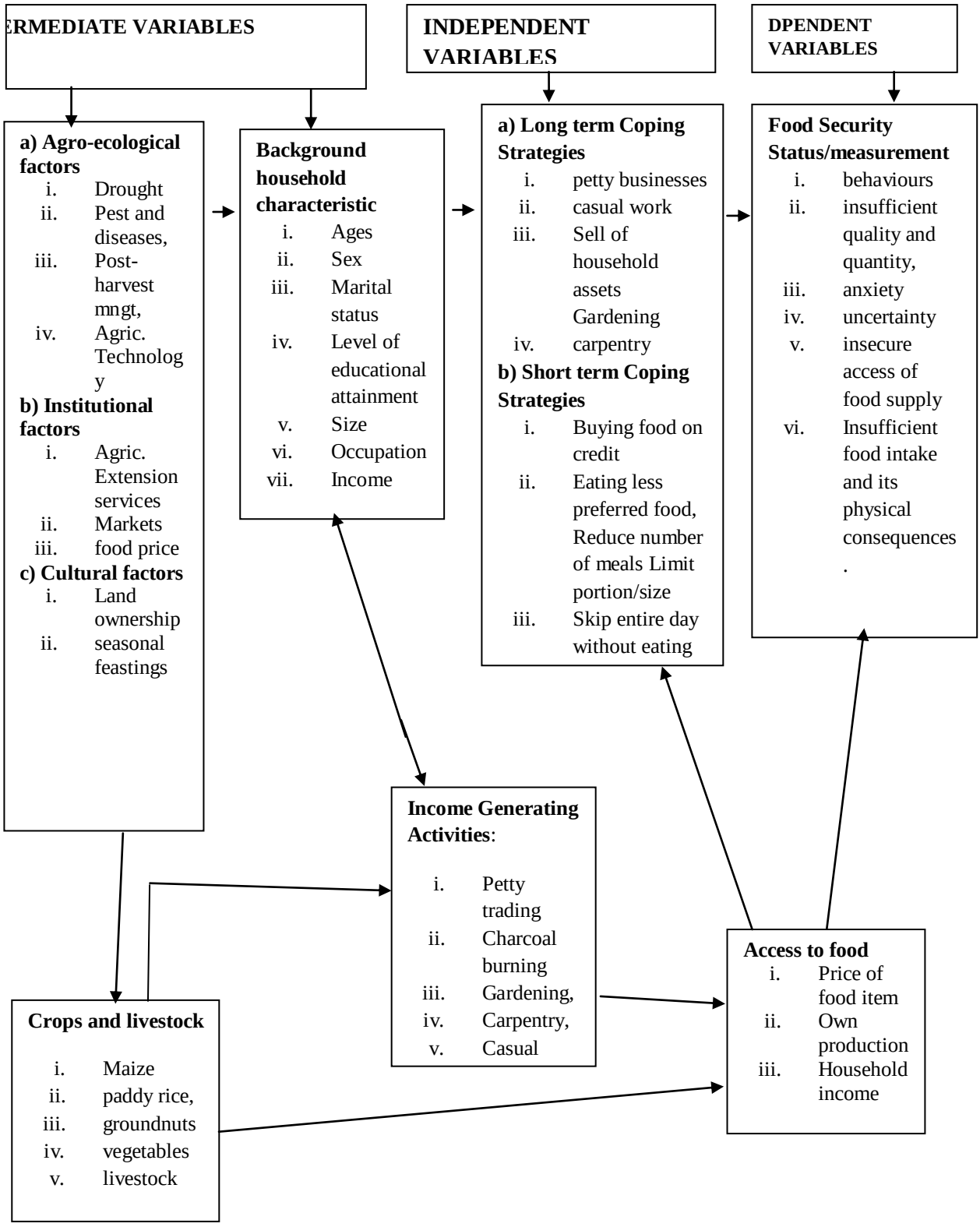
CHAPTER TWO

CONCEPTUAL ISSUES, THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1Conceptual Framework

The conceptual frameworkadopted for this study (Figure 2.1) assumes that the independent variables (both short term and long term coping strategies) have a direct influence on the dependent variable which is food security status. The indicator for food security status is measured through household behaviours signifying insufficient quality and quantity of available food, as well as anxiety and uncertainty over household insecure access to food supply; insufficient quality (includes variety and preferences of the type of food); and insufficient food intake and its physical consequences (Ngongi, 2013). The independent variable in this study is coping strategy, which influences the dependent variable food security. However, it is worthy of note to understand that the independent variable includes consumption (Buying food on credit, skipping meals and eating less preferred food). Then there is expenditure (avoiding health cost and education cost); Income (selling household asset); and migration (migrating to work and sending children to relatives).

The framework also assumes that the intermediate variables also have an influence on background variables. These intermediate variables include agro-ecological factors (drought, pest and diseases, postharvest management); institutional factors (agricultural extension services, markets, and food prices); and cultural factors (land ownership, seasonal feastings).



Source: Adapted from Ngongi, (2013)

Figure 2.1: A Conceptual Framework of Food Security and Coping Strategies

Factors contributing to food insecurity indicate a probability of failure to attain a certain threshold level of energy requirement for a healthy life. In the household level, less land ownership, drought or water scarcity, loss of off-farm jobs, crude traditional technology, food price fluctuation are the main risk factors. Others include weak agricultural extension services, poor division of labour at the household level, financial inability to use improved seeds, fertilizers, pesticides, and herbicides and bad farming practices leading to various environmental hazards (Ngongi, 2013). Further, background variables in the framework consist of age of the household head, sex of the household head, marital status, years of schooling of household head and household size, all of which have a direct influence on the independent variable and the interdependent variables. Income generating activities have influence on the dependent, access to food and farming activities which again influences the access to food which leads to food insecurity coping strategies (Ngongi, 2013).

2.1.1 Food security

In the 1970s, food supply shortfalls created by production failures stimulated major concern on the part of international community regarding food availability (Maxwell et al., 2003). Consequently, concerns about food security were directed more on food availability at the national and international levels up to the end of the 1970s. During the 1970s, food security was defined as the "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuation in production and prices" (FAO, 2006:1). Policies to address the problems of food security, therefore, focused on increasing consumption of agricultural inputs such as fertilizers and improved seeds that can dramatically increase yields (Fraser, Webster & McClean, 2009).

In 1983, FAO expanded the concept to include securing access by vulnerable people to available supplies, implying that attention should be balanced between the demand and supply side of the food security equation: "ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 2006:1). As a result, the analysis of food security shifted from national and global levels to household/individual level (Tilaye, 2004). From the definition it can be understood that access refers to the ability of an individual to acquire food, either through production or purchase, what Sen (1981) referred to as the means to acquire food (entitlements). In 1986, the highly influential World Bank report "Poverty and Hunger" (World Bank. 1986) focused on the temporal dynamics of food insecurity. It introduced the widely accepted distinction between chronic food insecurity, associated with problems of continuing or structural poverty and low incomes, and transitory food insecurity, which involved periods of intensified pressure caused by natural disasters, economic collapse or conflict. This concept of food security is further elaborated in terms of: "access of all people at all times to enough food for an active, healthy life".

In the 1990s, there was a shift to food utilization (nutritional security with an emphasis on food, health and childcare). Utilization is commonly understood as the way the body makes the various nutrients in the food to be active, healthy, energetic, and productive population in the society (Maxwell et al., 2003). Wiggins and Leturque (2010) stated that, it is not just food intake that affects nutrition, the way food is consumed, the care of children and above all the health of individuals can be equally important in food utilization. But the definition was broadened to incorporate food safety and also nutritional balance, reflecting concerns about food composition and minor nutrient requirements for an active and healthy life. Food preferences, socially or

culturally determined, now became a consideration. Sufficient energy and nutrient intake by individuals were the results of good care and feeding practices, food preparation, diversity of the diet, and intra-household distribution of food. The 1994 UNDP Human Development Report promoted the construct of human security, including a number of component aspects, of which food security was only one(UNDP, 1994). This concept is closely related to the human rights perspective on development that has, in turn, influenced discussions about food security.

The World Food Summit adopted a still more complex definition: "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, 1996). This definition is again refined in The State of Food Insecurity 2001: "Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002). This new emphasis on consumption, the demand side and the issues of access by vulnerable people to food, is most closely identified with the seminal study by Amartya Sen (Sen, 1981). Eschewing the use of the concept of food security, he focuses on the entitlements of individuals and households.

Food security has been defined as a situation when all the people, at all times, have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life (WB & FAO, 2010). According to Kruger et al. (2008), household food security encompasses three dimensions availability, accessibility, and utilization. Essentially, in order to attain food security a country must

fulfil three basic aims such as: ensure adequacy of food supplies in terms of quantity, quality and variety of food; optimize stability in the flow of supplies; and secure sustainable access to available supplies by all who need them. Adequate food availability at the national, regional and household levels, obtained through markets and other channels, is the cornerstone of nutritional well-being. At the household level, food security implies physical and economic access to foods that are adequate in terms of quantity, nutritional quality, safety and cultural acceptability to meet each person's needs. Household food security depends on an adequate income and assets, including land and other productive resources owned. Food security is ultimately associated with access to nutritionally adequate food at household level, for instance the ability of households or individuals to acquirenutritionally adequate diet at all times.

2.1.1.1 Phases of food security

The Integrated Food Security Phase Classification (IFSPC) is a globally accepted five-phase scale for communicating the severity of acute food insecurity. The tool is used to classify severity of food insecurity based on a range of livelihood needs. This is a standardized framework for situation analysis expressed in a scale that integrates food security, nutrition and livelihood related information into a clear statement of food security status. IFSPC classifies areas with acute food insecurity into five phases (minimal, stressed, crisis, emergency, famine) and each of these phases/levels has different implications for response objectives. Table 2.1 highlighted general distinctions between the phases of food security according to the Integrated Food Security Phase Classification (IPC).

Each of these phases is associated with Key Reference Outcomes with absolute and relative thresholds. The reference outcomes provide an objective means for

distinguishing phases and technically support a phase classification, thus enabling comparability and accountability in analysis. Famine (IPC Phase 5) is defined as the situation in which three conditions are met: at least 20% of an area's population faces an extreme lack of food, at least 30% of children are acutely malnourished, and the crude death rate exceeds 2/10,000/day.

Table 2.1: Phases of Food Security according to IPC Phase Classification

Phase		General Description
Phase 1	Minimal	Usually adequate and stable food access with moderate to low risk of sliding into Phase 3, 4, or 5.
Phase 2	Stressed	Borderline adequate food access with recurrent high risk (due to probable hazard events and high vulnerability) of sliding into Phase 3, 4, or 5.
Phase 3	Crises	Highly stressed and critical lack of food access with high and above usual malnutrition and accelerated depletion of livelihood assets that, if continued, will slide the population into Phase 4 or 5 and / or likely result in chronic poverty.
Phase 4	Emergency	Severe lack of food access with excess mortality, very high and increasing malnutrition, and irreversible livelihood asset stripping
Phase 5	Famine	Extreme social upheaval with complete lack of food access and / or other basic needs where mass starvation, death, and displacement are evident

Source: Adapted from IPC, (2006)

Nonetheless, available evidence, and the fact that many of the worst affected areas were unreachable, indicates that an Emergency (IPC Phase 4) is occurring. It is also possible that a Famine (IPC Phase 5) is on-going in the worst affected areas. Unique to the IPC is the explicit inclusion of Acute Food and Livelihood Crisis (Phase 3) as a food security and humanitarian phase. The food security community has long

acknowledged the importance of understanding livelihood dynamics and the links to food security (DFID 2001, WFP 2005).

2.1.1.2 Components of food security

There are four important components embedded in the world Food Summit (WFS) definition of food security that has acquired the widest acceptance since 1996. The summit state that "food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life" (FAO, 1996). Four elements build the framework of food and nutrition security: food availability, food access, food utilization, and stability. Stability fundamentally affects all other elements from the basis

i. Food availability

The first component relate to availability of food in a given country or households through any means (production, imports or food aids). At the national level food availability is a combination of domestic food production, commercial food imports and exports, food aid and domestic food stocks. While at household level food could be from own production or bought from the local markets. Regarding food production, water resources are required to produce the crops. Due to population growth and climate change, the pressure on existing natural resources increases. Impacts of climate change are often leading to land degradation, lack of irrigation water, reduced soil moisture and therefore losses of economic livelihoods. Food availability can be described as the extent to which food is within easy reach of households (for example in local shops and markets), both in terms of sufficient quantity and quality (FAO 2006).

Food availability at the micro-level is strongly related to the overall availability of food, which is determined by domestic food production, commercial food imports and food aid (FAO 2006). These are in turn influenced by domestic policies regarding food production, such as policymakers' focus on food self-sufficiency or food self-reliance. Other policies directly affecting food availability are agricultural subsidy programmes, exchange rate policies affecting international trade opportunities and policies creating stable and attractive conditions for agricultural investments. In general, the food availability dimension reflects the supply side (Barrett & Lentz 2009) and will therefore be affected by all the drivers and determinants that have an impact on the domestic supply of food and the ability to finance food imports. At a more local level, food availability is strongly contingent on road and market infrastructure, the degree of market integration, and local market institutions.

Women play an important role in the production of food. According to Doss, Truong, Nabanoga & Namaalwa, (2012), the share of women in the labour force has a significant impact on the national food availability and positively influences domestic food productivity. The agricultural productive potential of women, however, is not exploited to its full extent due to asymmetries in ownership of and access to agricultural inputs such as land, credit, pesticides and technology (World Bank 2009; Deere &Doss 2006*).*

ii. Food Access

Access is ensured when all households have enough resources to obtain food in sufficient quantity, quality to ensure a safe and nutritious diet (FAO 2006). This depends mainly on the amount of household resources and on prices. In addition, accessibility is also a question of the physical, social and policy environment. Drastic

changes in these dimensions may seriously disrupt production strategies and threaten food access of affected households. To achieve this, not only domestic and local food availability must be considered; households must also have access to the necessary resources to acquire food.

Important drivers of food access are household resources, food prices, food preferences and socio-political factors such as discrimination and gender inequality. Food access is to a large extent determined by food prices and household resources. Access to natural resources such as fields, forests, grasslands and water resources is a major determinant of the productive capacity of the food- producing household and therefore of household food supply decisions (UN Millenium Project, 2005). It needs to be stressed that at the individual and household level it is difficult to distinguish food availability from food access. In regions where local markets are malfunctioning, households generally depend on food production as a means to have access to food, in which case (local) food availability and food access strongly overlap. However, even in regions were local markets are well developed it is not always straightforward to distinguish between the two. Household food production is often an important source of income in developing countries.

An increase in food prices will generally raise the returns to household farm labour and may boost food production. A price increase may therefore positively affect food access through improved food availability. The resulting increase in income may further improve food access, although this effect can be counteracted by the higher cost of food. In any case, this example illustrates that food availability cannot always be easily separated from food access.

iii. Food utilization

Access to food is necessary but not a sufficient condition to ensure an adequate food and nutrition status (Barrett & Lentz 2009). Banerjee & Duflo (2006) indeed document that an increase in household income does not necessarily lead to an increase in the quantity or quality of food consumed, but can be spent on items such as alcohol or fast-food. Alternatively, an unequal distribution of food within the household might cause some members to eat more and others less than required. In both cases, at least some household members will not absorb the required amount of micronutrients, resulting in a poor food and nutrition status. Besides that, utilization requires a healthy physical environment and adequate sanitary facilities as well as the understanding and awareness of proper health care, food preparation, and storage processes. In this context safe drinking water plays an important role, especially for preparing food and creating a healthy environment for the population.

Today many developing countries are confronted with the "double burden of malnutrition", facing both the prevalence of undernourishment - especially among young children - and a rise in overweight, obesity and related chronic diseases. A possible cause of this double burden is the relatively low price of food that is high in calories but low in nutritious value, which might lead poorer households to prefer these unhealthy food products. In general, staple foods are cheaper than high-value foods such as vegetables, meat, fish and dairy, which contain more essential micronutrients (WHO, 2016)

iv. *Food stability*

Stability describes the temporal dimension of food and nutrition security, respectively the time frame over which food and nutrition security is being considered. Stability is

obtained when the supply on household level remains constant during the year and in the long-term. This includes food, income and other economic resources. Key indicators for exposure to risk include climate shocks such as droughts, erosion and volatility in the prices of agricultural inputs for food production. Further, it is important to minimize external risks through activities and implementations for improving the resilience of households. Such measure include insurances for example, against drought and crop failure as well as the protection of the environment and the sustainable use of natural resources like land, soil and water (IICA, 2009; Klennert, 2009).

Stability has to do with exposure to short-term risks which have a way of endangering long-term progress. Nigerian farmers are smallholders cultivating mainly for subsistence. Hence, this makes it difficult for them to cope with changes in the prices of inputs, and it also lowers their ability to adopt new technologies thereby resulting in reduced overall production. Changing weather patterns as a result of climate change have played a part in reducing food supply, for instance flood in the southern parts of the country and drought in the northern parts leads to substantial losses in production and income (FAO, 2008a). The interplay of all these variables determines whether an individual, household, state or nation is food secured or not. This is because sustainable food security at the household level does not guarantee sustainable food security at the state or national level. Stability of food supplies means that households do not risk losing access to food as a consequence of sudden shocks (climatic crisis) or cyclical events for example, seasonal food insecurity (Onabanjo, Akinyemi & Agbon, 2009).

2.1.2 Methods of determining food security

There are various methods of determining food security that can be summarized as qualitative and quantitative. Qualitative methods include self-appraisal, whereby households evaluate themselves on whether or not they had food shortage within the past twelve months. Quantitative methods include the number of meals eaten per day (under normal circumstances adult members eat at least three meals per day and children are required to eat at least five meals per day).

Webb et al (2006) highlighted the lack of precise measures of household food security and that the most commonly used measures of food security are based on proxy measures. In particular, measures of "access" dimension of food security have centred on agricultural productivity, food shortage or children's nutritional status. Maxwell et al (2008) in their study on indicators of food security based on coping behaviours listed the widely employed measures of household food security, which include nutritional status , actual household food consumption level based on a 24-hour recall, coping strategy index, household income/expenditure, productive assets, food shortage, dietary diversity and household food security access scale. Generally, households with less than 200 kg per capita per year and those with less than 270 kg per adult equivalent (AE) in a year are considered to be food insecure (Assenga & Kayunze, 2016). The use of Dietary Energy Consumed (DEC) per capita per day and per adult equivalent (AE) per day; households are considered food insecure if they consume less than 2100 kcal per capita per day and less than 2200 kcal per AE per day.

Another method is Household Income and Expenditure Survey (HIES), whereby food consumed is converted into DEC per capita per day and per AE per day (Kayunze, Mwageni & Mdoe, 2009). According to Leyna et al., (2007) coping strategies at household level can be used as an indicator in measuring food insecurity. Coping

strategies are simple, cheap, and provide timely and valuable information on food and needs at the household level.

Further, a subjective measure that attempt to assess the various components of food insecurity is the USDA Approach using the Household Food Insecurity Access Scale (HFIAS), which identifies the three key domains of household access to food; perception of insufficient quantity of food; inadequate quality of food; and uncertainty about whether the food budget or supply is adequate to meet basic requirements (Swindale & Bilinsky, 2006). Other studies have documented indicators such as dietary diversity and food frequency as the most common and valid indicators of nutrient adequacy and/or energy intake (Wiesmann, Hoddinott, Aberman & Ruel, 2006, Ruel 2003).

Another useful measure for analysing the determinants of food security is the Sustainable Livelihood Framework (SLF) of the Department for International Development (DFID). The SLF indicates that the livelihood of a given household is dependent on its asset endowments-mainly human capital, social capital, physical capital, financial capital and natural capital which together enable households to pursue a sustainable livelihood.

The FAO method which focuses on the estimation of dietary energy consumption on per-capita basis at the country. However, one of its weaknesses is that, the quality of diet is overlooked and has a high degree of measurement errors. The Household Expenditure Survey Method (HESM) also obtain information from the households, where respondents are required to provide information on their expenditure on food and other necessities (Bashir & Schilizzi, 2012). Though it has flexibility for the vulnerable households' identification that allows mapping of the determinants both

at local and national levels; measures the available amount of food but ignores the consumed amount at a given time and does not account for the amount of food consumed outside the households. More so, Dietary Intake Assessment (DIA) is usually carried out using different techniques. This method relies on participants' memory and recording of food consumption data. It measure food consumption rather than availability and most DIA methods rely heavily upon respondents' memory that can lead to measurement errors (Bashir & Schilizzi, 2012).

The study used the Households Food Insecurity Access Scale (HFIAS) also classified as the Food Insecurity Experience-based Measurement scale (FIEMS). This was complimented by the coping strategy index as one of the Participatory Rural Appraisal (RRA) method of measuring food security status. These methods are based on perception or experience reported by the respondents and the extent of severity is based on series of questions, a number of which rely on qualitative and subjective assessment. It measures directly the phenomenon of interest based on the food insecurity experience as perceived by the affected individual or household; it captures not only the physical but also the psychosocial dimensions of food security; and can be applied in very diverse socio-cultural settings yielding valid and predictable results.

2.1.3Food insecurity

Food insecurity is the opposite of food security. Therefore, it may be defined as a situation where people, individuals at times, lack physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life. According to Frongillo & Nanama (2012), household food insecurity results when food is not available, cannot be accessed with certainty in socially acceptable ways, or is not physiologically utilized completely. Food insecurity occurs whenever enough and safe

foods are not available or the ability to acquire such foods is limited. Food insecurity represents a major public health concern and is a useful index of health and well-being because it is associated with poverty, ill health, poor dietary intake, and limited social capital (Hadley, Zodhiates & Sellen, 2006).

According to Young, Wheeler, McCoy & Weiser, (2001) understanding the severity of food insecurity is essential for determining the best type of response. The severity of food insecurity is gauged by its impact on people's ability to feed in the short term, and its impact on livelihoods and self-sufficiency in the longer term. These two perspectives allow the severity of food insecurity to be judged as follows:-

i. A population is considered acutely food insecure if people experience a large reduction in their major source of food and are unable to make up the difference through new strategies;

ii. If the prevalence of malnutrition is abnormally high for the time of year, and this cannot be accounted for by either health or care factors;

iii. If a large proportion of the population is using marginal or unsustainable coping strategies

iv. If people are using "coping strategies" that are damaging their livelihoods in the longer term, or incur some other unacceptable costs, such as acting illegally or immorally.

2.1.3.1 Indicators of Vulnerability to Food Insecurity

Food insecurity describes a situation where people lack adequate access to food which meets their dietary needs and food preferences (Lecoutere, Vlassenroot, & Raeymalkers

2009) while, vulnerability refers to peoples' susceptibility to fall below predetermined food security threshold shocks that will gradually deplete their assets thereby increasing their level of vulnerability to, and experience of, severe food insecurity (Hart, 2009). In this instance, food insecurity is an outcome of vulnerability.

High population, poor health, low formal education, insufficient crop and livestock production, small size of farmland, low savings and credit are indicators very commonly used for the analysis of vulnerability to food insecurity (Devereux & Maxwell, 2003; Deressa, Hassan, Ringler, Alemu, & Yesuf, 2009). These indicators could be grouped into livelihood assets to explore household vulnerability to food insecurity. Evidently, ownership of productive assets significantly influences livelihood outcomes of rural households. Matshe (2009) indicated that vulnerability to food insecurity is linked to livelihood assets, strong institutional support and a favourable external environment. Devereux & Maxwell (2003) noted that vulnerability is closely linked to asset ownership and thus lack of assets is the main driving force that pushes households to be vulnerable to food insecurity. That is, the greater erosion of households" assets, the more vulnerable to food insecurity. Deressa et al. (2009) indicated that the determinants of vulnerability to food insecurity among rural households to include physical assets (livestock and number of oxen, housing units); financial capital assets (access to credit, off-farm employment); social assets (savings and credit associations); human capital assets (education, health, age and sex composition and family size) and natural assets (mean rainfall, rainfall deviation and farm size). Likewise, Khoshnodifar, Sookhtanlo & Gholami (2012) and Tagel (2012) noted that farmers' capacity to cope with drought and food insecurity depends on ownership of access to a wide variety of resources. These include land ownership,

farmers' income, farm size, educational level, gender, access to insurance, housing quality, health, access to technology, and access to levels.

Food insecurity exists when one or more of the food security components (availability, accessibility and/or utilization) are not fulfilled while; vulnerability is concerned with the measurement and characterization of the likelihood to fall in consumption below some acceptable level. Devereux (2006:3) had defined vulnerability to food insecurity as 'being at risk to become food insecure'. Households with livelihoods that do not enable accumulation of the assets required to cope with credits, social networking (social capital) and public support program. Scaramozzino (2006) further links vulnerability to food insecurity to scarce access to asset ownership including intangible ones such as social capital. As Shahbaz (2008) indicated, rural peoples' access to and ownership of certain livelihood assets may have a significant impact on their level of vulnerability to risks, as the limited access to livelihood assets increases the defencelessness and exposure to shocks and stress (risks). Philip and Rayhan (2004) also listed the contributing factors of vulnerability to food insecurity, to include diminishing access to social protection, rapid population growth, poor health, and low levels of education, gender inequality, fragile and hazardous location, lack of access to resources and information and limited access to political power.

The ability to produce sufficient foods for one's household at home is one way that a household could achieve food security. Another way is to generate sufficient income to purchase foods from the market. The former represents the stereotypical rural farmer and the latter the stereotypical urban dweller. Households may also have existing vulnerabilities that elevate their risk of worse food insecurity and are susceptible to other shocks that may make them more vulnerable to food insecurity (Krishna, 2010).

For instance, household heads or members may experience illnesses that disallow them from engaging in productive activities, which may in turn lead to household food insecurity. More so, households might also experience catastrophic loses to productive assets like land or oxen, or may lose jobs; that latter might be particularly critical for urban households given their reliance on income to purchase foods (Ruel, 2003).

However, several household composition factors have been highlighted as resulting in vulnerability among households. The few investigated are female-headed households and the size of households. Female-headed households have been specifically identified as being at risk for experiencing poor food insecurity outcomes during food crises. The FAO for instance notes, "female-headed households … are most vulnerable to sharp rises in basic food prices." (FAO, 2008) All else equal households that are larger have higher energy demands, and thus must be more likely to experience poor food insecurity, net of other factors.

2.1.4Coping strategies

Coping strategies represent a set of activities that are undertaken in a particular sequence by a household in response to exogenous shocks, which include famine, drought and other calamities (Webb & Braun, 1994; Dietz and von der Geest, 2004). Van der Geest & Dietz (2004) specifically indicated that coping strategies show a sequential pattern and that increased knowledge about the sequence could inform early warning systems to be planned to overcome famine. The same authors also added that coping strategies have discrete stages and households move to the next stage after they have exhausted the first stage.

In the 1960s and 1970s, poor people were often depicted in social science literature as passive victims who were economically exploited and marginalized (Dietz

and von der Geest, 2004). In line with this, Webb and Braun (1994:56) raised a question about "what do people do when faced with the threat of starvation?" Maxwell (2008:2) also put a leading question as "what do you do when you do not have enough food, and do not have enough money to buy food?" People are not passive receivers of undesirable situations; they employ several strategies to manage risks. Webb and Braun (1994) also indicated that people who die during famine should not be seen as passive victims but losers of a hard struggle for survival. Therefore, when hazards or undesirable conditions happen people try to cope with and not rely much on outsiders, unless and otherwise everything becomes out of their control (Heijmens, 2001). Webb and Braun (1994) showed that coping mechanisms do not involve overnight awakening to danger, rather a progression of narrowing options from broader attempt to minimizing risk. Other writers such as Ellis (2003) and Sorensen et al. (2004) do not agree to the sequential pattern of coping strategies and, in real situations, sequential approach may or may not be practical because different responses do not have similar time relevance. Though there are times when people's responses occur simultaneously, parallel processes may be taken rather than sequential events. Besides, the extent to which any household is forced to move along the sequence depends on its economic class.

According to literature such as that of Khatri-Chhetri& Maharjan, (2006); Hadley, Mulder & Fitzherbert, (2007); Maxwell et al., (2008) among others, households adopt both *ex ante* and *ex post* coping strategies in their efforts/attempts to be food secure. Generally, there are four categories of strategies, namely consumption, expenditure, income, and migration. Consumption strategies include buying food on credit, relying on less-preferred food substitutes, reducing the number of meals eaten

per day, regularly skipping food for an entire day, eating meals comprised solely of vegetables, eating unusual wild foods, restricting consumption of adults so children can eat normally, and feeding working members at the expense of non-working members. Expenditure strategies include the use of savings and avoiding health care or education costs in order to buy food. Income strategies include, the use of pension, small businesses and selling household and livelihood assets such as livestock. Migration strategies include sending children to relatives or friends‟ homes or migrating to find work (Maxwell et al., 2008). Increased use of coping strategies indicate a decrease in food security. Likewise, a decrease in food security results into increased frequency and severity of coping strategies. Thus, the analysis of coping strategies indicates a decreasing food security situation when coping strategies accelerate from temporary measures such as reduction in number or quality of meals for a brief, defined time period from which a household can recover, to measures that undermine future lives and livelihoods and damage social, financial, physical, or natural assets irreversibly (Maxwell et al., 2003). In this regard, there are two types of strategies employed by the households to reduce risks. They are ex-post coping and ex-ante adaptive strategies (Degefa, 2005).

2.1.4.1 Ex-post coping strategies

Ellis (2003) reported that households dispose moveable assets first (savings, stocks, livestock) and later on, they may dispose buildings, even land. Thus, placing themselves in a position of inability to recover from shocks in the future. Scholars such as Ejiga (2006), Wondowsen (2011), Kinyangi, Herrero, Omolo, van de Steeg & Thornton (2009), indicated that coping strategies are undertaken in a particular

sequence in response to exogenous shocks in which each response is used exhaustively before the household moves on to the next response.

Webb and Braun (1994)reported that when households face hunger and famine, they draw from their savings, use food reserves, diversify sources of income and reduce expenditure on non-food items in the initial stages of famine. During the later stages of famine, they switched to consuming famine foods and even family migration. In Bangladesh, households facing flood-created food shortages and responses include reducing the number of meals per day, changing the types of food items they consumed and borrowing food from neighbours (Frongillo & Wolfe, 2001). Quaye (2008) identified coping mechanisms used by households in northern Ghana to include collection of wild foods, market purchases, food payment in kind, support from relatives and friends, sales of livestock, migration and engagement in wage labour. Further, where the quantity of food becomes short, households limit intake between families, reduce the number of meals per day; and when it is severe, they pass the whole day without eating.

2.1.4.2 Ex-ante adaptivesStrategies

Ex-ante adaptation is a continuous process of change to livelihoods, often geared towards enhancing existing security, wealth, reducing vulnerability and poverty (Ellis, 2000). Further, ex-ante adaptive measures help to improve food availability and access their own production and income diversification. It anticipates events of shocks in advance (Mahrijan & Chhetri, 2006). Often reducing risk is not an option, so households try to mitigate risk via multiple livelihood strategies or diversification. Here, diversification means not putting all “one’s eggs in one basket” (Pandey & Bhandari, 2009). Maintaining flexibility is also an adaptive strategy that allows farmers to switch

to activities as the situation demands (Pandey, 2009). For example, a switch from the use of artificial fertilizers to compost is an adaptive strategy.

Start and Johnson (2004) postulated that the ex-ante adaptation strategies include cultivation of more land, on-farm and off-farm diversification (for example, change in mono cropping to mix, wage labour), intensification of cash cropping, and investments in social capital. This principle is true for rural households who use different types of activities to reduce shocks. Since adaptive mechanisms are long-term tactics, government involvement significantly reduces the shocks. For example, implementation of water harvesting techniques, employment of resettlement programmes in suitable ecological areas, safety net programmes, water-soil management practices, selection of seeds (adaptable) to drought-prone areas, etc. reduce household's vulnerability to food insecurity (Adger, Brooks, Bentham, Agnew & Eriksen 2004; Yaro, 2006).

2.1.5 Vulnerability

Vulnerability refers to people's propensity to fall, or stay, below a pre-determined food security threshold. Vulnerability is a function of people's exposure to risks and of their resilience to these (Lovendal, Knowles & Horii, 2004).The concept of "vulnerability" in the 21st century has made its way onto the mainstream development agenda. Traditionally, much of the analysis of vulnerability to food insecurity has focused on forecasting potential supply shocks and has side-lined issues related to access and utilization.

Vulnerability is a forward-looking concept based on the notion that the food security outcome of households is the realisation of a stochastic process, conditional on

a number of risk factors at different levels (Scaramozzino, 2006). Therefore, the household's vulnerability to food insecurity can be defined as the expected welfare loss associated with an inadequate value of the food security indicator, conditional on a number of characteristics of the households, the strategies they put in place, risk management policies implemented by public institutions, and factors outside the control of households and of the public institutions, such as community-wide negative shocks.

At the very least, the categories of vulnerable variables of a household constitute the following specific variables:

(i) demographic characteristics (including structure of the household, age, gender);

(ii) labour market variables (education, employment status, agricultural and non-agricultural labour income);

(iii) production variables (crop production, harvesting);

(iv) other economic variables (assets, land, saving, investment, credit);

(v) expenditure variables (food consumption, non-food consumption, durables);

(vi) food variables (breakdown of food consumption, dietary habits and preferences, intra- household food distribution).

2.2 Theoretical Framework

Theories are sets of organizing principles that help researchers describe and predict events (Johnston & Vanderstoep, 2009). Many authors and researchers have stressed the formulation and application of theories in the development process for many years. According to Kitchen, Hubbard, Bartley & Fuller (2002), theory is a set of ideas about

how the world works; as such, it is a means by which researchers seek to describe, explain or predict aspects of the world.

Food security has spatial and temporal dimensions and is explained by people-environment relationships. In relation to this, different academics at different times viewed diverse theories in relation to food security and these were grouped into three broad categories emphasizing the causes of food insecurity (Sen, 1981; Devereux, 1993; Twigg, 2001; Collinson, 2003). They are political economy theory, food economy theories, and vulnerability theory that need positivistic and interpretative approaches inthe analysis of food security. For instance, land tenure insecurity, weak targeting of safety nets, lack of accountability and transparency in local governance are grouped under political economy theory. Likewise, weak delivery of inputs to increase agricultural production and weak marketing infrastructure, lack of access to purchase the basic needs are related to the food economy theories in respect to food availability and accessibility decline theories. High population pressure, cultivating marginal and drought-prone areas, unpredictable rainfall and lack of access to the basic capital assets can be summarized under vulnerability theory in respect to PAR and access model. All these theories in one way or the other can have an influence on household food security outcomes.

This study is guided by four major theories of food security namely, Malthusian theory, Theory of diffusion of innovations, the Game theory and entitlement theory.

2.2.1 Malthusian theory

Thomas Malthus (1798) had positive contributions to make on food security. As posited by Malthus, population is growing at a geometric proportion while food

production is increasing at arithmetic projection. If population growth is not reduced, it would outstrip available resources, resulting in what came to be known as Malthusian catastrophes: naturally occurring checks on population growth such as famine, disease, or war.Therefore, food security pessimists are particularly alarmed by what they view as the strong linkage between food insecurity and global population growth.Dyson, (1996) cited in Kayunze, Mwageni & Ashimogo, (2007), argue that food insecurity is caused by having too many people compared to the quantity of food produced. This means that a strong and constantly operating check on population from the difficulty of subsistence is a necessity.

According to this theory, the cause of food insecurity is that population outstrips resourcesover a long period of time. Malthus maintained that economic arrangements--particularly the level of the real wage and the number of positions within the economy--dictate the level of population at a given time. This causal connection is supposed to work through positive and negative checks: positive checks include sources of increased mortality resulting from overpopulation (war, civil strife, famine), while negative checks include culturally specific checks on fertility—delayed nuptiality, birth control, and the like. Thus population change is a dependent variable, conditioned by the economic environment: as a regional economy becomes more productive, population can rise (Kayunze, Mwageni & Ashimogo, 2007).

Malthusian theory has been largely debunked by the Anti-Malthusian proponents like Esther Boserup (1965) and Julian Simons that improved agricultural technology will increase food production, population and this can lead to growth in agricultural development and new alternative are developed by markets. It is still fundamental to note that the Malthusian theory has remained prominent in the discourse

regarding hunger, the world's population carrying capacity and the need to reduce population growth in order to make food (and other resources) available. Malthus argument was a warning about population increase especially among the poor because he described the poor as breeding too rapidly and depriving the rest of the population of food; famine was seen as a natural defence against overpopulation. In the Nigerian situation, current production of food is far below the population requirement. Therefore, food distribution continues to be a problem in solving food security in Nigeria. Kaduna state is among the three most populated states in Nigeria too according to 2006 census data without assurance that food insecurity is not rising.

Food insecurity is a 'population' issue at the macro level; neo-Malthusian theory essentially continues to attribute food insecurity to high population growth. At the micro level, rural women tend to have as many children as necessary to secure enough labour to produce food for their families. Global population has grown exponentially as current numbers are estimated around 6,692,030,277 and are expected to reach 9.3 billion in 2050 (World Bank, 2009). A number of recent reports have implicated population growth as one of the main contributors to increasing food demand (Von Braun et al, 2008). The relationship between population growth and food security is not limited to increased demand for food as population growth can also have an impact on the food supply and access. In many areas population growth has been associated with land fragmentation and resettlement schemes in fragile environments that directly affect food production (Sadik, 1991).

Thus, Nigeria's food insecurity problems are tragic and severe; sometimes take the form of a classic Malthusian trap, where population growth outstrips food production potential. Kaduna Sate is the 3rd most populated States in Nigeria according

to 2006 census figures. This is because food production in Nigeria today is far less than the known potential for the country. African farmers today use almost no fertilizer (only one-tenth as much as farmers in Europe use), only 4 percent of their cropland has been irrigated, and most of the cropped area in Africa is not planted with seeds improved through scientific plant breeding (Robert, 2008). As a consequence, average cereal crop yields per hectare in Africa are only about one-fifth as high as in the developed world. Africa is failing to keep up with population growth not because it has exhausted its potential but instead because too little has been invested in developing that potential.

2.2.2 Theory of innovation diffusion

Diffusion of innovations theorywas propounded in 1962 in the U.S. by rural sociologists' Everett Rogers. Diffusion of innovation is a very important theory that describes the process of change, for example, diffusion of innovations in a community. This theory attempts to predict the behaviour of individuals and social groups in the process of adoption of innovation, considering their personal characteristics, social relations, time factor and the characteristics of the innovation (Padel, 2001). It explains how techniques, fashion, ideas, information are spread from the centre to neighbourhoodsWithin the same environment, some farmers would embrace modern techniques such as mechanical equipment, improved seeds, and chemical inputs and thus, guaranteeing food security, while others will remain opposed to the adoption of these modern techniques and as a result, continues to have poor harvest and being affected by food insecurity.

According to Simin & Jankovic (2014), rural communities are part of a global society and share its destiny. However, in many ways, they are very specific social organisms, especially when it comes to changes in the countryside and agriculture. Therefore, the process of spreading (diffusion) and introduction (adoption) of innovation, knowledge and technology - which is usually at the centre of social change in rural communities – is a complex and contradictory process.

The diffusion of innovations to farmers requires reorientation which is possible through communication and other support services. The needs and advantages of the modern techniques have to be explained to farmers especially in rural areas to understand and apply the same and thus, reduce incidences of food insecurity. This model has been graciously applied by many developing nations and had led to the popularization of agricultural extension services, demonstration farms or experimental farms also known as local innovation. Through these media, the rural farmers who are yet unaware of the modern innovations are brought face to face with the concepts, their application as well as their gains. The diffusion model has also gained considerable acceptance in Nigeria where it is emphasized as a solution to the problem of low productivity of the average farmer.

At the household level, apart from requiring adequacy, ensuring access also requires that food be physically accessible to all households. Common obstacles to physical access are war, civil strife, poor infrastructure, inadequate logistics for food distribution and market imperfections. Such problems are more likely to exist in regions characterized by difficult terrain and remoteness. Household food security can be ensured only when the capability to acquire food exists. A household acquires access to food through its own production, income-generating activities (wage employment or

trade), ownership of assets and transfers from sources external to it. While the relative importance of these sources can vary markedly, a household's command over the total of these resources must be adequate to acquire enough food on a continual basis (Sharma, 1992). This total command may be called a household entitlement to food (Sen, 1981).

The relevance of the theory to this study lies in the fact that it has made one to understand that farmers' in Nigeria also have differences in productivity even when they are given the same incentives and inputs including: loans, fertilizers, improved seedlings or other agricultural inputs as a result of their different abilities to adapt to modern farming techniques and innovations. Most of them are too conservative and therefore, resist change no matter the gains. This may not be unconnected to why Nigeria is battling with food insecurity. In the same vein, households that adopt innovative farming techniques may be considered likely to be more food secure than their counterparts who refused to adopt those techniques.

The problem of diffusion and implementation of innovations in agriculture should not be considered simplistic, so one would possibly thought that the process of diffusion and implementation of innovation will take place successfully if there are sufficient financial resources, agricultural experts, awareness of adopters and access to innovation etc. In the last century, the experiences of many countries (particularly less developed and developed ones) have often proved unsuccessful in modernization of agriculture and rural development. Although the activities were (sometimes) carefully prepared, generously financed and supported otherwise by the governments of these countries and influential international organizations, the expected outcome haven`t occurred (Petrovic, Samardzija, & Jankovic, 2004).

2.2.3 Game theory

The appearance of game theory in the economic literature goes back to the first half of the 20th century. The term, ‘game’, was first introduced in the study of Theory of Games and Economic Behavior in 1944 performed by John von Neumann, a mathematician, and Oskar Morgenstern, an economist, who established game theory as a separate, recognized field (Dimand & Dimand, 1996). Game theory is a mathematical method for analysing calculated circumstances such as in games where a person’s success is based upon the choices of others (Muggy & Heier, 2014)).

The decision-making function of farmers would be greatly simplified in a world free of risk and uncertainty. Obviously, the farmer’s decision-making environment is more complex than that just described. Uncertainty is introduced by technical and technological change, price variation and unpredictable human action.

Physical scientists cannot predict exactly the amount and quality of a product to be obtained from given resources. The input of factors such as weather and other natural phenomena is not known until production has taken place. Often, resource inputs are only classified quantitatively, and important qualitative properties are not stated. These conditions lead to technical uncertainty in agriculture. States of nature may be weather, disease, insects or other natural uncertainties which farmers face. The game against nature differs from true games in that the natural phenomenon is not necessarily a conscious adversary. Nature cannot be said to have specific desires or goals which influence how it plays the game.

Technological change is a second source of uncertainty. Change in production techniques, development of new products or inputs and introduction of other innovations cannot be accurately predicted, yet they affect the desirability of alternative

farm plans. Price provides a third major source of uncertainty. The complex of interrelated factors which contribute to price variability includes: (a) world and national economic conditions, (b) the general state of uncontrollable, natural phenomena affecting production, (c) commodity and business cycle phenomena, (d) governmental policy and (e) individual values and goals.A fourth source of farm uncertainty results from relationships among individuals, groups of individuals and institutions. Farmers cannot always predict governmental activities which affect future events and, thus, their own welfare. Man's goals change; therefore, commitments made between a farmer and another person in one time period may not attain goals which exist in another time period.

This study also considers uncertainty the usual environment for agricultural production. The term uncertainty has been used initially to describe a general condition of change, imperfect knowledge and lack of foresight. A more technical use of the term is introduced later.How farmers rationally plan their production and how research and extension personnel make recommendation to farmers under uncertainty are explained by various game theoretic models applied to agricultural data. More specifically, the decision problems of choice of crop varieties, alternative crops, fertilizer combinations and amounts, pasture mixtures and pasture stocking rates are scrutinized in a game theoretic framework (Walker, Heady, Tweeten & Pesek1960).

2.2.4 Food Economy Theory

Two important food economy approaches have been developed as explanations of famine and food insecurity causations. These competing approaches are grouped into food availability decline (FAD) and food entitlement decline (FED). This theory was propagated by Amartya Sen in 1980, who argues that the problem of food security is not

about the food supply failure. However, the problem of food security and famines is more about food access rather than food supply. The significant contribution of Amartya Sen with his entitlement theory for the theorizing of famines is that it shifts the paradigm of famines from supply approach (Malthusian tradition) to the ability of people to access food (Devereux, 2001, p. 246).

Food Availability Decline (FAD) and Food Entitlement Decline (FED) are very important approaches of importance to the study of food security. Sen (1981) defined FAD as "The availability decline per capita of food for consuming unit". This approach conceived famine as shortages of food supplies per capita, motivated by natural factors; e.g., drought, floods and other calamities that undermine crops (Giraldo, Betancur, & Arango, 2008). The central argument of this model is that "anything which disrupts food production such as drought, flood or war can cause famine. The position is being that a drought, flood or war causes crop failure and loss of livestock, reducing the availability of food in the affected region, and that such a food availability decline for an extended period by definition constitute famine" (Degafa, 2002). Kaduna State of recent is challenged by the farmers-herders conflict that is disrupting food supply in some parts of the State, which by implication is threatening the food security of the State.

This criticism of FAD ended up in the alternative model of 'Entitlement' proposed by the economist Amartya Sen in 1981. The entitlement approach to food insecurity discusses the ability of people to command food through the legal means available in the society. Entitlements are defined as the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces (Young et al., 2001). .

According to Sen, (1981) people"s exchange on entitlements reflects their ability to acquire food. Sen sub-divided these entitlements as follows:

a) *Production-based Entitlement:* Improving agricultural technology will lead to a reduction in hunger and food insecurity, agriculture has played and will continue to play this fundamental role. It contributes to two main key criteria, increasing the availability of food at prices that poor people can afford and providing improved job and income that will provide poor people the means to access increased food crop production.

b) *Inheritance and transfer entitlements* (from the state, or private gifts and loans). Transfer entitlement provides a mechanism of social order and cooperation governing the behaviour of a set of individuals within a given community. Transfer entitlement support values and produce and protect interests. Therefore, it can help mitigate food insecurity at the household level, for example by households giving food to one another.

c) *Trade-based entitlements:* Food prices vary seasonally, but poor households often sell their crops just after harvesting at lowest price because of an urgent need for cash for credit payments, school fees and medical (and other) bills. Market forces in terms of supply and demand for food affect food prices hence the extent to which various people have access to food through buying it. The supply of food can be compounded by poor infrastructure, or poorly integrated food markets in famine-prone areas as well as high transport costs and risks. According to Graaf, (2011) high transport costs, small markets and lack of infrastructure are the main common factors that affect agricultural production and food security negatively in all SSA countries.

d) *Own-labour entitlements* (waged labour and professions). Own-labour entitlements help people to generate sufficient income to allow people to access food. Improving access to food through increasing incomes can be seen as helpful to look at the impact of increasing agricultural productivity in three main areas which have direct impact on farmers' incomes, including those of smallholders, impact in terms of increasing rural employment opportunities and rural wage rates including those in the non-farm rural economy and wider impact on economic growth and poverty reduction more generally. In response to a decline in people's entitlements, people actively try to protect their livelihoods. These livelihoods are normally termed as coping strategies and they can be as short-term and long term coping strategies in responses to declining food entitlements (Young et al., 2001)

Sen's (1988) influential entitlement approach links vulnerability to inadequate access to assets, including intangible ones, such as social capital. However, access to assets offers no guarantee that the assets will be used in an effective fashion to reduce vulnerability. Sen argues that people do not usually starve because of an insufficient supply of food at the local, national, or international level, but because they have insufficient resources, including money ('entitlements') to acquire it. The Food Entitlement Decline (FED) emphasizes access to food, or people's relationship to the food, rather than the availability of food (Devereux and Maxwell, 2003). The main argument of this model is the mere presence of food in the economy or in the market does not entitle a person to consume it and thus starvation can set in without any obvious aggregate available fall.

2.3Literature Review

2.3.1 Food culture and practices that influence food security

The cultural practices of food production that determine food security include the systems of food production, distribution and utilization within both households and communities (Byaruhanga & Opedum, 2008). The main cultural practices that may influence food security as documented in literature on the subject matter are further examined. These include agricultural systems, cropping systems, crop preferences, land tenure systems, preferences in household food sharing and indigenous cultural food.

i. *Agricultural systems:*Agricultural systems directly or indirectly influence or transform the diet of the people (Ashish, Aishish, Majeed & Sudhir, 2008) as people eat what they produce. A society may practice subsistence farming, commercial farming or both. Subsistence agriculture is associated with low yields while commercial agriculture is associated with high yields, arising from the use of high-input packages (Boon, 2002). These benefits notwithstanding, it is important to note that in some circumstances, modern (intensive) agriculture undermines food security and health by putting the rural poor at a disadvantage, threatening their land ownership status, and degrading wild resources (Boon, 2002).Modern agriculture causes several environmental problems both on the farm and in the surrounding areas. For example, inappropriate use of agrochemicals such as pesticides, herbicides and fertilizers pollute water resources, interfere with soil chemistry, disrupt ecological systems, kill important soil flora organisms and fauna, and contaminate water, food and fodder (Nganwa, 2009)

ii. *Cropping systems:* The type of cropping systems farmers practice can influence food security either positively or negatively. According to Boon (2002) intercropping provides security for farmers against pests, disease and

unexpected climatic conditions. In the highly variable environments of Africa, including Nigeria, mixed crops and varieties can help small-scale farmers obtain higher yields than they could with mono-cropping. Higher yields are obtained from a mixture of crops and crop varieties, each one specifically adapted to the micro-environment in which it grows. Genetic diversity also provides farming communities with a range of products with multiple uses and value. Some varieties of a particular crop may be good for immediate consumption, for example, while others are better for long-term storage. For instance, the diversity in yam (early and late maturing varieties) enables farmers to have their needs satisfied at different periods of the year, although there is scarcity of yam from April to August (Agada & Igbokwe, 2016).

iii. *Crop preferences:*Crop preferences of individuals, households and communities can influence food security as people cultivate the crops they prefer. According to Byaruhanga & Opedum (2008) minor crops could provide an opportunity for diversifying diets, thereby contributing to improved food and nutritional security.

iv. *Land tenure systems:*Land holding pattern has direct influence on cropping patterns and hence food security. According to Ering (2011) the concept of ownership of land in many traditional Nigerian communities is theoretically communal. Land is upheld first and foremost, as the property of the community. Under the customary law that governs much of the country, all members of a rural community are entitled to a portion of land, which they receive through inheritance, allocation by the chief, leasing, borrowing, pledge, or gift. A man ceases to exercise such right only when the community as a body, shows interest in it. Although this customary system of tenure and land allocation continue to

afford common access to land across the country, in practice, land rights are often insecure and there is evidence that landlessness and land inequality are growing amongst smallholder farmers. There is evidence that poorer households, with less land per capita appear to be more income dependent on their landholdings than the better off. Moreover, natural resource availability for livelihoods is on the decline and land-based livelihoods are undermined by conflict, natural disasters and HIV/AIDS. These situations according to Ering (2011) have given rise to food insecurity and increasing cases of poverty. The traditional hold on land has made it difficult for land to be released to prospective and enterprising farmers for large scale farming and for development purpose (Ering, 2005, Ziervogel, Nyong, Osman, Conde & Downing, *(*2006) reported that ownership of farmland in Chingowa village of Magumeri LGA, Borno State, Nigeria is predominantly through paternal inheritance, which to a large extent excludes the women. The lack of ownership of land by women could retard development and contribute to poverty and food insecurity in view of the fact that about 70 percent of rural women in Nigeria are involved in food production and provision (Agada, 2012).

v. *Preference in household food sharing:* Studies of intra-household food allocation indicated that in some culture, certain individuals receive disproportionately more of the limited food available than others.Females are reported to receive less or poorer quality food than their male counterparts.This is because intra-household food distribution is often related to hierarchical position, with the head of the family and the income-earning members of the household receiving priority in eating. In such families, mothers and young children may receive a smaller share of the family's food relative to their nutritional needs (Basu *et at*,

1986 cited in Agada 2012). Evidence from South Asia also has indicated that women eat after everyone else has eaten at a meal and less likely than men in the same household to consume preferred food such as meats and fish (World Bank, 2009).

vi. *Indigenous cultural food:* Dietary diversity is the number of different foods or food groups consumed by the household over a reference period, not regarding the frequency of consumption. Nigeria is a nation with ethnically and culturally diverse food consumption patterns in the different agro-ecological zones with the diets of the people based on the foods produced and/or marketed in the different zones (Akinyele, 2007). Foods of Nigeria include meat, vegetables, fruits and the carbohydrates. The diets which are mainly carbohydrate stable are usually served with soups, relishes and sauces, which may or may not be spicy, prepared from a wide variety of other food stuff (www.fao.orgas cited in Agada, 2012). The meat consumed by Nigerians are beef, chicken, mutton, lamb, turkey, geese, pigeon pea, fish, guinea fowls, crab, shrimps and other sea foods. The fruits include bananas, oranges, tangerines, pineapples, carrots, guava, watermelon, melons, grapes, limes, mangoes, apples, tomatoes, peas and pawpaw (www.mapsofworld.com/style2008/style.cssas cited in Agada, 2012). The foods most consumed by the inhabitants of North Central Nigeria who are predominantly farmers include yam, cassava, maize, sorghum, millet and rice.

2.3.2 Determinants of food security among farming households

The socio-economic characteristics and resources of individual households have been identified as basic factors influencing the food security status of households (Sanusi et al., 2006). Kidane, Alemu & Kundhlande (2005) identified household size, education

and farmland size and land quality as determinants of food security status of a household. Educational attainment by the household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs; engage them in diversification of household incomes which, in turn, would enhance households' food supply. Amaza, Umeh & Adejobi (2006) noted that the major determinants of food insecurity are: household size, gender, educational level, farm size and types of household farm enterprise. They concluded that policy measures towards the provision of better family planning should be given adequate attention and priority by the government in addition to improving access to education, credit facilities and agricultural extension services for rural households. Sanusi et al. (2006) further reported in a study conducted in some selected Local Government Areas of Oyo and Lagos States that income status and the educational status of the household head influence food security status of the household. Babatunde, Owotoki, Heidhus, & Buchnerieder (2007) noted that household income, household size, education status of the household head and quantity of food obtained from own production determined the food security status of farming households in North Central Nigeria. They concluded that socio-economic variables of the households are important determinants of their food security or insecurity status.

Using the logistic regression model adopted by Feleke, Kilmer & Gladwin, (2005) and Kidane et al. (2005) in their studies, explanatory variables measured as continuous and discrete variables which are identified to be major determinants of food security can be collected and examined. These factors are expected to have a positive or negative impact on food security. Hofferth (2003) argued that the higher the age of the household head, the more stable the economy of the farm household, because older

people have also relatively richer experiences of the social and physical environments as well as greater experience of farming activities. Moreover, older household heads are expected to have better access to land than younger heads, because younger men either have to wait for a land distribution, or have to share land with their families. A similar study by Obamiro, Doppler & Kormawa, (2003) arrived at a similar conclusion regarding the relationship between age of a household head and household food security.

Educational status of household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs; enable them to read instructions on fertilizer packs and diversification of household income which, in turn, would enhance household food supply (Najafi, 2003). According to Najafi (2003), it is expected that households with large farms are food secure than those with small farms. A study by Zenda (2002) revealed that married people are able to share household activities such as agricultural production, herding of livestock, harvesting of fruits, fetching firewood and water. While households with single, divorced and widowed heads have to do all the household activities as they do not have all the support unless from children who are old enough to do some household activities.

Identifying the determinants of food security requires examining the determinants of the major dimensions of food security. In particular, it is important to examine what determines food availability as well as access to food, the two widely researched dimensions of food security. Factors that determine food availability operates on the demand side while those determining access to food operates on the supply side. Therefore, factors that cause changes in the demand for and supply of food

would also bring changes in the availability of and access to food respectively, ultimately influence food security (Abafita & Kim, 2015).

Bashir & Shilizz (2013) in their review of determinants of rural household food security in Africa and Asia takes into account the three components of food security and the factors that determine each of them. Accordingly, factors like education, household heads age, inputs availability, technology adoption, farm size, land quality, price of inputs, and credit have been identified as determinants of the availability components of household food security. On the other hand, factors like income, distribution of income within the household, household size, total earning of family members and family structure are identified as the determinants of the access aspect. Finally, gender and expenditure on the food and health are considered as determinants of utilization aspect.

Access to income-generating activities is a major determinant of the ability of households to purchase food. In general, the allocation of household resources to food production, wage labour or other business activities allows the household to access food, either directly through food production or indirectly through income generation (Hoddinott 2012). The returns to the investment of household resources in productive activities can be complemented by income and in-kind transfers from family, neighbours or the state to improve food access (Hoddinott, 2012). Income generation and food production possibilities of the household are directly affected by individual characteristics such as the educational and health status. Education is linked to the development of cognitive skills that are likely to support income generation and food production (UN World Food Programme 2006). Enhanced cognitive skills may raise income levels and employability through better decision-making in the allocation and distribution of resources and an increased marginal productivity (Mukudi 2003).

Education may also play an important role in household production decisions through a better knowledge of nutrition and health practices (Luo, Shi, Zhang, Miller, Medina & Rozelle, 2012).

The health status of an individual directly affects his/her ability to learn and to work. Poor improvement (worsening) of the health status can give rise to a vicious cycle. A better nutritional and health status enhances the returns to education (Bobonis, Miguel & Puri-Sharma, 2006) and increases an individual's labour time and labour productivity (UN World Food Program 2007; Rutten & Reed 2009). The increased resources made available by a better health status can be subsequently invested in an improved diet and hence lead to further health improvements.

The quantity and quality of food that a household can acquire given its resources will depend on domestic food prices, which are generally determined by food availability and aggregate food demand. For given prices and income, individual preferences will determine the consumption of different commodities, including food. Dietary preferences can be influenced by factors such as culture; religion and social status (Atkin, 2013).

Socio-political factors such as ethnic favouritism, social discrimination and gender inequality may also have an important impact on food access. Dohrmann & Thorat (2007) for instance argued that social discrimination in India prevents certain groups from participating in public food assistance programmes. Gender inequality in access to labour markets, financial services and productive resources such as land still pervades many developing countries and poses important constraints on the productive capacity of women, who in many societies play an important role in the provision of food through direct production or income generation (FAO, 2011).

From the foregoing, it can be observed that researchers have used multiple or logit regression models to estimate the determinants of food security status of households.However, in order for the different intensities of food security among the Nigerian households to be reflected in the analysis of the determinants of food security, this study used the probit model and assessed the determinant of food security while Tobit model to assessed the determinant of the levels food security in the study area.

Kidane, Alemu & Kundhlande (2005) identified household size, education and farmland size and land quality as determinants of food security status of a household. Educational attainment by the household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs; engage them in diversification of household incomes which, in turn, would enhance households' food supply. Sanusi et al. (2006) further reported in a study conducted in some selected Local Government Areas of Oyo and Lagos States that income and the educational status of the household head influence food security status of the household. Besides, the socio-economic characteristics and resources of individual households have also been identified as basic factors influencing the food security status of households too.

Amaza, Umeh, Helsen & Adejobi (2006) in a study to examine the determinants of food crop production and technical efficiency in the guinea savanna of Borno State Nigeria; using the maximum likelihood estimation (MLE) technique, noted that the major determinants of food insecurity are: household size, gender, educational level, farm size and types of household farm enterprise. The study concluded that policy measures towards the provision of better family planning should be given adequate attention and priority by the government in addition to improving access to education, credit facilities and agricultural extension services for rural households. In Borno State,

less than half of survey households (42 percent) were found to be food secure (Amaza *et al.* 2006), while in Nasarawa State, 58.9 percent of surveyed households were food insecure (Ibrahim *et al.*,2009).

Terefe (2013) in a study on household food security in Ethiopia where households' daily calorie availability was measured to determine household food security status, identified household size, livestock ownership, farm size, access to market and technology adoption as the determinants of household food security. The findings also showed that 62 % of the sampled households were food insecure. Despite the food secure households acquisition of adequate kilo calories they faced 2.46 food deficient months indicating the weekly calories availability per adult equivalent may not best describe food security status all year round. Coping strategies which were practiced are reducing number of meals, size of meals, borrowing cash and grain and receiving food aids, sales of animals, participating in food for work programmes, off-farm and non-farm jobs, rent out land and mortgage land. Another study by Kahsay & Mulugeta (2014) on determinants of rural household food insecurity in Laelay Maichew Woreda Tigray, Ethiopia analyzed data using descriptive statistics and multiple linear regressions. Findings indicated that five variables were significant at 95% confidence level and the selected explanatory variables accounted for 39.9% of the variation in calorie availability. In general, age of household head, uses of improved seeds and land sizes had positive relationships with food security.

2.3.3Constraints to Food Security

Food crisis does not just occur. They were precipitated by remote or immediate causes. Some of the constraints to food security are individual-induced, some are corporately induced, and someare societal problems, while others are national and international

effects of some inadequacies and deficiencies in some policies (Fadiji &Omokore, 2010). Food insecurity in Africa is considered as a challenge across the region, and that its causes are complex, attributed to multiple, and often intertwined factors (Pauw & Thurlow, 2011). The main concerns are the impacts of climate change, an increase in food prices, loss of subsistence and traditional food crops and cash crop (FAO, 2010).

General causes of food insecurity in many developing countries are the small size of acreage; dependency on rainfall; the use of low-level technologies for tillage, poor crop and livestock husbandry techniques, and poor storage and processing of crop and livestock products. Others include post-harvest losses, financial incapacitation that restricts the used of improved seeds, fertilizers, pesticides, and herbicides; low prices offered in cash crops, poor markets for agricultural and livestock products; poor agricultural extension services; poor division of labour at the household level; bad farming practices leading to various environmental degradation; and poor transportation means that affects distribution of input supply and products transportation to market places (Kayunze *et al*., 2009).

In addition, many rural households face labour shortages due to migration of young people to the urban areas in search of employment. The HIV/AIDS pandemic has also contributed to loss of labour for household agricultural production since the infected and those caring for them cannot devote enough time and energy for agricultural production (United Republic of Tanzania [URT], 2009b). Other factors affecting food availability include high pre and post-harvest losses due to pests and, disease and climatic conditions. According to Makale (2012) losses caused by insects during six months of storage were 2% to 3% for husked maize cobs, as regards threshed from grains loses due to insects infestation after three months storage was 15%. Rodents

cause serious wastage of the stored produce as much as 20% loss per year, both by their consumption and faecal contamination.

Another cause is population growth; where there is an increment in population of humans without corresponding increase in crop production. Poor African and Third World countries have the highest growth rate in the world which puts them at increased risk of food crises. Again, low food crop production to match the demand for food, resulting into continuous rise in prices of food crops leading to low purchasing power. Further, war/conflicts and crisis (leading to seeking refuge and internal displacement) most especially in many parts of Africa lead to inaccessibility to food owing to displacement of work-force and abandonment of many families. Environmental disasters such as floods, desertification, global warming are natural causes of food insecurity, while inadequate water supply is affecting food production at the same time to thirst and hunger.

Even though there is a tale of woe that has visited some states and the attendant effects such as flood, food price inflation, insecurity, and loss of income for millions of households which appears to be an emerging phenomenon never before seen in Nigeria. This phenomenon is the renewed challenges to security in most states of the nation, for instance communal clashes in some states, insurgency challenges, farmers-herdsmen conflict and lots more (Eme *et al*, 2014).

According to the World Banks food price watch (2014), food prices shocks can be responsible for the origination and continuation of conflict and, more generally, political instability. In Nigeria, farmers in the north east were having difficulty accessing their farms owing to insurgency in that part of the country coupled with herdsmen farmer clashes and climate change effect on agricultural produce in the other parts of the

country. The devastating effects of Boko Haram insurgency in the north east has left a very devastating impact on other states in the country, especially when it has to do with the supply of food stuffs. This therefore, implies that insurgency in northern Nigeria has not only affected the prices of food commodities but caused scarcity of certain food commodities in the market. Farmers have been forced to leave their farms leading to a projection of over 100,000 and 5,000 population in Borno and Yobe states respectively to experience famine by the end of 2017 (Cadre Harmonizes Data, 2016).

Cattle rustling and communal conflicts in states like Kaduna, Niger, Plateau, Nasarawa and Benue continued to affect the supply of food. This has forced many pastoralists to move southwards earlier than usual thereby affecting the local livestock trade negatively. Following extensive research across the country, a report titled "Strategic Conflict Assessment"of Nigeria (SCA)was put together and launched in Abuja. Findings of the assessment, among others indicated that in the North-Central geo-political zone, as a result of land scarcity, conflicts between herders and farmers have remained dominant across all the States in the region. Nomadic herders often clash with members of farming communities over land resources. In addition, rural banditry and cattle rustling are rife in this zone; these are characterized by armed assaults, rape, kidnapping, organized attacks and reprisals on the villages and communities (SCA, 2016).

One of the challenges is increase in population of Nigeria that is putting intense pressure on scarce natural resources and has also resulted in the growing rural-urban migration. This is saddening because, the vulnerable people experiencing food insecurity lives primarily in the rural areas. They have little political leverage, live in scattered and difficult to reach areas and are left to deal with extreme climatic

conditions and a fragile ecosystem (NEPAD, 2015), thereby increasing the state of their vulnerability.

2.3.4 Policy efforts and challenges of food security in Nigeria

Since 1960s, every administration in Nigeria made efforts to achieve food security in the country. By 1974, agricultural development has remained the principal component of the country's rural development package. Eleven (11) River Basin Development Authorities (RBDA's) were established to facilitate irrigation agriculture as an attempt to expand food production. Also, farm settlements were established for cash and food crops to reduce food importation.Government's effort between 1981 and 1985 yielded good results as the contribution of agriculture to GDP rose from 21.1% to 35.4%. This was the result of the Green Revolution Programme which complemented the R.B.D.A programme.

The Military Government in 1986 later came with the rural infrastructural development programme and established the Directorate of Food, Roads and Rural Infrastructure (DFRRI). The programme was to open up the rural areas for effective agricultural activities and boost food production. Other programmes initiated by the government include: Better Life for Rural Women Programme (Now women Commission)(1987); Community Banking Programme-CBP (1990); National Agricultural Land Development Authority- NALDA (1991); Family Support Programme-FSP (1992); and Family Economic Advancement Programme-FEAP (1994).

In 2008, Nigeria released its National Programme for Food Security (NPFS), bringing to brim light a number of constraints to food security in Nigeria and adopting a value chain approach for addressing these constraints. The vision of the NPFS is to

ensure sustainable access, availability and affordability of quality food to all Nigerians and to be a significant net provider of food for the global community. In the recent times, government embarked on other programmes such as MDG's and SDG's meant to ensure food security in Nigeria. The targets of the MDGs and the SDGs include reduction of hunger and poverty. However, sustainable development can only be attained through increased attention to agriculture, food security and sustainable water resource.

Apart from MDG's and SDG's, the following new programmes were introduced by the government of Nigeria.

a. The Growth Enhancement Support Scheme (GESS) which represents a policy and pragmatic shift within the existing Fertilizer Market Stabilization Programme that changed the role of government from direct procurement and distribution of fertilizer to a facilitator of procurement, regulator of fertilizer quality and catalyst of active private sector participation in the fertilizer value chain.

b. The Nigerian Incentive-Based Risk-Sharing System for Agricultural Lending is another new innovative mechanism targeted at de-risking commercial lending to the agricultural sector and designed to provide a transformational and one bullet solution. The goal is to trigger an agricultural industrialization process through increased production and processing to boost economic earnings across the value chain.

c. The Staple Crops Processing Zones scheme focuses on attracting private sector agri-businesses to set up processing plants in zones of high food production.

This is enabled by government efforts to establish appropriate fiscal, investment and infrastructural policies (Eme *et al* 2014).

Despite these efforts in policies and programmes, agriculture has been constrained by numerous challenges like rural-urban migration; wavering policy formulations and implementation; insufficient infrastructural support; poor input distribution system; focus on oil economy, poor pricing system, over dependence on rain-fed farming, poor capacity utilization, low investor's confidence and environmental degradation; other issues addressed include; poor access to funds; poor socio-economic status of farmers, insufficient technological transfer system, corruption and poor commitment to implementation of agricultural policies.

Although the government is trying to meet the sustainable development goal of zero poverty in 2030, with an increase in GDP from $369.1 in 2010 to $ 568.5 in 2014; about 60% of the population still live on less than $1.25 a day (WDI, 2014). World Bank (2012) estimates the population of Nigeria to be above 160 million people, the largest in Africa almost accounting for 47% of West Africa's total population. As the population increases, the country's demand for food increases, while the ability to produce food diminishes because pressures from the growing population in form of desertification, climate change and erosion are also impacting on the already diminishing resources and further threatening food production.

Nigeria's economic performance has not been impressive over the past decades. Of recent, the trend of investment has shown that the performance of the economyis below expectation and the situation is further worsened by the negative growth rates experienced thereby putting the country at recession in 2017. This is no doubt largely

occurred as a result of the unstable macro-economic and political environment during the past decade.

In terms of food utilization, Nigeria has not performed very well. NDHS, (2013) reports that37% of Nigerian children are stunted, 29% are underweight while 18% are wasted and out of these percentages that are stunted and underweight, majority reside in the rural than the urban areas, with percentage of 43% and 26% respectively. All these are signs of acute and chronic malnutrition caused by high poverty rate in the country. High poverty rate as well as poor sanitation leads to poor nutrition. According to World Food Programme (WFP) (2013), Nigeria has an energy intake of 1730Kcal and an average protein supply of 64g capita per day far below the 2500-3400Kcal minimum recommended daily intake per day. This shows that Nigeria is facing the challenge of unbalanced diet leading to various nutrition deficiency symptoms. Also among the 109 countries assessed by Global Food Security Index (GFSI) (2015), Nigeria is 91st with 37.1 score based on indices of affordability, availability, quality and safety. Food import have been on the increase from 19.9% in 2000 to 30.6% and 22.7% in 2011 and 2012 respectively while food export is barely 5.3% of merchandise (World Development Indicator, 2016).

2.3.5. Case studies of food security in Nigeria

Food security has to do with the absence of threats of hunger or malnutrition. In a broad sense, it entails safety from basic physiological needs (Akinyele, 2009). The lack of safety will be manifested in chronic hunger or starvation and malnutrition. A synthesis of these definitions with the main emphasis on availability, access and utilization, serves as the working definition in the projects of international organizations (Haile, Alemu & Kudhlande, 2005). Thus, the problem of food insecurity is primarily a

distributional issue, a matter of getting available food to people who need it, when they need it, and of ensuring their regular, appropriate and affordable access to food (Barrett, 2002). Developing policies and interventions to increase food security therefore requires an understanding of each of these factors, their interrelationships and their relevance to particular group of people (FAO, 2005).

Many empirical results have been obtained on food security and many indicated an alarming dimension that deserves urgent attention. Some of the literatures are both national and international studies on food security. Most of these studies including (Babatunde, Owotoki, Heidhus & Buchnerieder, 2007; Adebayo *et al*, 2012; Otunaiya and Ibidunni, 2014; Ahmed, 2014; Ojeleye, *et al*, 2014; Abdullahi, *et al*, 2015 and many others agreed that many households in Nigeria suffer food insecurity even though it varies across states and regions in Nigeria.

According to Agboola (2005), the use of the term "food security" at the national (and global) level has often been focused on issues on supply side of the food equation and particularly a country's ability to provide enough food to meet the needs or demands to the population either through domestic production or food imports. Agboola (2005), in a study titled "Analysis of Food Insecurity and Coping Strategies among Farming Households in Osun State" reported that based on the recommended daily calorie intake of 2260 kcal, 82% of the households were food secure and 18% were food insecure for households that combined crop production with livestock production. Land size owned by household heads was found to have significant and positive relationship with food security status of households suggesting the larger the size of farm land, the morefood secured is the household. This possibly explained that the major source of food in the study area come from their own production and there was limited access to other means of income generating activities. So the household with

large farm size which is cultivatedis likely to have better yield and harvest which gives a better chance for the household to be food secured (Agboola, 2005). While also estimating a food insecurity line by applying the method of food energy intake, Ayantoye, Yusuf, Omonona, & Amao(2011) study of rural households in Ondo and Ekiti States focused more on identifying households facing chronic food insecurity. Findings revealed the seasonality of food insecurity, as 42 percent of households were food insecure in the harvesting season, and as much as 78 percent in the planting season.

Babatunde, Awotoki, Heidhus & Buchnerieder (2007) in a study on the socio-economic characteristics and food security status of farming households bin Kwara State, North-central Nigeria; employed both descriptive analysis and econometric tools. The recommended Calorie approach revealed that 36% and 64% of the households were food secure and food insecure respectively. The shortfall/surplus index showed that food secure households exceeded the recommended calorie intake by 42%, while the food insecure households fell short of the recommended calorie intake by 38%. Therefore, the logit result revealed household income, household size, education of the households head and quantity of food obtained from own productions were found to determine the food security status of the farming households in the study area. They concluded that socio-economic variables of the households are important determinants of their food security or insecurity status.

Idrisa, Gwary&Shehu (2008) analysed the food security status among 120 farming households in Jere Local Government Area of Borno State. Data were analysed using frequency, percentages, head count methods, food security gap and squared food security gap. The incidence of food insecurity was found to be higher among households within the age of 40-49 years (27.5%), but the depth and severity were

higher (0.24 and 0.41 respectively) in the ages group of household 50 years and above. The study also found high levels of food insecurity particularly in households where member incomes and educational attainment were low. More so, large family size, low-income level and low level of education were identified as having a negative impact on food security among farming Households in Jere LGA.

Muhammad-Lawal and Ometesho (2008), carried out a study on cereals and farming household's food security in Kwara State. The result showed that in spite of the abundant calorie availability in the study area, it could be classified as food – insecure in view of the fact that the average protein availability to the people is less than the minimum per capita requirement. At household level, the study showed that majority of the households were subsisting on less than the minimum required calorie and protein per capita per day. On the place of cereals in farming household food security, the study showed that cereals constitute 33% of the average household food crop production, 34% of the total food availability, more than 1/3 of the average household food purchase. Also, over 33% and 47% of the average farming household calorie and protein supply in the study area, respectively. Besides, the results showed that cereals play a significant role in food security in the study area and that any variation in cereals production and supply had a major effect on farming household food security in the study area.

In another study, Oluwatayo (2009) presented an account on the contribution of cooperatives in food security in Ekiti State, Nigeria. Data were analysed using descriptive statistics, dietary diversity index measures and probit model. Analysis of the results indicated that mean age of respondents was 53 years with average household size of 8. Respondents' distribution by gender revealed that there were more male-headed households than female-headed households with about 37 percent and 52 percent of the former and the latter having no formal education respectively. The probit regression

model found that household members belonging to a cooperative are more food secure than non-co-operators. According toIbrahim, Bello & Ibrahim (2009) majority of farming households (58.9%) in Nasarawa State were food insecure and the production of crop enterprises based on an efficient allocation of resources as recommended by the optimal farm plan would improve the food security status of the food insecure households.. Ayoade & Adetunbi (2013), in their study on the determinants of farmers' coping strategies to household food insecurity in Oyo State, Nigeria found out that 35.5% of the farmers were food secure while 64.5% of the farmers were food insecure. Borrowing food materials was ranked first among the coping strategies with a mean score of (2.81), while the determinants are mostly age of the households head and the size of the household.

Ala & Bello (2010) carried out a study on the contribution of food crops to household food security among crop farmers in Patigi Local Government Area, Kwara State, Nigeria and found out that farmers in the study area are relatively food secure. Accessibility of inputs such as fertilizer, processing and storage facilities, improved seedlings, tractor and access to credit loan were necessary to encourage farmers to improve household food security and raise their standard of living. In another major study by Bamire (2010) using discriminant technique and probit regression model in analyzing the effects of land use factors on food security among rural households in 4 Local Government Areas (LGAs) in the dry savanna zone of Nigeria. This zone, located in the northern part of the country, is the most extensive vegetation belt representing about 13% of total land area. The findings showed that 75% of the households were food insecure and spending 30% of their income on food. The study in addition revealed that; farm size, use of land improvement techniques, age, membership of the association

and access to extension services as the important determinants and predictors of food security.

Adewuyi & Hayatu (2011), in their study on effect of poverty on food security of rural households in Adamawa State using logit regression model revealed that there is a negative and statically significant relationship between the household food security and the poverty status of the household. They suggested that the food security of the households will improve if household poverty is reduced. Hence, they recommended that the design of poverty reduction programmes should focus more on improving food production for the growing population through increased funding of agriculture and controlled food prices. On the other hand, Sultana and Kiani (2011) found that household with educated household heads were more food secured than those without education.

Olorunsanya &Omotesho(2012) conducted a study on gender analysis of food security status of rural households in Kogi State. Descriptive statistics, Foster, Greer and Thorbecke class of poverty indices as well as Tobit regression model were used as analytical tools. The robustness of the estimated Tobit parameters were also verified using stochastic dominance analysis. The results of the Foster, Greer and Thorbecke poverty measures showed that the female-headed households were poorer than their male-headed counterparts. At varied poverty lines of 70-145% of the estimated line, the female-headed households were also poor. The major determinants of food security status of rural farming households in the area were household size and gender of the household heads. The study therefore recommended that poverty reduction strategies in the study area should be gender specific and should focus mainly on variables that influence the poverty status of each category of households.

Outside Nigeria, studies on food insecurity have been documented. For example, Bashir, Schilizzi, & Pandit(2012) assessed the food security conditions of rural landless households in twelve districts in the Punjab province in Pakistan by the use of a binary logistic regression analysis. Their study found that the monthly income of households, livestock assets and education level of household heads positively impacted on household food security level. On the education, it found that household heads with education up to middle (8yrs) and intermediate (10-12yrs) school levels were more food secure. However, the age of household head and the increasing household size had inverse relationships with household food security. The authors opined that income appears to be the most important determinant of food and having access to food finally depends on an individual's purchasing power to command enough food that is needed. The results from the study of Bashir *et al*., (2012) confirmed the findings of earlier studies by Idrisa *et al*., (2008), that farming households in Northern-part of Nigeria who reported that households with low level of education, larger family sizes and low levels of income were the most affected by food insecurity. Further, a studyresult was reported by Modirwa &Oladele (2012) on household food security among male and female headed households engaging in farming in the rural part of the Eden district in the Western Cape of South Africa. The study aimed at identifying the factors affecting the food security level of the households. Empirical results showed that poor access to markets, storage facilities, land tenure systems and lack of credit were the major factors that affected household food security. These factors were reported by both male and female headed households in the study area.

More so, Aidoo, Mensah, & Tuffour (2013) found out that farm size, availability of off-farm income and access to credit had significant positive influence on household food security. However, household size was found to influence food security negatively

at the household level in Sekyere-Afram plains district of Ghana. The study also established that households headed by married people had higher probability of becoming food insecure compared to those headed by unmarried people. Bashir and Shilizz (2013) in their review of determinants of rural household food security in Africa and Asia took into account the three components of food security and the factors that determine each of them. Accordingly, factors like education, household heads age, inputs availability, technology adoption, farm size, land quality, price of inputs, and credit were identified as determinants of the availability components of household food security. On the other hand, factors like income distribution within the households, household sizes, total earnings of members and family structure were identified as the determinants of the access aspect. Finally, gender and expenditure on the food and health are considered as determinants of utilization aspect.

Mohammed, Ayanlere, Omotesho & Lawal (2013) also carried out their study on optional farm plan and food security situation among agro-pastoralist households in Giwa Area of Kaduna State, Nigeria and found out that 65% and 35% of the households were identified as food secure and food insecure respectively. The quantity and quality of food that a household can acquire given its resources will depend on domestic food prices, which are generally determined by food availability and aggregate food demand. For given prices and income, individual preferences will determine the consumption of different commodities, including food. Dietary preferences can be influenced by factors such as culture; religion and social status (Atkin, 2013).

In a similar vein, Ojeleye, Adebisi & Fadiji (2014) in a study titled "Assessment of Farm Household Food Security and Consumption Indices in Kaduna State, Nigeria" employed descriptive statistics and Food Security Index for analysis. The study showed

that about one-third of the rural farm households sampled was food insecure and that the average household farm size was 2.05ha as food secure and insecure households cultivate 2.09ha and 1.96ha respectively. The food security indices for the food secure and insecure households were found to be 1.462 and 0.852 respectively. Otunaiya & Ibidunni (2014) assessed the determinants of food security among farming households in Ogun State; the study also examined the sustainability strategies adopted by the sampled household to sustain their livelihood and food security status. Food security index and logit regression model were used and the result showed that about 70% of the farming households were food secured. Dependency ratio (-0.26) and household size (-0.45) were found to aggravate probability of household food insecurity condition, while educational status of household head (1.39), farm size (0.19), membership of cooperative society(0.54), access to credit (1.06) and access to food on credit (0.70) enhanced household food security status. Engaging in other off-farm activities was the most common coping strategy of the households to sustain their livelihood and escape food insecurity.

Again, Ahmed (2014a) in a study examined issues of food security among smallholder irrigation and non-irrigation farmers in Kudan, Chikun and Jamaa LGs of Kaduna State, Nigeria. Econometric tools were used to determine factors affecting the food security status of households. Using the recommended calorie required approach; the study revealed that 57% and 43% of the irrigation households were food secured and food insecure respectively, while 42% and 58% of the non-irrigation households were food secure and food insecure respectively. The factors responsible for these differences were education, membership of cooperatives, technology adoption, and distance to market, age, farm size and per capita income.Muche, Endalew &Koricho (2014) analysed the determinants of household food security in Mana Woreda of Jimma

zone Ethiopia, where household caloric acquisition was employed to measure household food security status. The finding revealed that 42.9% and 57.1% of the households were found to be food insecure and food secure respectively; while educational status of household head, family size, number of oxen owned and use of farm inputs were the determinants of household food security. However, Fakayode, Rahji, Oni & Adeyemi (2009) examined the food security situations of the Nigerian's major farm households in Ekiti State, Nigeriausing the USDA approach. The analysis of farm household food security was used to measure the intensity of food severity among the farm households, and the findings revealed that only 12.2% of the farm households were food secure, 43.6% were food insecure without hunger, 35.9% were food insecure with hunger (moderate) and 8.3% were food insecure with hunger (severe). They stressed further that the constraints faced by farm households in the production of major staple crops were mainly those of high cost of transportation, poor receipts from farm output sales, inadequate storage and processing facilities. They therefore recommended among other things that credit and or subsidy should be made available to farmers.

Ahmed (2014b), in a study found improved seed to have significant positive effect on the food security status of households. Households using improved seeds were more likely to be food secure than those who did not. Improved seeds and other technological inputs helped farmers to augment productivity and to boost production. Farmers can enhance their production by using high yielding varieties and other complementary farm. He also found non-farm income to have significant and positive relationship with the food security status of the households. This is an indication thatfarmers who engaged in non-farm activities had better chances to be food secure. This might be due to the fact that households engaged in non-farm activities are better endowed with additional income and more likely to escape food insecurity.

Lastly, Abdullahi, Hassan,& Ayanlere (2015) in a study examined the determinants of food security status among rural Farm households in North-Western Nigeria. The result of the logistic regression model showed that four out of the seven variables included in the model were significant. These seven variables are age of household head, years of education of household head (years), extension contact (number of contacts), household size (nos.), farm size (ha), source of labour (man-day) and household per capita income. The determinants of food security in the study area were age, extension contact, source of labour and per capita income of the respondents. The determinants of food security in the study area were age, extension contact, source of labour and per capita income of the respondents.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1. The Study Area

3.1.1 Location and size

Kaduna State is located between Latitudes 9˚ 03′ to 11˚ 32′North of the Equator and Longitudes 6˚ 05′ to 8˚ 38′ East of the Greenwich Meridian. Kaduna State shares common borders to the north by Katsina, Zamfara and Kano states, to the west by Niger state, to the east by Bauchi state and to the south by Plateau, and Nasarawa States and the Federal Territory, Abuja (Figure 3.1) The total land mass of the State is estimated at 46,053 Sq Km which is about 5% of the total land area of Nigeria (Kaduna State Development plan, 2013).

3.1.2 Climate

Kaduna State experiences a tropical continental climate with two distinct seasons namely, dry and rainy seasons. The dry season lasts from November to Mid-April while the rainy reason, which is cool, and lasts between 5-6 months, starts from mid-April. The wet season (May - October) when rainfall is very much heavier in the Southern part of the State in places like Kafanchan and Kagoro, which have an average of over 1,524 mm/year, than in the Northern part like Makarfi and Ikara, which have an average of 1,016mm.(KSDP, 2013). The average annual rainfall and humidity are 1,272.5 mm and 56.64%; respectively while the average daily minimum and maximum temperatures are 15.1 and 35.18 degrees Celsius (KSDP, 2013). The two climatic conditions in the State greatly influence activities of the people, who are predominantly occupied in agriculture and affect crops and livestock grown in the study area. The weather patterns pose serious adverse effects which reduce crop productivity associated with heat, drought, storms and spread of pest (Nigerian Arts and Culture Directory Project [NACD], 2017).



Figure 3.1: Kaduna State and theLocal Government Areas (LGAs)
Source: Modified from the Administrative Map of Kaduna State (2016)

3.1.3 Relief and drainage

River Kaduna is the only major river in Kaduna State and has its source in the highlands around the Jos Plateau. It is however fed by many tributaries and in turn runs into many rivers. Kaduna State is a scenic wonder of exotic plateaux and rocky hills. Parts of the State like Zaria town, Kagoro and Kwoi areas have protruding hard resistant granite rocks as a result of weathering through the ages of previous existing pre-Cambrian rocks. The erosive activities resulted in the outgrowth of rocks forming inselbergs and large rocky upland regions which are a wonder and give a sense of adventure to visitors. Examples are the Kufena rocks in Zaria and the Kagoro ranges (NACD, 2017). The entire land structure of Kaduna State consists of an undulating plateau with major rivers in the State including River Kaduna, River Wonderful in Kafanchan, River Kagom, River Gurara and Galma.Topography is that of an undulating Plateau that forms part of the rich tourist attractions in areas like Kufena in Zaria, Kagoro, Kwoi and Gwantu. These areas have protruding hard resistant granite rocks that are so attractive for sightseeing (NACD, 2017). Relief and drainage affect land degradation. Some of the adverse effect may include declining food production, drought, ecological imbalance and deterioration in the living standard of the population.

3.1.4 Soiland vegetation

According to Food and Agricultural Organisation (FAO's), soil classification (2013), Kaduna State is covered by the red-brown to red-yellow ferruginous tropical soil which is derived from intensive weathering and granitisation of the basement complex rocks which are mostly migmatites, gnesis, granite and schist. These soils are generally well drained and mostly sandy-loam and loamy soil in plains while in the valleys there are deposits of hydromorphic soils, which occupy the flood plains of the rivers (FAO,

2013). The soils in the area are rich in mineral content sufficient enough to support agricultural activities in the area.The vegetation of Kaduna State stretches from the tropical grassland known as Guinea Savannah to the Sudan Savannah in the North. The grassland is a vast region covering the Southern part of the State to about Latitude 1100'' North of the equator. The components of vegetation of tall grass and big trees are of economic importance during both the wet and dry season. The most common specie of vegetation in these areas is the Raffia Palm. Areas with better drainage systems can support big trees like Iroko and Oil Palm trees. Read more: https://www.legit.ng/1131040-major-types-vegetation-nigeria.html. The whole state is covered by the tropical grassland vegetation with the density of trees and other plants decreasing as one move northwards (Abaje, 2007).

Vegetation support agricultural development and indeed food production towards meeting afood secured population in the study area as economic trees such as mango, oranges, bananas, pawpaw etc. form an important portion of food consumed and nutrient intakes for rural community households. Vegetation is thick and grasses about 3.6 meters tall with big trees, which grow shorter as one approaches the Sudan Savannah (Abaje, 2007).. Examples of economic trees found in the state include; mango, oranges, bananas, pawpaw and other indigenous vegetation species that are used as food *adansonia digitata* (kuka) *moringa oleifera* (zogale) *solanum incanum* (Yalo) and *vitellaria paradoxa* (kadanya).

3.1.5 People and economic activities

Some of the major indigenous ethnic groups in the state include: Hausa, Atyap, Fulani, Bajju, Ham, Gbagyi, Koro Kaninkon, Gure, Kurama, Ikulu, Aegworok, Atakkad, Adara, Chawai, Kagoma, Kahugu, Ninzo and Numana. There are also other ethnic

groups residing in the state which include the Igbo, Yoruba, Idoma and so forth. The state has 23 Local Government Councils, while the major religions in the state are Islam and Christianity, with Islam predominantly practiced in the Northern part and Christianity in the Southern part. The state has a rich cultural heritage in terms of festivals, music, dance and crafts (NACD, 2017).

About 80 percent of the state's population is engaged in peasant farming producing both food and cash crops Kaduna State Development Plan [KSDP], 2013). The crops produced in the state include;cotton, groundnut, tobacco, maize, sorghum, cowpea, millet, rice, cotton, ginger, cassava, sugar cane, yam and potatoes. During the dry season, a considerable number of people in the state are engaged in irrigation farming along some major rivers and dams (KSDP, 2013).

Agriculture is the major occupation of the people. In fact, the statistics of a few years back indicates that Kaduna state comes only second to Kano state in total number of farmers in the nation. Kano state ranks first with 5.67%, while Kaduna is 4.93% of the total national farming population in Nigeria (National Bureau of Statistics [NBS], 2012). Agriculture accounts for an estimated 56% of Kaduna's GDP. Kaduna state produces 22% of the country's maize, 69% of soya bean, 36% of cotton and 10% of ground nuts (peanuts) and agricultural produce from Kaduna State are sold to neighbouring states. The state is also one of the leading producers of ginger in Kachia and other southern kaduna settlements, sugar cane in Makarfi and maize in Giwa and Saminaka (Kaduna State Government, 2012). The sector is dominated by wet season farming and irrigated dry season farming. Most farmers currently produce cereals such as maize, sorghum, millet and rice during the rainy season. Kaduna state is one of the largest producers of rice in Nigeria and it sells substantial quantities to other Nigerian

States and export to other neighbouring African countries (KSG, 2012). The state is also an important producer of fruits and vegetables. Farming is mainly traditional in nature, though this is gradually giving way to modern methods (Kaduna State Government, 2012).

The cropping pattern in the area is dominated by mixed cropping, although sole cropping is also practiced. Some farmers keep livestock like cattle, goats, pigs, sheep, donkey and poultry (KSDP, 2013).The major system of farming practiced is the subsistence farming by peasant farmers with few people who invested in commercial farming who produces large quantity of agricultural products. A little dry season farming is practiced in the area by people living close to the rivers in the study area. Tomatoes, pepper, leafy edible vegetables, onions, okro and sugar-cane are grown in the Fadama areas.

Animal rearing is also an important occupation which is carried out by most ethnic groups in form of subsistence mixed farming except the Fulani in the area that depend largely on cattle rearing. These animals supply organic manure to farm lands, provide income and also are used for consumption. Animals such as cattle; goats, pigs, sheep and poultry are predominant animals reared in the area. Trading activities also form another vital occupation that combines both agricultural and non-agricultural commodities made from crafts (KSG, 2012)

3.2 Methodology

3.2.1 Reconnaissance

The reconnaissance was carried in 2016 in some Local Government Areas in Kaduna State Nigeria. During the reconnaissance visit, Kajuru, Kaura and Lere LGAs were

visited in April 2016. Three major considerations influenced the selection of the areas for this study. Firstly, agriculture was noticed to be the major occupation of the people and farming is more of traditional than mechanized in a rich arable land. Local markets were spotted around the communities with rural people engaged in small trading activities such as; sales of local chickens and goats, fishing, food crops and locally brewed alcohol. Children were also engaged in hawking of fruits like banana and mango, carrying goods in the market areas and most youths engaged in farm labour on farmlands for money known as *Kwadigo*. The information gathered indicated that households were not food secured despite the available natural resources and thereby employed different coping strategies for survival, making it justifiable for this study. This reconnaissance assisted the researcher to carefully select the communities for the study which are truly rural in nature against the semi urban areas of the selected local government areas.

3.2.2 Types and sources of data

In line with the stated objectives, the study sought data from rural households, and different farmers' groups. In this regard, both quantitative and qualitative data were generated for the study.

3.2.2.1 Types of data

The data collected for the study included respondent's age (years), sex of respondents, respondent's educational level, family size, occupation, farm size and membership of any cooperative group; agricultural and cropping systems practice; types of crops produced, food culture and practices; sources of livelihood, production assets, source of farm labour and

Methods of storage. Others are the level of production (subsistence and commercial), causes of food shortages, coping strategies for food insecurity in use in the study area, perception on food situation at household level; determinants of food security, constraints to food security and suggestion on how to improve food availability in the study area.

3.2.2.2 Sources of data

Both primary and secondary sources of data were used in the study. The primary sources of data were obtained through questionnaire survey, observation and Focus Group Discussions (FGD). FGD sessions were held in each of the Local Government Areas selected, a total of six (6) LGAs of the study area. The FGDs constituted leaders and members of the various associations such as youth groups, farmers groups, women farmers group and cooperative groups as identified in each Local Government. More so, each FGD constituted 8-15 selected persons. The data collected during the FGDs provided more insight on some of the data collected through the questionnaire and observation such as: the food culture and practices of the people; causes of food shortage among households and major constraints to food security as well as suggestions to achieving food security in their communities. Data on socio-economic characteristics, household food security using a nine-item household food insecurity access scale (HFIAS), food culture and practices of households, constraints to food security and food insecurity coping strategy (CS) were collected through questionnaire survey. The questionnaire was close ended, which is better to collect information from rural respondents and this enabled ease at performing analysis. The FGDs assisted in probing more on issues observed and provided more data that substantiated that of the questionnaire.

The secondary sources of data used were official gazettes and annual reports from the Agricultural and rural Department of the Local Government Areas and Kaduna Agricultural Development Project (KADP) activities reports. Also, population data were collected from the National Population Commission for purpose of determining the sample size for the study.

3.2.3 Population, sampling techniques and sample size

The total household population in the study area was 288,821 in 2006 (NPC, 2007). The figure was projected to 2017 at a growth rate of 3.05 % which gave 388,152 households. The study made use of Krejcie and Morgan (1970) sample size table which suggested that for population range of 100,000-1,000,000, the adequate sample size should be 384. Therefore, since the population of the study area falls within this range, the sample size for this study is 384.The sample size of each ward is proportional to size of the population as presented in Table 3.1.

The study adopted a multi-stage sampling technique. The first stage was the purposive selection of six Local Government Areas (LGAs) namely, Soba, Lere, Kajuru, Giwa, Kaura and Zango-Kataf from the existing twenty three LGAs in the State taking cognisance of their high level of involvement in agricultural activities. The LGAs selected were rural in nature where the people engaged mostly in farming and other agricultural activities.The second stage involved the purposive selection of two wards from each of the selected LGAs based on their involvement in agricultural activities.This purposive sampling technique enabled the researcher to select predominantly rural farming wards in the LGAs, which gave a total of twelve (12) wards. At the third stage, the study adopted random sampling technique in selection of the households. The head of the household supplied the information and where the head

was not available the most senior in the household was approached. The stratified randomization method of sampling was used in selecting household heads for administration of questionnaire.

Table 3.1: Sampled Size by Selected Wards

SENATORIAL DISTRICT	LGAs	LGAs WARDS	2016 POP.	SAMPLE	WARDS	PROP.
Kaduna Central	Birnin Gwari Chikun **GIWA** Igabi Kaduna South **KAJURU** Kaduna North	Kakangi, Gangara, **SHIKA,** Idasu,Danmahawayi, **YAKAWADA,** Giwa, Kidandan, Galadimawa Kadage and Pan Hauya **KAJURU ,** Tantatu **,** Buda **KUFANA,** Afogo**,** Kasuwan Magani, Kallah, Rimau, Idon and Maro	69,735 39,067	69 39	Shika Yakawada Kajuru Kufana	35 34 20 20
Kaduna South	Jaba Jema'a Kagarko **KAURA** Kauru Sanga **ZANGON KATAF** Kachia	Fada, **KUKUM,** Kpak, Agban, Kadarko, Kaura **MALLAGUM,** Manchok, Bondon, , Zankan Zonzon , **ZAMAN DABO,** Unguwar Gaiya, Gora **ZONKWA,** Madakiya, Gidan, Jatau, Unguwar Rimi, Kamantan, Kamuru Ikulu North andZango Urban	45,005 81,886	45 81	Kukum Mallagum Zaman Dabo Zonkwa	22 22 41 40
Kaduna North	Ikara Kubau Kudan **LERE** Makarfi Sabon Gari **SOBA**	Sabon Birnin, **YAR KASUWA,** Garu, Kayarda **LERE,** Ramin Kura, Saminaka, Lazuru, Abadawa, Dan Alhaji Gure/Kahugu **MAIGANA,** Kinkiba, Gimba	81,107 71,351	80 70	Yar kasuwa Lere Maigana	40 40 35

		Kwassallo, Richifa, Gamagira, Dan Wata Turawa, **SOBA,** Garun Gwanki, Rahama			Soba	35
	Zaria					
TOTAL	**6**	**64**	**388,151**	**384**	**12**	**384**

Source:Field work 2018

NB: Selected LGAs and settlement are in capital letters, bolded

3.2.4 Data collation and analysis

Both quantitative and qualitative data analysis techniques were used in this study. Hence, data collected through questionnaire were coded, collated and analysed using descriptive and inferential statistics, while Focus Group Discussions (FGDs) were analysed textually. Data from the questionnaire survey were analysed using Regression, descriptive and factor analysis; through Statistical Package for Social Sciences (SPSS) version 20.

Objective (i) and (ii): The types of food produced, and the food culture and practices: Descriptive statistics such as averages and percentages presented in Tables and graphs were used to analyse the socioeconomic characteristics, various food types produced, and the food culture and practices of the respondents in Kaduna State.

Objective (iii): To determine the food security status among rural households:There are different methods used to measure food security status in a given society namely, individual calorie intake, household calorie intake, diet diversity index and coping strategy index (Opsomer, Jensen, and Pan, 2003). The United States Department of Agriculture (USDA) developed a household food security scale (HFSS) based on an 18-item questionnaire that measures household food security status in the preceding 12 months (Hamilton *et al.*, 1997). Realizing that the scale can be potentially used in developing country contexts, having tested it in Burkina Faso, Bangladesh, Bolivia, Ghana, and the Philippines indicated that the HFIAS approach can be applied successfully to different developing and developed country contexts.

The study adopted the USDA approach and CSI for the analysis of household food security in the study area. The USDA method also called the HFIAS model categorizes households using a constructed food security scale. This scale is a number continuum in a linear scale that ranges between 0 and 10. The scale measures the degree of food insecurity experienced by a household in terms of a single numerical value. In general, the set of HFIAS questions work symmetrically together to provide a measurement tool for identifying, with considerable sensitivity, the level of food insecurity/hunger experienced in a household. The categorization is based on the "food secure", "food insecure without hunger", "Food insecure with hunger (moderate)", and "Food insecure with hunger (severe)" households. Table 3.1 categorises the food security scale as adopted by the USDA.

Table 3.2: USDA Food Security Scale Measurement

Food secure	Food insecure		
	Food insecure without hunger	Food insecure with hunger	
		moderate	severe
0-2.32	2.33-4.56	4.57-6.53	6.54-10

Source: Adapted from USDA (2000)

Food secure households: These are households that show zero or minimal evidence of food insecurity. The group's value ranges between 0-2.32 on the food security scale.

Food insecure without hunger households: These groups show concern about the adequacy of the household food supply. They therefore show adjustments in their daily food management. This group's value ranges from 2.33-4.56 on the food security scale.

Food insecure with hunger (moderate) households: These groups of households have their food intake reduced such that the household adults have repeatedly experienced the physical sensation of hunger. The group's value is between 4.57-6.53 on the scale.

Food insecure with hunger (severe) household: Households in this group have their children's food intake reduced to an extent that the children have experienced hunger. The group's value on the food security scale ranges between 6.54-10.0.

Apart from the USDA Approach, the Coping Strategy Index (CSI) was also used to determine the food security status of the population to know if it supports the results from the USDA Approach.

Objective (iv): Assess the determinants of households' food security:To identify the determinants of food security among households in the study area, a Probit regression model was used. In the model, food security status of the households is a function of a set of independent determinants. This model was employed to assess the factors influencing the achievement of food security status in the study area.

The probit model is specified explicitly as (Habyarimana, 2015):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_6 X_6 + e \ldots\ldots\ldots\ldots\ldots\ldots \ldots\ldots\ldots 1$$

Where;

Y = Food security status, 1 = Food secure, 0 =Food insecure households)

X_1-X_6= vector of explanatory variable (predicators)

β_0-β_6

β_0= Constant

e = Error term

X_1 = Sex of the household head (male=1, female=0

X_2 = Marital status respondent. (1= Married; 2 Not married

X_3 = Age of the household head (years)

X_4 = Household size (Number of members)

X_5= Education of household head (Measured in the level of education)

X_6= occupation of the household head

Objective (v): examine the constraints to ensuring food security in the study area; a list of 20 possible constraints was presented. A 5-point Linkert-type scale of strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1) was used to determine the serious constraints among households. Principal component analysis was used in estimating the factors constraining achievement of household food security among rural and urban farming households in Benue State Nigeria (Abu & Soom, 2016). It is specified as;-

Pi = aiix + a^ + *** + ajnxn ……..……2

P2 = a2iXi + a22X2 + *** + a2nXn

P3 = asiXi + a32X2 + *** + a3nXn

Pn = aniXi + a,,2X2 + *** + a_mXn

Where;

$P_i p_2$ P_n = observed variable/factors constraining food

security

Ai an = factor loading correlation coefficients

Xix2 Xn = unobserved underlying factors constraining the study selected factors with high factors loadings scores ±0.40 or greater.

Principal Component Analysis (PCA) was employed to reduce and group the twenty (20) analysed constraints to food security. PCA is a technique for extracting from a set of variables those few orthogonal linear combinations of variables that most successfully capture the common information by converting these interrelated variables into a new set of uncorrelated variables called the principal components. PCA does data reduction by combining a large number of indicators into fewer similar groups, with each defining the underlying dimension in the contributing variables forming the group.

Eigen values are simply the coefficients attached to eigenvectors ranked in descending order of their eigenvalues to arrive at the principal components in order of significance. This implies that they are the measure of the data's covariance.

Abu and Soom (2016) used Principal Component Analysis (PCA) to analyse factors constraining household food security among rural and urban farming households of Benue, Nigeria. More so, Akukwe, Krhoda, & Oluoko-Odingo (2018) used PCA to analyse the effects of flooding on food security in agrarian communities of south eastern Nigeria.

Objective (vi): Assess the coping strategies to food insecurity: To ascertain the coping strategies employed by households during food insecurity, numerous methods for testing ranking of coping strategies have been identified from literature and notable among them are Garrett's ranking score techniques, Friedman's two-way analysis of variance and Kendall's coefficient of concordance. There is close relation between Friedman's test and Kendall's coefficient of concordance (Legendre, 2005). Kendall's coefficient of concordance was employed by this study because the Kendall's (W) provides the test of agreement of the rankers (respondents), among their rankings which the Friedman's and Garrett's test lack. The formula for the coefficient of concordance W is then given by:

$$W = \frac{\sum/T^2 - (\sum T)^2/n)/n]}{m^2(n^2-1)/12} \quad \text{---------- 3}$$

The formula is further simplified as follows:

$$W = \frac{12\sum[T^2 - (\sum T)^2/n)]}{nm^2(n^2-1)} \quad \text{---------- 4}$$

Where; T = sum of ranks for each coping strategies being ranked.

m= number of rankers (sampled households) and

n = number of coping strategies being ranked

Kendell Coefficient of concordance analysis was used by Melkamu and Singh (2015) to investigate household's common coping strategies in northern Rajasthan using Kendall's coefficient of concordance (W).

CHAPTER FOUR

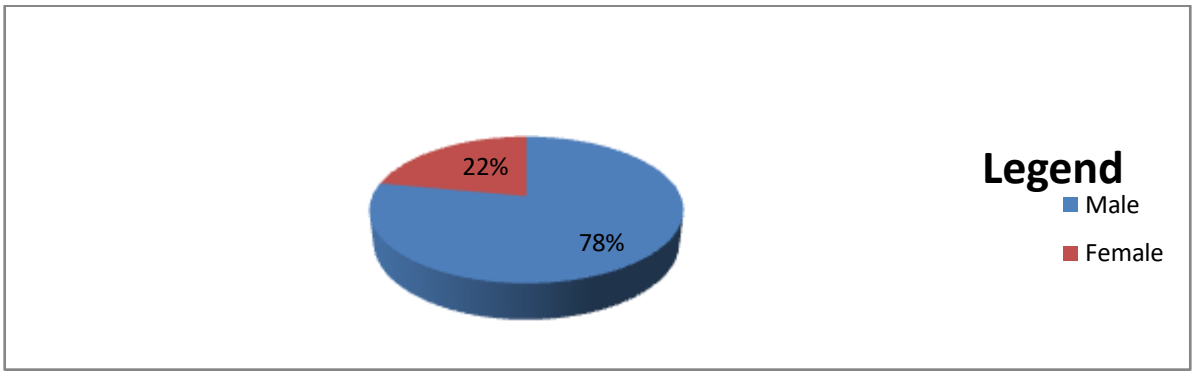
RESULTS AND DISCUSSION

4.1 Socio-Economic Profile of the Respondents

Socio-economic information of the rural households with regards to food security is very important as studies have shown that outstanding factors which include age of the farmers, sex, level of education, household size, farm size, non-farm income, extent of involvement in farming have been shown to affect the productivity of farmers and invariably their wellbeing (Sanni, 1991 and Ojeleye, 2002). The socio-economic factors that were likely to affect the food security of rural households examined in this study include sex, age, marital status, educational attainment, household size and occupation.

4.1.1 Sex of the respondents

The sex of the household head is expected to have effect on the level of involvement in farming activities and so food security. This also determines the kind of activities involved in on the farm and the type of crop cultivated. Figure 4.1 present the analysis of the sex of household head in the study area.

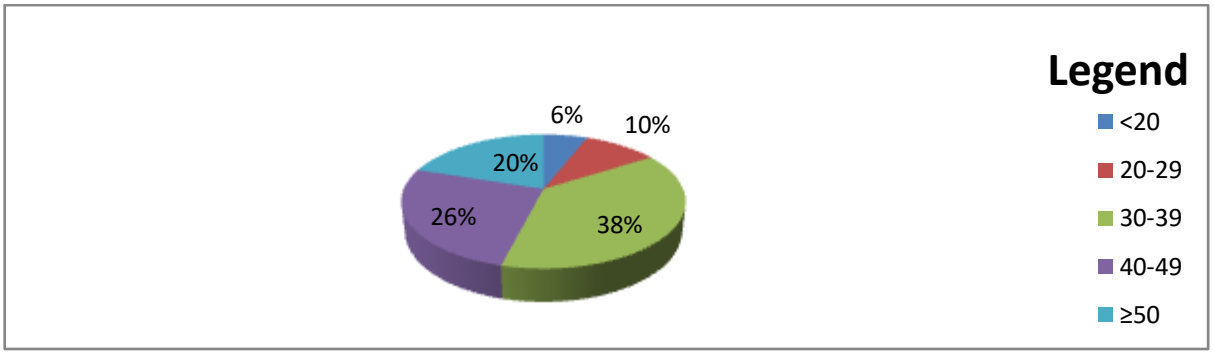


Source: Field Survey, 2018
Figure 4.1: Sex of respondents

The result in Figure 4.1 shows that (over 70%)of the respondents were males and 22% were females. This finding reveals that male headed households dominated the study area. According to Ziervogel et al., (2006), men have easier access to farmland through paternal inheritance than women. Based on this, male headed households are expected to have more access to farmland for food production. This is supported by Yahaya and Aina (2007), who posited that males are often more energetic and could readily avail themselves for energy demanding task especially farming activities, while women are limited in farm production process as a result of religious and cultural factors. This could be a boost to food security since male-headed households are in a better position to pull more labour force than female-headed ones (Bogale & Shimelis, 2009).

4.1.2 Age-group of the respondents

Age is a socio-economic attribute upon which farmers' abilities and physical disposition in planning, organizing, controlling resources and accomplishing activities and farm task are based. Age has also been found to affect the rate of household adoption of innovations, which in turn, affects household productivity and livelihood improvement strategies (Amaza et al., 2006).The survey further revealed in Figure 4.2 that 37.6% were between 30 and 39 years of age, while 26.2% were between 40 and 49 years.



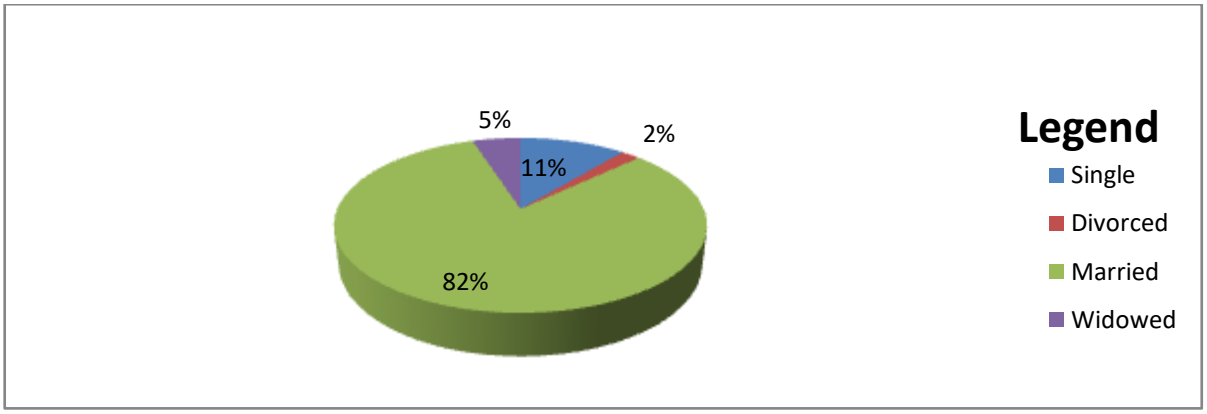
Source: Field Survey, 2018

Figure 4.2: Age-Groups of the Respondents

The mean (average) age of the respondents was 40 years approximately showing a virile and agile average youthful age of respondents with the consequent capability of doing a lot of farm work if given proper incentives. The finding suggests that most household heads were in their productive age and would be able to make meaningful impact in agricultural production for improved food security. Babatunde et al., (2007) found out that the older the household head, the lower the probability that the household would be food insecure. The findings are also in consonance with that of Ojeleye (2015) that majority of the sampled farmers in Kaduna State were within the productive age of 21 and 50 years.

4.1.3. Marital status

The study therefore collected data on the marital status of respondents as presented in Figure 4.3. Marriage is an element of cultural pride and a mark of responsibility in many Nigerian cultures and society. The significance of marital status on food security can be explained in terms of the supply of agricultural family labour. It is expected that family labour would be more available where the household heads are married (Amaza *et al*., 2006).



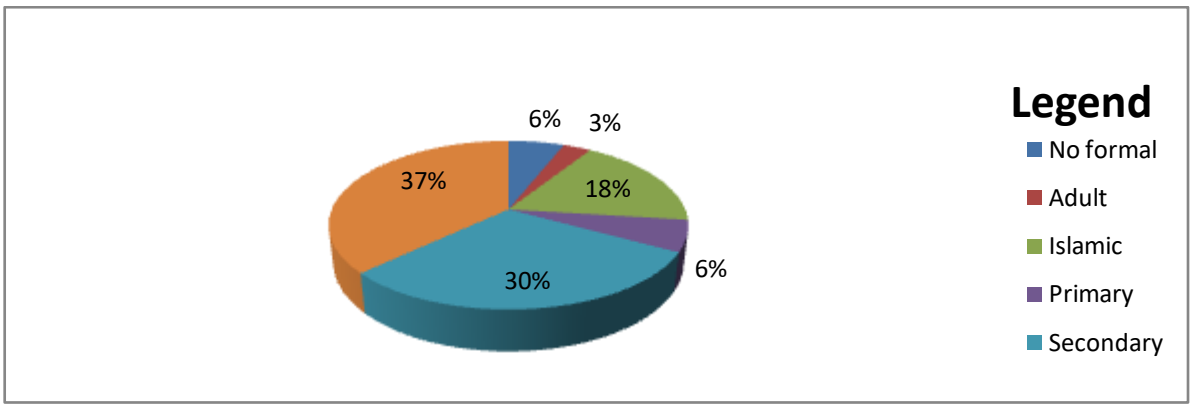
Source: Field Survey, 2018

Figure 4.3: Marital status

Majority respondents were married while only 10.7% were single. There were only a few widowed and divorced household heads constituting 5.2% and 1.6% respectively. Married households could have positive consequences on food security status particularly if the household is large; therefore encourage them to participate in agricultural production in order to raise their income and standard of living.

4.1.4. Highest formal educational level

Education is important for many human activities including food related issues. Education also has enormous social benefits. It saves lives by magnifying the effects of improved sanitation, reducing the risk of conflict and improving food security.Higher earnings among more educated individuals mean more resources to buy food, better access to nutritious foods, and more options to cope with price shocks and food shortages. Findings in Figure 4.4 show that majority of respondents had post-secondary and secondary education standing at 36.9% and 29.6% respectively.



Source: Field Survey, 2018
Figure 4.4: Highest Formal Educational Attainments

It is expected that education in agricultural production will assist the farmers to test and accept innovations available to them. Muhammed *et al*., (2009) posited that formal education is an important attribute that helps farmers to innovate, adapt and

adopt improved recommended production practices. According to Babatunde *et al.,* (2007), education is a social capital, which could impact positively on a household's ability to take good and well-informed production and nutritional decision. Therefore, there is a high probability that farmers in the study area will easily adopt new farming practices and technologies since a higher number of them were found literate which may bring about increase in food production. Lack of education and knowledge can affect farmers' capacity to adapt to change or to cope with food production stresses leading to food insecurity among populations (UNCTAD, 2010).

4.1.5 Household size

The household size means the number of people in the house. This include wives, children and other relatives and dependants who reside within the family and eat from the "same pot". Findings in Table 4.1 shows that household size of 6-10 persons were with 46.1% of the respondents, while 11-15 had 22.3% followed by 1-5 persons with 16.1%.

Table 4.1: Household Size

S/N	Household size	Frequency	Average	%
1	1-5 people	61		16
2	6-10 people	176		46
3	11-15 people	85	10.4	22.3
4	16-20 people	42		11
5	21-25 people	15		3.9
6	Greater than 25 people	3		0.8
	Total	382		100

Source: Field Survey, 2018

The average household size in the area is approximately 10 persons. This result varied with the national average household size of about 5 persons for Nigeria in 2008 as reported by National Bureau of Statistics (2009). This implies that most of the

farmers had large household sizes, which could probably serve as an insurance against shortfalls in the supply of farm labour. According to Sule, Ogunwale and Afala (2002) as cited in Ifeoma and Agwu (2014), household size has a great role to play in family labour provision in agricultural production.

In subsistence agriculture as practiced in the study area, household size is very important as it determines to a large extent the supply of labour to the farm. However, large households with many dependents (children and the elderly) could be of little or no advantage to the farming household when it comes to food security. In fact, it can be a disadvantage as this would mean having more unproductive mouths to feed.

4.1.6 Occupation of household head

Occupation of individual household heads reflects other characteristics and pointer to whether such household cultivate or purchase their foods. Table 4.2 presents the issue.

Table 4.2: Occupation of Household Head

S/N	Household occupation	Frequency	%
1	Farming	272	71.2
2	Trading	23	6
4	Civil service	85	22.3
5	Artisan	2	0.5
	Total	382	100

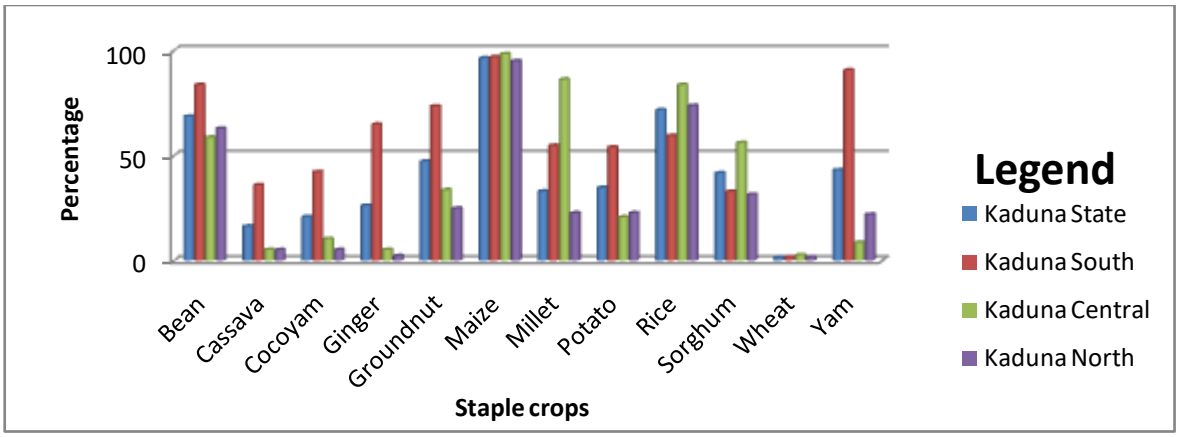
Source: Field Survey, 2018

Table 4.2 shows that about 71.2% of the respondents were full time farmers who depended mainly on farming as a means of livelihood. About 22.3% of the sampled household heads were engaged in civil service other than farming activity while 6% and 0.5% were involved in trading and artisanship such as tailoring, carpentry, commercial motorcycling (achaba) and milling machine operators. The 22.3% households that are in civil service were either primary or secondary school teachers. Oseni & Winters (2009)

showed that non-farm activities in Nigeria help households to improve their farm production through higher input use, including more employment of hired labour.

4.2. Major Types of Crops Produced

The physical and ecological conditions of the study area are favourable for the production of crop like cereals and legumes, cultivated solely or mixed with one or more crops.The consumption of staple crops by a household is a critical element in food security of the members of that household, giving the central role of staple crops in human nutrition, agricultural production, and Nigeria's food security at large (Immink and Alarcón, 1992). Figure 4.5 presented the findings of the study.



Source: Field Survey, 2018
Figure 4.5: Crops Cultivated by Households

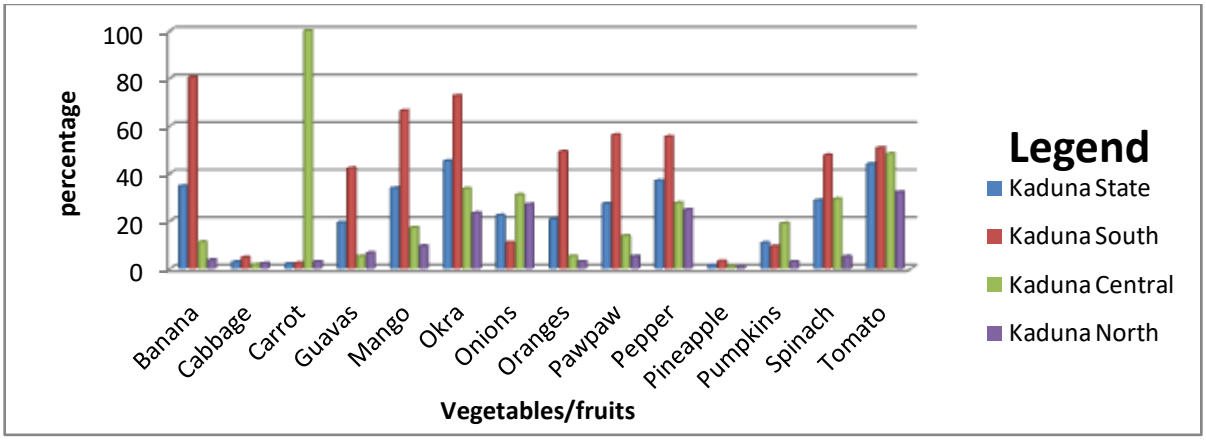
In presenting the most widely grown crops, Figure 4.5 revealed that 96% of the respondents regularly cultivated maize which is the most important cereal crop grown and consumed in the State. This was followed by rice, which has approximately 72% of the respondents cultivating it, while 69% are engaged in beans production in the State. The predominance of maize and rice in the study area may be explained by the fact that the climatic and ecological conditions support the cultivation of cereals and that they are the predominant staple food crops consumed in the study area. Leguminous crops such as beans and groundnut were grown in association with cereal crops, such as maize and

sorghum. Other crops grown in the study area were potatoes, millet, and yam. The study further revealed that the most prevalent cropping pattern is cereal and legume based.

Southern part of Kaduna has a comparative advantage in the production of crops like maize, yam, groundnut and ginger. While central part of Kaduna has maize, millet and rice as the most cultivated crops and the northern part of Kaduna has maize, rice and beans. Maize no doubt is a major crop produced in the state.

4.2.1 Vegetables and fruits

Vegetables and fruits influence the intake of cereal staples, manage hunger and play a central role in household food security for poorer rural groups (Mavengahama, McLachlan, & Clercq, 2013). Neglected or underutilized local varieties of fruits and vegetables often offer good a good source of nutrition, as such farmers need to be supported in growing new varieties and different crop mix. Figure 4.6 present the types of vegetables cultivated in the study area.



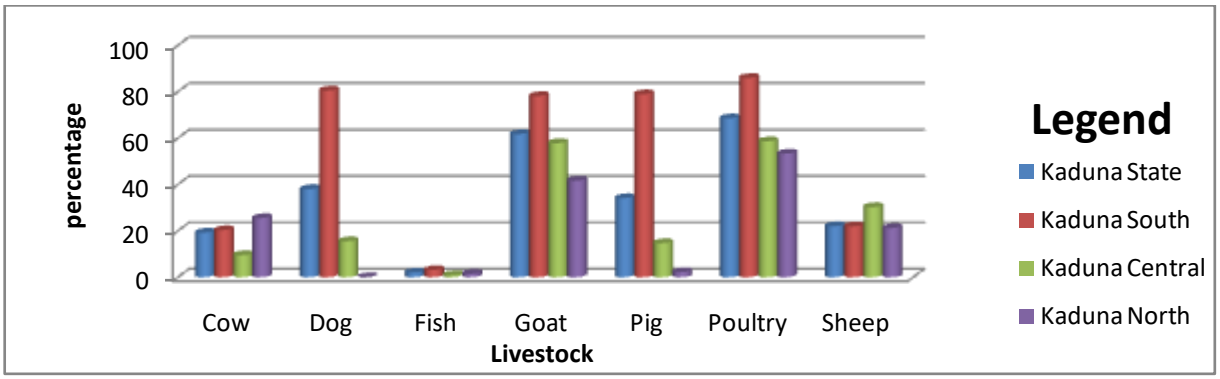
Source: Field Survey, 2018
Figure 4.6: Vegetable and fruits grown by households

The findings revealed that 45% of the respondents are into production of Okra,while tomato is next with 44% and pepper was produced by almost 37% of the respondents in the area. More so, fruits like banana, mango and pawpaw were also produced by 35%, 34% and 27% of the total respondents in the State respectively.

The findings indicated that the northern parts of Kaduna State are majorly into the production of carrots, tomato, onions, okra and pepper. Spinach, onions, pepper and tomatoes are majorly produced in central part of the state while the southern part of the State is comparatively good at fruits such as bananas, oranges, mangoes and okra all together. This pattern could be explained by the soil and climatic condition of these parts of the State.

4.2.2 Livestock reared

Livestock is a rich source of protein and the products are mainly egg, meat and milk which is important for improving the nutritional status of man (Umeh and Odo, 2007). Livestock also provide increased economic stability to the farm or household, acting as a cash buffer (small livestock) and as capital reserve (large animals), as well as a deterrent against inflation (Sansoucy, 1995).



Source: Field Survey, 2018

Figure 4.7: Livestock produced/reared or kept by the Households

Figure 4.7 revealed the livestock reared by rural households whereby poultry and goats were topmost with 69% and 62% respectively. People in southern part of the state rear animals such as dogs, pigs and goats but households in the northern part of the State do not rear pigs which can be attributed majorly to the cultural and religious beliefs but are engaged in production of poultry, sheep, goats and cows. Households in the central part of the State are into rearing of goats, poultry and sheep.

4.3 Cultural Practices in Food Production

4.3.1 Participation in agricultural activities by gender

Participation in agricultural activities is disaggregated by gender among rural households in the State. Both men and women take part in land preparation, planting, fertilizer application, seed storage, processing of food crops and sale of produce. During the FGD in Zango Kataf, Lere and Kajuru, discussants agreed that men are majorly responsible for making ridges, pest management and herbicide application, while women are responsible for weeding, harvesting and processing of farm produce.

In southern part of the State, a discussant during an FGD in Zonkuwa said:

> Agricultural activities are done by both men and women especially planting, weeding and storage of harvested crops. Men have the sole responsibility of land preparation, ridging, fertilizer application, pest management and seed storage while women are responsible for harvesting, processing of crops and sale of produce (Pastor Isaac Makama).

In Northern part of Kaduna, from the FGD findings, discussants especially in Soba LGA agreed that men were responsible for land preparation, ridging, fertilizer application, herbicide application and sale of produce, while women are responsible for planting, weeding, harvesting and crop processing. Further, both men and women were involved in harvesting of crops and storage of harvested crops. The outcome of Kaduna Central was not different from what was obtainable in Kaduna North.

The striking difference in the agricultural division of labour between the northern and southern parts of Kaduna State is that while women in rural households of

southern part of the state were responsible for sales of farm produce, men were mainly responsible for the same task in rural households in northern parts of the state. This can be attributed to the fact that majority of southern Kaduna households are Christians while majority of northern Kaduna rural households are Muslims, therefore explaining the custom of men performing the task of sale of farm produce. Increased agricultural productivity for rural households for their food security, therefore, depends on increased access by both men and women to productive resources.

4.3.2 Decision making on agricultural activities

As shown in Table 4.3, majority (92%) of the respondents reported that husbands took decisions on agricultural production activities such as when to start land clearing, what fields to use, which crops to plant, who in the household should plant which crops and who should carry out what activity.

Table 4.3: Decision Making on Agricultural Activities

S/N	Who takes decision in the household	Frequency	Percentage
1	Husband	351	91.9
2	Children	8	2.1
3	Wife	23	6
	Total	382	100

Source: Field Survey, 2018

The results indicate that decision-making on agricultural production activities was exclusively the preserve of the male folk. This may be due to the patriarchal nature of the society and power relations as well as access to resources that has been structured in such a way that favours only men in the area. The exclusion of women who contribute about 70% of agricultural labour, 50% of animal husbandry related activities and 60% of food processing activities in Nigeria (Federal Ministry of Women Affairs

and Social Development [FMWASD], 2007) from household decision-making could impact negatively on rural household food security.

4.3.3 Agricultural and cropping systems practised

An examination of the agricultural systems practiced by rural dwellers indicated that a fairly high number (57%) of the respondents practice both subsistence and commercial farming, though they were more in to subsistence farming (Table 4.4).

Table 4.4: Farming Systems practiced

S/N	Farming systems practice	Frequency	Percentage
1	Subsistence	153	40.1
2	Commercial	10	2.6
3	Both	219	57.3
	Total	382	100

Source: Field Survey, 2018

The result of the table is consistent with the report of International Institute of Tropical Agriculture [IITA] by Philip *et al* (2005) which states that majority of Nigerians depend largely on subsistence agriculture. Land tenure system, low soil fertility, restricted access to improved technologies and inadequate fertilizer supplies as well as lack of loans to rural household farmers may probably account for households engaging in subsistence farming, because commercial farming requires large farm lands, available technologies, access to farm inputs and capital expensive.

The study further examined the cropping system which ispresented in Table 4.5. The finding revealed that majority (57%) of the respondents practiced mixed cropping while a few (36%) practiced a combination of mono cropping and mixed cropping. Worthy of note is the insignificant few (6%) that only engage in commercial farming in the area.

Table 4.5: Cropping Systems

S/N	Cropping systems	Frequency	Percentage
1	Mixed cropping	219	57.3
2	Mono cropping	24	6.3
3	Both	139	36.4
	Total	382	100

Source: Field Survey, 2018

This implies that most rural dwellers in the area were into subsistence farming in the State. The practice of mix cropping could have positive influence on food security by providing security for farmers against pests, disease and unexpected climatic conditions; help small-scale farmers obtain higher yields; provide farming communities with a range of products with multiple uses and values; and varieties of crops for immediate consumption and for long term storage (Boon, 2002).

4.3.4 Acquisition of farmland

Both smallholder and large-scale agriculture are necessary to boost productivity and produce enough food to feed the world's poor. Interest in farmland is rising due to rising food prices, food insecurity concerns and worries about climate change effects or scarce resources. In terms of acquiring farmland, findings in Table 4.6 showed that a significant number (67%) of the respondents in the study area acquired farm land through inheritance.

Table 4.6: Acquisition of Farmland

S/N	Acquisition of farmland	Frequency	Percentage
1	Inheritance	257	67.3
2	Purchase	44	11.5
3	Communally own land	32	8.4
4	Rent	45	11.8
5	Pledge	4	1
	Total	382	100

Source: Field Survey, 2018

However, a small proportion (11.5%) of the respondents cultivated lands they personally owned through purchase. This implies that the major means of acquiring farmland in the area is by inheritance and most households are indigenous to their communities in the area. According to Ering (2011), farm land acquisition through inheritance hinders large scale farming or cultivation or restricts the freeing of land to would be investors for socio-economic development particularly in rural areas of Nigeria.

4.3.5 Sources of labour

The types of labour used in rural households during agricultural production in the study area can be categorized into three.These are family labour, hired labour and exchange labour. Labour is a key asset for smallholder farming households in rural Nigeria.

Table 4.7: Sources of Labour

S/N	Sources of labour	Frequency	Percentage
1	Family	276	72.3
2	Hired	87	22.8
3	Exchange labour	19	5
	Total	**382**	**100**

Source: Field Survey, 2018

Findings as presented in Table 4.7 shows that 72% of the respondents used family labour while about 23% used hired labourer.During the FGD, a discussant in Yarkasuwa observed that:

> Some households hire labour due to youth's migration or rural-urban drift of most active household members since some farmers are aging in the study area (Danladi).

When a household has insufficient family labour to complete the farm tasks, hired labour is used. The availability of family labour is a prerequisite for a household to increase farm size leading to increased food production. In addition, the use of family labour indicates the subsistence nature of the farming system, which is mainly for

family survival. Apart from family labour available within the household, labour exchanges among relatives that involve other households were also practiced as noted by a respondent during FGD in Yarkasuwa, Lere LGA.

In the context of Nigeria's smallholder production where farm mechanization is virtually non-existent and all farm work is done manually, having access to necessary labour for agricultural production directly affects the levels of household farm income and food security. In addition to working on a household's own farm, labour may also be deployed in off-farm economic activities, thus providing additional income to the household which could be used for food purchases in times of food shortage. Most of the farm work in Kaduna State is done during the rainy season between May and October accordingly.

4.3.6 Methods of processing food crops

The causes of food losses and waste in low-income countries as well as rural areas is connected to technical limitations in harvesting techniques, storage and cooling facilities, infrastructure, packaging and marketing systems. Given that smallholder farmers in developing countries live on the margins of food insecurity, a reduction in food losses could have an immediate and significant impact on the livelihoods.

Table 4.8: Methods of Processing Food Crops

S/N	Methods	Frequency	Percentage
1	Traditional	295	77.2
2	Modern	87	22.8
	Total	382	100

Source: Field Survey, 2018

Result in Table 4.8 reveals that 76.7% of the respondents were using traditional processing method such as sun drying on the road side and open fields as well as smoking for processing food. The view on the use of traditional method of processing was strongly supported by discussants during the FGDs in all the LGAs. The traditional

method mentioned include threshing of rice, soya beans, millet by hand, where bunches of panicles are beaten against a hard element (a wooden bar or a flail). Farmers mainly use local processing methods and facilities, which cause post-harvest losses. A respondent in Zonkuwa observed that:

> The area has a lot mango trees and produces yam too but these are most often wasted during the harvesting season, as no modern processing companies to process them into other products for consumption in the later time of the year (Isaac Makama).

Though fruits are now harvested after maturity (but not ripe) to reduce the level of waste but so many households may only subscribe to this when they have buyers at that moment. More so, there new methods of hybridization of manual and mechanical methods of processing which are observed not be used by most households.

4.3.7 Methods of storage food crops

Storage is a component within a farming system that is undertaken because of its contribution to food security. For small farmers the main reason in storing farm produce is to ensure household food supplies and provide a form of savings, to cover future cash need through sale, or for barter exchange or giving. The findings are presented in Table 4.9.

Table 4.9: Methods of Storage/Preserving Food Crops

S/N	Methods of preserving food crops	Frequency	Percentage
1	Bagging	95	24.9
2	The use of traditional barns	195	51.0
3	Gallons or modern containers	43	11.3
4	Agro-chemicals	49	12.8
	Total	382	100

Source: Field Survey, 2018

More than half of the respondents, that is 51% stored agricultural produce locally using traditional barns, while 24% used bagging in the form of sacks. Adequate food storage greatly increases food security by reducing postharvest losses and making more food available to the household. A few of the respondents 11.3% and 12.8% use modern containers and agro-chemicals respectively. Some of the containers observed are metal containers where produce such as maize and beans are been stored in an airtight condition, while othersuse rubber gallons ranging from 50 litters and above. Quite a few agricultural commodities are treated with agricultural chemicals after they are harvested. These chemicals are meant to prevent weevils and other insects infesting cereal grains during storage. The findings puts the study area at risk of food stability all through the year.

According to Asoegwu & Asoegwu (2007) traditional grain storage with cribs, rhombus, gourds, sacks, by hanging on roof tops, trees and fire places and barns have not provided adequate protection from rain, insects and rodents, resulting in 20 – 65% loss of farm produce annually in Nigeria. Inadequacy of storage facilities resulted in substantial on-farm and off-farm post-harvest losses estimated at 20-40 percent of most harvested products in Gombe State, Nigeria (Egbutah, 2009).

A participant in the FGD in Zango Kataf LGA observed that:

> Most households in their areas produced enough food crops to take them round the year, but the lack of storage facilities rather prompt them to selling their produce yam and cocoyam in a low price (Isaac Makama).

More so, as observed in Lere LGA, a participant in the FGD at Yarkasuwa explained that:

> There is a modern storage facility in the form of silos used in our area and farmers are made to pay a little token of ₦30 per bag of products stored in every month, this has helped to reduce post-harvest loss in the area and have prevented farmers from selling at the time of low prices (Luka John).

4.3.8 Control over household income

Patterns of spending on food and other expenditures within a household reflect not only the sources and amount of the household's income, but also who controls money and assets within the household. Household decision making and control over allocation of resources are critical to food security status of rural inhabitants. Table 4.10 shows the dimension of control over household income in the study area.

Table 4.10: Control over Household Income

S/N	Control of family income	Frequency	Percentage
1	Husband	313	81.9
2	Wife	25	6.5
3	Children	44	11.5
	Total	382	100

Source: Field Survey, 2018

Findings from the analysis indicated that close to 82% of the respondents accepted that husbands had control over household income while wives controlled only 7% of family income in rural parts of Kaduna State.However, the United Nations (2008) reported that in areas where men are in control of household income compared to those where women have control over income. Furthermore, International Food Policy Research Institute [IFPRI] (2004) notes that if women controlled the household income, undernourishment is likely to reduce.

4.3.9 Preference in household food sharing

Knowledge of the preference in household food sharing aid in explaining the nutritional status quo and information for the design and implementation of food security programmes. Every day, households must make difficult decisions about how limited food should be shared among their members especially during time of food insecurity. So, these food allocation decision and preference have important nutritional and sometimes life-critical consequences. The situation in the study area is presented in Table 4.11.

Table 4.11: Preference in Household Food Sharing

S/N	Preference in food sharing	Frequency	Percentage
1	Husband	141	36.9
2	Wife	131	34.3
3	Children	110	28.8
	Total	382	100

Source: Field Survey, 2018

The findings as presented in the table revealed a higher percentage close to 37% of the respondents who reported that husbands were served first in household food distribution, while about 34% went for women and 29% for children who are served first in the family food sharing. This shows a preference for husbands when it comes to food sharing may be as the head of the household in the area. This result concurs with the assertion of Bharati,*et al*(1986) that females in sub-Saharan Africa of which Nigeria is inclusive receive less or "poorer quality" food than their male counterparts because the intra-household food distribution is often related to hierarchicalposition, with the head of the family and the income-earning members of the household receiving priority in eating. In such families, mothers and young children may receive a smaller share of the family's food relative to their nutritional needs. During the FGD in Kaura LG, a participant explained that:

> Some chicken parts for instance (gizzard) is forbidden for a woman or a child to eat due to some said cultural

beliefs even as they are becoming aware it is one of the most nutritious parts of a chicken (Madam Jumai Daniel).

4.4 Food Security Status of Households

Household food security is very essential now that Nigeria is currently facing problems of food crisis. Households are food secure when they have year-round access to the amount and variety of safe foods their members need to lead active and healthy lives. At the household level, food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household.

4.4.1 Food security status

Food security status of rural households in the study area is presented in Table 4.12. The findings indicate that cases of severed food insecure households with hunger in the state are not rampant based on the subjective measure of analysis of food security situation used in the study.

Table 4.12: Food Security Status

S/N	**Items**	Frequency	Percentage
1	Food secure	244	63.9
2	Food insecure without hunger	130	34
3	Food insecure with hunger (moderate)	8	2.1
	Total	382	100

Source: Field Survey, 2018

The result indicated that majority (about 64%) of farming households are being food secure. This finding is in agreement with Ojeleye *et al.*, (2014) who found that 66.39% of the household were food secure while the remaining 33.61% were food insecure in Kaduna State. The findings also indicated that a total of 36% of

respondents were food insecure (34% food insecure without hunger and 2.1% food insecure with hunger).

The coping strategy index is another indicator of households food security used alongside the USDA Approach or HFIAS model in this study to assess the extent to which households used harmful coping strategies when they do not have enough food or money to buy food. It was used to validate or invalidate the outcome of the food security status of households in the area. The result of the severity weight ranking by Focus Groups in the study area is presented in Table 4.13a.

Table 4.13a: Severity Weight Ranking by FGDs

	Coping Strategies	Focus Group Ranking for Each Individual Behaviour							Average	Ranking
S/N		F1	F2	F3	F4	F4	F5	F6		
1	Reducing the numbers of meals per day	1	1	1	2	1	1	1	1.1	1
2	Reduce size of meals	1	1	1	1	2	1	2	1.3	1
3	Begging or engaging in degrading jobs	2	1	2	2	2	2	2	1.8	2
4	Consuming seed stock for lack of food	2	1	1	3	2	2	2	1.9	2
5	Skipping food consumption for an entire day	2	2	2	2	2	2	2	2	2
6	Reducing the ration of adults to allow more food for children	3	3	2	3	2	2	2	2.5	3
7	Withdrawing children from school for lack of food	3	3	3	3	3	2	2	2.7	3
8	Selling household assets (land)	3	2	3	3	3	3	3	2.9	3
9	Consuming immature crops	3	3	4	3	2	4	4	3.3	3
10	Send household members to eat else where	3	3	4	3	3	3	4	3.3	3
11	Consuming to less preferred and cheaper food	4	4	4	3	3	3	4	3.6	4
12	Purchasing food on credit	4	4	4	3	4	3	4	3.7	4
13	Stealing just to feed	4	3	4	4	4	4	4	3.9	4

Source: Field Survey, 2018

The reduced coping strategy index (CSI) is considered a proxy indicator of the food access component of food security and it is calculated on the basis of a specific set of behaviours each with its own universal severity weighting (Maxwell et al., 2003;

Maxwell & Caldwell, 2008). The number of days a household had to adopt a particular food-based coping strategy" was used to create the CSI.

For each household, a score was given to each coping strategy.

The score = (frequency with which coping strategy is used) × (severity weight).

The scores for each coping strategy wasadded together to give a composite score for each household. Higher values of the index indicated more severe food insecurity.

Table 4.13b: Food Security Status using CSI Score

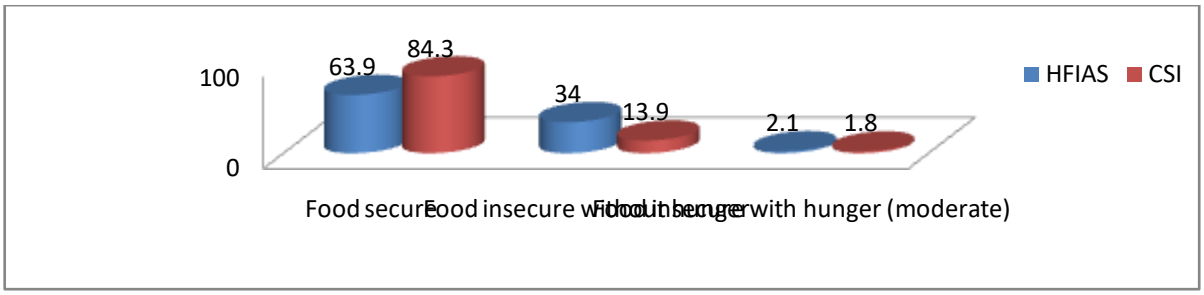
S/N	Food security status	Frequency	%
1	Food secured	322	84.3
2	Food insecure without hunger	53	13.9
3	Food insecure with hunger (moderate)	7	1.8
	Total	382	100

Source: Field Survey, 2018

The result in Table 4.13b revealed that majority (84.3%) of the respondents in the study area were largely food secured while a total of 15.7% were found to be food insecure with 13.9% food insecure without hunger, while 1.8% food insecure with moderatehunger. This implies that households were more food secure using the CSI than the HFIAS approach and also validate the findings that more of the households in the area are food secure.

4.4.2 Comparison of Food Security Status Based on the two Methods Used

The households food insecurity access scale (HFIAS) and the coping strategy index (CSI) are both subjective measurement of food security status of household which is a qualitative measure of how people perceived their food security situation. The food security status obtained usingHFIAS based on 30 days' data and CSI are summarized in Fig. 4.8.



Source: Field Survey, 2018

Figure 4.8: Food security Status based on HFIAS and CSI

The results showed that food insecurity incidences in Kaduna State based on HFIA is much higher with 36.1% combined, than that the CSI household levels of food insecurity with 15.7% combined in the study area. The high food security incidences based on CSI with 84.3% could be due to one week (7 days) recurrent period of time as households were restricted to 7 days recall time.

4.4.3 Socio-economic characteristics and food security status

The socio-economic characteristics and food security status of the households were further cross-examined. The analyses are discussed in Table 4.14 using the distribution of households by age, sex, marital status, education and households' size. In Table 4.14, household heads within the age group of 30 - 39 years were found to constitute 41% of the population of the food secure, while those within the age range 40-49 were 25% supporting a productive age group among the rural population that are food secure. In general, a major percentage of household heads were within the age group 30-49 years. The food insecurity incidence increases with increase in age of household head older than 50 years and decrease in household heads age below 30 years. This may be as a result of age distribution of the active labour force in the country, as those below the age of 30 years generally constitute smaller level of the labour force and as such, with small household size.

Findings also revealed that 81% of the food secure group were males while 19% were females. This is contrary to the food insecure group with moderate hunger where 63% were females and 38% were males. From the analysis, food insecurity incidence is higher in female-headed households. This is owing to inadequate access to productive resources due to socio-cultural constraints or may be as a result of lower dependency ratio observed in male headed households where both the head and their spouse are engaged in income generating activities while in the female headed households, the dependency is mainly on the female head that are either widowed or unmarried.

Table 4.14:Socio-Economic Characteristics and Food Security Status

	Food secure		Food insecure without hunger		Food insecure with moderate hunger	
Age	**Frequency**	**percentage**	**Frequency**	**Percentage**	**Frequency**	**percentage**
<20	12	4.9	12	9.2	0	0
20-29	29	11.9	9	6.9	0	0
30-39	99	40.6	53	40.8	1	12.5
40-49	62	25.4	27	20.8	4	50
≥50	42	17.2	29	22.3	3	37.5
Total	244	100	130	100	8	100
Sex						
Male	198	81.1	98	75.4	3	37.5
Female	46	18.9	32	24.6	5	62.5
Total	244	100	130	100	8	100
M/status						
Single	28	11.5	12	9.2	1	12.5
Divorce	3	1.2	2	1.5	0	0
Married	202	82.8	108	83.1	7	87.5
Widow	11	4.5	8	6.2	0	0
Total	244	100	130	100	8	100
Education						
No formal	9	3.7	11	8.5	4	50
Adult	5	2.1	3	2.3	0	0
Islamic	40	16.4	26	20	0	0
Primary	11	4.5	12	9.2	0	0
Secondary	81	33.2	55	42.3	2	25
Tertiary	98	40.2	23	17.7	2	25
Total	244	100	130	100	8	100

HH/size						
1 – 5	42	17.2	19	14.6	1	12.5
6 – 10	120	49.2	68	52.3	6	75
11 – 15	52	21.3	26	20	1	12.5
16 – 20	21	8.6	10	7.7	0	0
21 – 25	8	3.3	7	5.4	0	0
>25	1	0.4	0	0	0	0
Total	244	100	130	100	8	100

Source: Field Survey, 2018

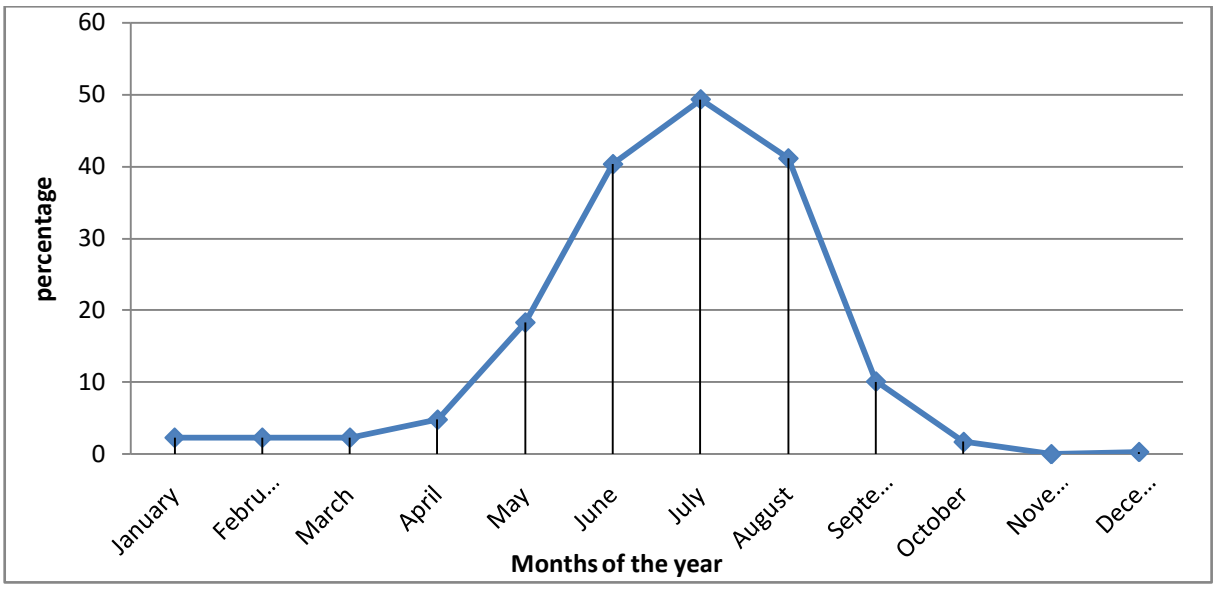
In the same vain, Table 4.14 reveals that households where the heads are in marital union (82.8%) tend to be more food secured than those with single and widowed head. Further, the findings on educational attainment showed that households in the food secure group with no formal education, adult, Islamic and primary education were less food secure constituting about 4%, 2%, 16.% and 5% respectively; while those with secondary education and post-secondary education ranked high constituting 33% and 40% respectively. For the food insecure group, the proportion of household heads in the population increases with low level in attainment of formal education. As the status changes, food insecurity increases with household heads with low level of education, while it decreases with those with tertiary education having the lowest food insecurity incidence. The more educated the household head, the more food secure the household because, education not only enhances productivity and production efficiency, but also provide opportunities to seek diverse income sources that enhances food security.

On the household size, Table 4.14 indicated that food security decreases with increase in household size. This could be as a result of increase in the dependency ratio in the households. Household with size ranging from 6-10 were the most food secured group with 49%. Further increase after 10 household sizes showed continuous decrease in food security. The Malthusian theory is seen at play at this stage because families with household sizes above 10 persons become food insecure due to the fact that more

mouths are to be fed and the little resources such as land become more competitive and scarce as result of the increase population of the members of the household. According to the theory, the cause of food insecurity is that population outstrips resources over a long period of time.

4.5.4 Period of severe food shortages

The four pillars of food security are food availability, access to food, utilization and stability. In other words, stability is given when the supply on household level remains constant throughout the year and in a long-term. As such, food insecurity can be transitory, seasonal, or chronic. Figure 4.9 presented a graph showing the seasonality of food insecurity within the year. The finding indicated that months with severe food shortages in the study area were June, July and August with high percent of food shortages of 40%, 49% and 41% respectively. Food shortage is at its peak in the month of July in the study area and within these months, the rains are becoming heavier thereby affecting other non-farm activities. Besides, more labour needed by households and the remaining food stuff are used as seedlings in the farms.



Source: Field Survey, 2018
Figure 4.9: Months with high level of food insecurity

Further, no food harvest at that time and prices of goods become costly. Details of the nature of period of severe food shortages is reflected by Figure 4.9. After the months of August, the condition begins to change as food starts coming in from the earlier harvest of fresh farm produce in the months of October, November and December. The months of October to March are always food secure months in the study area.

The game theory is applicable in this instance, whereby households are faced with uncertainties as to when to start cultivation of the land due to the unpredictability of rain fall and how to store their produce especially to meet up with months of food shortages due to fluctuation of prices and unpredictable human actions too. The delivery of fertilizers and other farm inputs can hardly be predicted by farmers as that always come too late and when they no longer need the inputs, as all hope to get it has been lost.

4.5 Determinants of Food Security Status of Rural Households in Kaduna State

The probit model was used to estimate the determinants of food security of farming household in Kaduna State. The estimated coefficients of the probit model, along with the standard error, t-values and marginal effect are presented in Table 4.15. The log likelihood ratio statistics was -221.022. The details are presented in Table 4.15.

This ratio exceeds the critical Chi square values at $p<0.0001$ level of significance. The log likelihood ratio value represents the value that maximizes the joint densities in the estimated model. The Prob > chi^2 was (0.31) and statistically significant at $p<0.01$ level of probability. The probability of obtaining this chi-square statistic

shows the effect of the predictor variables on specified alpha level. This implies that at least one of the regression coefficients in the model is not equal to zero. The significant chi-square value of 31% indicates that the explanatory variables jointly influence rural households' food security.

Table 4.15: Probit Model Result on the Determinats of Food Security

S/N	Variables	Coefficient	Standard error	T-value	Marginal effect
1	Age	-0.0046	0.0065	-0.712	0.041
2	Sex	-0.3412	0.1440	-2.368***	0.069
3	Marital status	0.0788	0.0996	0.791	0.705
4	Education	0.1101	0.0417	2.636***	0.741
5	Household Size	0.0026	0.0127	0.201	0.795
6	Occupation	0.1652	0.0939	1.758	0.031
Numbers of observation		382			
Log likelihood ratio test		-221.022			
Restricted log likelihood		-230.908			
Ben./Lerman R-square		0.567			
Chi-square χ^2		19.773			
Df		5			
Prob (chi-square > value)		0.310			

P-Value<0.05, ***p<0.001 The p-value ≤ 0.05

Source: Field Survey, 2018

The result in Table 4.15 further shows that sex, education and occupation are statistically significant determinants of food security. However, the parameter estimates of the probit model provide only the direction of effect of the independent variables on the dependent (response) variable. Estimates do not represent actual magnitude of change or probabilities. Thus, the marginal effects from the model, which measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable, are also reported in Table 4.15.

The estimated coefficient of sex was negative and significant in influencing households' food security in the study area at 1% probability level. Households with male heads are more likely to be food secured than their female headed counterparts. The result confirms a prior expectation that male dominance in agricultural production is due to the hectic nature of the farming operations such as ploughing, harrowing, weeding and tilling of farming lands.Further, the male-headed households have more access to opportunities than female-headed households because the probability of working off-farm and on-farm is expected to be positive for the former (Beyene, 2008). Moreover, women are usually more time constrained given their greater involvement in domestic chores. This may likely reduce their probability of engagement in farming activities compared to their male counterparts. Male-headed households are 6.9% more likely to be food secure than female headed households.

Education is positive and significant at 1% indicating a rather strong relationship with food security. This suggests that household heads with higher education are more likely to be food secure than their non-educated counterparts. The marginal effect of 0.741 shows that one extra year of formal education increases the probability of being food secure by 7.4%. This is similar to the findings of Ibekwe (2001) and Parasada (2002). It is understandable that where the education of household head is higher, they are capable of diversifying into other means of livelihoods making them have multiple means of income. Education is an important socio-economic factor that influences farmers' decision making because of its influence on farmers' awareness, perception and adoption of innovations that can bring about increase in productivity and food security. Abdulrahman, David, Yusuf, Abdulazeez, & Binuyo, (2016) opined that

educational improvement could lead to awareness of possible advantages of modernizing agriculture and improvement of the quality of labour.

Lastly, the major primary occupation of the household in the study area is farming. If members of rural households have more occupations, then the probability of working off-farm is expected to increase thereby increasing their income level and making them more food secured. Occupation is positive and significant at 10%, implying that farmers who have more than one occupation are more likely to diversify than those with only one occupation. The marginal effect of 0.031 shows that one extra diversification increases the probability of food security by 3.1%. The results also show a positive relationship between vulnerability to food insecurity and households' dependence on farming activities.

Several household composition factors have been highlighted as generating vulnerability among households. However, the few that are investigated here are female-headed households and the size of households. Female-headed households have been specifically identified as being at risk of vulnerability to food insecurity. The FAO for instance notes that "female-headed households are more vulnerable to sharp rises in basic food prices." (FAO, 2008). Female-headed households are at greater risk because they tend to experience less wealth and therefore more food insecure. The result reveals that female-headed households are significantly poorer and are more food insecure due to lack of control in decision making within the household.

4.6 Constraints to Food Security by the Respondents

Constraints to food security were investigated and established through respondents views. Principal Component Analysis (PCA) was then run on the

constraints on food security to determine the underlying dimensions. Twenty constraints have been established and they include: reduced availability of labour (out migration), too much rain, rapid population growth, inadequate rain, less control over household heads by wives, low crop yield (pest and diseases), low level of education and skill, poor access to market, poor infrastructure (roads), poor nutrition education, limited access to land, poor post-harvest processing and storage technologies, community and ethnic conflicts, inadequate extension services, poor health status, high food prices, poverty, bad governance, inadequate access to improved inputs and inadequate loans to farmers. The results is as presented in Table 4.16.

Table 4.16: Principal Component Analysis Result for Constraints

	Nature of Constraints	Mean	StDev	component Matrix				Communality
				1	2	3	4	
1	Reduced availability of labour (out migration)	3.009	1.319	0.548	0.521	0.121	0.136	0.605
2	Too much rain	2.99	1.668	0.559	0.55	0.29	0.17	0.729
3	Rapid population growth	2.968	1.3	0.578	0.213	0.148	-0.067	0.406
4	Inadequate rain	2.817	1.629	0.642	0.455	-0.308	0.294	0.801
5	Less control over household heads by wives	2.747	1.355	0.449	-0.283	0.089	0.536	0.577
6	Low crop yield (pest and diseases)	2.696	1.55	0.697	0.541	-0.169	0.137	0.826
7	Low level of education and skill	2.661	1.33	0.741	0.025	0.178	-0.375	0.722
8	Poor access to market	2.619	1.351	0.701	-0.341	0.16	0.215	0.679
9	Poor infrastructure (roads)	2.616	1.411	0.701	-0.331	0.211	0.194	0.684
10	Poor nutrition education	2.616	1.291	0.645	-0.365	0.324	0.065	0.659
11	Limited access to land	2.612	1.308	0.718	0.007	0.059	-0.296	0.607
12	Poor post-harvest processing and storage technologies	2.568	1.301	0.673	-0.225	0.059	0.249	0.569
13	Community and ethnic conflicts	2.555	1.449	0.608	0.272	0.358	-0.252	0.635
14	Inadequate extension services	2.555	1.292	0.657	-0.052	0.123	-0.362	0.581
15	Poor health status	2.396	1.289	0.581	-0.308	0.303	-0.02	0.524

16	High food prices	2.354	1.374	0.667	-0.075	-0.39	0.082	0.609
17	Poverty	2.271	1.414	0.711	0.081	-0.364	-0.153	0.667
18	Bad governance	2.21	1.4	0.612	-0.16	-0.409	0.134	0.585
19	Inadequate access to improved inputs	2.102	1.286	0.59	-0.176	-0.254	-0.34	0.558
20	Inadequate loans to farmers	2.07	1.318	0.588	-0.31	-0.472	-0.148	0.687

Note: Factor loading >0.5 are highlighted in bold. The name of factors for 1, 2, 3, and 4 are 1= social and human capital deficiency, 2= environmental capital deficiency, 3= weak economic and production resources and 4= inputs-output imbalance.

Source: Field Survey, 2018

Reduced availability of labour from (out migration) was on the top of the constraints having a mean value 3.099 for the households, with a standard deviation of more than 1, stated that the respondents unanimously accept it as the highest constraint. Labour in this sense is the physical labour used on the farms because most rural youths are migrating out of the rural areas and leaving only the aged behind who do not have the energy for vigorous farming activities thereby affecting food production and supply in these households. Not all households have the means to employ labour on their farms too. This shows that labour is an important variable in agricultural production, particularly in developing countries where mechanization is rare or not feasible on small scale farms.

In the study area, human power plays a crucial role in virtually all farming activities. This situation has been attributed to use of family labour. According to the farmers, during active period of production-every householdwould have been engaged in his family farm work. The demand for labour is normally very high and expensive during the peak period of land clearing, ridging, harvesting, processing and weeding (Abdulrahman et al., 2016).

Too much rain constitutes the second major constraint with mean value 2.99 for the households. Farmers complained that this flooding made the farms to be

inaccessible and it prevented maximum use of the land. The unpredictability of rainfall by rural households as explained by the game theory affect food production of farmers. Farmers struggled to estimate the pattern of rainfall thereby risking some of their decisions on food cultivation. Too much rain often affect the production of most crops like beans, millet and guinea corn.

Rapid population growth was ranked third among the constraints with a mean value of 2.968, this may not be unconnected with recent statistic where the World Bank ranked Nigeria as the seventh most populated countries in the world with an estimated population of over 200 million people (http://worldpopulationreview.com/countries/nigeria-population accessed /7/4/17). Many rural households head give birth to so many children such that they are now competing for the available land for cultivation. Therefore, it affect the level of food production in most rural households. It is unhealthy competition over land hence, the fragmentation of farm land which make some farmers barely cultivating a hectare of land. This claim is supported by the FGD in Giwa LGA, where one of the participants said:

> we had enough land available for cultivation before in our family when we were only two, but now as we have all married and given birth to grown up children with wives, the quest for land is on the increase every day as the available farm lands are not enough for each of them to cultivate" (Mal. Adamu shika).

Therefore, inadequate land as a result of increase in household members' population is affecting the level of food production consequently leading to food insecurity among rural households.

Too low rainfall (drought) was ranked fourth among the constraints with a mean value of 2.817. This is an indication that drought is a limiting factor in

production in the study area. The rainfall experienced of recent in the study area fluctuates and seizes for weeks and months. Temporary drought sets in and this affect the production of stable crops and vegetables. Sometimes the rains fall heavily in some months unpredictably, then seizes in some weeks unpredictably leaving rural households to gamble in their daily decisions about food production, hence the applicability of game theory.

Low crop yield as a result of pests and diseases was ranked fifth among the constraints with a mean value of 2.696. Most agricultural crops are susceptible to attack by different insects and pests throughout the life cycle and the effective control of these is inevitable if reasonable yield is expected. Maize farms were affected by armyworms that fed on the top leaves and left wet, brown pellets (faeces) in most farms around Kajuru LGA. This pest and diseases attack has seriously led to low productivity which automatically represent a serious decline in quality and substantial reduction in price. This finding is similar with that of Abdulrahman *et al* (2016) who opined that pests and disease are responsible for (as causative factors) decline in cocoyam production in Kaduna State.

Poor access to market rank sixth with a mean value of 2.619. This poor access to market cannot be unconnected to the unorganized nature of our periodic rural markets which could also translate to the reasons for some of the farmers with low productivity were food isinsecure. Market information as regards good prices is also a challenge in this aspect. Markets are located in far areas which induce farmers to sell at giveaway prices to the middle men roaming their villages. This was seen in areas like Kukum, Yarkasuwa and Maigana who have periodic markets and can only access bigger markets which are not close like the smaller periodic markets.

Poor infrastructure (road) and poor nutrition education were the eight constraints both with a mean value of 2.616 each. The existence of poor road infrastructure will inevitably impact negatively on the competitiveness of African agriculture through increasing internal transport costs. Due to poor road network in some of the rural communities studied like Zaman-dabo, part of Kukum, Maigana and Mallagum; the farmers found it very difficult to bring their agricultural products to the market especially during rainy season. The implication is that the farmers dispose of their products at ridiculously low prices and are at the mercy of middlemen which reduces in the final analysis their income to meet other food needs within their households.

Limited access to land was the ninth constraint with a mean value of 2.612. This indicated that inaccessibility to land is a limiting factor in production in the study area. Land is a basic source of livelihood providing employment, the key agricultural input, and a major determinant of a farmer's access to other productive resources and services. Farmer's right to land is a critical factor in social status, economic well-being and empowerment. Limited access to land by women could be attributed to land tenure system which is strictly by inheritance.

Infrequent extension visit, community and ethnic conflicts and post-harvest losses (processing and storage technology) were found as constraints with average values 2.555, 2.558 and 2.568 respectively. The implication of few extension contacts is that information and education on improved crop varieties and modern farm techniques may not be properly disseminated to farmers. FGD participants complained that the KADP and the LGC close to them are not doing enough to educate them on new technologies in Soba LGA. More so, Luka John one of the participants during the FGD session testified that:

> We have only one extension agent in the whole of Yarkasuwa ward in Lere LGA, which is very insufficient looking at the entire population of farmers and that agent is seen once in a blue moon (Luka John).

However, it is an established fact that inadequate processing and storage facilities often lead to perishability of some crops, pest attack on farm products, glut during harvests period reduces and wastage farm produce. Similarly, processing facilities like thresher, miller and grater are very expensive to procure, highly technical for local farmers to operate and very difficult and expensive to maintain. Most farmers resort to the use of local methods such as sticks and pay for the services rendered by available stationed millers around or in most cases far from their communities. This leads to great loss in farm revenue and the risk involved in losing revenue by farmers from their investments could reduce the level of production in agriculture. Similar findings have been reported by Flaten et al., (2005). More so, community conflicts have affected food security most especially when conflict has to do with land and other productive resources. There has been attacks between farmers and herders in all the zone of the state and this has constituted a cog in the wheel of progress toward achieving food security among rural inhabitants.

Farmer's response on poor health status, lack of loan, poverty and inadequate access to improve inputs were next among the constraints with average values of 2.396, 2.070, 2.271 and 2.102 respectively. Poverty is a "basket" containing all these other variables. This implies that poverty is seen as lack of access to social and economic infrastructure such as education, health, portable water, good roads and sanitation. The perception of the farmers about poverty can be translated to; is similar to the definition provided by Etim, Edet, & Esu, (2009), who viewed poverty as the

level of deprivation that encompasses short falls or inadequacies in basic human needs, which prevent people from achieving internationally acceptable levels of well-being.

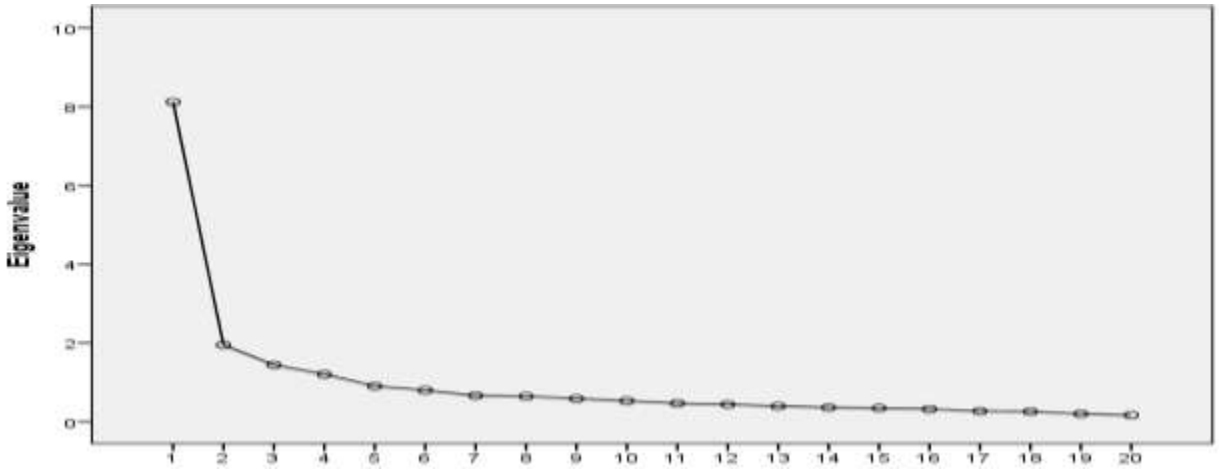
Principal component analysis was employed to transform the original constraints variables into smaller set of linear combinations. Hereafter, four factors were extracted through factor analysis for the constraints using principal component extraction method. These factors had were selected because they hadEigen values>1 with a total variance 63.5%. In social science variance ≥ 59.85 is presumed sufficient (Ahsan, 2011). Table 4.16 also presents the four factors and their relevant loading items (having value>0.50). The factors listed from 1 to 4 are given as: social and human capital deficiency, environmental capital deficiency, weak economic and production resources, and inputs-output imbalance.

Factor 1 was named as social and human capital deficiency had high loading factors on lack of education and skill, limited access to land, lack of extension services, poverty, poor infrastructure and poor health status. Factor 2 was environmental capital deficiency factor consisting of flooding, drought and pest and disease. Factor 3 named as weak economic and production resources which includes high food prices, poor access to market, poor post-harvest processing and storage technology and lack of loan. Factor 4 was named as inputs-output imbalance including reduced availability of labour (out migration), low crop yield and inadequate access to improved inputs. In the existing study factor analysis values of factor loading higher than 0.50 are reflected as significant (Flaten et al., 2005).

Further, all the alpha coefficient in bold text was higher than 0.5 the conventional cut off point and explained variance of 63%, there was an indication that the underlying construct of this factor was adequately reflected by these statements.

However, the entire alpha value in un-bold text which was less than 0.5 as the conventional cut off point implied that the statements used did not significantly contribute to the explanation of the underlying factor. Thus, these statement items were not used for any further analysis. Communalities which shows how much of the variance (i.e. the communality value which should be more than 0.5 to be considered for further analysis. Only population growth variable is removed from further steps factor analysis) in the variables has been accounted for by the extracted factors.

More so, the screen plot in Figure 4.10 shows the eigenvalues against all the factors. It was used in this analysis to determine how many factors to retain. The result revealed that the curve begins to flatten between factors 4 and 5.



Source: Field Survey, 2018

Figure 4.10: Eigenvalues against all the factors

Note also that factor 5 onwards have an eigenvalue of less than 1, so only three factors have been retained. However, the Eigenvalue actually reflects the number of extracted factors whose sum should be equal to number of items which are subjected to factor analysis. The firstsocial and human capital deficiencyfactor accounted for 40.6% of the variance, the second environmental capital deficiency factor 9.7% and the third weak economic and production resources factor 7.2%. All the remaining factors are not significant.

4.6.1 Kaiser Meyer Olkin (KMO) and Bartlett's Test

The KMO measures the sampling adequacy (which determines if the responses given by the sampled respondents are adequate or not should be closer than 0.5 for a satisfactory factor analysis to proceed. Kaiser (1974) recommend 0.5 (value for KMO) as minimum (barely accepted), values between 0.7-0.8 acceptable, and values above 0.9 are excellent. The KMO test calculates sampling acceptability and diverges between 0 and 1. If KMO value is 1, then it means each variable is completely foretold with no error by the other variables. However, for this analysis the KMO value was 0.903 for the constraint strategies (Table 4.17).

Table 4.17: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.903
Bartlett's Test of Sphericity	Approx. Chi-Square	3350.903
	Df	190
	Sig.	.000

Undecided/Neutral (U/N), 3.50-4.49 = Agree (AG) and 4.50-5.00 = Strongly Agree (SA)

Source: Field Survey, 2018

Looking at Table 4.17, the KMO measure is 0.903, which is perfect. This findings is in line with that of Von Pock, (2007) who suggested that KMO ≥0.50 is acceptable. Hence, in this study the values attained were more than 0.80, indicating that arrangement of correlation was pretty compact for factor analysis.

Bartlett's test is another indication of the strength of the relationship among variables. From the same Table 4.16, it is clear that the Bartlett's Test of sphericity is significant (0.000). That is, highly significant at 1% probability level. Bartlett's test of sphericity and χ^2 for the analysis was 3350.903, which is substantially acceptable.

4.7 Coping Strategy Adopted by Rural Households in Kaduna State

The study aimed to identify households coping mechanisms in response to food insecurity at rural household level. More than ten coping mechanism were investigated and they include: reduce size of meals, consuming less preferred and cheaper food, reducing the numbers of meals per day, purchasing food on credit, reducing ration of adults to allow more food for children, selling household assets (e.g. land), begging or engaging in degrading jobs, consuming seed stock for lack of food, skipping food consumption for an entire day, consuming immature crops, send household members to eat elsewhere, withdrawing children from school for lack of food and stealing just to feed.The coping strategies adopted by rural households in the study area in order to mitigate the effects of food insecurity are presented in Table 4.18.

Table 4.18: Coping strategies adopted by households

S/N	Coping Strategies	Freq.	%	Mean	Std. Dev
1	Reduce size of meals	193	54.4	1.6755*	1.95389
2	Consuming to less preferred and cheaper food	192	54.1	1.7593*	2.0336
3	Reducing the numbers of meals per day	181	51	1.4763*	1.81229
4	Purchasing food on credit	125	35.2	1.0263*	1.63386
5	Reducing ration of adults to allow more food for children	123	34.6	0.9342	1.576
6	Selling household assets (e.g. land)	105	29.6	0.7842	1.45133
7	Begging or engaging in degrading jobs	87	24.5	0.7632	1.62166
8	Consuming seed stock for lack of food	80	22.5	0.5289	1.21629
9	Skipping food consumption for an entire day	62	17.5	0.4	0.95437
10	Consuming immature crops	54	15.2	0.5395	1.46589
11	Send household members to eat else where	42	11.8	0.3237	1.02885
12	Withdrawing children from school for lack of food	36	10.1	0.2763	1.05018
13	Stealing just to feed	14	3.9	0.1105	0.72162

Number of observation =382
Kendall's coefficient of concordance (W) = 0.863
X2 = 1202.747
Df= 78
Sig= 0.0000

**Perceived coping strategies*
Source: Field Survey, 2018

The entries revealed that the most widely employed coping strategies by households in cushioning the effects of food insecurity include: reducing the size of meals (M=1.6755), Swapping consumption to less preferred cheaper food (M=1.7593), reducing the numbers of meal per day (M=1.4763) and purchasing food on credit (M=1.0263). This is also represented by approximately between 51% and 54% the same Table 4.18. This implies that when households are faced with food shortages, the immediate strategies that they adopted are to eat less quantity and less quality food. This is in consonance with the findings of Ibrahim et al., (2009) who reported that some coping strategies employed by households include reducing the quality and quantity of meals and the purchase of less preferred food.

Kendall's coefficient of concordance was used in this study because the Kendall's (W) provides the test of agreement of the rankers (respondents), among their rankings which the Friedman's and Garrett's test lack. Table 4.18 also presented the coefficient of concordance to be 0.863 with 78 degrees of freedom. This coefficient is significant at 1 percent. This implies that, there is 86.3 percent agreement among rankings of the respondents concerning the coping strategies of rural households choose to live always the same level of welfare. The asymptotic significance was 100%, which represents the fact that, there was a 100% agreement among the various rankings that 86.3 percent of the coefficient of concordance is correct. Therefore, it can be concluded that there is agreement among rural households concerning the chosen coping strategies ranking during period of food shortages.

The result of the study is also consistent with the findings of John, Demi & Ditchfield (2013) who examined the Food Security Status of Farming Households in the Forest Belt of the Central Region of Ghana. The study revealed that eating less

preferred food, limiting size of food consumed (rationing) and skipping meal within a day were preferred strategies households adopted to minimize the impact of food insecurity. These strategies go on to tell the level of food insecurity of households in the area to be low and not severe. However, the finding of this study does not conform with the findings of Idrissa et al., (2008) who revealed allowing that children to eat first, buying of food on credit and eating once a day as preferred strategies among the farming households in the Borno State as result of high food insecurity.

The result also revealed that rural households do cope by sales of assets to buy food. To some extent, this is to be expected, because livestock is a commonly held asset amongst rural households. This high frequency of livestock ownership and willingness to cope through the sale of livestock support the claim that farmers in rural areas of the developing world use livestock as a form of liquid savings that can be converted easily to cash whenever the need arises.

However, the least strategy used in the study area to cope with food insecurity was to steal just to feed and withdrawal of children from schools. During the FGD in Soba LG, Hamisu Soba said:

> Instead of our children to be withdrawn from schools due to shortage of food, the children are rather encouraged to attend school to benefit from the school feeding programmes in their communities (Hamisu Soba).

Their children often go to school just to secure a meal offered to them, therefore, the school feeding has recently become a coping strategy used by children of most rural households in periods of food shortage (June-September). In this situation, food crises had persisted and the household need to take a drastic action to save the situation.

It was further discovered from the FGDs some other strategies adopted by household members faced with food insecurity. Hajiya Laraba said:

> We know people that are stealing from other peoples farm just to feed in Kajuru town, but they will never accept to tell you what they do due to shame but we know it is about hardship and hunger in the area (Hajiya Laraba).

Sagir Yusuf from Soba LG also narrated some extreme coping strategies used by some food insecure households when he stated that:

> we have family members that have turn to consuming some leaves called Cassia obtusifolia "Tafasa" as food, others are into the consumption of chaff (a by-product gotten from the making) of a local soya bean cake known as "Awara", while others are always gathering leftover cooked rice during ceremonies in both near and far communities which is later washed and dried to be re-cooked some other times where there is no food to cook.

More so, the outcome of the FGDs proved that most families consume pre-matured crops around September as a coping strategy to food shortages experienced in the preceding months. Most of these strategies were seen by households as degrading as such, those who practiced these strategies borrowed food or borrowed money from relatives and not from a neighbour for fear of being insulted when conflict occurs in future. Other coping strategies adopted though by a very few respondents are sending household members to eat elsewhere, consuming immature crops most especially during the months of severe food shortage, consuming seed stock and engagement in degrading jobs to get income among others.

4. 8 Tobit Regression Result (Hypothesis Testing)

The tobit regression model was used to test the null hypothesis that states that there is no significant relationship between the socio-economic characteristics of rural farm households and their level food security status. The model was used to estimate the parameters of the determinants of level food security of rural household in Kaduna State using their socio-economic characteristics. Having identified the food insecure and food secure households; the next step is to identify the socio-economic characteristics that are correlated with the food the levels identified. It is an econometric model that has been applied for analysing factors affecting household food security levels is the Tobit model explained hereafter. This model is chosen because it has an advantage over other discrete models (Logistic and Probit) in that; it measures not only the probability that a household become food secure or insecure, but also the intensity of the food insecurity (Sisay & Edriss, 2013).

Table 4.19: Tobit Model Result on Determinant of level of Food Security

S/N	Variable	Coefficient	Standard error	b/St.Er.	P[|Z|>z]
1	Age	0.0060	0.0034	1.762*	0.0780
2	Sex	0.4441	0.0778	5.707***	0.0000
3	Marital status	0.2605	0.0536	4.859***	0.0000
4	Education	0.0931	0.0226	4.125***	0.0000
5	Household Size	0.0248	0.0068	3.664***	0.0002
6	Occupation	-0.1226	0.0483	-2.540***	0.0110
7	Sigma	0.6965	0.0263	26.510***	0.0000
Numbers of observation		382			
Log likelihood ratio test		-376.876			
ANOVA Base fit Measure		0.207			
Decomp Base fit Measure		0.55			

***p<0.001, **p < 0.05 and *p < 0.10. The p-value ≤ 0.05

Source: Field Survey, 2018

The result of the estimated truncated regression model in Table 4.19 shows that the DECOMP based fit measure is 0.55. This indicates that 55% variation in level of food security is explained by variations in the specified explanatory variables. The Likelihood ratio (LR) of -376.876 was significant at 1%, suggesting that the model has

good explanatory power on the changes in level of food security among the respondents at 95% level of confidence. Therefore, the hypothesis is rejected.

The estimated coefficient of age was positive and it significantly influenced household food security at 10% probability level. This suggests that the higher the age of the respondents, the higher the food security level; as there may be many options of making food available from both agricultural and non-agricultural opportunities. This finding is at variance with Abdulrahman *et al*., (2016) who reported an inverse relationship between age and farmers level of food security in Kaduna state

Sex is an important variable as far as farming operation is concerned depending on the geographical location. The result revealed that sex is positive and significant in influencing rural households' level of food security at 1% probability level. Male headed households were more likely to be food secure than their female counterpart. The result conforms with a prior expectation that male dominance in agricultural production is due to the labourious nature of farming operations.

Education had a direct relationship with level of food security and statistically significant at 1% level.Thus, suggesting that the higher the educational level of the household, the more they are food secure. Literacy is believed to have a positive implication on efficient procurement and use of productive resources, adoption of farm innovation and income diversification. Further, the level of education determines the level of opportunities available to improve livelihood strategies, enhance food security, and reduce the level of poverty. It affects the level of exposure to new ideas and managerial capacity in production and the perception of the household members on how to adopt and integrate innovations into the household's survival strategies. This result is in line with Abdulrahman *et al.*, (2016) who opined that educational improvement can

lead to awareness of the possible advantages of modernizing agriculture and improvement of the quality of labour.

Household size was positive and significant in influencing rural households' level of food security at 1% probability level. This implies that a larger family size may enhance labour availability that can be used for different agricultural activities (Oyewole, 2012). The significance of household size in agriculture hinges on the fact that availability of labour for farm production, the total area cultivated to different crop enterprises, the amount of farm produce retained for domestic consumption, and the marketable surplus are all determined by the size of the farm household. However, the absolute number of people in a certain family cannot be used to justify the potential for productive farm work. This is because it can be affected by some important factors namely; age, sex and health status. Essentially, it is the composition of the household that determines labour supply for the accomplishment of farm operations. While occupation is positive and significant at 1% probability level, implying that farmers who have more than one occupation are more likely to diversify than those with one occupation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Major Findings

The study was conducted to analyse the determinants of food security and coping strategies of rural households in Kaduna State, Nigeria. In order to achieve this, five objectives were set which include to determine the type of food crops that are grown and the food culture practiced; determine the food security status of rural households; assess the determinants of households food security; ascertain the constraints affecting food security of rural household and establish the coping strategies employed by rural households for food insecurity all in the study area.

The study established that over 90% of rural households were into production of staple crops such as maize, rice72% and beans69% in Kaduna State. The findings also revealed that groundnuts and yams were the least produced staple crops of rural dwellers respectively. Vegetables and fruits mainly produced were ledby okra with 45%, followed by tomatoes with 44%, pepper by 37%, bananaby 35% and mango by34%; while leading livestock reared are local chickens 69% and goats 62%. Further, pigs and dogs were reared in the southern part of the state, rams and cows reared by households in the northern part of the state.

The food culture and practices of food production revealed that men took decisions on household agricultural activities by 92%, both subsistence and commercial farming with 57% is practiced, though majorly subsistence farming; and mixed cropping with 57%. More so, farmlands were acquired in Kaduna State through inheritance by over 60% and family labour was used by 72% than mechanized

production, while food is processed traditionally/locally by 77% leading to post-harvest losses.

More so, findings revealed that over 60% of households in Kaduna State were found to be food secured while a few 34% were experiencing food insecurity occurring within the months of June, July and August of the year. The result of the coping strategies index revealed over 80% of households are food secure than those who are food insecure without hunger and food insecure with moderate hunger in the study area.

The major determinants of food security status are sex at 1% probability level and educational attainment of household heads at 1% probability level in the study area.Male-headed households are 6.9% more likely to be food secure than female headed households, while the marginal effect of 0.741 shows that one extra year of formal education increases the probability of being food secure by 7.4%. Occupation was also significant at 10% probability level, implying that farmers who have more than one occupation are more likely to diversify than those with one occupation. The marginal effect of 0.031 shows that one extra diversification increases the probability of food security by 3.1%.

However, the leading constraints to food security among rural households in Kaduna State from the findings are reduced availability of labour (out migration), too much rain, high population of households, drought and pests and diseases with mean value scores of 3.009, 2.99, 2.968, 2.817 and 2.747 respectively. Other constraints also included inadequate skills, poor infrastructure, limited access to land as a productive asset, lack of extension services available to the rural households' farmers, farmers-herders conflict and post-harvest losses as a results of lack of modern storage facilities. Further, four factors were extracted through factor analysis for the

constraints using principal component extraction method. The factors with eigenvalues >1 with a total variance 63.5% are social and human capital deficiency, environmental capital deficiency, weak economic and production resources, and inputs-output imbalance.

Rural households seldom adopt less severe coping strategies during periods of food insecurity such as reducing the size of meals, swapping consumption to less preferred cheaper food, reducing the number of meals per day and purchasing food on credit with mean values of 1.6755, 1.7593, 1.4763, and 1.0263 respectively. The Kendall's 'W' is found to be 0.863 and significant at 1% level, indicating a high level of agreement among the coping strategies by sampled households.

Lastly, the tobit regression model indicated a 55% variation in level of food security explained by variations in the specified explanatory variables. Therefore, rejected the hypothesis "there is no significant relationship between rural household's socio-economic characteristics and their level of food security".

5.2 Conclusion

It can be concluded that rural households in Kaduna State are into production of staple food crops such as cereal and leguminous crops; as well as poultry. Rural households in Kaduna State mainly acquire farmlands by inheritance; decisions within household members is the preserve of the men; Preservation and storage of food is traditionally done even as husbands control household income and also given preference in food sharing; However, the farming system is characterised by the traditional subsistence farming through the use of simple farm tools and small farm holdings. The State is potentially food secure with socio-economic variables such as household size and households' education as important determinants of food security in the study area.

Food production is constrained majorly by rural-urban drift, flood, increase in population, drought and pest and diseases affecting households. Notwithstanding, the food insecurity among households is common within the months of June, July and August where households employ severe coping strategies for survival in these moments of scarcity. Rural households in the study area adopt less severe coping strategies due to the fact that the food insecurity level is minimal. Therefore, rural households despite potentially food secure through subjective measurements are vulnerable to social and human capital deficiency, environmental capital deficiency and weak economic and production resource.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

1) Efforts should be made by government to promote rural households withimproved food production technologies in line with contemporary practices such as timely supply of farm inputs like fertilizer, pesticides and hybrid seeds. Also, to ensure access to farm management practices in order to raise their current level of production and of course their access to food for family consumption.

2) Increase in households' population pressure is increasingly limiting the access to land for cultivation which has been strongly indicated to negatively affect food security status of households. Therefore, family planning measures have to be adopted by farmers through promulgation of government policy on effective design of concepts and messages aimed at imparting knowledge about family measures. The policy should be directed towards the provision of better family planning, increased awareness and access to family planning facilities should be

given adequate attention and priority by the government and other civil society organizations. This can be carried out by government through the Ministry of Rural Development.

3) There is a need for government and agricultural related civil society organization to facilitate households into forming cooperative societies in there specialize food production to increase their income. These cooperatives can serve as avenues for loan facilities acquisition, information dissemination and inputs access from government and other stakeholders.

4) In view of the negative impact of the age of farmers on food security, there is need to encourage the youths in the rural areas to participate vigorously in farming. Food security strategies should be designed to focus on and address the identified determinants.

5) Owing to the fact that the livelihoods of over 70% of rural households in the study areas are linked to land and natural resource exploitation.Therefore, government at all levels should establish training schools and research institutes in order to encourage farmers to attend such training schools for capacity building, knowledge update and skills acquisition for the promotion of increased agricultural production.

6) Extension agents should be made available to farmers to train them on new modern processing and food productions methods. Government should embrace this modern food production technique that comes in form of agricultural biodiversity aimed at increasing livestock and crop production to ensure

sustained food security and the extension workers should be used to bringing rural farmers on board.

7) Government and the Civil Society Organization (CSO) should give support to households engaging in non-agricultural livelihoods such as micro-enterprises for food processing services, such as threshing, drying, milling, grinding, and packaging. This will encourage income and occupational diversification and value chain in primary production through income diversification so as to meet their minimum food requirements in the rural areas especially in those months of food shortage.

8) More so, Governments in Kaduna State and Nigeria through the relevant ministry of agriculture and rural development should intensify support for appropriate food storage and preservation techniques at the household and village levels to ensure food availability throughout the year and avoid wasting most especially during bumper harvest of crops like yams, mango and other perishable crops in the study area.

9) Private and public participation should be encouraged by governments at all levelstoformulate and implement policies aimed at addressing the identified constraints to food security in Kaduna State such as water shortage by constructing dams to enable irrigation farming in the dry season. This will increase food availability in all seasons of the year and ensure that more households have stability of food supply. Further, government can curtail rural-urban migration through provision of rural infrastructure to increase labour availability in farms; and pest and diseases by providing and subsidizing pesticides to farmers.

10) Rural households engaged into similar production should be organised into groups, associations, or cooperatives to enable them serve as platforms towards increasing their social capital. Such groups can also be used as platforms for nutrition education of members and rural people, providing extension services through dissemination of information on basic farm methods and technologies, facilitating access to rural agricultural credit or loans and inputs.

5.4 Contribution to Knowledge

The study revealed through subjective assessment that rural households in Kaduna State are mainly food secure (64%) except for the months of June, July and August of the year. As such, sex and educational level of rural households with a T-value of -2.368 and 2.636 respectively at 1% probability determines rural household food security in Kaduna State. More so, households are vulnerable to low availability of labour (out migration), too much rain, high population of households, drought and pest and diseases with mean values score of 3.009, 2.99, 2.968, 2.817 and 2.747 respectively, with social and human capital deficiency component which accounted for 40.6% variance mainly affecting rural household food security in the state

Lastly, the study revealed that rural households employ less severe coping strategies during periods of food insecurity such as reducing the size of meals, swapping consumption to less preferred cheaper food, reducing the number of meals per day and purchasing food on credit with mean values of 1.6755, 1.7593, 1.4763, and 1.0263 respectively. These strategies employed further explained a less incidence of food insecurity in the study area.

5.5 Suggestions for Further Studies

1. Further research could focus on the analysis of the interactions between determinants of food security and gender of the household heads in rural communities.

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APPENDICES

Appendix I: Questionnaire

DearSir/Madam,

I am a PhD research student from Ahmadu Bello University; Zaria carrying out a research on the **"Analysis of Determinants of Food Security and Coping Strategies among Rural Households in Kaduna State, Nigeria".** You are please required to give earnest and correct information which would be used for academic purpose. All information shall be treated confidentially. Your Cooperation will be highly appreciated.

Thanks
Laah D. Emmanuel

Instruction: Please tick as appropriate

Section A: Socio-Economic Characteristics of Household Heads

1. Village/ward……
2. Local Government Area (……)
3. What is your age? ……years

4. Sex: a) Male b) Female

5. Marital Status:

a) Single	b) Divorced
c) Married,	d) Widowed

6. Level of education:

a) No formal education	b) Adult education
c) Islamic education	d) Primary education
e) Secondary education	f) Tertiary education

7. What is the number of persons in your household?.....

8. What is your primary occupation

a) Farming	b) Trading
c) Civil Service	d) Artisan

Section B: Major Types of Crops Produced or Cultivated

1. Below is a list of crops; tick as many as possible the crops you cultivate/produce by your household:

Rice (A)	Maize (B)	Sorghum (C)	Millet (D)	G/nuts (E)	Cassava (F)	Yam (G)	Potato (H)
Wheat (J)	Beans (K)	Cocoyam (L)	Ginger (M)	Others			

2.

Tomatoes (A)	Cabbage(B)	Spinach (C)	Carrot (D)	Onions (E)	Pumpkins (F)	Pineapples (G)	Guavas (H)
Oranges (I)	Bananas (J)	Pawpaw (K)	Mangoes (L)	Okra (M)	Pepper (N)	Others (specify)	

3.

Goats (A)	Cow (B)	Sheep (C)	Pigs (D)	Fish (E)	Chickens (F)	Dogs (G)
Others (specify)						

4. Household Food consumption

Food Type/Quantity consume	**Daily**	**Weekly**	**Fortnightly**	**Monthly**	**Not sure**
Cereals					
Root and Tuber					

Pulse, Legumes, Nuts					
Vegetables					
Fruits					
Meat/poultry offal					
Eggs					
Fish, seafood					
Milk and milk product					
Oil/fat					
Sugar/honey					
Others (specify)					

SECTION B: FOOD CULTURE AND PRACTICES

5. Who in the household takes decision on agricultural activities?

a) Husband	b) Children
c) Wife	

6. What type of agricultural system does the household practice?

a) Subsistence	b) Commercial
c) Both	

7. What type of cropping system does the household practice?

a) Mixed cropping	b) Mono cropping
c) Both	

8. Do you use cattle to plough? **a)** Yes **b)** No
9. If yes, what is the source of the cattle? **a)** Hired **b)** own **c)** borrowed
10. What varieties of crops are preferred by the household? a) Cash crops b) Non-cash crops
11. Which are your main sources of livelihood?

a) Farming	b) Livestock raising
c) Off-farm (specify)	d) Others (specify)…

12. To which of the following processing/storage assets do you have access and use?
    a) Irrigation equipment
    b) Processing assets i.e. cereal, cassava, rice mills etc.
    c) Food storage facility
    d) None of the above
    e) Others (specify)……..
13. Which of the following production assets do you have access to and use?

a) Improved seeds	b) Technical advice	Improve breeds
f) Agro-chemicals	g) Credit and loans	

14. How does the household acquire farm land?

a) Inheritance	b) Purchase	c) Communal
c) Rent	d) Pledge	

15. What are your sources of farm labour? (**A)** Family (**b)** Hired (**c)** Exchange Labour
16. By what method of farming does the household process farm produce? **A)** Traditional Method **b)** Modern Method
17. By what method does the household preserve and store farm produce?.....
18. Who in the household controls family income? **(A**) Husband **(b)** Wife **(c)** children
19. Who in the household is given preference in food sharing? **(A)**Husband/Adults/Males **(b)**Women/Younger/girls **(c)**Children

Section C: The Level of Food Security

For each of the following questions, consider what has happened in the past 30 days.

- Please ensure whether this happened never, rarely, (once or twice), sometimes

S/N	Household food Insecurity Access Scale (HFIAS)	Never	Rarely	Sometimes	Often
1	Where you worried that your household would not have enough food				
2	Were you or any household member not able to eat the kind of food you preferred because of lack of money				
3	Where you or any of your household member eat just a few kinds of food day-after-day owing to lack of money				
4	Did you or any other household member eat food that you preferred not to eat because of lack of money to obtain other types of food?				
5	Did you or any household member eat a smaller meal than you felt you needed because there was not enough food?				
6	Did you or any household member eat fewer meals in a day because there was not enough food?				
7	Was there ever no food at all in your household because there was no money to get more?				
8	Did you or any household member go to sleep at night hungry because there was not enough food?				
9	Did you or any household member go a whole day without eating anything because there was no food?				

(3-10 times), or often (more than 10 times) in the past 30 days

In which of the last 12 months did you experience a lack of food or money such that one or more members of your household had to go hungry? Tick yes as applicable to any of the months.

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Yes												

Section D: Determinants of Food Security

In your own opinion what is the cause of food shortage in your household?

S/N	Causes of food shortages during this season	Yes	No
1	Inadequate rainfall /Drought		
2	Lack of income to buy food		
3	Low supply in the market		
4	Large HH size vis-a-vis household food production		
5	Higher prices of food stuff in the market		
6	Lack of access to herbicides and pesticides		
7	Lack of agricultural extension services		
8	Lack of modern farm technology		
9	Lack of storage facilities		
10	Household members migrate for casual employment		
11	Farmers and pastoralist; ethnic conflict effect on food production		
12	unavailability of credit loans for farming activities		
13	Lack of land ownership		
14	Inadequate improved seeds		
15	Lack of access to fertilizers,		

Section E: Coping Strategies Adopted by Rural Households for Food Insecurity

S/N	Behaviors: In the past 7 days, if there have been times when you did not have enough food or money to buy food, how many days has your household had to:	Frequency: Number of days out of the past seven: (Use numbers 0 – 7 to answer number of days; Use NA for not applicable)
1	Reduced the numbers of meal per day	
2	Skipped food consumption for an entire day	
3	Reduced in size of meals	
4	Restricted consumption of adults to allow more for children	
5	Swapped consumption to less preferred cheaper food	
6	Purchased food on credit	
7	Consumed immature crops	
8	Consumed seed stock for lack of food	
9	Send household d members to eat else were	
10	Withdrew children from school for lack of food	

11	Begged or engaged in degrading jobs	
12	Sold household assets i.e. land	
13	Stole just to feed	

Section F: Perceived Constraints to Food Security

The Table below is a list of possible constraints that may affect food security of your household, indicate the level of agreement to each of the constraints.

S/N	Constraints	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	Too much rain					
2	Too low rain (drought)					
3	Low Crop Yield (pest and diseases)					
4	Reduced availability of labour (out migration)					
5	Inadequate and lack of access to improved agri cultural inputs (seeds, fertilizers, agro chemicals and irrigation)					
6	Rapid population growth					
7	Limited access to land					
8	Lack of education and skill					
9	Poverty					
10	Lack of extension services					
11	Community and ethnic conflicts					
12	High food prices					
13	Bad governance					
14	Poor access to market					
15	Poor infrastructure (roads)					
16	Poor nutrition education					
17	Poor post-harvest processing and storage technologies					
18	Lack of control over household by women					
19	Poor health status					
20	Lack of loans to farmers					

Appendix II: FGD Guide

Check list for FGD on determinants of food security and coping strategies of rural household's in Kaduna State

Structure for recording of FGD

Date

Local Government Area----------Ward----------Village----------

Time FGD started

Time FGD ended

Attendance: Name

Photograph Picture

Interview Guide for Focus Group Discussions

1) Identify the various ways by which your culture influences your systems of crop production, distribution and utilization.
2) What is your perception of food security/insecurity?
3) What combinations of diets are eaten regularly in this village?
4) Rank your perceived constraints to food security in order of seriousness.
5) What do you do when you don't have adequate food or don't have enough money to buy food?
6) What are the main ways of getting food in your community?
7) Do you think that the people in your community have enough food throughout the year?
8) What do you think are the causes of food insecurity?
9) What other ways people have to do to improve food security in this area?
10) What is the dominant livelihood strategies pursued by the people in the area?
11) What do the communities do when there are food shortages?
12) Is there population pressure in your community and how can you evaluate its impact on food security and land?
13) How is the influence of drought on crop production?
14) What are the causes for the decline of crop production?
15) In your own opinion what is the cause of food shortage in your household?
16) What are the major crops grown in your village? Which crop is important and why? Rank according to their importance.
17) In which months do many household experience food shortages within a year and why?
18) What ways do these household uses to cope with food shortages

Appendix III: Coping Strategies Severity Ranking Template

You should please rank the severity of the following coping strategies in your communities using a range of weights from one to four from lowest (least severe) to highest (most severe).

1 Dietary Change		
A Rely on less preferred and less expensive foods		
2 Increase Short-Term Household Food Availability		
	B=Borrow food from a friend or relative	
	C=Purchase food on credit	
	D=Gather wild food, hunt, or harvest immature crops	
	E=Consume seed stock held for next season	
3 Decrease Numbers of People		
	F =Send children to eat with neighbours	
	G=Send household members to beg	
4 Rationing Strategies		
	H=Limit portion size at mealtimes	
	I=Restrict consumption by adults in order for small children to eat	
	J=Feed working members of HH at the expense of non-working members	
	K=Reduce number of meals eaten in a day	
	L=Skip entire days without eating	