CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Food is the most basic necessity for the existence of man. It gives nourishment and strength to the human body. It is regarded as the highest on the scale of human wants and needs (Obayelu, 2010). Hence, a major objective of national policy is to provide adequate access to good and nutritious food for the healthy living of the populace. Additionally, food intake has been found to have a solid linkage with both productivity and human wellbeing (Aromolaran, 2004). The human body needs energy derived from food to maintain normal body functions and carry out productive activities (Babatunde, 2010). In a developing country like Nigeria, the expenditure/consumption pattern shifts towards food and this makes it account for the highest proportion of the total expenditure. However, in developed countries, the reverse is the situation. Also, there is a change in the kind of food items as well as the non-food items that are consumed from one locality to the other (NBS, 2006).

In an agrarian society like Nigeria, the place of agriculture cannot be overemphasized, given its importance in the life of human beings. Primarily, adequate supply of food to the people in such a society is expected to be ensured by agriculture (Edun and Haruna, 2013). Nigeria is endowed with a lot of natural resources and has considerable agricultural potential. The country has a large expanse of land of about 92.38 million hectares, comprising 1.3 and 91.1 million hectares of water bodies and land respectively. The area for agriculture is 83.6 million hectares, consisting of 47.9% pasture, 33.8% of arable land, 13.0% forest or woods, 2.9% of land permanently in crops, and 2.4% of irrigable land or Fadama (Adetunji, 2006). But less than half of this area is being cultivated at present. Agriculture remains the most feasible way of feeding the nation amidst the several alternatives that the global market presents. It has also proved to be the main factor in the growth of the economy of Nigeria as well as the main source of national food security (Fashogbon, 2011).

About three-quarters of Nigeria's working population are involved in agriculture. They, however, cultivate generally small and scattered agricultural landholdings (Oni, 2009). Farm plots per household ranges between 2 and 28 plots and between 0.5 and 5.0 hectares, which increases in size from the southern to the northern area, resulting in low capitalization and low yield of crop per hectare (Ogundari and Ojo, 2007). Generally, farming is rain fed and of the largely subsistence variety. Food crops (produced largely for consumption) and industrial/ export products are the two major types of crops that is cultivated in the country. Nigeria is listed by the Food and Agriculture Organization (FAO) to be among the nations that cannot meet all their food requirements at present from her reduced inputs and cultivation of crops. This may remain so for some time even when the level of input is improved a little bit. (Isife and Okorie, 2014).

The rising fuel costs, sporadic climate patterns, and the increase in the use of land for the cultivation of crops for bio-fuels are factors affecting the global food crisis. Rising incomes in poorer nations have equally increased food demand, thus reducing global reserves (ECOSOC, 2008).

Food demand is a crucial area of study for economists in any age. It relies upon various variables such as own-price, prices of other substitutes, income and consumer preferences. It also depends on demographic factors which include the age distribution and levels of the household size (Udoh, 2013). The theory of demand is used extensively to decide household or individual consumption behaviour. Price and expenditure elasticity give profitable data on the way buyers respond to changes in income and price. This fact is valuable in research designs and food policies for different categories of consumers (Abdullai and Auberta, 2004). In the past, the study of demand (Pollack and Wales, 1978) concentrated on specifications of models representing the agent's consumption decisions. Lately, studies on demand have concentrated on the analysis of consumer demand behaviours and various factors influencing them (Abdullai and Auberta, 2004). Findings in the greater part of these investigations are imperative on the need to design options for development policies.

As a result of the great increase in the population of Nigeria to 196 million and a yearly percentage increase of 2.61% (NBS, 2017) which has resulted in an overwhelming pressure on the demand for food, there is therefore, the pressing need to keep on carrying out more research on food demand. The unstable rate of inflation has significantly debased household incomes in the nation while the prices of foods keep on soaring daily and, ultimately, making it unavailable for the common man. The food price index rose from 91.1% in 2000 to 174.6% in 2017 (FAO, 2018); in Nigeria the consumer price index for food rose outrageously to 278.6 index points in February, 2019 from 14.36 index points in January, 1995 (CBN, 2019). This proves that households' income can scarcely withstand increasing food prices, which have contributed greatly to the poor purchasing power of households and negatively affected their expenditure pattern (Asagunla and Agbede, 2018).

Likewise, income growth is one of the major variables driving changes in global food demand/consumption patterns in both developed and developing nations. As the purchasing power of households on food increases among a lot of consumers in the world, they tend to move to more costly types of foods. However, various nations with different income levels respond to demand in distinct ways; nations with low income react more to changes in income than nations with moderate or high income (Gao, 1996). Among consumption items, the magnitude of demand responses changes consumption groups that are staples. For example, clothing and food have a lower response to changes in income whereas consumption groups like medical care, rent and other luxuries, for example, recreation, have higher responses to income (Seale *et al*, 2003).

The study of the food demand structure in Nigeria appears to have acquired added impetus in recent years. This is due largely to the intense and still increasing demand pressure on food, both in rural and urban areas, arising from the rapid rates of population growth in Nigeria, increasing rural - urban migration, the growing importance of the food and nutrition status as an indication of national socio-economic development and the use of food in relief operations in theatres of war, natural disasters and famines around the world (Obayelu, 2010). For a developing country like Nigeria, it is therefore, important to carry out food demand surveys, especially in the rural areas where a larger proportion of the populace live and where also the productive base of the economy, involving agriculture and its associated activities, is located. Also of importance is the need for a food demand survey in urban areas, in order to analyse the patterns of urban household food demand and to compare them with the rural areas so as to guide policy makers in assessing urban households' per capita expenditure in relation to the nutritional needs for an active and a healthy life.

1.2 Problem Statement

Adequate amounts and quality of food are essential in influencing our capacity to survive, flourish and learn (Morduch, 1995). The extent of food demand essentially depends on its price and the population, income and dietary habits of the people under consideration. Nigeria's population, according to the National Population Commission (NPC, 2006) increased from 55,670,055 in 1963 to 140,005,542 in 2006 representing an increase of 151.5% in 43years. Over 70% of the working adult population are employed in the agrarian sector, directly or indirectly. Nigeria's agrarian yield comes from peasant farmers living in the rural areas, where 65% of the populace dwell (Omonona, 2000). Most of these farmers have restricted access to present-day farming inputs and other gainful resources, thereby making the supply of food fall short of its demand (Okolo, 2006). The world food consumption in kcal/individual/day grew from an average of 2370 from 1990 - 1992 to 2560 from 1995 - 1997 and finally to 2600 from

2003 –2005. Currently it has grown to 2900 kcal/person/day in 2015 and will increase to 3050 in 2030 (FAO, 2008). In Nigeria, food consumption in kcal/individual/day grew from 2000 in 1984/86 to 2815 in 1997/99. This development was accompanied by significant structural changes. Diets moved from staples, for example, roots and tuber, towards more livestock, vegetable oils and fruits. The increase in the consumption of rice and wheat has led to an increase in its demand, thereby leading to a rise in its importation (Erhabor and Ojorgho, 2011).

Also, post-harvest losses are on the increase because harvesting, processing, transportation and storage techniques are inefficient; as a result, supply is unstable. In developing countries, 40% of losses occur at post-harvest and processing levels. Roughly one-third of the food produced in the world for human consumption every year get lost or wasted (FAO, 2018). When these losses are reduced, it would raise the quantity of food available for human consumption and enhance global food security, a growing concern with increasing food prices due to growing consumer demand, increasing demand for biofuels and other industrial uses and increasing weather variability (Mundial, 2008; Trostle, 2010). In addition, crop production contributes a significant proportion of typical incomes in certain regions of the world (70% in sub-Saharan Africa) and reducing food loss can directly increase the real incomes of the producers (World Bank, 2011). Average per capita income has dramatically increased throughout the years, consequently leading to a rise in demand for food and dietary shift (World Bank, 2005).

In spite of the scope for improving agricultural growth and various poverty-reducing agricultural programmes initiated by the federal government, it has been averred that food demand for the growing population in Nigeria is of importance to international as well as government organisations. The structure of food demand in the country has also been changing as a result of changes in population, personal income levels, rapid rate of urbanisation and tastes and changing preferences for food items. The south-western part of Nigeria is changing and increasingly becoming urbanized; it is therefore likely that the structure of food demand has changed from what it used to be. Therefore, there is need for an assessment of the food demand and expenditure patterns in south west Nigeria to provide the empirical evidence required to understand the issues involved in designing an appropriate mix of policies such as effective price and income support policies for national and regional planning. Moreover, understanding the impact of demographic and socio-economic characteristics of households on food demand in Nigeria is germane to evolving appropriate policy instruments to enhance people's welfare. Furthermore, a great deal of probing investigations (analytical as well as empirical) is needed as background to understand food demand structures for appropriate public policies and actions for eradicating famine and eliminating endemic under-nutrition. More evidence on this issue is important, especially at the household level, as evidences at the macro level may not be appropriate for bringing about possible solutions. Also, information on comparative analysis of demand for food among rural and urban households is scanty. The present study attempts to fill this gap by providing further evidence on the understanding of food demand structures in south west Nigeria.

Following from the above, the study intends to answer the following questions in order to be able to assess the factors that determine demand for food by households in south west Nigeria:

- What is the household expenditure pattern in respect of the different food groups in the study area?
- What are the factors determining households' food demand in the study area?
- How do factors determining households’ food demand also affect households’ budget shares on food groups?
- How do price and income affect household’s expenditure on food groups?

1.3 Objectives of the Study

The main objective of this study is to examine household food demand in south west Nigeria. The specific objectives are to:

(i) profile the food expenditure patterns of rural and urban households,

(ii) determine the composition of food groups in the rural and urban areas and across income quintiles,

(iii) assess factors influencing households’ demand for various food groups and

(iv) estimate expenditure and price elasticities of demand for food groups.

1.4 Research Hypotheses

The following hypotheses were tested: These are stated in the null form

Ho_1: There is no significant difference in food group expenditure shares in rural and urban households in the study area.

$Ho_{2:}$ There is no significant difference in households’ food group expenditure shares across income (expenditure) groups in the study area.

$Ho_{3:}$ There is no significant relationship between demand for food groups and households’ socio-economic and demographic characteristics in the study area.

1.5 Justification of the Study

The motivation for this study stems from a number of important considerations. The importance of studies on food cannot be over-emphasized since the knowledge on food demand is essential both to improve development planning as well as policy decision-making. Research on household demand has to be a continuous one since food problems is dynamic, changing in magnitude and nature over phases of economic development. The increasing demand from an increasing population and rising incomes has been hard for agricultural production to meet up with. There is a low-level capacity for agriculture to satisfy the food and fibre needs of the country (FAO, 2018). The rates of growth in the production of the main foods in Nigeria have not been adequate to meet the demand of a growing populace. Statistics reveal that as population growth increases by 3.2%, production of food grows at 2.5% whereas demand for food has also been increasing at a rate higher than 3.5% annually (Ambali *et al*, 2012).

Additionally, a true perception of the consumption implications of food production policies is just starting to develop. Food production and consumption affect each other (Tsegai, 2009). A sufficiently effective demand for food is required to sustain the increase in food production since producers require market for their products. Also, consumption parameters give important data on the linkages between food consumption and motivating forces for agricultural production, through the marketing system. For example, to formulate policies and programmes in relation to diversification of crops, the readily obtainable commodity-wise disaggregated food demand parameter is basic (Tsegai, 2009). Moreover, it is obvious that the economy of Nigeria had been developing at a somewhat swift rate over the previous decenniums or so (Obayelu, 2010). Accordingly, over this past decade, the average per capita income dramatically increased and its consequence on food demand is evident:

Subsequently, we see affluence or people living in luxury existing together with those living in abject poverty. This implies that a good number of the populace may at present fall short in terms of energy and protein intake. The different households living in urban and rural areas, and also across the various income groups' exhibit food demand behaviours that vary fundamentally (Chisanga and Zulu-Mbata, 2018). This infers that a precise analysis of the patterns of expenditure on food in south west Nigeria needs an investigation that is meant to capture these distinctions in demand behaviour. The study analyses expenditure patterns on food in south west Nigeria, taking into cognizance the contrasts in the demand behaviour across urban and rural households and throughout the various income groups. It is hoped that information from the study will provide a deeper understanding on food demand structures in the study area, and permit the formulation or review of more effective food policies and programs.

The study also seeks to assess the various factors affecting household food demand in study area. Findings from it are essential to design development policies for improved food expenditure patterns in households. The study uses the Quaids model which, unlike most other demand models, permits varying income elasticities on the demand curve. The impacts of the remaining socio-economic characteristics with the exception of income on the household's expenditure shares and prices of commodities can also be captured. Likewise, it allows goods to be grouped as necessities at some level and luxuries at other levels of income. It is based on some underlying indirect utility function. It also has the property of Engel function that is non-linear which fits more into household information (Banks *et al,* 1997). The study differentiates itself from past studies on food demand or food consumption/expenditure in terms of its objectives, methodology, study areas and policy relevance. Some of the earlier studies either limited their scope to food demand in rural households or farming households in one or two local government areas within a state. But this study covers the entire households across the selected states taking into consideration the comparative analysis of demand for food amidst households in urban and rural areas and various income groups. Some of the studies which have looked into structures of the demand for food in urban and/or rural areas are Young and Hamdok (1994); Soe *et al (*1994); Awudu *(*2004); Obayelu (2010); Fashogbon and Oni (2012). In any case, there is still need to investigate in full the question of whether the factors that influence food demand contrast amongst rural and urban areas Ecker *et al* (2011) and what the effects of these distinctions are for the design and operation of food policy and programmes.

This study hopes to complement Obayelu's work on one hand because it uses the QUAIDS model too to examine the impact of the socio-economic and demographic variables/factors on the expenditure share of the various food groups. Moreover, the study hope to extend Obayelu's work by supplying a more detailed analysis on the factors that influences food demand in south west Nigeria since consumption/expenditure patterns differ from one zone to another. Furthermore, as a result of scanty information on comparative analysis of food demand among rural households and urban households, this study investigated the expenditure patterns and food demand of both rural and urban households as well as across various income groups to discover whether or not they differ so as to provide useful information for policy design.

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1.6 Organization of the Report

The report is divided into five chapters. Chapter two presents literature review, the theoretical/conceptual framework for the study as well as the analytical review. Chapter three presents the methodology adopted in the study. These include the study area description, the sampling techniques, measurement of variables and the analytical techniques adopted. The empirical results are discussed in chapter four while chapter five concludes the report with summary, conclusions, recommendations as well as suggestions for further studies.

CHAPTER TWO

LITERATURE REVIEW

The literature on the theory of demand and empirical estimation of consumer demand is reviewed in this chapter. The sections discusses the theory of demand, demand functions, elasticity of demand, price elasticity of demand, demand analysis, global trend in food demand, food demand in Nigeria. The literature on the methodologies for carrying out food demand analysis, approaches to estimating food demand equations, zero expenditure issues, determinants in food demand analysis, empirical review of household food demand studies, empirical evidences on factors affecting food demand and conceptual framework used in the study is also reviewed.

2.1 Theoretical Review

2.1.1 The theory of demand

Demand theory is a principle relating to the relationship between consumer demand for goods and services and their prices. Demand theory forms the basis for the demand curve, which relates consumer desire to the amount of goods available. As more of a good or service is available, demand drops and so does the equilibrium price.

Demand is defined as the quantity of a product or a service that a buyer has the willingness and ability to purchase at a particular price in a given time frame. Every one of the buyers has an individual demand for certain goods and services and the level of demand at each market price shows the value buyers put on an item and the expected satisfaction gained from buying and consumption. Market demand is the aggregate of the demand of individuals for an item from every consumer in the market. Demand must be effective, which means a consumer's desire to purchase an item must be backed up by the ability to pay for the item. Buyers must have adequate purchasing power to have any impact on the allocation of scarce resources to the production of an item. The demand for an item, X, may be strongly connected to the demand for a related item, Y.

The price of a commodity and the quantity of it demanded are inversely related, other factors remaining constant. An increase in the price of a commodity leads to a contraction in demand whereas a reduction in the price of a commodity causes an expansion in demand. The relationship that exists between the quantities of an item demanded and the price of that item in a given period of time is revealed by a demand curve, assuming all other factors of demand are held constant. Income, consumer preferences and prices of other goods are three factors held constant when deriving a demand curve. A change in any of these variables causes the demand curve to move or shift to another position whereas a change in the price of the good (change in quantity demanded) causes movement along the demand curve. A change in price affects the demand for a good which can be disaggregated into two components: the substitution effect and the income effect. The substitution effect is constantly negative while the income effect might be negative or positive, contingent upon the kind of good. Income effect occurs when there is a reduction in the price of an item on the grounds that a buyer can keep up with his or her present consumption level for less expenditure. As long as the item is normal, a portion of the subsequent increment in real income is used by buyers to increase the purchase of the good. Substitution effect occurs when the price of an item decreases on the grounds that the item is currently generally less expensive than alternative ones, thereby causing a change in the demand for other competitive goods to the moderately less expensive one.

For a normal good, substitution and income effects fortify each other. The two effects result in an increase in quantity demanded when price falls while when the price of a commodity increases, the two effects result in a fall in quantity demanded. For a normal good, therefore, the direction of change in its price and that of the change in the quantity purchased is always negative, that is, the relationship is inverse, since both income and substitution effects are negative. Hence, the total effect, which is the sum of both, is also negative. The normal good, therefore, obeys the law of demand. The two effects on an inferior good move in opposite directions. The substitution effect results in a fall in the quantity demanded as price increases but the reverse is the case in respect of the income effect. In the case of a fall in price, the substitution effect results in a rise in quantity demanded, but the opposite is the case for the income effect. The income effect is positive for an inferior good in the sense that a decrease in the price of a good results in a decrease in the quantity purchased of the good due to the income effect alone and vice versa. The total effect of the price change is negative because the negative substitution effect more than offsets the positive income effect. The inferior good also obeys the law of demand. The demand curve, therefore, remains negatively sloped, as with the normal good, but less price-elastic than in the case of normal good because the total effect of a price change is lower for an inferior good relative to the total effect of a corresponding price change for a normal good.

In the case of Giffen’s good, the substitution effect of a decrease in the price of a good is still negative, like in all other cases; but the income effect is positive, as in the case of the inferior good. Moreover, the positive income effect of a price change is stronger than the negative substitution effect in absolute value, hence there would be a positive relationship between price and quantity demanded. The Slutsky theorem describes the substitution effect of a price change. The theorem states that the substitution effect of a price change is always negative. The law of demand derives from this theorem in the sense that the inverse (negative) relationship between price change and the quantity of a commodity demanded, as stipulated by the law of demand, derives primarily from the negative substitution effect of price change.

All goods are related in consumption, either as substitutes or as complements.

Complementary Goods: These are two goods used together to satisfy a want; they enhance each other's utility in consumption or complement each other in providing consumer satisfaction. Examples are petrol and automobiles, pen and ink, tea and sugar. A decrease in the price of a product increases the demand for its complement. For instance, the demand for petrol increases when prices of vehicles reduce. Also, with a drop in the price of ink, the demand for pens increases. Demand for a product is inversely related to the price of its complement.

Substitute Goods: These are commodities which can be used to replace one another; they are alternative sources of providing a consumer with a required satisfaction or utility. Examples are tea and coffee, scooter and motorcycle, palm oil and groundnut oil, among others. The presence of alternative goods (substitutes) to meet a given demand divides the total demand among the wide range of goods. Increase in the number of substitutes brings about a fall in the demand for anyone of them. For instance, if the price of coffee rises, the demand for its substitute (tea) rises. The demand for a good is directly related to the price of its substitute. A decrease in price of a good leads to a fall in demand for its substitute, and an increase in the price of a good leads to a rise in the demand for its substitute.

We also have different kinds of goods which include normal goods, inferior goods and luxury goods.

Normal Goods: These are goods whose demand increases as the real income of an individual increases but its demand falls when income falls, while prices remain constant. The coefficient of the income elasticity is positive and lower than 1.

Inferior Goods: These are goods in which a rise in income results in a fall in their demand. The income elasticity has a negative coefficient. For example, (Tesco value bread) when income increases, one could buy higher quality bread.

Luxury Goods: Increase in income leads to a higher percentage increase in demand; the income elasticity is greater than 1. Note that a luxury good can also be a normal good but a normal good is not necessarily a luxury good.

2.1.2 Demand function

With the exception of price, a change in any of the other factors affecting demand (income, prices of substitute commodity) makes the demand curve to shift while a change in the price of the commodity itself results in a movement along the demand curve. The demand function for a commodity in a market can be expressed as

$Qd = f(P, P^s, Y, T, E)$……………………….(2.1)

where:

Q_d = quantity demanded

P = price of the commodity itself

P^s = prices of other commodities that may be substitutes or complements

Y = consumer income

T = taste and preferences of the consumer

E = other socio-economic characteristics of the consumer.

The theory of demand shows that there is an inverse relationship between the quantity of a product demanded (Q_1 to Q_2) and the own price of the product (direct price effect, P_1 to P_2). In other words, with other factors remaining constant, when the price of such goods rises, there will be a fall in the quantity purchased (Fig. 2.1). However, relationship between the quantity of a commodity demanded and the prices of other commodities may be positive, negative or zero. This is referred to as the price-cross effect. For substitute products, the relationship that exists between the price of one and the demand for another is expected to be positive, while it is likely to be negative for complementary goods. That is, a rise in the price of a product will trigger a reduction in the demand for the other. For independent products however, the relationship is expected to be zero, indicating that the price of one does not influence the demand for another (Leth-Petersen, 2002). Apart from price, the income of the buyer also has an effect on the quantity of a product demanded [q=f(y)]. That is, as a consumer's income (y_1 to y_2) increases, quantity of commodities demanded (q_1 to q_2) are expected to increase while that of other commodities, known as 'inferior', are expected to decrease.

Consumer behaviour is the action shown by consumers while making decision to select household and consumer items. The theory of household consumer behaviour is based on the concept of consumer preference and the assumed existence of a consumer utility function.

The consumer is assumed to be rational and the market, perfectly competitive. Hence, the consumer is identified as a utility maximiser. The classical theory of consumer behaviour rests on the concept of optimum choice under constraint, with the assumption of consumer rationality. A consumer chooses a commodity bundle in accordance with his preferences, under the constraints of market prices, consumer income and assets (physical, social, human). A rational consumer thus seeks to maximise the utility of the commodity within his budget constraints.

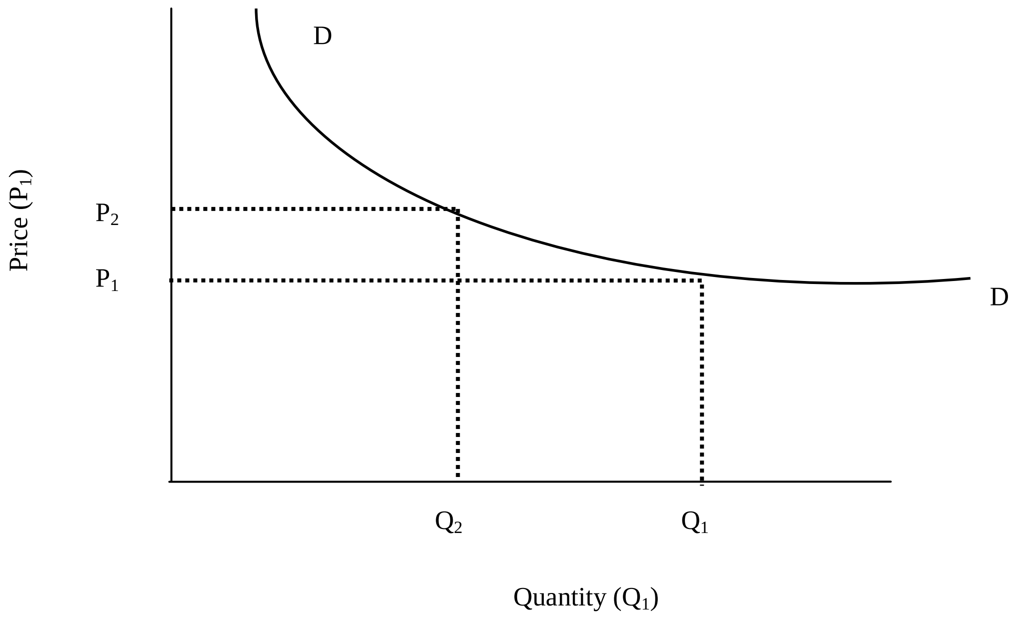

Figure 2.1: Hypothetical demand curve showing the relationship between price and the quantity of the commodity demanded.
Source: Obayelu, 2010

2.1.3 Elasticity of demand

A number of different elasticity measures are linked with functions of demand. Each of the elasticity measures shows the responsiveness of quantity demanded to changes in a certain variable. An elasticity coefficient can be said to be the percentage change in quantity demanded in response to a 1% change in the relevant variable, all other things being equal. Hence, the elasticity is partial. The best available indicator of how households react to policies is demand elasticities, which change relative to prices and the level and distribution of income (Huseyin, 2003). Elasticity could be measured at a point or between two points along the demand curve (point and arc elasticity respectively), (Adegeye and Dittoh, 1985).

Elasticity in response to change in factors of demand could be equal to, less or greater than 1. When equal to 1, we have unitary elasticity where the response of the quantity of a commodity demanded by a consumer or buyer is the same as the change in the demand factor; that is, a 1% rise in the price of a commodity will be equal to a 1% decrease in demand for that commodity and vice versa. An infinitely large or small change in quantity demanded in response to a relative change in factors of demand represents perfectly elastic and perfectly inelastic demand respectively. That is, for elastic demand, a price increase will result in an increase in the purchased quantity whereas for inelastic demand, a price increase indicates that the fall in quantity purchased will be relatively smaller than the price increment. Zero elasticity is observed when a relative change in factors of demand has no effect on the quantity of a commodity demanded. Relative elasticity occurs when we have less than 1% change in quantity demanded in response to a 1% change in the demand factor.

Elasticity of substitution on the other hand, measures the extent to which one commodity can be substituted for another and still remain on the indifference curve. The value ranges from infinity to zero. Infinite elasticity occurs when the two commodities are perfect substitutes as represented by a linear indifference curve. If two commodities are perfect substitutes, they are economically the same commodity. However, many commodities are likely to have high elasticities of substitution. The zero elasticity occurs when the two commodities cannot be substituted for each other as indicated by the L-shaped indifference curve. In practice, it is difficult to find many commodities that are perfect complements, but there are many that have a very low elasticity of substitution. One of the most important implications of elasticity is the relationship between elasticity and total revenue or expenditure. Price elasticity of demand is the most vital elasticity.

2.1.4 Price elasticities of demand

The most essential elasticity coefficients are own-price elasticity, price-cross elasticity and income elasticity.

- **Own-price elasticity of demand**: This refers to the proportionate change in quantity demanded in response to a proportionate change in its own-price, keeping other variables constant. It determines how a price change affects total spending on a commodity. The price elasticity coefficient is normally negative, except in the Giffen's case. A negative own-price shows that a rise in the price of a commodity results in a fall in the demand for it. When its absolute value is less than unity, it is said to be a price-inelastic demand; it is unity for unitary price elasticity of demand and higher than unity for price elastic demand. For inelastic demand, an increase in price means that the fall in the quantity purchased will be relatively smaller than the rise in price. So, the consumer's total expense for the commodity in question increases. Where the demand is elastic, the reverse is what is obtained as the price of the item increases (Fog, 1992).
- **Price-cross elasticity of demand**: This is the proportionate change in quantity demanded in response to a proportionate change in the price of another commodity, given other factors. The sign of the coefficient of the price cross elasticity is positive for substitutes; that is, when the price of commodity *i,* rises, the consumers will move towards demanding commodity *j*. However, the sign is negative for complements; that is, a fall in the demand for commodity *i* as a result of an increase in its price will cause a fall in the demand for commodity *j*.
- **Income elasticity of demand**: It refers to the proportionate change in quantity demanded in response to a proportionate change in income. The income elasticity coefficient is always positive and may be higher than unity, equal to unity or less than unity. It is often used to categorise commodities into luxuries and necessities. Commodities with income elasticity coefficient greater than unity are luxuries and are said to be demand-elastic with respect to income while those with income elasticity coefficients that are unity or less are necessities and are said to be demand-inelastic with respect to income. If e_i is greater than 1, it indicates that an increasing proportion of the consumer's income is spent on the commodity as the income increases; commodities in this case are luxury goods. If e_i is less than 1, the proportion of income spent on the commodity falls as income increases, hence the goods are called necessities. Unitary income elasticity is considered roughly as the dividing line separating luxury commodities necessities

Mathematically, the elasticities of demand are represented as thus:

Price elasticity of demand (e_p) $= \frac{\delta q_i}{\delta p_i} \cdot \frac{p_i}{q_i}$ ……………(2.2)

Income elasticity (e_i) $= \frac{\delta q_i}{\delta y} \cdot \frac{y}{q_i}$ .... (2.3)

Price-cross elasticity (e_{ij}) $= \frac{\delta q_i}{\delta p_j} \cdot \frac{p_j}{q_i}$ ....(2.4)

where

P_i = price on the ith good

q_i = quantity demanded for the ith good

P_j = prices of related goods, and

y = money income

A commodity with a price elasticity that is greater than unity is said to be price-elastic and one with a price elasticity smaller than unity is said to be price-inelastic. A given percentage increase in the price of a price-elastic good will decrease the quantity of the good demanded by a greater percentage than for a commodity (e.g food) that is price-inelastic.

Table 2.1 Effects of Price Change

Elasticity	Price Change	% Changes	Expenditure
Inelastic	Increase	% Δ P > % Δ X	Rises
	Decrease	% Δ P < % Δ X	Falls
Unit Elastic	Either	% Δ P = % Δ X	No change
Elastic	Increase	% Δ P < % Δ X	Falls
	Decrease	% Δ P > % Δ X	Rises

- If e_{px}> -1, demand is inelastic
  - price rises, so does total expenditure on x
- If e_{px}< -1, demand is elastic
  - price rises, and total expenditure on x falls

Marshallian and Hicksian Elasticities of Demand

The elasticities of price are obtained from both Hicksian and Marshallian demand equations. The Hicksian demand equation is derived by solving the dual problem of expenditure minimisation at a certain utility level whereas a Marshallian demand equation is derived from maximising utility subject to a budget constraint (Obayelu, 2010). Compensated or Hicksian elasticities are elasticities obtained from the Hicksian demand function while Uncompensated or Marshallian elasticities are elasticities obtained from Marshallian demand functions. However, the Slutsky equation can be used to convert Marshallian elasticities into Hicksian elasticities (Gravelle and Rees, 1992; Nicholson, 1992). The utility from the Marshallian function is computed directly as a function of consumption or commodities bought whereas the utility from the indirect utility function is computed as a function of income and prices. The expenditure function approach is another method where we use the demand functions by Hicksian which rely upon utility level and prices. The key distinction between these two demand functions (Hicksian and Marshallian) is that at a price increase on a commodity, the buyer should remain on the same level of satisfaction before and after the price increment, when we look at the change in the Hicksian demand. Along these lines, it is assumed that the buyer receives some pay back for a rise in price through income increment. Subsequently, the income effect is not considered, so that only the substitution effect remains. The reverse is the case for the Marshallian demand, where the utility level might change and the income remains constant (Pedersen, 1998). It is important to use the compensated elasticities when using the Hicksian demand functions. These elasticities mean the same thing as in the non-compensated or general elasticities, aside the fact that their computation is based on the Hicksian demand function and not the Marshallian demand function which is used for non-compensated elasticities.

Numerically, the compensated own-price elasticity is smaller than the non-compensated (general) own-price elasticity, because the compensated own-price elasticity is computed by maintaining the utility level while non-compensated elasticity is discovered by considering the percentage change in price for a maintained income level. The disparity between the compensated and non–compensated elasticities is equivalent in the same way to the total budget share spent by the buyer on commodity *i*. This means that the larger the proportion of the budget expended on commodity *i*, the more the buyer gets influenced by an increase in the price of commodity *i*. The reason why compensated price-cross elasticity is numerically higher than the non-compensated price-cross elasticity can also be explained with the same argument. Marshallian demand is uncompensated due to the fact that without figuring in the thought that the agent now achieves a different level of utility, it solves the new optimal level of input. At the end of the day, the buyer's response can be categorised into substitution and income effects, when p_j changes.

Substitution effect: At the point when pj changes, regardless of whether or not the individual stays on the same indifference curve, his optimal choice x_j will change in the light of the fact that the MRS must be equivalent to the new price ratio. Naturally, the change in p_j makes a commodity relatively less attractive at the margin and initiates substitution away from that commodity.

Income effect: At the point when pj changes, regardless of whether MRS remains the same, the individual's optimal choice, xj, will change since real income changes and he should shift to another indifference curve. Instinctively, the change in p_j changes the cost of infra-marginal units of commodity j, changing the budget set and, in this way, utility.

Marshallian demand shows both substitution and income effects. For substitution effect, the utility u is held constant, and the relative price of commodity x is allowed to change. Whereas, for Income effect, the tradeoff between commodity x and y is held constant, and the real income moves out. The Hicksian (Compensated) demand reflects just the substitution effect. The Slutsky equation shows that the compensated and uncompensated price elasticities will be similar if:

- the share of income devoted to *x* is small
- the income elasticity of *x* is small

The Slutsky Equation disintegration gives an insight into the connection between the Hicksian compensated demand curve for x and the Marshallian uncompensated demand curve for x. The slopes of the two demand curves, assessed from some common starting parameter environment, differs by the income effect.

In the case of the normal commodity, the Marshallian demand curve is flatter than the relevant Hicksian demand curve. The Marshallian demand x_i $(p_1,\dots,p_n ,m)$ portrays how consumption differs with prices and income, and results from maximising utility, subject to budget constraint. The Hicksian demand h_i $(p_1,\dots,p_n ,u)$ depicts how consumption shifts with prices and utility, and is acquired by minimising expenditure, subject to utility constraint. An adjustment in the price of a commodity changes the slope of the budget constraint. At the point when price changes, the two effects that become an integral factor are substitution effect and income effect; we separate these effects using the Slutsky equation. For a normal commodity, the Hicksian demand curve is less responsive to changes in price than the uncompensated demand curve. The uncompensated demand curve shows both income and substitution effects while the compensated demand curve reflects just substitution effects.

Producers also utilise Price Elasticity of Demand (PED) estimates to anticipate the effect of an adjustment in price on the total revenue and expenditure on an item. The likely price unpredictability in a market following sudden changes in supply is essential for producers of goods who may experience big price movements from time to time. The impact of an adjustment in a government indirect tax on price, quantity demanded and whether the business can pass on a few or greater parts of the taxes to the purchasers are additionally imperative derivatives of PED. Data on the price elasticity of demand can be utilised by a business as an aspect of a policy of price discrimination. This is the place a monopoly supplier chooses to charge different prices for the same commodity at the various segments of the market. The price elasticity of demand can be applied to various problems in which one needs to be aware of the expected change in quantity demanded or revenue, given a contemplated change in price. Elasticity is an essential idea in understanding the incidence of indirect taxation, wealth distribution and different kinds of commodities as they relate to the theory of consumer choice. Elasticity is also vitally essential in any discussion of welfare distribution, specifically consumer surplus, producer surplus, or government surplus. Total expenditure elasticity captures the percentage variation in the demand for the i^{th} commodity for 1% variation in total expenditure. If e_i signifies expenditure elasticity, the demand for a “normal” commodity should rise when the total expenditure rises ($e_i > 0$). If the variation is relatively more than the income growth ($e_i > 1$), the commodity is said to be a “luxury” item. On the other hand, if, in spite of the rise in income the demand of good falls ($e_i > 0$), it is said to be “inferior”.

2.1.5 Demand analysis

Demand analysis, according to Seale *et al* (2003), may be portrayed as a science that reveals which goods and services a consumer will select among the broad-range ones. In as much as the demand for a commodity or groups of commodities rely on the prices and other available goods, when we analyse consumer demand we are basically analysing what consumer prefers, that is, the way buyers decide to distribute their income among the different commodities. The concept of utility is used by economists to explain the degree of satisfaction or welfare originating from a particular distribution of income among various goods. Demand analysis is based on how to maximise utility, subject to a given level of income or budget constraint. This is expressed as:

Maximize $u = v(q_1, q_2 \ldots q_n)$ and subject to $\sum p_k q_k = x$ …………………………… (2.5)

where u is the utility function of the quantities of commodities consumed, x is the total income, and p and q are prices and quantities, respectively. Solving this maximisation problem by setting up the Langrangean function will lead to a set of demand equations that express the quantity demanded for each commodity as a function of price and income,

$q_i = g_i(x, P)$ ……………………………………..…………………………..(2.6)

where P is the vector of commodity prices. This type of demand function that is based on utility maximisation is known as a Marshallian or uncompensated demand function. For a logarithmic utility function, both price and income elasticities can be computed by taking the derivative of the Langrangean functions, leading to the following equation,

$$d \log q_i = e_i \, d \log x + \sum_{j=1}^{n} \mu_{ij} \, d \log p_j \quad \ldots\ldots (2.7)$$

where e_i is the income elasticity and μ_{ij} are the uncompensated price elasticities. The following conditions on the elasticities must hold so that changes in prices and total expenditure do not violate the budget constraint in the demand function,

$$\sum_{j=1}^{n} \omega_j \eta_i = 1 \text{ and } \sum_{j=1}^{n} \omega_i \mu_{ij} + w_j = 0 \ldots\ldots (2.8)$$

where w is the budget share. These two conditions are referred to as Engel and Cournot aggregation respectively, and together are sometimes known as the adding-up restriction.

The solution to the consumer's problem of maximising utility, subject to the budget constraint, is the Marshallian demand function. However, the consumer's problem can also be expressed as one of minimising total expenditures subject to a predetermined utility level or,

Minimize $x = \sum p_k q_k$ subject to $v(q_1, q_2 \ldots q_n) = u$……………......……………. (2.9)

The Hicksian demand function is the solution to this problem, which equals the Marshallian demand function when evaluated at the optimal utility level, and given by:

$q_i = h_i(u, P) = g_i(x, P)$……………………..………………………………….. (2.10)

The Hicksian demand function is also known as the compensated demand function, since it represents demand when utility is held constant. Price elasticities derived from the Hicksian demand function are known as "compensated" or "Slutsky" price elasticities and are equivalent to the uncompensated price elasticity (also known as "Cournot" price elasticities) plus the product of the income elasticity and the budget share. This is expressed as:

$\varepsilon_{ij} = \mu_{ij} + \eta_j w_j$………………………………………………………………. (2.11) where, ε_{ij} is the Slutsky price elasticity.

2.1.6 Global trend in food demand

Globally, food demand is progressively being determined by economic growth, urbanisation and population, especially in developing nations. Dietary patterns at the same time are moving towards vegetable oils, sugar and more livestock products, such as meat, fish, milk and eggs as sources of food energy. These three food groups together now accounts for 29% of the dietary energy supply, as against 20% three decades back in developing nations. Their share is anticipated to further rise to 35% and 37% in 2030 and 2050 respectively. (For quite a few years now the share of these food groups in industrialized nations, has been around 48%). These progressions have not been all inclusive and wide inter-nation diversity remains in the share of different commodity groups to total food consumption (FAO, 2006). Regardless of the trends globally, a tremendous number of malnourished and undernourished individuals as well as overweight individuals still exist. The new consumption trend likewise suggests a bigger role for processed foods creating new open doors for income-generating value-added activities. Food consumption projections are inherently uncertain and can be used just to recognise wide tendencies, given the interactions among different factors (Foresight, 2011). The FAO baseline projection (Bruinsma, 2009) of 70% expansion in worldwide food demand in 2050 has been widely acknowledged. It is essential to underline that these projections are not about needs but about demand. Despite the fact that demand will rise, there will still be malnutrition and undernourishment, as these depend not only on availability of food but also on distribution of income.

Towards 2050, demand is set to significantly increase due to the continuing change in dietary patterns, population growth, income growth and emerging economies (Foresight, 2011). There will be a shift to non-seasonal and high-status foods, including more meat consumption, especially in nations with increasing income. FAO projects that by 2050, the average meat consumption per person will be 40% higher than in 2010. According to this estimation, the rise in consumption of livestock products will cause a 553 million tons rise in the demand for feed, which represents half of the total demand increase for coarse grain between 2000 and 2050 (FAO, 2009). Global food demand is turning out to be less sensitive to price changes. As price goes up, global demand will not reduce but have disproportionate effects on the poor (HLPE, 2011). The prices of numerous staple foods have been uncommonly expanded lately. For example, the price of milk powder rose by 90%, rice by 25%, wheat by 70% and maize by 80% between 2005 and 2007 (Ivanic and Martin, 2008).

In 2008, additional increment in the prices of food had reached a disturbing extent. International price of wheat and maize were three times higher in 2008 than in mid-2003, and the price of rice was five times higher (von Braun, 2008). By early March 2011, the food prices passed the level that it came to in the second quarter of 2008 (FAO, 2011). The high food prices have been disadvantageous to the poor in developing nations who spend almost 60-80% of their total budget on food (Wood and Nelson, 2010; Mitchell, 2008; Ivanic and Martin, 2008; von Braun, 2008). Since the poor spend an extensive larger part of their income on food, many farmers obtain more of their income from producing food. This suggests that changes in food prices will greatly affect the welfare of both farmers and poorer consumers.

2.1.7 Food demand in Nigeria

The consumption pattern of a household is the mix of qualities, quantities, acts and tendencies describing a community or a human group's use of resources for survival, solace and satisfaction. Obviously, the kind of food and non-food items consumed vary from region to region. Consumption patterns typically contribute significantly to the social and economic policy of the nation. In a developing nation like Nigeria, the consumption pattern is skewed towards food, meaning that food represents a higher percentage of the total expenditure (NBS, 2010).

Cereals are vital staple foods in Nigeria and the consumption pattern reveals that they are generally consumed in every part of the nation. The northern part of Nigeria consumes more cereals than the southern part. Examples of these cereals are guinea corn, millet, maize, rice and sorghum. However, the southern parts of Nigeria consume more starchy foods than the northern parts. The northwest records a minimal consumption of starchy foods (Fashogbon, 2011).

At the national level, 64.68% of the total household expenditure in 2009/2010 was expended on food, with the left-over of about 35.32% expended on non-food items. Tubers and plantain accounted for the largest proportion of household expenditure, representing 14.6% of total household expenditure. Total expenditure on food in urban areas was ₦5 billion in 2009/2010, whereas in rural areas it was ₦9 billion. In the urban sectors, tubers and plantain and vegetables were the most outstanding consumables at 23.2% and 17.8% respectively of total food expenditure. In the rural areas, tubers and plantain accounted for the highest expenditures on food. Cereals and vegetables accounted for 22.2% and 14.3% respectively, of total food expenditure. (NBS, 2012). Besides, Nigeria gained some grounds in the area of per capita daily calorie consumption. The average per capita daily calorie consumption grew from 2050 kcal between 1979 and 1981 to 2430 kcal from 1989-1991 and to

2700 kcal between 2000 and 2002. Cereals, roots and tuber together accounted for 65.3% of the diet between 2000 and 2002 compared to 64% from 1979-1981, (FAO, 2006) representing an 11% increase in per capita daily calorie consumption between the two periods.

Also, a number of factors affecting the market prices of foodstuffs have been identified by various research efforts (Adegeye and Dittoh, 1985; IITA, 2001; Obasi, 2007). These have been identified from the different stages of production to the marketing stage. Agricultural products are sold at various points. The abundance of these marketing points gives rise to different prices. This is due to either distance from the farm to the market or due to marketing services such as transportation costs and handling cost. The unique role of agricultural marketing is that it acts as a link between production and consumption. This has been so defective resulting in high food prices. Also, the activities of middlemen and agents adversely affect both rural and urban market prices of foodstuffs (Sotunde, 1997). The levels of food prices have risen so drastically in recent years that the consumption patterns of many people, both in rural and urban areas have been adversely affected resulting in undernourishment. Odo (2005) observed a large variation in the prices of livestock products between rural and urban markets which he attributed to lack of transportation, storage and drying facilities. Akinyele (2009) discovered that over the past six years, the trend in food prices in Nigeria have been fluctuating. Nationally, the prices of rice, yam, beef, chicken, egg, palm oil, fruits and vegetables have been on the increase. However, in 2006, a reduction was seen in the prices of beans, garri, guinea corn, millet, and maize. In the rural areas where a lot of vegetables are not bought but gathered, the trend in rising food prices is less serious. The farm gate prices of food items have not also increased sharply as in urban areas. Food price increase has, however, evened out in both rural and urban areas due to the rising preference of rural dwellers for imported rice and livestock products. (Fashogbon, 2011).

2.2 Methodologies for carrying out Food Demand Analysis

2.2.1 The QUAIDS model

Consumer demand analysis has recently advanced towards system-wide methodologies. Various arithmetical specifications of demand systems are now in existence, including the Working Model, the Rotterdam Model, the Translog Model, the Linear and Quadratic Expenditure Systems, and the Almost Ideal Demand System (AIDS). Deaton and Muellbauer (1980) consolidated the Rotterdam and Translog models into the Almost Ideal Demand System (AIDS) that is touted to have the best properties of the two, which includes approximating any demand system discretionarily to first-order, aggregating perfectly over consumers, satisfying the axioms of choice and fit for testing Slutsky's symmetry and the limitations of homogeneity. From that point forward, the AIDS model has apparently turned into the most broadly used systems approach for modeling consumption behaviour for grouped commodities. The AIDS model has been a mainstream model of demand behaviour. The ubiquity of the AIDS model is because of its numerous alluring properties, especially the way it takes into account reliable accumulation of individual demands to market demand and satisfies the axioms of choice. It can likewise be approximated by a linear form at the estimation stage (Moschini, 1995). An extension of the AIDS model was built up by Banks *et al.* (1997), is known as the Quadratic Almost Ideal Demand System (QUAIDS); it is quadratic in log total expenditure.

However, the AIDS model has problems with capturing the impacts of non-linear Engel curves, as has been shown in different empirical demand studies. Therefore, to keep up with the appealing properties of the AIDS model, while keeping up consistency with both the relative effects of price within a utility maximisation system and the Engel curve (Lewbel, 1996), a quadratic term in log income was added to the AIDS model, leading to the Quadratic AIDS (QUAIDS) model specification. The increased flexibility of the demand system representation is in this manner accomplished in a mean way through the addition of the quadratic term. The Linear Expenditure System has been criticised for its additive preference structure while the translog has been criticised for mistakenly classifying goods as complements when they are actually substitutes, and it loses its flexibility when semi definiteness (curvature) is imposed (Diewert and Wales, 1987).

From these problems, globally flexible functional forms that have larger regular regions and higher ranking have grown very rapidly. Examples of such functions include the Laurent models (Barnett and Choi, 1989) and the General Exponential Form (GEF) of Cooper and McLaren (1996), which may be easily constrained to be regular over an unbounded region and subsume all of the points in any given sample. Lewbel, however, focused his attention on the ranking of demand systems. Most locally flexible demand systems rank two or less and are linear in the log of total expenditure. To accommodate the nonlinear Engel curves, the nonlinear terms are restricted to a quadratic in log income to provide a significantly better fit of budget shares to changing income levels. The Quadratic Almost Ideal Demand System (QUAIDS) has rank three and non-linear Engel curves in empirical analysis can better be approximated. Since a QUAIDS model produces a considerably larger regular region than the locally flexible forms, it can be classified as effectively globally regular, where corresponding utility and indirect functions and cost functions satisfy their theoretical properties for non-negative demand, price and all utility levels, as appropriate.

There is still one empirical paradox regarding QUAIDS. Empirical findings suggest that most agents have PIGLOG demands, implying that Engel curves must be linear in expenditure for aggregate demand to resemble a utility maximising representative consumer. On the other hand, the rank three cross sectional Engel curves are far from being nonlinear in expenditure. Lewbel (1996) solved the paradox by proving theoretically that the presence of relatively few non-PIGLOG households is swamped by the majority of PIGLOG households. He compared the exact aggregation models and the representative consumer models using the individual household expenditure data of the UK and the US from 1970 to 1984. He found that the two different types of models gave similar results regarding model fit and price and income elasticities. The QUAIDS model is a generalization of PIGLOG (Price-Independent Generalized Logarithmic) preferences based on the following indirect utility (V) function (Bopape, 2006).

$$\text{lnv} = \left\{ \frac{\ln x - \ln a(p)}{b(p)} \right\}^{-1} + \lambda(p)\}^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.12)$$

Where, p is a vector of prices, ln$x$ is the log of total expenditure, fc(p) and X(p) are functions that are homogeneous of degree zero in prices and *a(p)* is a function that is homogenous of degree one in prices. As in the original AIDS model, In a(p) and In b(p) are specified as the following translog and Cobb-Douglas equations:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \ln p_i + \tfrac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} \gamma_{ij} \ln p_i \ln p_j \quad \ldots\ldots\ldots\ldots\ldots \quad (2.13)$$

$$b(p) = \prod_{i=1}^{k} p_i^{\beta i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.14)$$

where i = 1,………., k denotes commodities. The function λ (p) is specified as:

$$\lambda(p) = \sum_{i=1}^{k} \lambda_i \ln p_i where \sum_{i=1}^{k} \lambda_i = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.15)$$

Applying Roy's identity to (1) will give the budget share equations of QUAIDS. In order to control heterogeneity across households and changing preference structures, demographic variable (z) is included in the QUAIDS model through the linear demographic translating method (Pollak and Wales, 1978), leading to the following empirical specifications of the budget share equations of QUAIDS

$$\omega_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{x}{a(p)}\right] + \frac{\lambda_i}{b(p)} \left\{ \ln\left[\frac{x}{a(p)}\right] \right\}^2 + \sum_{s=1}^{l} \partial_{is} Z_S \qquad \text{............ (2.16)}$$

Zs = (Z_1 .... Z_L) represents a set of demographic variables. To ensure integrability of the demand system, the theoretical restrictions of homogeneity, adding up and symmetry are imposed on the parameters (Moro and Sckokai, 2000).

2.2.2 Approaches to estimating food demand equations

The contribution of Stone started the estimation of complete demand systems within a framework that is consistent with the classical theory of demand, which now make up a large part of applied and theoretical literature (Deaton, 1986). However, in 1980, Ray had earlier found most of the models formerly used in estimating demand to be characterised by three main features:

i. the use of time series national accounts data, which ignores demographic variables or restrict their role to unit scale effects implicit in converting all the aggregate data into per capita ones.
ii. the use of demand models derived from additive utility functions, which implies strong separability of the household's preference structure; and,
iii. the use of demand models like Rotterdam and Double-log which, though not explicitly derived from utility functions, are consistent with a utility maximisation objective when the utility function is log-linear.

The Consumer theory requires a usual limitation that must hold for the consistency and theoretical plausibility of any system of demand (Deaton and Muellbauer, 1980). In this regard, four restrictions which have been identified from literature are:

i. Adding up: This condition needs that the addition of the budget shares of all items be equal to one, which is obvious as the budget share of a commodity, *i*, is calculated by dividing the expenditure on good ith by the total (overall) expenditure,
ii. Homogeneity: Demand functions are homogenous of degree zero in prices and income. This means that a consumer’s demand will not change, if the prices of all goods bought and the income of the consumer are changed by the same proportion. This reveals that the only thing that matters to consumers is income changes and relative price, not money income levels or absolute price. By implication, the money illusion is not needed in the theory

of demand (Ahmed and Shams, 1994; and Hahn, 1994).

iii. Symmetry: General demand functions are such that the effect of substituting commodity 1 for commodity 2 is equal to the substitution effect of commodity 2 for 1. This property of general demand functions is known as the symmetry property and it requires that compensated demand effects be symmetric (Deaton and Muellbauer, 1980). In other words, when the price of good *i* rises, there will be a rise in the compensated quantity demanded of *j*. Choices that are inconsistent would be made between products (no substitute or complement products) in the absence of this restriction.

iv. The negativity restriction: This arises from the convexity of the utility function, which is as a result of the fact that costs are minimised in the Hicksian demand function, or alternatively, utility is maximised in the Marshallian demand function.

These four restrictions above represent the basic restrictions on all demand functions.

The primary aim of demand analysis is to determine price and income elasticities that meet these restrictions. Although these elasticities can be determined without the use of demand equations, they are derived from cost minimisation or utility maximisation. A logarithmic demand model directly specifies the logarithmic quantity demanded as a function of logarithmic income and prices, with their elasticities acting as coefficients. These coefficients can be estimated easily by applying ordinary least squares to time series or cross-sectional data. However, to satisfy the necessary restrictions and maximize utility, this model would need constant elasticities and constant budget shares, which is not consistent with the observations that budget shares change when income changes (Deaton and Muellbauer, 1980). Hence, the use of the Quadratic Almost Ideal Demand System (QUAIDS).

Another commonly used demand model is the Linear Expenditure System: In the LES, the assumption is that households maximize an additive utility function (Klein-Rubin, 1948) known as the Stone-Geary utility function, which is expressed as:

$$U = U_h(x,z_t) = a_o \log(x_h - x_0) + \varepsilon a_t \log(z_h i - z_t°) \quad i = 1, ...n \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(2.17)$$

where U is utility, $z_h i$ is the n^{th} attribute of the h^{th} household, x is a composite good, $z_t°$ are the attributes of the household at a minimum need and x_0 are the base amounts of the composite good. If x_0 and $z_t°$ are equal to zero, then the utility function becomes a Cobb-Douglas utility function (Horowitz, 1995). However, LES suffers from the limitation of additive systems, which is considered to be an extreme restriction in demand analysis. A similar model is the one developed by Frisch (1959), which is also based on the additivity or "want-independence" assumption. A consumer's preference is said to be want-independent if the marginal utility of any one commodity depends on the quantity of the commodity alone and not on the quantity of any other. Therefore, the Frisch methodology has similarly been criticised for this severe restriction.

2.2.3 Model selection

Economists are interested in the demand for food and services. However, many of the models used have been criticised on various grounds. The linear expenditure system suggested by Stone (1954) is a crude utility-based demand model which imposes unjustified and strong restrictions on elasticities of price (Deaton, 1974; Cooper and McLaren, 1996). The recognition of this led to development of extensive literature, first on flexible demand systems the Rotterdam model by Theil, 1967 and the Translog model of Christensen *et al.*, 1975; Jorgenson *et al*., 1982) and later on semi- and non-parametric specifications of demand such as the AIDS model by Deaton and Muellbauer (1980). The translog model on the other hand has also been criticised for wrongly classifying goods as complements instead of substitutes, and when semi- definiteness (curvature) is imposed, it loses its flexibility (Diewert and Wales, 1987). The AIDS model, which in recent literature is the most popularly used, treats all commodity groups as a singular system. It however, has a problem in its use to analyse the effects of household demographic and socio-economic factors.

This study used the QUAIDS model because, the effects of other socio-economic and demographic factors on the household expenditure shares can also be captured (Banks *et al.*, 1997). It allows varying income-elasticities on the demand curve, unlike most other demand models, hence allowing goods to either be necessities or luxuries at some income levels. Based on many empirical studies in both developing and developed nations, the QUAIDS model has also been proved to be most suitable for analysing household food demand systems,

2.2.4 Zero expenditure in survey data

A popular characteristic of information from a survey is the presence of zero expenditure on individual products (Tafere *et al,* 2010). Generally, information from survey data are not detailed enough to identify various sources of zero observations (Obayelu *et al,* 2009) which must be taken care of to get consistent parameter estimates. In cross-sectional expenditure data, the existence of zero observation is due to (i) infrequency of purchase (ii) corner solution and (iii) true non-consumption or non-participation (Pudney, 1989).

Infrequency of purchase: This occurs when the purchase cycle of the commodity under review is longer than the length of the survey period.

The corner solutions: This implies that at the existing income and prices, the household decides not to consume the exact food.

Non-participation: This is when a consumer takes a decision not to take part in the purchase of the commodity that is considered, and this decision is not influenced by price and income levels.

Thus, it is difficult to say which one of the three the observed zero food expenditure or consumption depicts. It is, therefore necessary to use a technique that removes the problem. Models for treating the problem of zero observation have been suggested by Deaton and Irish (1984), Blundell and Meghir (1987) and Heien and Wessells (1990).

This study adopted the method used by Heien and Wessells (1990), which is specifically connected with the AIDS model function. This has to do with the censored simultaneous equation model where the dependent variables are censored by a sub-set of unobserved latent variables. The budget shares of the food groups (dependent variables), are zero or positive for every household. The zero values of budget shares are censored by an unobservable latent variable that influences the choice of not buying the specific product during the time of the survey. A binary indicator variable can be used to suggest the choice to purchase or not to, which is a function of the latent variables and is estimated with the use of a Probit model (Lee, 1978). The assumptions that comprise the basis for using this model are as follows: (i) the error terms are approximately normal, with zero mean and a finite variance-covariance matrix that is constant over all observations and (ii) the individual observations are independently and identically shared. This method has also been empirically applied by Nayga (1995), Gao *et al* (1997), Chern (2000), Tey *et al* (2009) and Tafere *et al* (2010).

2.2.5 Comparative analysis of Tobit and Heckman models for correcting selectivity bias

Tobin's method was used in some past studies (Pitt, 1983; Goletti, 1993) to estimate the food demand system. This method was employed to solve the econometric problems arising from zero observations or no consumption (Keithly, 1990 and Dellenbarger *et al,* 1992). Though the model allows the positive probability of observing zero consumption, it is, however, very restrictive in its parameterisation due to the assumption that the factors that determine the probability of consumption are the same as those that affect the level of consumption. This limitation has, therefore, made the Tobit model unpalatable for empirical analysis of demand, with or without budget shares as dependent variables. Heckman's two-step procedure has therefore, in recent times, been applied to correct selectivity bias in food consumption. In Heckman's model, the first step is the probit analysis for participation decision and the second is the use of the normal ordinary least squares to analyse the decision to consume. Included in the equation of demand in the Heckman model, is an inverse Mill ratio which is used to correct selectivity bias in the sample (Fashogbon, 2011).

2.3 Determinants Incorporated in Household Food Demand Analysis

The Theory of Demand has been broadly applied to determine the consumption behaviour of individuals or households. Price and expenditure elasticity supply important information on consumers' reactions to change in income and price. They are also useful in designing food policies and the research needs of different categories of consumers (Jung and Koo, 2000, Abdullai and Auberta, 2004).

The AIDS model is one of the most popular models in recent times used in estimating food demand and other consumption categories in various nations. Some of those who have used these models are Karagiannis and Mergos, (2002), LaFrance and Beatty (2006), Dunne and Edkins (2005). Some studies concentrated on particular items. For instance, Caswell (1995) focused on the demand for beef while Eales and Unnevehn (1988) analysed chicken and beef products. Recently, studies on demand, especially in developing nations, have directed interest on analysing consumer demand behaviour across different income groups (Abdulai and Auberta, 2004). Findings are useful in the design of development policy options.

Studies have also shown that food demand is affected by some factors such as income levels, population growth and movements, lifestyles and preferences, human resource development, economic growth (Pandya-Lorch and Rosegrant, 2000). Based on evidence from the literature, the key economic and household characteristics that affect food demand patterns are discussed as follows:

i. Prices and Household Food Demand

Traditionally, price is a key determinant of demand for goods. Theoretically, it has been established that normally, there is a negative relationship between the prices of commodities and household demand for them. Therefore, if the price of a commodity increases, the quantity demanded will reduce, and vice versa (Fan *et al*, 1994, Park *et al*, 1996).

ii. Income and Household Food Demand

The income of a person or household determines the purchasing power of such a person or household. However, a negative relationship exists between the disposable income and the percentage of it spent on food. This derives from Engel's law, which says that, as the disposable income increases, the share of it spent on necessities (or food in particular) reduces and vice versa.

Normally, the amount expended on food and the quality of food consumed are positively correlated, but when the percentage expended on food is compared to the percentage expended on other items in relation to total expenditure, the percentage spent on food becomes smaller. (Savadago and Brandt, 1988; Fan *et al*, 1994; Park, *et al,* 1996).

iii. Age and Household Food Demand

The age of the household head and food demand have been found to be positively correlated in that as the age increases, it is likely the household size will likely increase resulting in an increase in the household's demand for food. Several studies have revealed that the household's demand for food rises when the household head is older and vice versa (Savadago and Brandt, 1988; Heien and Pompelli, 1988; Fan *et al*, 1994).

iv. Household Size and Household Food Demand

The size of a household has been shown in different studies to be a key determinant of household food demand. It has been found to have a positive relationship with household food demand. Heien and Pompelli (1988) found out that the size of the household was a positive determinant of household demand for beef in the United States.

v. Level of Education of Household Head and Household Food Demand

The educational level of head of a household sometimes determines the preference of the household for some particular classes of food. For instance, it has been shown empirically that the higher the educational level of a head of household, the higher is the preference of the household for some processed cereals, and as such higher shares are allocated in the budget to such food classes (Savadago and Brandt, 1988).

vi. Marital Status of the Head of Household and Household Food Demand

It has been discovered that a key determining factor in household food consumption is the marital status of the household head. Married household heads tend to consume more of less expensive or domestically produced foods and less non-food items than unmarried household heads. This is because married heads are more likely to belong to larger families than unmarried heads, hence the higher the likelihood of their consuming less expensive or less preferred foods (Savadago and Brandt, 1988).

2.4 Empirical Review of Household Food Demand Studies

Studies that have employed the QUAIDS model are numerous. Blundel *et al* (1993) employed the model to evaluate how important it is to use micro-level data in analysing consumer demand. Banks *et al* (1997) and Blundell and Robin (1999) employed expenditure data on a wide range of consumption items in the United Kingdom. Moro and Sckokai (2000) used Italian food expenditure data and Abdulai (2002) applied the QUAIDS to food expenditure data from Switzerland. The quadratic terms in the QUAIDS were found to be empirically suitable to describe household budget behaviour in Switzerland, indicating that the traditional Working-Laser specification with linear Engel curves is not a suitable representation of food consumption behaviour. In his work, price and expenditure elasticity were computed for six food aggregates: meat and fish, milk, cheese and eggs; fruit and vegetables; bread and cereals; fats and oil; other foods. The analysis from the study showed that for most of the food groups, expenditure elasticity was inelastic while cross-price elasticity was low, indicating limited substitution among the food groups.

Various studies in developing and developed nations also confirm the appropriateness of the QUAIDS model. For instance, Meenakshi and Ray (1999) used Indian food expenditure data, Abdulai and Aubert (2004) employed food expenditure data from Tanzanian, Molina and Gil (2005) used Peru aggregate consumption data from Peru while Gould *et al* (2006) used urban China food expenditure data. Also in Nigeria, Obayelu *et al* (2009) used the QUAIDS model to analyse household demand for food in north central Nigeria. His findings revealed that fruits and vegetables, legumes, cereals and animal protein foods were expenditure-elastic. Own-price elasticity also showed that all the food groups, except roots and tubers were price inelastic while uncompensated price-cross elasticity showed that all the food groups, except roots and tubers, had negative complementary relationships. Fashogbon (2011) used the QUAIDS model to analyse food demand among rural household in Ondo State. His findings revealed that expenditure elasticity of the fruits and vegetables group was inelastic. Grains were found to be expenditure inelastic across all household groups, fats and oil was elastic while animal protein foods (Fish, Meat, Milk, Egg) were luxuries. All food groups were found to be price-elastic, except starch and grain foods which were price inelastic. The own-price elasticities, as expected, was negative

The QUAIDS model corrects econometric problems from expenditure endogeneity and censoring and can be estimated in a flexible form, without imposing linearity on the price aggregators. Hence, the QUAIDS model was used in this study to provide estimates of expenditure and price elasticities and to capture demographic and socio-economic variables that contribute to food demand (Banks *et al,* 1997; Lissyotou *et al,* 1999; Nicol, 2001). It further analysed the food demand of rural and urban households in the study area because of the inherent desirable properties exhibited by the model, most especially, its ability to accommodate demographic and socio-economic variables of households.

Many empirical studies have been carried out on food demand in Nigeria, but almost all of these focused on the demand for individual food items. Obi (2003) found that the increasing demand of the fast-growing populace has not been met by the production of animal protein foods. Adejobi (2004) used the Almost Ideal Demand System (AIDS) model to examine household food budget share going to the different food subgroups amongst rural farming households in Kebbi State. He observed that the household expenditure on food was 72%, out of which cereals received the highest shares followed by animal protein foods. Okoruwa and Adebayo (2006) analysed household food demand in Adamawa State using the Linear Approximation Almost Ideal Demand System (LA-AIDS) model on a cross sectional data and came out with the fact that legumes, cereals, imported dairy products and other foods exhibited substitutability with the roots and tubers food group while fruits and vegetables, local dairy products as well as other animal protein foods showed a complementary relationship with roots and tubers among households in Adamawa State. In addition, Okoruwa and Adebayo (2006) observed that with the exception of cereals, all food commodity groups were positive with respect to price of legumes, implying substitutability. The local dairy products show complementarity with roots and tuber, legumes, cereals, animal protein foods and other foods while it showed complementarity with fruits and vegetable as well as imported products. The price-cross elasticity for other animal protein foods showed that animal protein in the study area had a complementary relationship with roots and tubers, legumes and dairy products while it showed substitutability with cereals, fruits and vegetables and imported dairy products. Odusina (2008) looked at the urban demand for different rice varieties with a view to understanding the consumption pattern for local rice and the reason for the preference of imported rice to local rice.

2.5 Empirical Literature on Factors Affecting Food Demand and Consumption Pattern

Numerous studies have attempted to estimate income elasticities and other determinants of food demand for household samples using data from recall surveys. Phillip (1995) identified the income of the consumer and the price of the commodity as major determinant of consumption besides other factors such as education, taste, age, household size. While analysing food consumption and nutritional status, Okon (2010) came up with the conclusion that those with low earnings spend more than half of their earnings on food items when compared with high income earners. This is in consonance with Engel's Law which states that "the proportion of income spent on food decreases as the disposable income of consumer increases". Heien *et al* (1989), in their work on consumption of food in Mexico, found that family composition has a significant effect on food consumption. Their study also indicated that the addition of a child to the family significantly affects the consumption of nearly every food category.

Heilig (1999) identified population growth and age composition as major driving forces of food demand in China. Using estimated Engel equations, Choi and Lee (2003) identified age of household heads, gender, types of households and location of residence as factors affecting food consumption in Korea. Abdullai *et al* (1999) employed Linear Approximation AIDS in their demand study in India. They found that demographic variables such as household size, location, seasonality and the educational level of household heads significantly affected food consumption. Liu (2003), used econometric models of QUAIDS to analyse household demand for food in China. His result shows that the QUAIDS is better than the AIDS, but the level of significance for the quadratic term reduced as other effects such as demographic and censoring effects are regarded in a system of demand. In a similar study, Gould (2004) used the QUAIDS in a study involving urban households in China to quantify the pattern of food demand. The result showed that an increase in market prices results in a change in purchasing patterns. Therefore, leading to a fall in the total quality of commodity.

Tsegai and Kormawa (2002) undertook a study on the determinants of the demand for cassava in northern Nigeria between 1999 and 2000 using the AIDS model. Their result showed that cassava was a price-inelastic food with positive expenditure elasticity. Njoku and Nweke (1994) described the pattern of rice consumption among households in Imo state, Nigeria, using the AIDS model. Their result showed that income elasticity of demand was higher than 1 and fall from low income groups to high income groups, as expected. Furthermore, household income was found to be the most prominent factor determining food consumption.

2.6 Stepwise Framework for Multistage Budgeting Procedure

Analysis of household demand follows a stepwise procedure. According to Dey *et al*, (2011), multistage budgeting technique addresses a common problem in empirical estimation of demand modus requiring a sizeable number of equations, given the wide variety of goods consumed and jointly purchased by households. The multistage budgeting technique can involve two, three or four budgeting stages, depending on the variety of food items investigated. Irrespective of the stages employed, the first budgeting stage assumes that households in a survey allocate their expenditure (income) across broad commodities affected by household income and some demographic characteristics. However, it is important to note that first budgeting stage is possible when consumer preferences are assumed to be independent (or strong separability), such that preference ordering among items within one broad consumption group is independent of quantities of items consumed in other groups (Muhammed *et al*, 2011). Similarly, the second budgeting stage assumes that the households under investigation make allocations in their budgets across categories of different items that make up the first budgeting stage. Also, in the third budgeting stage, households are assumed to further allocate their budgeting across categories of different items that make up the second budgeting stage. Factors usually taken into consideration in respect of the standard consumer include income, price and household demographic variables. (Lipsey, 1975; Koutsoyianis, 1985; Ishida, *et al*, 2003).

The multistage budgeting procedure used in the present study is shown in Figure 2.2. It shows that the total household expenditure for food groups is determined by a combination of economic factors, for example, market prices, income and preferences of household head as well as non-economic factors like age, household size and level of education.

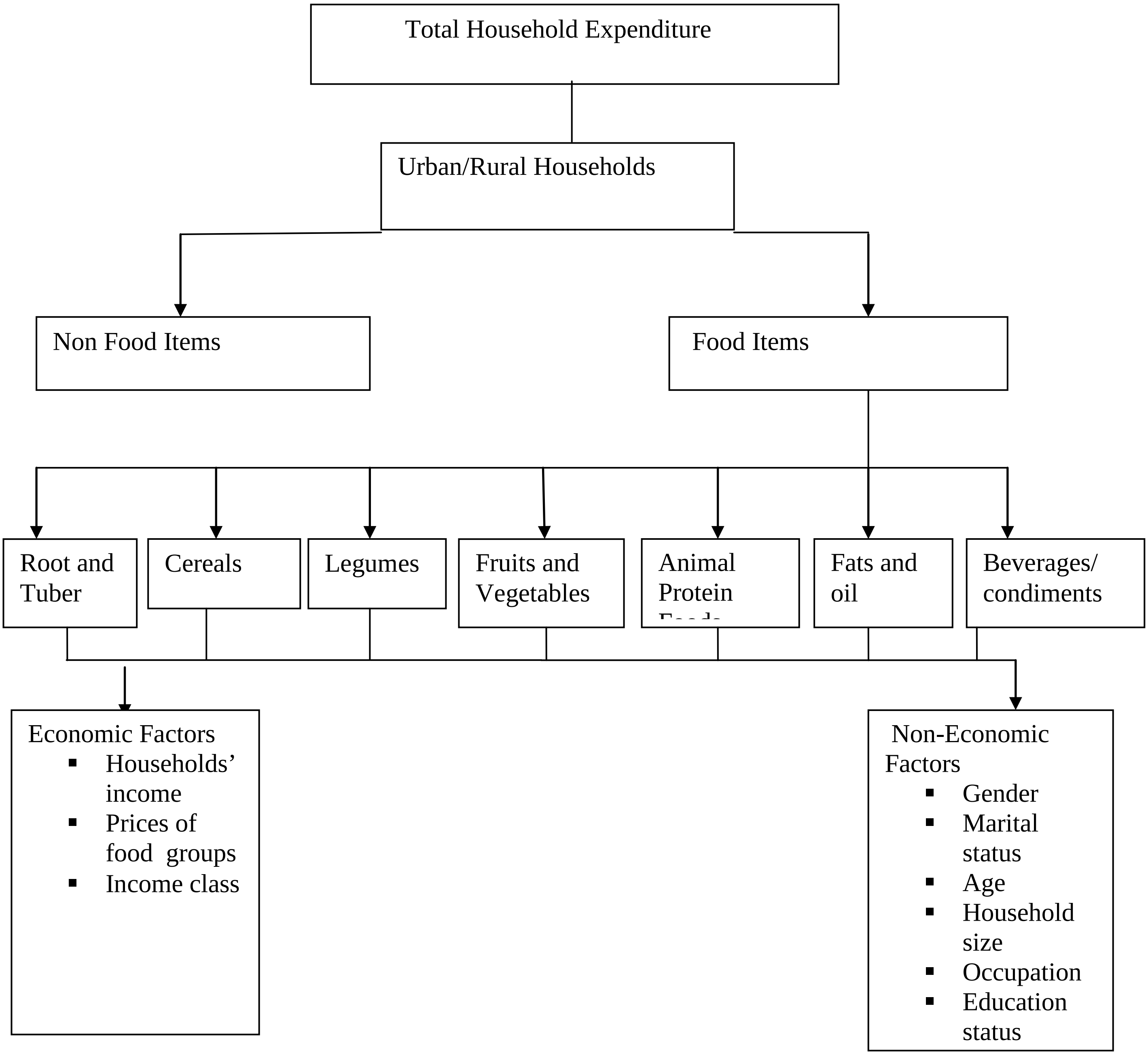

Fig 2.2: Conceptual framework for the multi-stage budgeting procedure

Source: Adapted and modified from Ruel et al, 2005: International Food Policy and Research Institute (IFPRI).

CHAPTER THREE

METHODOLOGY

This chapter describes the area of study, sources of data, sampling technique, methods of data collection and sample size as well as the methods employed to analyse the data collected so as to realise the aims of the study.

3.1 Area of Study

The research was conducted in south west Nigeria, the home of the Yorubas. It consists of Ogun, Osun, Ekiti, Lagos, Ondo and Oyo states and is situated within longitude 3°-14°E and latitude 4°-14°N. It has a high relative humidity and an averagely high temperature. The two prominent seasons are the rainy season and the dry season lasting from March/April to October/November and October/November to March/April respectively. During the dry season, the temperature is relatively high, with a mean of around 33°C. The temperature in the rainy season may reduce to as low as 24°C, particularly around July/August; and rainfall distribution changes from about 1000mm to about 2000mm.

The South west Nigeria has a land area of approximately 114,271km^2 with a total population of 27,581,992 (National Population Commission (NPC), 2006). Farming is the major occupation of most of the men while most of the women are more into buying and selling as well as food processing. The three principal vegetation are the rain forest, mangrove forest and savanna. Ekiti, Ogun, Ondo and some parts of Oyo State are mainly in the tropical rain forest area while the mangrove forest is found in Lagos State. Guinea and derived savanna is found mostly in Osun State and some parts of Oyo and Ogun states. Land, minerals, forest, water and agricultural resources are the natural endowments in the area. Important cash crops cultivated in the area are rubber, cocoa, oil palm, kolanut and citrus. Grains, sugar cane and tubers are produced in the savanna while the waterside areas produce fish bountifully. All these are resources that have been exploited for the development of the region.

The South West is the most urbanised part of the country; a lot of its cities have manufacturing sectors that are growing as well as large offices and apartments, government service centres, educational institutions.

3.2 Sampling Technique and Method of Data Collection

Collection of data from selected households in the study area was between April and June, 2014. Respondents were selected in both states using a multistage sampling procedure. Firstly, Osun and Ondo states were randomly selected from the six states in the South West region of Nigeria. Commensurate with the number of local government areas (LGAs) in each of the two states, 15 LGAs were randomly selected from the two states. The proportionate factor used is given as follows:

$$N_i = \frac{n}{N} \times 15 \quad \text{..................} \quad 3.1$$

where N_i = number of LGAs selected from state *i* (i= 1 to 2)

n = number of LGAs in state *i*

N = total number of LGAs in the two states

15 = the number of LGAs desired from the two states

Based on this proportionate factor, six (6) out of 18 LGAs and nine (9) out of 30 LGAs (NPC, 2006) were selected from Ondo and Osun states respectively. In the third stage, one rural and one urban community were selected from each of the selected LGAs. In the fourth stage, 350 households were chosen randomly in proportion to the total households in each of the LGAs selected. The formula used for the households' selection is stated thus:

$$H_i = \frac{h_i}{TH} \times S \quad \text{..................} \quad (3.2)$$

where, H_i= the number of households sampled from state *i* (i= 1 to 2)

h_i= number of households in state *i*

TH= total number of households in the two states

S= number of households sampled from the two states (350)

A total of 178 households, comprising 94 urban households and 84 rural households were randomly selected from Ondo State while 172 households comprising 93 urban households and 79 rural households were randomly selected from Osun State (see Table 3.1) based on the fact that Ondo State has a higher number of households (774,574) than Osun State (744,275) (NPC, 2006).

A household refers to all the persons who live in a given house, share a mutual source of income and /or food and are obliged to answer to the same head. The head of the house is the person responsible for all financial and leadership decisions relating to the household. Households from each of the selected LGAs were chosen using the following formula:

$$H_L = \frac{h_i}{TH_L} \times H_i \quad \text{..................} \quad (3.3)$$

where, H_L = the number of households to be selected from each LGA

h_i = the number of households in LGA *i*

TH_L = total number of households in the selected LGAs in state *i*

H_i = number of households selected from state i

The respondents were either household heads or their spouses. Of the 350 copies of the questionnaire administered, 304 were retrieved.

Table 3.1 Selected States, Local Government Areas (LGAs), Towns/Villages and

number of Households

State	LGAs	Towns / Villages	No of questionnaire administered	No of questionnaire used for analysis
Ondo	Akure South	Akure town U Oda R	16 14	16 14
	Idanre	Odoode U Aponmulona R	16 14	15 14
	Ifedore	Igbara-Oke U Irese R	16 14	15 14
	Owo	Owo town U Uso R	16 14	14 14
	Akoko South East	Akungba U Epinmi R	15 14	14 14
	Irele	Ode-Irele U Lipanu R	15 14	14 14
		Total	**178**	**172**
Osun	Aiyedaade	Gbongan U Orile Owu R	11 8	7 8
	Ifelodun	Ikirun U Eko-Ende R	10 9	6 9
	Irewole	Ikire U Naasinmi R	10 9	6 9
	Egbedore	Dada Estate U Ara R	10 9	5 9
	Iwo	Iwo town U Ogburo R	10 9	6 9
	Olorunda	Igbonna U Oba-Oke R	10 9	7 8
	Ayedire	Ile-Ogbo U Alajue R	10 9	5 8
	Ilesa West	Oja-Oba U Kajola R	11 9	7 9
	Ife North	Ipetu modu U Morayin R	11 8	6 8
		Total	**172**	**132**

Source: Field Survey, 2013. U= Urban, R= Rural

3.3 Sources of Data

A structured questionnaire designed for generating information from the study area was used to collect primary data for the study. The questionnaire was pre-tested to remove any imprecision and validate its effectiveness in administration. The primary data collected from each household head include the following: (i) socio-economic and demographic characteristics like gender, age, level of education, household size, employment status, household income level, sources of income and credit access. (ii) Household food demand data which include total household expenditure, food expenditure, non-food expenditure, quantities of various foods purchased and their prices, using the seven-day memory recall.

3.4 Analytical Techniques and Model

In order to achieve the stated objectives in this study, a number of analytical tools were employed to analyse the data and ensure that the data were consistent with the underlying theory. The analytical tools adopted include descriptive statistics such as tables, means, percentages, standard deviation and frequencies. These were employed to analyse the socio-economic characteristics of households with respect to patterns of food expenditure in the area of study. The two-step estimator and the QUAIDS models were used to analyse functional relationships among variables.

3.4.1 Descriptive statistics

Tables, frequencies, means, standard deviation and percentages were used to profile households' food group expenditure in order to compare and contrast the pattern that exists between the urban and rural households and to examine the share of expenditure to each food group in the study area. The first and second objectives of this study were to determine the food expenditure profiles of households in rural and urban areas as well as across the income groups. This was achieved by presenting the descriptive statistics of household food purchase patterns of the rural and urban households and the corresponding share of expenditure on each of the food groups relative to the total food expenditure. Also, the composition and shares of each food items in the food groups in the rural and urban households and across the income quintiles were determined. The total value of all food items purchased by the household in the 7-day memory recall period was a composite value of food produced at home; food purchased and the bush meat that was brought into the house over the 7-day period. Households' per capita monthly expenditure serves as a proxy for households' per capita monthly income due to the fact that households' total expenditure is traceable and more stable for empirical analysis of this nature than the reported income. Information from income usually has errors due to measurements and may also contain a transitory component of income (Burney and Khan, l991). In this study, it was assumed that the respondents spent all their income without any savings or investments and no loan was obtained. The household per capita monthly income was grouped into quintiles in order to illustrate differences in food group expenditure across income (expenditure) groups. The first quintile represents the poorest households while the fifth represents the richest households.

The income (expenditure) groups in Naira per month were:

<20000 = first quintile

20001- 40000 = second quintile

40001 - 60000 = third quintile

60001 - 80000 = fourth quintile

>80000 = fifth quintile

The T-test was used to establish whether a significant difference exists in the food-group expenditure of rural and urban households. The formula for the t-test is stated as follows:

$$T = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots \text{(3.4)}$$

where, X_1 = the mean of group 1 (Rural)

X_2 = the mean of group 2 (Urban)

S_1^2 = sample variance for group 1

S_2^2 = sample variance for group 2

n_1 = sample size for group 1.

n_2 = sample size for group 2

3.4.2 Determinants of household demand for food groups

To obtain the third and fourth objectives of the study, a two-step estimator approach was used. A probit regression was first computed to ascertain the likelihood of a particular household purchasing the food group. From the result, the Inverse Mills Ratio (IMR) was computed for every household. In the second stage estimation of the demand relations, the IMR was employed as a tool that incorporates the censoring latent variables. STATA 13.0 software was used to run the analysis and all socio-economic variables included in the QUAIDS model were included in the probit regression, except main occupation and credit access. This estimation procedure corrects the sample selection bias caused by the existence of zero purchase of food groups reported by some households.

A Probit regression was calculated in step one to definitely ascertain the likelihood that a certain household purchased a food group or not as observed in studies by Mutuc *et al* (2007) and Tey *et al* (2009). Decision to purchase was modeled as a dichotomous problem of choice; that is, $C_i = 1$, if the food group is purchased and $C_i = 0$, if otherwise. Thus, the Probit model is represented as:

$$P_{(C_i=1)} = F(Z_i) = \frac{1}{\sqrt{2\Pi}} \int_{-\infty}^{z_i} e \frac{u^2 du}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad (3.5)$$

where, the unobservable Z_i is a linear combination of the observable explanatory variables.

$$Z_i = b_o + b_1X_1 + b_2X_2 + \ldots\ldots\ldots + b_nX_n + u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.6)$$

$$Z_i = b + \sum_{j=1}^{n} b_j X_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

In these equations,

P_i = the probability that the household purchases the particular food group

$F(Z_i)$ = the standard cumulative function

N = the sample size

n = the number of explanatory variables or all the specified explanatory variables

Z_i = the unobservable level of stimulus for the i^{th} household

Z_i^* = the critical or threshold level of the index Z_i and $Z_i \sim (6, 1)$ with mean 6 and variance 1 and $U \approx N(0,\sigma^2)$.

The full Probit model is represented as:

$$Z_{iF} = b_0 + b_1X_1 + b_2X_2 \ldots + b_nX_n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. \quad (3.8)$$

The restricted model is given as

$$Z_{iR} = a_0 + a_1X_1 + a_2X_2 \ldots + a_mX_m \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad (3.9)$$

where n > m (as m is a subset of n)

$$Z_iF = b_0 + b_1X_1 + b_2X_2 + \ldots + b_{17}X_{17} + u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. \ldots\ldots\ldots \quad (3.10)$$

Z_i = 1 if the household purchases food group, 0 otherwise.

Z_1 = 1 if household purchases roots and tuber, 0 otherwise.

Z_2 = 1 if household purchases cereals, 0 otherwise.

Z_3 = 1 if household purchases legumes, 0 otherwise.

Z_4 = 1 if household purchases fruits and vegetables, 0 otherwise.

Z_5 = 1 if household purchases animal protein foods, 0 otherwise.

Z_6 = 1 if household purchases fats and oil, 0 otherwise.

The food groups identified were based on the classification by Obayelu (2010). These include roots and tubers (RT), cereals (CR), legumes (LG), fruits and vegetables (FV), animal protein foods (AP) and fats and oil (FO),

The explanatory variables are:

X_1 = Dummy variable for location of residence (1= rural, 0= otherwise)

X_2 = Household head's age (years)

X_3 = Household head's marital status (1=male, 0=otherwise)

X_4 = Size of household (head count)

X_5 = Education year of household head (years)

X_6 = Household's per capita monthly expenditure (naira)

X_7= Main occupation (1=agriculture, 0= otherwise)

X_8= Credit access (1= yes, 0=otherwise)

X_9 = Composite unit price of roots and tuber (#)

X_{10} = Composite unit price of cereals (#)

X_{11}= Composite unit price of legumes (#)

X_{12}= Composite unit price of fruits and vegetables (#)

X_{13} = Composite unit price of animal protein foods (#)

X_{14} = Composite unit price of fats and oil (#).

The explanatory variables were selected based on previous studies such as Nayga (1995); Han and Wahl (1998); Ruel *et al* (2005); Mutuc *et al* (2007); Obayelu (2010); Tey *et al* (2009); Ecker and Quim (2011); Ogundari and Arifalo (2013).

The probability derived was utilised to calculate the Inverse Mills Ratio for every household. In the second step estimation of the demand relations, the *IMR* includes the censoring of latent variables and is expressed as:

For $Z_i = 1$ $\quad IMR_i = \phi\,(P[Z_i = 1]) / \psi\,(P[Z_i = 1])$ ……………………………. (3.11)

For $Z_i = 0$ $\quad IMR_i = \phi\,(P[Z_i = 1]) / (1 - \psi\,(P[Z_i = 1])$ ………………... (3.12)

whereϕ and ψ represent density and cumulative probability functions respectively.

Share equations were then specified in the QUAIDS model in the second sub-step, with the inclusion of the *IMRs* as instrumental variables. If the coefficient of *IMR* is significant in the second sub-step, then the sub-sample of purchasing households represents itself and excludes non-purchasers from the analysis. The estimated model therefore suffers from selectivity bias. However, if the coefficient of the *IMR* is insignificant, it means there is no selectivity bias in the data. This means that the sub-sample of households purchasing food group is representative of the population.

3.4.3 Quadratic Almost Ideal Demand System (QUAIDS)

The QUAIDS, originated by Banks *et al* in1996, was employed to examine the socio-economic and demographic factors determining households' expenditure on the selected food groups. It is a rank three budget-share system that is quadratic in the logarithm of total expenditure; its attractive property is that it allows goods to be luxuries at low levels of total expenditure and necessities at higher levels.

The QUAIDS model, which stems from a generalisation of the PIGLOG preferences, begins from an indirect utility function of the form:

$$\text{InV}= \left\{ \left[\frac{\ln m - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.13)$$

where V is the indirect utility for j commodity, m is the household income,

a(p), b(p) and λ(p) are functions of the vector of unit prices p that guarantees the homogeneity property of the indirect utility function and the term[lnm –lna (p)] / b(p) is the indirect utility function of the PIGLOG demand system (a system with budget shares linear in log total expenditure). It is needful that a (p) is homogenous of degree one in p, b(p) and λ (p) homogenous of degree zero in p.

The lna (p) given in equation (3.14) has the usual translog form

$$\ln a(p) = \alpha_0 + \sum_j \alpha_j \ln p_j + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.14)$$

and b(p) is the simple Cobb- Douglas price aggregator expressed as

$$\text{b(p)}= \prod_{i=1}^{n} p_i^{\beta_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.15)$$

λ (p) is defined as

$$\lambda(p) = \sum_{i=1}^{n} \lambda_i \ln p_i \qquad \text{where} \quad \sum_i \lambda_i = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.16)$$

When Roy's identity is applied to the indirect utility function, the budget shares (ω_i) in the QUAIDS is given as

$$\omega_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln \left[\frac{m}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[\frac{m}{a(p)} \right] \right\}^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.17)$$

As evident in equation (3.17), Banks *et al* (1997) reveals that in these demand functions, the coefficients of the quadratic term must depend on price, which contradicts Blundell *et al* (1993) where the quadratic term does not depend on price. To reduce the number of parameters to be estimated and for consistency in theory homogeneity, symmetry and additivity, restrictions are usually imposed. An adequate requirement for the expenditure shares to be homogenous of degree zero in prices is: $\sum_i^n \gamma_{ij} = 0, \forall i$. In compensated demand functions, symmetric changes can be imposed by setting $\lambda_{ji,} \forall i \neq j$ Additivity require $\sum_{i=1}^n \alpha_i = 1 and \sum_{i=1}^n \beta i = 0$; these terms are trivially satisfied for a model with n goods when the estimation is carried out on a subset of n-1 independent equations. The parameters of the dropped equation are then computed from the restrictions and the estimated parameters of the n-1 expenditure shares. The fourth restriction involves concavity of the expenditure function. This restriction has, however, no obvious parametric representation. Theil and Mnookin (1966) argue that the rejection of demand properties should not be attributed to unorthodox consumer behaviour and, as such, analysts should guide these data to yield a sensible picture that complies with the theory by simply imposing theoretical constraints. Demographic effects were added, in line with Banks et al, (1996 and 1997), to influence preferences through the intercept in equation (3.17), or

$$\alpha_i = \rho_{10} + \sum_{j=1}^{s} \rho_{ij} d_j \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.18)$$

where dj is the jth demographic variable of which there are s numbers. Demographic variables are included using this translating approach because of its simplicity (Pollak and Wales, 1978).

The budget shares (ω_i) then becomes:

$$\omega_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(p)}\right] + \frac{\lambda_i}{b(p)} \left\{ \ln\left[\frac{m}{a(p)}\right] \right\}^2 + \sum_{s=1}^{L} \delta_{is} z_s + u_i \ldots\ldots (3.19)$$

where $z_s = (z_1, \ldots, z_L)$ is a set of demographic variables. Also, when the IMRs generated from the Probit regression are included in the budget share equation, it becomes:

$$\omega_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(p)}\right] + \frac{\lambda_i}{b(p)} \left\{ \ln\left[\frac{m}{a(p)}\right] \right\}^2 + \sum_{s=1}^{L} \delta_{is} z_s + \pi_i IMR_i + u_i \ldots (3.20)$$

Therefore, from equation (3.19) and (3.20) ij = food groups ;

$\alpha_i, \lambda, \beta, \gamma$ are the parameters to be estimated

w_i = average budget share to item i by the household

α_i = average value of budget share when price and income effects are absent

β = parameters that determine whether goods are luxuries or necessities

γ_{ij} = effects on the budget of item, i, of 1% change in the prices of items in group j

P_j = unit price of item j

m = per-capita expenditures on all commodities

∂_j = vectors of socio-economic and demographic variables.

π_i = vector of IMRs

μ_i = error term

It is important to note that P refers to unit price of food item and not the actual price. Deaton (1987) noted that P is not the exogenous market price; it is, instead, the unit value, which reflects households' food quality choices. Given that households' price on food items are difficult to obtain from primary surveys, researchers often use the unit price which is obtained by dividing total expenditure by quantity of food consumed as shown in household food budget obtained from the primary survey.

3.4.4 Calculations of budget shares of food groups

The individual food group budget share is calculated thus,

$W_{GI} = (P_{GI,} q_{GI}) / X_G$ = budget share of the ith food in group G, relative to total expenditure in group G;

G = particular group with G = 1, 2, 3……………, N

P_{GI} and q_{GI} = the price of ith food and its quantity in group G

$$W_G = \frac{X_G}{X} \text{ = The budget share of group G} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (3.21)$$

$$X_G = \sum P_{GI} q_{GI} = \text{Total expenditure in group G} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.22)$$

X = Total expenditure on the food groups

The following grouping of foods was based on the classification by Obayelu, (2010):

i. Roots and Tubers Crops (RT): Cassava tubers, other cassava products (cassava flour, chips and Gari), yam tubers and other yam products (flour and chips), sweet potato, Irish potato, cocoyam.

ii. Cereals (CR): Fresh maize, dry maize, maize flour, sorghum, rice, wheat grain and flour.

iii. Legumes (LG): Beans, soybean, groundnut and melon

iv. Fruits and Vegetables (FV): Orange, banana, plantain, mango, pawpaw, pineapple, coconut, guava, grape, okro, bitter leaf, green, pepper, tomato, conchorus, onion, garden egg and so on.

v. Animal Protein Foods: (AP) Goat meat, beef, mutton, pork, bush meat, turkey, chicken, fish (dry, fresh), crayfish and snail

vi. Fats and Oil (FO): palm oil, vegetable oil (groundnut oil, soybean oil, melon oil), butter and margarine, etc

The explanatory variables included in the model are:

Expenditure Shares

$$w_i = \frac{p_i q_i}{m}$$

w_i = households' expenditure share on each food group *i*

w_1 = share of roots and tubers (Roots and tubers)

w_2 = share of cereals (Cereals)

w_3 = share of legumes (legumes)

w_4 = share of fruits and vegetables (Fruits and Vegetables)

w_5 = share of animal protein foods (Animal Protein Foods)

w_6 = share of fats and oil (Fats and Oil)

$$\sum_{i=1}^{j} w_i = 1 \qquad \text{………………………………………………………} (3.23)$$

Prices of Food Groups

P_i = Composite unit price of food group i (N)

P_1= Composite unit price of roots and tuber (N)

P_2= Composite unit price of legumes (N)

P_3= Composite unit price of cereals (N)

P_4= Composite unit price of animal protein foods (N)

P_5= Composite unit price of fruits and vegetables (N)

P_6= Composite unit price of fats and oil (N)

Following Urzúa (2010), the price for each food group was constructed by first computing the weighting factor (a_{jh}) for each of the 6 groups for each household as:

$a_{jh} = w_{jh}/w_{ih}$

where w_{jh} = expenditure of household, h, on the individual food item j, where j = 1 – 6 and w_{ih}= the total expenditure of household h in group i

Using this weights and the unit prices derived for each food item, the composite price of group i is calculated as

$$p_i = p_1^{a_1} p_2^{a2} ...... p_n^{a_n} \quad \text{...} \ (3.23)$$

This is the composite unit price of group i used in the estimation of the QUAIDS model.

Quantities of Food Groups

The quantity of every food item purchased by the households in the 7-days memory recall period was estimated by converting their local measures to kilogram and later to the grain equivalent (GE), using the conversion factor by Kormawa (1999) as shown in the appendix. This was done to allow for the aggregation and technical relationship of the food items.

q_i= quantity of food group *i* (Kg-GE)

q_1 = physical quantity of roots and tuber (Kg-GE)

q_2 = physical quantity of cereals (Kg-GE)

q_3 = physical quantity of legumes (Kg-GE)

q_4 = physical quantity of fruits and vegetables (Kg-GE)

q_5 = physical quantity of animal protein foods (Kg-GE)

q_6 = physical quantity of fats and oil (Kg-GE)

m = households' total expenditure on all food groups in the demand system (Naira)

Demographic and Socio-economic Variables

zi = demographic and socio-economic variables

z_1 = dummy variable for location of residence (1= rural, 0= otherwise)

z_2 = age of household head (years)

z_3= household size (head count)

z_4 = years of education of household head (years)

z_5 = main occupation (1= agriculture, 0= otherwise)

z_6 = credit access (1 = yes, 0 = otherwise)

IMR = Inverse Mill's Ratio

3.4.5 Calculations of expenditure elasticity, compensated and uncompensated price elasticities

Banks *et al*, (1997) gave the formulae for the elasticities in the QUAIDS. In obtaining them, the budget share equation was first differentiated with respect to ln m and ln P_j respectively, to obtain $\mu_i = \frac{\partial w_i}{\partial \ln m} = \frac{2\lambda}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}$ ....(3.25)

and $\mu_{ij} = \frac{\partial w_i}{\partial \ln p_j} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_k \gamma_{jk} \ln p_k\right) - \frac{\lambda_i \beta_j}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2$ .... (3.26)

The expenditure elasticities are obtained as $e_i = \mu_i / w_i + 1$.

The uncompensated price elasticities are given by $e_{ij}^{\mu} = \mu / w_i - \delta_{ij}$ $where \delta_{ij}$ is the kronecker delta which when i=j is equal to 1, otherwise $\delta_{ij} = 0$

Using the Slutsky equation, $e_{ij}^{c} = e_{ij}^{\mu} + w_j e_i$, one can calculate compensated price elasticities and use it to evaluate the symmetry and negativity conditions by examining the matrix with element $w_i\left[e_{ij}^{c}\right]$, which, in the usual way, should be symmetric and negative semi definite. Furthermore, using the following' formulae, income, own price and price-cross elasticities can be calculated from the QUAIDS model (Savadogo and Brandt, 1988).

Income elasticity (e_{ij}) = 1 + bj/Wj (To know which food groups are luxuries or necessities)

Own-Price elasticity (e_{ij}) = 1 + (Yij/wi)+bi (To know which food groups are price-elastic or inelastic)

Price-Cross elasticity (e_{ij}) = Y_{ij}/w_i) – (b_i *w_j)/wi (To know which food groups are complements or substitutes)

where i $\neq$ j

The elasticities estimated with the above formulae is referred to as Marshallian elasticities. The result from the above was used to deduce what would happen to the demand of the various food groups.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter reveals and discusses the outcome of the analysis of the data collected for the study. It is divided into five parts. The first section presents and discusses the summary statistics of household heads' socio-economic variables. Section two profiles the expenditure shares of food groups across rural and urban areas and expenditure quintiles. Household expenditures on food and non-food items are presented in section three while households' decisions on food are presented in section four. Factors influencing households' demand for food groups and the expenditure, own and cross price elasticities of food groups are presented in section five.

4.1 Socio-economic Characteristics of Households

To completely understand household food expenditure patterns in the study area, there is need to analyse the household heads' socio-economic characteristics. Some of the most important characteristics considered are the respondents' location, gender, age, household size, marital status, occupational status, income level and cooperative membership. The descriptive analysis of the socio-economic characteristics of the respondents are presented in Tables 4.1 to 4.4

4.1.1 Gender

Table 4.1 shows that most of the households (81.9%) in the study area were headed by males while only 18.1% were female-headed. The same pattern was the case in both urban and rural areas, with males constituting 84.6% in urban areas and 79.5% in rural areas, while female-headed households constituted 15.4% and 20.5% in urban and rural areas respectively.

4.1.2 Marital status

The pooled data shows that 83.6% were married, 5.9% single, 5.6% divorced and 4.9% widowed, thus revealing that the majority of the household heads in the study areas were married. This may have a significant influence on food demand. Similarly, 84.6% of the respondents in urban areas were married while 82.6% were married in rural areas; 6.2%, 8.1% and 3.1% respectively were single, divorced and widowed in the rural areas while 5.6%, 2.8% and 7.0% were single, divorced and widowed in the urban areas thus showing that most of the household heads were married in both rural and urban areas.

4.1.3 Age distribution

The result of the pooled data reveals that the mean age of the household heads was 48.76 years, with 47.56 years and 49.83 years for urban and rural areas respectively. The age group between 46 and 60 years was the most predominant, showing that a greater proportion of the household heads were in their productive and agile years. Age may however, influence the type of food groups consumed by households as regards their physical and/or health needs.

4.1.4 Household size

Table 4.1 reveals that in the rural areas, 48.5% of the household heads had household sizes of between one and five members while in the urban areas, 61.5% also had household sizes of between one and five members. In the pooled data, more than half of the respondents (54.6%) had family sizes of between one and five members. The modal household size in the rural areas was five while that of the urban areas was four. The mean household size in both rural and urban areas was 6 and 5 members respectively while the pooled data was 6. Further analysis with the t-test showed that the difference in household size between rural and urban areas was significant at 1%, meaning that there is a significant difference at this level between the mean household sizes of rural and urban households in the study area.

4.1.5 Educational status

The majority of respondents (84.5%) had a form of formal education while only 15.5% were not formally educated (Table 4.2). This implies that an average head of household in the area could read and write. The highest percentage of respondents in the rural areas (41.0%) as well as in the urban areas (55.9%) had tertiary education, implying that most of the respondents in the urban and rural areas were literate.

4.1.6 Main occupation

In the rural areas, 57.8% of the respondents were involved in non-agricultural jobs while 42.2% were into agricultural activities. But in the urban areas, 81.1% were engaged in one form of non-agricultural job or the other while only 18.9% were into agricultural activities. Overall, the majority of respondents in both rural and urban areas were involved in non-agricultural activities (Table 4.2).

4.1.7 Employment status

Table 4.2 also reveals that 34.8% of the respondents in the rural areas were involved in other jobs, followed by trading 24.8%. But in the urban areas, salaried jobs (32.1%) were the most prominent form of employment, followed by involvement in other jobs (31.5%). The pooled results shows that majority of the respondents (33.2%) were also involved in other jobs. However, the job undertaken by the majority in the rural areas differs from those of the urban areas.

Table 4.1: Distribution of Respondents according to Sex, Marital status, Age and Household Size (HHSZ)

	Rural	Urban	Pooled (Rural and Urban)
Gender			
Male	128(79.5)	121(84.6)	249(81.9)
Female	33(20.5)	22(15.4)	55(18.1)
Total	161(100)	143(100)	304(100)
Marital status			
Married	133(82.6)	121(84.6)	254(83.6)
Single	10(6.2)	8(5.6)	18(5.9)
Divorced	13(8.1)	4(2.8)	17(5.6)
Widow	5(3.1)	10(7.0)	15(4.9)
Total	161(100)	143(100)	304(100)
Age (years)			
15 – 30	19(11.8)	16(11. 2)	35(11.5)
31 - 45	55(34.2)	51(35.7)	106(34.9)
46 – 60	56(34.8)	54(37.8)	110(36.2)
61 – 75	31(19.2)	22(15.3)	53(17.4)
Total	161(100)	143(100)	304(100)
Mean Age	49.83	47.56	48.76
Mode			60.00
Standard deviation	15.58	12.96	14.42
T – Value	1.384**		
Household Size			
1 – 5	78(48.5)	88(61.5)	166(54.6)
6 – 10	63(39.1)	50(35.0)	113(37.2)
11-15	19(11.8)	5(3.5)	24(7.9)
>16	1(0.6)	-	1(0.3)
Total	161(100)	143(100)	304(100)
Mean	6.00	5.00	6.00
Mode	5.00	4.00	5.00
Standard deviation	3.98	2.68	3.49
T-value	3.434***		

Source: Estimates from field survey, 2014. Figures in parenthesis are in percentage Figures in parentheses are in percentage except for the t-test where it is standard deviation, *, **, *** are significant levels at 10%, 5% and 1% respectively

Table 4.2: Distribution of Respondents according to Educational Status, Main Occupation, and Employment Status.

	Rural	Urban	Pooled
Educational Status			
No formal education	31(19.3)	16(11.2)	47(15.5)
Quranic education	-	1 (0.7)	1(0.3)
Pry education	31(19.3)	15(10.5)	46(15.1)
Sec education	33(20.4)	31(21.7)	64(21.1)
Tertiary education	66(41.0)	80(55.9)	146(48.0)
Total	161(100)	143(100)	304(100)
Main Occupation			
Non agriculture	93(57.8)	116(81.1)	209(68.8)
Agriculture	68(42.2)	27(18.9)	95(31.2)
Total	161(100)	143(100)	304(100)
Employment Status			
salaried job	36(22.4)	46(32.1)	82(27.0)
Private job	21(13.0)	21(14.7)	42(13.8)
Trading	40(24.8)	28(19.6)	68(22.4)
Students	8(5.0)	3(2.1)	11(3.6)
Other jobs	56(34.8)	45(31.5)	101(33.2)
Total	161(100)	143(100)	304(100)

Source: Estimates from the field survey, 2014

4.1.8 Membership of Cooperatives

The pooled data in Table 4.3 reveal that 57.9% of the household heads did not belong to any cooperative society. In the rural areas, 59.6% were not members of any cooperative society while in the urban areas, 55.2% did not belong to a cooperative society. That most household heads in both rural and urban areas did not participate in cooperative societies would probably affect their access to credit facilities.

4.1.9 Access to cooperative credit facilities

In the rural areas, 39.8% had access to cooperative credit facilities while 60.2% household heads did not have access to credit facilities. Likewise, in the urban areas, 37.8% of household heads had access to credit facilities while 62.2% did not. Results of the analysis of the pooled data show that 33.8% of household heads had access to credit while the majority (61.2%) did not. The low level of access to credit facilities may be due to the fact that most of them did not belong to any cooperative society.

4.1.10 Income

The households' per-capita monthly expenditure served as a proxy for household per-capita monthly income in the study area, and was grouped into quintiles.

The result of the analysis of household income reveals that the mean household income in the rural areas was N45, 025.20 while the mean monthly income earned in the urban areas by the household heads was N47, 594.22. The variations in income levels between household heads in the rural and urban areas had implications for the demand for food in the study area. The t-test analysis of households' monthly incomes across the rural and urban areas showed that incomes were significantly different at 5% level of significance. The variation between the incomes in the two areas had an implication on the households' food demand.

Table 4.3: Distribution of Respondents according to Income Groups, Membership of Cooperatives and Access to Credit

	Rural	Urban	Pooled
Membership of cooperative			
Membership	65(40.4)	63(44.1)	128(42.1)
Non Membership	96(59.6)	80(55.9)	176(57.9)
Total	161(100)	143(100)	304(100)
Access to Cooperative Credit Facilities			
Have Access	64(39.8)	54(37.8)	118(38.8)
No Access	97(60.2)	89(62.2)	186(61.2)
Total	161(100)	143(100)	304(100)
Income Group (Naira per month)			
<20000	67(41.6)	28(19.6)	95(31.3)
20001-40000	62(38.5)	59(41.3)	121(39.8)
40001-60000	24(14.9)	17(11.9)	41(13.5)
60001-80000	5(3.1)	10(7.0)	15(4.9)
>80000	3(1.9)	29(20.2)	32(10.5)
Total	161(100)	143(100)	304(100)
Mean	45025.20	47594.22	45292.86
Standard deviation	32816.81	38677.80	35634.90
t- test	-0.137**		

Source: Estimates from survey data, 2014.

Figures in parentheses are in percentage except for t-test where it is standard deviation, *, **, *** are significant levels at 10%, 5% and 1% respectively

4.2 Households Food Expenditure Profiles

This sections presents the results of the household expenditure shares of food groups and food items within the food groups in the rural and urban areas and across the income (expenditure) quintiles as well as the household expenditure on food and non-food.

4.2.1 Households' expenditure share of food groups

An analysis of the expenditure shares of the various food groups in Table 4.4 reveals that roots and tubers had the highest expenditure share of 27% in the rural areas, 22% in the urban areas and 25% in the study area generally. This was closely followed by cereals with 22% in the rural areas and 21% in the study area generally. But in the urban areas, the roots and tubers group was closely followed by fats and oil group with 21%. This is similar to some findings in past studies (Olorunfemi and Ajibefun, 2007 and Ashagidigbi *et al* 2012).

The expenditure share for Other Foods was the lowest among the food groups: 2% in the rural areas, 3% in the urban areas as well as the study area generally. Fruits and vegetables also recorded the second lowest in the rural (5%) and the urban (6%) areas, which may have implications for their health.

Furthermore, across the expenditure (income) quintiles in (Table 4.5), roots and tubers recorded the highest shares of 25%, 25%, 24%, and 28% respectively, in the first four quintiles. In the fifth quintile, however, animal protein foods recorded the highest expenditure share (23%) from the total expenditure on the food groups. This indicates that their relatively high income levels enabled them to be able to afford a higher consumption of protein foods. This is in line with the *a priori* expectation that as income increases, the amount expended on quality food also increases. Fruits and vegetables also recorded the second lowest in the first and second quintiles which was not so for the third to fifth quintiles. This may be as a result of households' awareness of the importance of fruits and vegetables in the diet.

The general inference from the foregoing is that although households in the study area had some similarities in the pattern of their expenditure shares to various food groups, there were still some dissimilarities in patterns of expenditure shares of food groups between rural and urban households and among the various expenditure (income) quintiles. Roots and tubers were the most widely consumed staple food in the rural and urban areas in the study area as well as among the various expenditure (income) quintiles, with the exception of the richest where animal protein foods were the most consumed, which is in line with the economic theory. According to Engels law, the proportion of the expenditure on food is inversely related to total income. He further noted that there is a higher propensity of households experiencing increasing income to spend a bigger proportion of their food budget on a diversified diet in order to improve the nutritional status of members of the household.

Table 4.4: Percentages of the Expenditure on Food Groups in the Rural and Urban Areas

Food Groups	Rural	Urban	All Households
Roots and Tubers	27.13 (0.236)	22.19 (0.195)	24.81 (0.219)
Cereals	21.62 (0.195)	20.09 (0.185)	20.90 (0.191)
Legumes	8.70 (0.100)	10.14 (0.115)	9.38 (0.107)
Fruits and Vegetables	5.23 (0.094)	5.76 (0.099)	5.48 (0.096)
Animal Protein Foods	17.19 (0.177)	17.68 (0.190)	17.42 (0.183)
Fats and Oil	17.78 (0.167)	21.02 (0.181)	19.30 (0.174)
Others	2.36 (0.040)	3.12 (0.051)	2.72 (0.046)

Source: Estimates are from the Field Survey, 2014. Standard deviations are in parenthesis

Table 4.5: Percentages of the Expenditure on Food Groups across Income Quintiles

Food Groups	Income 1	Income 2	Income 3	Income 4	Income 5
Roots and Tubers	25.40	24.99	24.31	27.53	21.70
	(0.229)	(0.231)	(0.195)	(0.211)	(0.177)
Cereals	21.92	20.77	22.25	10.68	21.40
	(0.198)	(0.197)	(0.188)	(0.108)	(0.171)
Legumes	12.09	10.11	4.76	4.87	6.59
	(0.111)	(0.123)	(0.052)	(0.056)	(0.066)
Fruits and Vegetables	3.46	5.41	7.88	7.52	7.69
	(0.081)	(0.101)	(0.088)	(0.106)	(0.116)
Animal Protein Foods	13.31	17.31	21.07	23.36	22.60
	(0.155)	(0.187)	(0.180)	(0.211)	(0.213)
Fats and Oil	20.76	18.64	18.06	21.14	18.20
	(0.184)	(0.169)	(0.153)	(0.170)	(0.198)
Others	3.06	2.77	1.68	4.88	1.82
	(0.039)	(0.058)	(0.017)	(0.059)	(0.014)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.2 Composition and expenditure shares of roots and tubers

On the average, yam tuber had the highest expenditure share (48%) from total expenditure on the roots and tubers food group in both rural and urban areas (Table 4.6). It had 49% in the urban areas and 47% in the rural areas. This is a reflection of households' preference for yam tubers in the areas. Next was processed cassava which recorded 26% of the total expenditure on roots and tubers in the study area generally, 25% in the urban areas and 28% in the rural areas. Cassava tuber had 5%, cocoyam, 2% and sweet potato 0.6%. Irish potato, with 0.2%, had the lowest expenditure shares in the study area generally. This could be attributed to the fact that unprocessed cassava, cocoyam, sweet potato and Irish potato are not traditional staple foods in the communities.

Furthermore, across the quintiles, the yam tuber was the most purchased root and tuber by both the poor and the rich (Table 4.7). However, in the first to third quintiles, the yam tuber had the highest expenditure share of 45%, 47%, and 48% respectively, in the roots and tubers group whereas in the fourth and fifth quintiles, the expenditure shares of yam tubers constituted 61% and 54% respectively, higher than the pooled average of 48%. The high expenditure share of yam tubers and the increase in the share across the quintiles reveals the preference of the communities for the commodity. Unprocessed cassava, cocoyam, sweet potato and Irish potato, however, had the lowest expenditure shares across the expenditure quintiles in the study area. Generally, in the roots and tubers food group, the yam tuber was the most preferred food in the rural and urban areas as well as across the quintiles while unprocessed cassava, cocoyam, sweet potato and Irish potato were not traditional staple foods in the communities.

Table 4.6: Composition and Percentages of the Expenditure on the Roots and Tubers Group among Rural and Urban Households

Composition of Food Group	Rural	Urban	All households
Cassava tuber	5.86 (0.200)	4.90 (0.151)	5.41 (0.179)
Processed cassava	27.78 (0.342)	24.76 (0.318)	26.36 (0.331)
Yam tuber	46.61 (0.390)	49.20 (0.366)	47.83 (0.378)
Yam flour	16.34(0.249)	19.04 (0.256)	17.61(0.251)
Sweet potato	0.40 (0.045)	0.74 (0.052)	0.56 (0.048)
Irish potato	0.26 (0.020)	0.23 (0.017)	0.24 (0.019)
Cocoyam	2.75 (0.105)	1.13 (0.054)	1.99 (0.085)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.7 Composition and Percentages of the Expenditure on the Roots and Tubers Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Cassava tuber	3.48	7.29	5.23	2.85	5.44
	(0.129)	(0.222)	(0.192)	(0.088)	(0.129)
Processed cassava	27.84	26.76	24.93	20.24	25.17
	(0.337)	(0.338)	(0.325)	(0.282)	(0.332)
Yam	44.95	46.58	48.40	61.36	54.03
	(0.387)	(0.377)	(0.403)	(0.346)	(0.340)
Yam flour	23.04	16.62	13.02	15.13	12.30
	(0.301)	(0.211)	(0.237)	(0.254)	(0.208)
Sweet potato	0.00	0.61	1.63	0.00	0.92
	(0.000)	(0.052)	(0.088)	(0.000)	(0.045)
Irish potato	0.00	0.37	0.42	0.00	0.38
	(0.00)	(0.023)	(0.026)	(0.000)	(0.019)
Cocoyam	0.69	1.77	6.38	0.42	1.77
	(0.045)	(0.085)	(0.155)	(0.016)	(0.052)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.3 Composition and expenditure shares of cereals

Table 4.8 reveals that rice accounted for the highest (52%) expenditure share of cereals group in the study area generally (pooled). In rural and urban areas, expenditure shares of rice were 62% and 53% respectively. This reflects the fact that rice has become a staple food in Nigeria in both rural and urban areas.

Across the five quintiles, rice had the highest expenditure shares of 57%, 56%, 58%, 50% and 67% respectively followed by maize with 39%, 39%, 29%, 40% and 24% respectively (Table 4.9). Sorghum was not consumed at all across the various income groups and among rural and urban households in the study area. This shows that sorghum was not a recognised food in the study area due largely to traditional preferences. In both rural and urban areas, wheat, with 7%, recorded the lowest expenditure share. Generally, rice has become a staple food in the rural and urban areas as well as across all the quintiles whereas sorghum was not a recognised food in the study areas.

Table 4.8 Composition and Percentages of the Expenditure on the Cereals Group

Composition of Food Group	Rural	Urban	All Households
Maize	31.68 (0.367)	39.96 (0.386)	41.57 (0.396)
Sorghum	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)
Rice	61.76 (0.432)	52.70 (0.448)	51.50 (0.441)
Wheat	6.56 (0.156)	7.34 (0.151)	6.93 (0.153)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.9 Composition and Percentages of the Expenditure on the Cereals Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Maize	38.88	38.62	28.57	39.50	24.04
	(0.364)	(0.412)	(0.396)	(0.419)	(0.384)
Sorghum	0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rice	57.15	56.12	57.49	50.12	67.20
	(0.482)	(0.460)	(0.490)	(0.444)	(0.506)
Wheat	3.97	5.30	13.94	10.38	8.76
	(0.107)	(0.159)	(0.202)	(0.145)	(0,152)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.4 Composition and expenditure shares of legumes

Table 4.10 shows that beans accounted for over 70% of the total expenditure on legumes in the pooled sample while groundnut and melon had 15% and 12% respectively. In the rural areas, the expenditure share of beans was 77% while in the urban areas, it was 70%. Melon accounted for the lowest shares in the rural and urban areas with 9% and 15% respectively. Across the quintiles, beans accounted for over 70% expenditure shares in the first, second and fifth quintiles while in the third and fourth quintiles, the expenditure shares of beans were 62% and 67% respectively (Table 4.11). Beans was therefore a preferred food item in the legumes food group in the rural and urban areas and across the quintiles.

Table 4.10 Composition and Percentages of the Expenditure on the Legumes Group

Composition of Food Group	Rural	Urban	All households
Beans	76.48(0.432)	69.76(0.436)	73.32(0.433)
Groundnut	14.77(0.351)	15.51(0.357)	15.12(0.353)
Melon	8.75(0.255)	14.73(0.315)	11.56(0.286)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.11 Composition and Percentages of the Expenditure on the Legumes Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Beans	75.40	75.93	61.69	66.67	75.32
	(0.435)	(0.410)	(0.467)	(0.507)	(0.434)
Groundnut	17.15	11.98	17.18	20.00	15.98
	(0.375)	(0.316)	(0.381)	(0.414)	(0.368)
Melon	7.45	12.09	21.13	13.33	8.70
	(0.240)	(0.286)	(0.378)	(0.352)	(0.227)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.5 Composition and expenditure shares of fruits and vegetables

Table 4.12 show the percentages of the expenditure shares of fruits and vegetables among rural and urban households and across the quintiles. Plantain recorded the highest expenditure share of over 40% in the study area generally, as well as in the rural and the urban areas. This was followed by tomato with 14% in the rural areas and 15% in the urban areas. The expenditure shares of most of the other fruits and leafy vegetables were less than 1% in the rural and the urban areas of the study area. This reflects the fact that fruits and vegetables were often purchased in small quantities and at relatively low prices in the study area.

Furthermore, across the expenditure (income) quintiles, the expenditure shares of plantain also recorded the highest expenditure share of 44%, 36%, 42%, 57% and 35% respectively across the quintiles (Table 4.13). The percentages of the expenditures in respect of many fruits and leafy vegetables were relatively low across the quintiles since each was less than 1%. In general, leafy vegetables and many fruits were poorly consumed in the rural and urban areas as well as across the quintiles. Plantain was the most widely consumed food item in the fruits and vegetables group.

Table 4.12 Composition and Percentages of the Expenditure on the Fruits and Vegetables Group

Composition of Food Group	Rural	Urban	All Household
Plantain	40.08 (0.338)	40.71 (0.301)	40.47 (0.321)
Banana	7.23 (0.164)	2.76 (0.082)	5.13 (0.134)
Okra	4.01 (0.159)	3.39 (0.146)	3.72 (0.153)
Tomato	14.09 (0.257)	15.11 (0.234)	14.57 (0.246)
Pepper	7.17 (0.169)	10.52 (0.178)	8.75 (0.174)
0nions	10.26(0.275)	11.46 (0.247)	10.82 (0.261)
Carrot	0.07(0.006)	0.75 (0.038)	0.39 (0.027)
Eggplant	0.55(0.037)	0.27 (0.024)	0.42 (0.032)
Cabbage	0.00(0.000)	0.00 (0.000)	0.00 (0.000)
Cucumber	0.03(0.004)	0.03 (0.004)	0.03 (0.004)
Corchorus	0.19(0.011)	0.19 (0.010)	0.19 (0.010)
Spinach	0.06(0.004)	0.07 (0.005)	0.06 (0.005)
Bitter leaf	0.05 (0.004)	0.05 (0.004)	0.05 (0.004)
Waterleaf	0.11(0.011)	0.15(0.014)	0.13 (0.012)
Orange	5.54 (0.165)	4.98(0.145)	5.27 (0.156)
Mango	2.70(0.113)	2.72(0.112)	2.71 (0.113)
Pawpaw	2.21(0.098)	3.23 (0.127)	2.69 (0.113)
Pineapple	0.17(0.021)	0.32(0.038)	0.24 (0.031)
Apple	0.77(0.060)	1.08(0.073)	0.92 (0.066)
Coconut	2.48(0.125)	0.88(0.062)	1.73 (0.101)
Guava	0.06(0.006)	0.10(0.007)	0.08 (0.007)
Sugarcane	0.96(0.073)	0.64(0.058)	0.81 (0.066)
0thers	1.02(0.073)	0.59(0.054)	0.82 (0.065)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.13: Composition and Percentages of the Expenditure on the Fruits and Vegetables Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Plantain	44.22 (0.312)	35.89 (0.323)	41.87 (0.359)	56.59 (0.354)	35.30 (0.265)
Banana	6.14 (0.157)	4.82 (0.131)	6.70 (0.143)	4.37 (0.062)	1.61 (0.065)
Okra	4.68 (0.177)	4.12 (0.159)	1.54 (0.002)	4.70 (0.008)	3.67 (0.177)
Tomato	13.06 (0.244)	17.24 (0.261)	8.64 (0.173)	6.51 (0.177)	20.54 (0.282)
Pepper	9.84 (0.206)	8.98 (0.162)	6.80 (0.143)	2.57 (0.062)	10.02 (0.185)
Onions	12.47 (0.285)	12.35 (0.266)	7.72 (0.241)	0.48 (0.009)	8.99 (0.252)
Carrot	0.29 (0.027)	0.65 (0.034)	0.08 (0.004)	0.02 (0.001)	0.26 (0.014)
Eggplant	0.00 (0.000)	0.51 (0.036)	0.71 (0.040)	0.00 (0.000)	1.12 (0.051)
Cabbage	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)
Cucumber	0.00 (0.000)	0.04 (0.004)	0.00 (0.000)	0.00 (0.000)	0.15 (0.009)
Corchorus	0.17 (0.010)	0.21 (0.012)	0.10 (0.003)	0.00 (0.002)	0.35 (0.011)
Spinach	0.00 (0.000)	0.07 (0.005)	0.13 (0.005)	0.00 (0.000)	0.17 (0.089)
Bitter leaf	0.00 (0.000)	0.06 (0.005)	0.06 (0.002)	0.00 (0.000)	0.16 (0.009)
Waterleaf	0.17 (0.017)	0.17 (0.013)	0.17 (0.003)	0.17 (0.000)	0.07 (0.002)
Orange	4.54 (0.176)	4.26 (0.128)	6.81 (0.152)	9.38 (0.263)	7.39 (0.263)
Mango	1.77 (0.096)	2.99 (0.111)	2.83 (0.087)	5.83 (0.226)	2.81 (0.121)
Pawpaw	0.69 (0.067)	3.07 (0.129)	6.55 (0.146)	4.47 (0.173)	1.41 (0.039)
Pineapple	0.00 (0.000)	0.22 (0.025)	1.12 (0.071)	0.00 (0.000)	0.00 (0.000)
Apple	0.03 (0.003)	1.45 (0.079)	0.24 (0.013)	0.00 (0.000)	2.83 (0.134)
Coconut	1.07 (0.084)	2.58 (0.127)	2.16 (0.104)	0.68 (0.026)	0.40 (0.019)
Guava	0.03 (0.003)	0.16 (0.010)	0.00 (0.000)	0.16 (0.006)	0.16 (0.006)
Sugarcane	0.00 (0.000)	0.00 (0.000)	3.82 (0.144)	1.73 (0.067)	1.96 (0.111)
Others	0.83 (0.081)	0.19 (0.021)	2.05 (0.099)	2.51 (0.097)	0.79 (0.097)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.6 Composition and expenditure shares of animal protein foods group

Table 4.14 shows that fish accounted for the highest percentage (38%) of the expenditure on commodities in the animal protein food group in all households. In the rural areas, however, fish accounted for 36% while in the urban areas it accounted for 40%. This was followed by chicken which accounted for 16% in the rural areas and 18% in the urban areas. However, sheep meat, turkeys and shrimps each accounted for less than 1% in the rural areas, which shows that these sources of animal protein were poorly purchased. In urban areas, the animal protein foods that were poorly purchased were sheep meat, bush meat and shrimps. Cheese was not a recognised animal protein food in the entire study area.

Across the expenditure quintiles, fish accounted for the highest percentage of 47% and 34% respectively in the first and second quintiles (Table 4.15). This was followed by chicken, with 21% in the first quintile and 19% in the second quintile. But in the third to fifth quintiles, beef accounted for the highest percentage of 42%, 40% and 40% respectively. The percentages of the expenditure on eggs was low with 13%, 7%, 6%, 3% and 3% respectively across the quintiles, revealing that eggs were more preferred by the poor than the rich households. Milk, on the other hand, had a higher percentage of the expenditure than eggs with 6% in the second, third and fifth quintiles, 7% in the fourth quintile and 1% in the first quintile. This shows that milk was poorly purchased by the poorest households.

From the foregoing, the patterns of household allocation of expenditure to animal protein food groups in rural and urban areas as well as across the various quintiles differed slightly, although there were some similarities. Fish was a preferred food item in the rural and urban areas as well as among the poor while beef was preferred among the rich. Turkey was poorly purchased in the rural areas while bush meat was poorly purchased in the urban areas. Eggs were more preferred among the relatively poor than the relatively rich while milk was poorly purchased by the relatively poor households.

Table 4.14 Composition and Percentages of the Expenditure on the Animal Protein Foods Group

Composition of Food Group	Rural	Urban	All Households
Beef	15.68(0.290)	14.31(0.271)	15.04(0.281)
Goat meat	3.64(0.149)	2.27(0.104)	3.00(0.130)
Sheep meat	0.63(0.042)	0.82(0.046)	0.72(0.044)
Bush meat	2.83(0.122)	0.85(0.058)	1.90(0.098)
Chicken	16.42(0.346)	17.92(0.346)	17.13(0.345)
Turkey	0.91(0.053)	1.03(0.056)	0.97(0.025)
Fish	35.71(0.348)	39.53(0.379)	37.49(0.362)
Snail	11.39(0.381)	9.96(0.279)	10.72(0.290)
Shrimp	0.32(0.016)	0.74(0.033)	0.51(0.025)
Eggs	7.99(0.233)	8.25(0.207)	8.11(0.221)
Other meat	0.00(0.000)	0.00(0.000)	0.00(0.000)
Milk	4.48(0.163)	4.32(0.171)	4.41(0.166)
Cheese	0.00(0.000)	0.00(0.000)	0.00(0.000)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.15 Composition and Percentages of the Expenditure on the Animal Protein Foods Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Beef	5.36	13.12	41.85	39.53	39.49
	(0.186)	(0.260)	(0.340)	(0.319)	(0.355)
Goat meat	0.25	3.40	5.49	15.03	0.78
	(0.018)	(0.138)	(0.180)	(0.285)	(0.030)
Sheep meat	0.65	0.51	0.39	3.81	0.79
	(0.046)	(0.041)	(0.025)	(0.080)	(0.040)
Bush meat	2.00	1.64	2.07	0.67	2.92
	(0.114)	(0.093)	(0.067)	(0.014)	(0.118)
Chicken	20.68	18.51	12.12	9.40	11.39
	(0.391)	(0.356)	(0.273)	(0.264)	(0.266)
Turkey	0.36	1.05	2.45	0.61	0.75
	(0.020)	(0.062)	(0.096)	(0.014)	(0.022)
Fish	46.84	33.76	18.21	10.48	25.64
	(0.409)	(0.366)	(0.285)	(0.197)	(0.330)
Snail	9.15	14.86	4.64	9.10	8.25
	(0.282)	(0.337)	(0.165)	(0.262)	(0.255)
Shrimp	0.14	0.49	0.75	0.82	1.28
	(0.014)	(0.025)	(0.018)	(0.017)	(0.050)
Egg	13.18	6.90	5.81	3.17	2.90
	(0.298)	(0.204)	(0.146)	(0.079)	(0.055)
Other meat	0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Milk	0.95	5.76	6.22	7.38	5.81
	(0.058)	(0.194)	(0.181)	(0.257)	(0.189)
Cheese	0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis.

4.2.7 Composition and expenditure shares of fats and oil group

Table 4.16 shows that palm oil accounted for the highest percentage (57%) of the expenditure in the rural areas followed by other vegetable oils with 41%. In the urban areas, the expenditure on other vegetable oils was the highest (55%), followed by that on palm oil (43%). This finding is consistent with the report on household expenditure shares on fats and oil in rural areas by Fashogbon (2011). Margarine was the least purchased.

As regards expenditure shares by quintiles (Table 4.17), palm oil accounted for the highest percentage of the expenditure with 53%, 52% and 57% respectively in the first, second and fifth quintiles whereas in the third and fourth quintiles, expenditure shares of other vegetable oils were the highest with 55% and 54% respectively. In general, palm oil was the most preferred in the rural areas and among the relatively poor and rich households whereas other vegetable oils were preferred in the urban areas and among the relatively rich.

Table 4.16 Composition and Percentages of the Expenditure on the Fats and Oil Group

Composition of Food Group	Rural	Urban	All Households
Palm oil	56.59 (0.467)	43.21 (0.437)	51.95 (0.455)
Other Vegetable oils	41.18 (0.461)	55.06 (0.441)	46.06 (0.45)
Margarine	2.23 (0.136)	1.73 (0.108)	1.99 (0.124)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

Table 4.17 Composition and Percentages of the Expenditure on the Fats and Oil Group across Income Quintiles

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Palm oil	53.33	52.40	45.25	39.64	57.31
	(0.475)	(0.457)	(0.432)	(0.461)	(0.422)
Other Vegetable oils	43.03	46.46	54.50	53.93	42.21
	(0.472)	(0.457)	(0.431)	(0.474)	(0.415)
Margarine	3.64	1.14	0.25	6.43	0.48
	(0.177)	(0.078)	(0.011)	(0.249)	(0.019)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis

4.2.8 Composition and expenditure shares of other foods (beverages, seasonings and condiments)

As shown in Table 4.18, cocoa drinks accounted for the highest percentage of the expenditure on other foods (42%) in the study area generally. But in the rural areas, the percentage of the expenditure on cocoa drinks was 41% while in the urban areas it was 42%. This was followed by tea with 25% in all households, 28% in the rural areas and 21% in the urban areas. The percentages of the expenditure on artificial seasonings were also consistently high in the rural and urban areas. This was probably a reflection of their preference for artificial seasonings in the study area.

In Table 4.19, cocoa drinks accounted for the highest percentage of the expenditure on other foods across the quintiles with 39%, 48%, 41%, and 36% respectively, with the exception of the third quintile where tea accounted for the highest percentage with 47%, followed by cocoa drinks with 13%. In general, cocoa drinks and artificial seasonings were preferred food items among the rural and urban households as well as across most of the quintiles. It can be generally inferred that some features were common to both rural and urban households in the patterns of allotment of percentages of the food expenditure to the various food items in the food groups and across the quintiles. However, there were still some dissimilarities in the patterns in respect of some food items in the various food groups between rural and urban households and among the various quintiles.

Table 4.18 Composition and Percentages of the Expenditure on Other Foods Group

Composition of Food Group	Rural	Urban	All Households
Cocoa drink	40.50 (0.408)	42.10 (0.424)	42.17 (0.415)
Tea	28.43 (0.383)	21.21(0.340)	25.03 (0.365)
Coffee	4.84 (0.201)	7.92(0.239)	6.29 (0.219)
Soft drink	0.03 (0.004)	0.06(0.005)	0.05 (0.005)
Juice	1.27 (0.079)	3.07(0.109)	2.12 (0.095)
Alcohol	0.63 (0.038)	1.10(0.056)	0.85 (0.048)
Wine	0.15 (0.015)	0.12(0.010)	0.14 (0.013
Sugar	0.70 (0.035)	0.90(0.039)	0.80 (0.037)
Chocolate	0.55 (0.036)	1.05(0.051)	0.78 (0.044)
Ice cream	0.05 (0.005)	0.00 (0.000)	0.03 (0.004)
Biscuit	1.06(0.073)	2.41(0.104)	1.70 (0.089)
Snacks	2.68 (0.099)	2.65(0.101)	2.66 (0.099)
Seasonings	9.34 (0.221)	8.10(0.193)	8.76 (0.208)
Salt	5.35 (0.126)	6.05(0.153)	5.68 (0.139)
Locust beans	2.36 (0.089)	2.07(0.063)	2.23 (0.078)
Curry	2.06(0.104)	1.19(0.041)	1.65 (0.081)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis.

Table 4.19 Composition and Percentages of the Expenditure on Other Foods Group across Income Quintiles.

Composition of Food Group	Income 1	Income 2	Income 3	Income 4	Income 5
Cocoa	38.73	47.72	12.96	40.87	35.79
	(0.418)	(0.438)	(0.302)	(0.425)	(0.373)
Tea	28.84	22.80	47.21	30.61	16.10
	(0.382)	(0.360)	(0.386)	(0.387)	(0.277)
Coffee	7.53	6.78	4.43	0.34	5.94
	(0.251)	(0.232)	(0.174)	(0.009)	(0.179)
Soft drink	0.00	0.00	0.12	0.64	0.00
	(0.000)	(0.000)	(0.008)	(0.017)	(0.000)
Juice	0.20	2.11	2.31	0.33	8.43
	(0.015)	(0.097)	(0.091)	(0.010)	(0.185)
Alcohol	0.15	0.46	2.49	0.60	2.48
	(0.014)	(0.026)	(0.086)	(0.016)	(0.091)
Wine	0.07	0.06	0.41	0.00	0.31
	(0.007)	(0.007)	(0.027)	(0.000)	(0.018)
Sugar	0.25	0.83	0.55	1.10	2.49
	(0.017)	(0.039)	(0.017)	(0.027)	(0.074)
Chocolate	0.39	0.21	2.18	4.15	0.76
	(0.026)	(0.021)	(0.074)	(0.110)	(0.043)
Ice cream	0.00	0.00	0.00	0.12	0.00
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)
Biscuit	1.92	0.74	2.57	4.88	2.04
	(0.109)	(0.047)	(0.098)	(0.189)	(0.065)
Snacks	0.37	1.17	10.74	2.97	4.63
	(0.026)	(0.043)	(0.228)	(0.063)	(0.088)
Seasonings	13.27	7.69	5.99	10.62	2.05
	(0.261)	(0.201)	(0.193)	(0.159)	(0.058)
Salt	4.23	5.22	5.37	2.26	13.70
	(0.130)	(0.132)	(0.107)	(0.046)	(0.217)
Locust beans	3.18	1.79	1.46	0.40	2.91
	(0.109)	(0.069)	(0.035)	(0.009)	(0.054)
Curry	0.87	2.42	1.21	0.11	2.37
	(0.041)	(0.118)	(0.040)	(0.003)	(0.054)

Source: Estimates from survey data, 2014. Standard deviations are in parenthesis.

4.3 Zero Expenditure on Food Groups

When micro-data is used to model demand, it is expected that a number of households that purchased zero quantities of some commodities during the time the survey was carried out would be observed (Bopape, 2006). A number of econometric challenges are faced in a sample with a large number of households with zero purchase

Table 4.20 shows the percentages of purchasing and non-purchasing households vis-a-vis the various food groups in the study area. In the rural areas, the roots and tubers group recorded the highest purchase (97.5%), followed by the fats and oil, legumes, cereals and animal protein foods groups. The proportion of households that purchased fruits and vegetables was the lowest (80.7%). In the urban areas, the roots and tubers group also had the highest percentage (99.3%); following it were legumes, fats and oil, cereals and animal protein foods groups. Fruits and vegetables also recorded the least (76.2%), like in the rural areas. The same trend was also observed in the pooled data result where the roots and tubers recorded the highest (98.4%) purchased while the fruits and vegetables group recorded the lowest (78.6%) purchased. The variation in respect of legumes and fats and oil in the rural and urban areas implies that the types of food purchased in the rural and urban areas differ.

Also in the pooled data, the highest zero purchased food group was fruits and vegetables which was 21.4% followed by animal protein foods (12.8%) whereas the lowest zero purchased food group was the roots and tubers group (1.6%). The same trend was observed in the rural and urban areas of the study area. The high percentage of zero purchase of fruits and vegetables as well as animal protein foods may have negative nutritional implications on household members in the study area.

Table 4.20 Percentage of Households with Zero Expenditure on Food Groups in Rural and Urban Areas

Food Groups	Rural (n =161 or 53.0%)		Urban (n=143 or 47.0%)		Pooled (n= 304 or 100%)	
	P	ZP	P	ZP	P	ZP
Roots and Tubers	157(97.5)	4(2.5)	142(99.3)	1(0.7)	299(98.36)	5(1.64)
Cereals	152(94.4)	9(5.6)	125(87.4)	18(12.6)	277(91.1)	27(8.9)
Legumes	154(95.7)	7(4.3)	141(98.6)	2(1.4)	295(97.0)	9(3.0)
Fruits and Vegetables	130(80.7)	31(19.3)	109(76.2)	34(23.8)	239(78.6)	65(21.4)
Animal Protein Foods	141(87.6)	20(12.4)	124(86.7)	19(13.3)	265(87.2)	39(12.8)
Fats and Oil	155(96.3)	6(3.7)	138(96.5)	5(3.5)	293(96.4)	11(3.6)
Others	141(87.6)	20(18.4)	124(86.7)	19(13.3)	282(92.7)	22(7.2)

Source: Estimates from survey data, 2014. Percentages are in parenthesis. P is percentage of purchase; ZP is percentage of non-purchase or zero purchase

4.4 Household Expenditure on Food and Non-Food Items

The money spent on food by households reveal how adequately such households meet their food needs. This section, therefore, presents relevant statistics on household per capita expenditure in order to compare expenditures of rural and urban households and across the quintiles in the area of study. The mean expenditure per household per month is the amount of money spent by the household on the average, in a month.

The analysis of households' expenditure on food and non-food items revealed that rural households spent more on food items (59%) than they do on non-food items (41%). The reverse is the case in urban households where less (33%) of their total expenditure was spent on food and more (67%) was spent on non-food items. This is consistent with the findings in the study of Ashagidigbi *et al (*2012).

Across the income quintiles, results reveal that income quintiles one and two (the relatively poor) spent more (63% and 59% respectively) on food items than they did on non-food items (37% and 41% respectively), whereas income quintiles three to five (the relatively rich) spent progressively less (47%, 37% and21% respectively) on food items than on non-food items (53%, 63% and 79% respectively) (Table 4.22). The result shows that, as household income rose in the study area, the proportion spent on food fell. This is consistent with Engel's law and the FAO (2008) report that the proportion of income spent on food tends to decrease with higher levels of per capita income. From the foregoing, households' expenditure on food and non-food items differed in the rural and urban areas as well as among the relatively poor and relatively rich households.

Table 4.21: Mean Distribution of Households' Expenditure on Food and Non-Food Items (# per month)

Household food expenditure	Rural	Urban	All households
Mean Expenditure on food	15805.71	15027.76	15439.76
Mean Expenditure on non-food	10947.83	30675.92	20227.82
Mean Expenditure	26753.54	45703.68	35667.58
% share of food exp. in total exp.	59.08	32.88	43.29
% share of non-food exp. in total exp.	40.92	67.12	56.71

Source: Estimates from survey data, 2014.

Table 4.22: Mean Distribution of Households' Expenditure on Food and Non-Food across Income Quintiles (# per month)

Household expenditure	Income 1	Income 2	Income 3	Income 4	Income 5
Mean Expenditure on food	7971.66	16238.79	22163.82	24906.89	21536.46
Mean Expenditure on non-food	4614.47	11514.86	25099.27	42314.67	82931.07
Mean Expenditure	12586.13	27753.65	47263.09	67221.56	104467.53
% share of food exp. in total exp.	63.34	58.51	46.89	37.05	20.62
% share of non-food exp. in total exp.	36.66	41.49	53.11	62.95	79.38

Source: Estimates from survey data, 2014

4.5 Households' Decision on Food Sharing in the Study Area

Table 4.23 reveals that 25% of the households had no specific methods of sharing food in their households. The majority (27.3%) of the urban households also had no specific methods of sharing food in their household while in the rural areas; the majority (26.1%) shared food amongst household members based on age. In the pooled data as well as in the urban areas, the least (16.1% and 14.7%) respectively number of households shared food based on the gender of household members, while the least (14.9%) in the rural areas shared food based on age and gender. Also, over 90% of the households gave special attention to children. In the rural area, the type of attention given to children is that most (75.8%) of them are served first and best while in the urban areas the type of attention given to children was that the majority (87.4%) are served with more quality food.

Table 4.23 also show that households' decision on the type of food to purchase at a particular time in all households (pooled) as well as a rural and urban areas (42.4%, 34.8% and 51% respectively) was found to be the joint decision of the household head and his wife. In the study area, less than 12% of the households allowed their children to make decisions on the choice of food to be purchased. Also, the number of household members was found to be a determining factor in the quantity of food to be purchased. About 45.7% of all households, 50.9% of rural households and 39.9% of urban households based the quantity of food to be purchased on the number of household members. The second most important factor that determines the quantity of food to be purchased is the amount of money available to buy the food rather than buying on credit.

Furthermore, the prevalent factor that determined the type of food to be purchased by the household in the study area was consideration for balanced diet; that is the food that would give the household members a balanced diet. About 45.7% of all households, 46% of rural households and 45.5% of urban households adopted the criterion of balanced diet in their choice of the types of food to purchase. The least revealed factor that determined the type of food to be purchased by the household in the study area was the types of food produced on their farms. In general, households' decisions on food to be purchased and consumed differ in the rural and urban areas, although there were still some similarities in some of their decisions.

Table 4.23 Households' Decisions on Food to be Purchased and Consumed in the Study Area

Characteristics	Decision	Rural	Urban	All household
How do you Share food?	Share food based on age	42(26.1)	31(21.7)	73(24.0)
	Share food based on gender	28(17.4)	21(14.7)	49(16.1)
	Share food based on age and gender	24(14.9)	28(19.6)	52(17.1)
	Share food based on who comes first	30(18.6)	24(16.8)	54(17.8)
	No specific method of sharing food	37(23.9)	39(27.3)	76(25.0)
	Total	161(100)	143(100)	304(100)
Do you give special attention to children?	No	13(8.1)	14(9.8)	27(8.9)
	Yes	148(91.9)	129(90.2)	277(91.1)
	Total	161(100)	143(100)	304(100)
What type of Attention?	More food quantity	18(11.2)	4(2.8)	22(7.2)
	More quality food	21(13.0)	125(87.4)	146(48.0)
	Children served first and best	122(75.8)	14(9.8)	136(44.7)
	Total	161(100)	143(100)	304(100)
Who decides on what type of food to eat?	The household head	32(19.9)	14(9.8)	46(15.1)
	The wife	47(29.2)	38(26.6)	85(28.0)
	All the children	19(11.8)	15(10.5)	34(11.2)
	The male children	4(2.5)	1(0.7)	5(1.6)
	Female children	2(1.2)	2(1.4)	4(1.3)
	The house help	1(0.6)	-	1(0.3)
	The head and wife	56(34.8)	73(51.0)	129(42.4)
	Total	161(100)	143(100)	304(100)
What determines the quantity of food to be eaten?	Total amount of available food	28(17.4)	25(17.5)	53(17.4)
	Number of people in the Hhold	82(50.9)	57(39.9)	139(45.7)
	Amount of money available	32(19.9)	37(25.9)	69(22.7)
	Amount of food eaten in last meal	19(11.8)	24(16.8)	43(14.1)
	Total	161(100)	143(100)	304(100)
What determines the type of food to be purchased and eaten?	Types of food produced on farm	14(8.7)	5(3.5)	19(6.3)
	Food affordable in the market	37(23.0)	38(26.6)	75(24.7)
	Food that will give balanced diet	74(46.0)	65(45.5)	139(45.7)
	Food that we can afford	36(22.4)	35(24.5)	71(23.4)
	Total	161(100)	143(100)	304(100)

Source: Estimates from survey data, 2014. Figures in parenthesis are in percentages.

4.6 Determinants of Households' Food Demand in the Study Area

This section is focused on discussions of results obtained from the QUAIDS model which is the second stage estimation. The result of the first stage estimation which is the probit regression is presented in the appendix. Tables 4.24 – 4.26 present the results of the analysis.

4.6.1 Determinants of households' food demand in the study area (Pooled)

Table 4.24 shows the coefficients of the variables that significantly influenced households demand for food groups as well as those of variables that were insignificant.

Coefficients of variables that significantly influenced household demand for roots and tubers (RT) in the study area, as shown in Table 4.24, were those of prices of roots and tubers (RT), cereals (CR), fats and oil (FO) and age of household head at $P<0.01$. Others includes the price of legumes (LG) and location at $p<0.05$ as well as per capita food group expenditure and household size at $p<0.1$. Coefficients that were not statistically significant include those of prices of fruits and vegetables and animal protein foods, year of education, primary occupation and access to credit facilities. Therefore, they had no significant influence on the dependent variable.

The demand for cereals was also significantly determined by the price of cereals, price of fats and oil, per capita food group expenditure and household head's age at $p<0.01$. Coefficients of the prices of fruits and vegetables and animal protein foods were significant at $p<0.05$; that of the years of education of household head was also significant at $p<0.1$.The statistically insignificant coefficients include those of the price of legumes, location, household size, primary occupation and access to credit facilities.

The demand of households for legumes was influenced by the prices of legumes and fats and oil at 1% significance level. Others include per capita food group expenditure and age of household heads at $P<0.05$ and years of education and primary occupation of household head at $p<0.1$. The coefficients that did not significantly affect and, hence, did not influence the dependent variable were the prices of fruits and vegetables and animal protein foods, location, household size and access to credit facilities.

Coefficients of variables that significantly determined the demand for fruits and vegetables by households were the price of fruits and vegetables at $p<0.01$, price of animal protein foods at $p<0.05$ and primary occupation at $p<0.1$. The coefficients that did not significantly influence demand are the price of fats and oil, per capita food group expenditure, location, age of household heads, household size, years of education and access to credit facilities.

The demand of households for animal protein foods was determined by the price of animal protein foods, price of fats and oil and per capita food group expenditure at $p<0.01$. Others include size of households at $p<0.05$ and location at $p<0.1$. The coefficients that did not influence the households' demand for animal protein foods include age of household heads, years of education, primary occupation and access to credit facilities.

Household demand for fats and oil was influenced by the price of fats and oil, per capita food group expenditure and age of household heads at $p<0.01$ as well as household size at $p<0.05$. Those that were statistically insignificant include location, primary occupation, years of education and access to credit facilities.

The implications of the significant coefficients of variables in the combined rural and urban areas (pooled) are as follows. The significant own-prices reveal that household budget share of all food groups was affected by their own prices. The positive coefficients of the own-prices of all food groups (RT, CR, LG, FV, AP, FO) show that household's budget share of all food groups increased with an increase in their own prices, given other factors. In other words, as the prices of all food groups increased, given all other factors, households tended to increase the relative share of the household food expenditure allocated to them. But it is perverse, being positive. This is probably due to the confounding influence of other factors like income. This corresponds with the findings of Abdullai (2002), Obayelu *et al* (2009) and Ashagidigbi *et al* (2012) that budget share of household on food increased with increase in their own prices. The negative price coefficients of RT, CR, LG and AP with respect to fats and oil indicate that the budget share of RT, CR, LG and AP decreased with an increase in the price of fats and oil, meaning that as the price of fats and oil increased given all other factors, households tended to reduce the relative share of household food expenditure allocated to RT, CR, LG and AP. This is in line with the findings of Ashagidigbi *et a*l (2012) that budget shares of RT, CR, LG and AP reduces with increase in the price of fats and oil. The budget share of RT is inversely related to the prices of cereals and legumes; that is RT decreased with increase in the prices of cereals and legumes. This implies that as the prices of cereals and legumes increased, household tended to cut the relative shares of the total food expenditure allocated to roots and tubers in the study area and vice versa. Also, CR decreased with a rise in the prices of fruits and vegetables and animal protein foods. This means that as the prices of fruits and vegetables and animal protein foods increased, household tended to reduce the budget share allotted to cereals. The demand for fruits and vegetables rose with a rise in the price of animal protein foods. This is an indication that owing to the higher prices of animal protein foods, households increased the relative shares of their total food expenditure allocated to fruits and vegetables and vice versa.

The coefficient of the food expenditure term was significant for almost all the food groups and its squared term was significant for CR, AP and FO. This indicates that the response of households' demand for almost all food group to increase in expenditure on food groups supports the non-linear nature of a specific type of food group expenditure. Also, the significant coefficient of household expenditure (which serves as proxy for income) shows that higher income tend to make households increase their relative food budget share allocated to most of the food groups.

Furthermore, the location of household heads has a significantly negative influence on the budget share of roots and tubers but a positive influence on budget share of animal protein foods. These reveal that the demand for roots and tubers is lower among rural households; the reverse is the case for animal protein foods in the rural areas. Respondents who were older consumed less roots and tubers and legumes but more cereals and fats and oil. Also, household size negatively influenced the demand for roots and tubers, but positively influences the demand for animal protein foods and fats and oil. This implies that larger households apportion a reduced share of their budget to roots and tubers which may be due to economies of scale in larger households (Abdullai and Aubert 2004; Ruel *et al*, 2005; Worako 2009; Ogundari and Arifalo 2013), and an increased share of their budget to animal protein foods and fats and oil. This is consistent with the findings of Adejobi (2004) whose study revealed that larger households allocate more of their budget to animal protein foods and fats and oil.

As the educational status of respondents' increased, their demand for cereals and legumes also increased. This is in agreement with the findings by Sabates and Gould (2000) who concluded that the respondent's educational attainment has an influence on the choice of food. Also, the occupation of respondents had a significantly negative influence on the demand for legumes but a positive influence on the demand for fruits and vegetables. This implies that household heads that are into agriculture demand less of legumes and more of fruits and vegetables. The inclusion of Inverse Mills Ratio (IMR) in the estimated model is to test for selectivity bias.

Table 4.24 Determinants of Households' Demand for Food Groups in the Study Area

Variables	RT	CR	LG	FV	AP	FO
Constant	0.8180***	-1.1051***	0. 2492***	0.2056***	0.2359***	0.5970***
	(0.1103)	(0.5317)	(0.0709)	(0.0513)	(0.0686)	(0.0975)
Price coefficients						
Ln price of RT	0.1218***					
	(0.0123)					
Ln price of CR	-0.0814***	0.2984***				
	(0.0159)	(0.0170)				
Ln price of LG	-0.0120**	-0.0068	0.0377***			
	(0.0051)	(0.0110)	(0.0042)			
Ln price of FV	-0.0033	-0.0130**	0.0001	0.0175***		
	(0.0040)	(0.0072)	(0.0021)	(0.0021)		
Ln price of AP	0.0021	-0.0145**	0.0028	0.0055**	0.0305***	
	(0.0048)	(0.0083)	(0.0023)	(0.0021)	(0.0040)	
Ln price of FO	-0.0273***	-0.1828***	-0.0218***	-0.0069	-0.0265**	0.2653***
	(0.0102)	(0.0151)	(0.0081)	(0.0053)	(0.0055)	(0.0146)
Expenditure and Expenditure squared						
Ln Exp	0.0184*	-0.1595***	-0.0185**	0.0060	0.0315***	0.1222***
	(0.0111)	(0.0067)	(0.0078)	(0.0056)	(0.0072)	(0.0091)
Ln Exp2	-0.0001	-0.0044***	-0.0004	-0.0003	-0.0006***	0.0058***
	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Household characteristics						
Location	-0.0032**	0.0001	0.0001	-0.0000	0.0021*	0.0009
	(0.0013)	(0.0009)	(0.0007)	(0.0007)	(0.0011)	(0.0009)
AgeHH	-0.0002***	0.0001***	-0.0000**	-0.0000	0.0000	0.0001***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
HHsize	-0.0004*	0.0000	-0.0002	-0.0001	0.0004**	0.0003**
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Edu Years	0.0000	0.0002*	0.0001*	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Main Occup	-0.0015	0.0010	-0.0013*	0.0014*	-0.0005	0.0010
	(0.0015)	(0.0011)	(0.0008)	(0.0008)	(0.0012)	(0.0010)
Credit Access	0.0004	0.0008	-0.0006	-0.0002	0.0000	-0.0004
	(0.0013)	(0.0009)	(0.0007)	(0.0007)	(0.0010)	(0.0009)
IMR	0.0437***	-0.0048	0.0321***	0.0016	-0.0499***	-0.0226***
	(0.0092)	(0.0063)	(0.0050)	(0.0046)	(0.0078)	(0.0068)

Source: Computed from QUAIDS result, 2014. ***, **, * indicate levels of significance at 1%, 5%, and 10% respectively; t-ratios are in parentheses; dependent variable= budget shares; ln = Logarithm; RT= Roots and Tubers; CR= Cereals; LG= Legumes; FV= Fruits and Vegetables; AP=Animal Protein Foods; lnEXPD=logarithm of total food expenditure; $lnEXP^2$= square of logarithm of total food expenditure; IMR=Inverse Mills Ratio; AgeHH=Age of household head; HHsize=Household size; Edu Years =Years of schooling; Main Occup=Main occupation of household head; Credit Access=Access to credit facility

4.6.2 Determinants of households' food demand in the rural and urban areas

Tables 4.25 and 4.26 show the results of the analysis of factors that determine household demand for food groups in the rural and urban areas of the study area.

1. <u>Rural Areas</u>

Coefficients of variables that significantly influenced household demand for roots and tubers (RT) in the rural areas were the prices of roots and tuber (RT) and cereals (CR) and household size at $P<0.01$. Others include the prices of animal protein foods and fats and oil, age of household head, at $p<0.05$ as well as price of legumes and primary occupation at $p<0.1$ (Table 4.25). Coefficients that did not significantly determine the demand for roots and tubers include price of fruits and vegetables, per capita food group expenditure, years of education and access to credit facilities.

Households' demand for cereals was determined by the prices of cereals, animal protein foods and fats and oil and per capita food group expenditure at $p<0.01$. Others include the price of fruits and vegetables, age and household size at $p<0.05$. The insignificant coefficients include those of the price of legumes, years of education, primary occupation and access to credit facilities. Hence, they did not significantly influence household demand for cereals in the rural areas.

Determinants of demand for legumes at $p<0.01$ were the prices of legumes and fats and oil and household size which were significant at $p<0.05$ and age of household head at $p<0.1$. The coefficients of variables that did not determine the demand for legumes in the rural areas include prices of fruits and vegetables and animal protein foods, per capita food group expenditure, years of education, primary occupation and access to credit facilities.

The demand of household for fruits and vegetables was determined by prices of fruits and vegetables and animal protein foods at $p<0.01$ as well as the age of household head at $p<0.05$. The insignificant coefficients were the price of fats and oil, years of education, access to credit facilities, primary occupation and household size; hence, they did not influence the demand for fruits and vegetables in the rural areas.

Factors affecting households' demand for animal protein foods include price of animal protein foods and per capita food group expenditure at $p<0.01$; others were price of fats and oil, age of household head and years of education at $p<0.05$. The factors that did not affect households' demand for animal protein foods include household size, primary occupation and access to credit facilities.

Determinants of household demand for fats and oil include the price of fats and oil, per capita expenditure on food groups and household size at $p<0.01$. The factors that did not determine household demand for fats and oil include age, years of education, primary occupation and access to credit.

The significant coefficients of variables in the rural areas have implications. Household's budget shares on all food groups (RT, CR, LG, FV, AP, FO) in the rural areas increased with an increase in their own prices, given other factors. That is, as the prices of all food groups increased, households tended to increase the relative share of household food expenditure allocated to them. The budget share of RT decreased with a rise in the prices of legumes, cereals and fats and oil in the rural areas, meaning that as the prices of cereals, legumes and fats and oil increased, households tended to reduce the relative share of food expenditure apportioned to roots and tubers.

The budget share of RT in rural areas increased with a rise in the prices of animal protein foods. That is, as the prices of animal protein foods increased, households tended to increase the relative share of household expenditure allocated to roots and tubers. The budget share of CR in the rural areas decreased with the increase in the prices of fruits and vegetables, animal protein foods and fats and oil implying that a rise in the prices of fruits and vegetables, animal protein foods and fats and oil will cause a reduction in the household's budget share allocated to cereals.

In the rural areas, the budget share of legumes reduced with a rise in the price of fats and oil. Also, the budget shares of fruits and vegetables increased with an increase in the price of animal protein foods while the budget share of animal protein foods decreased with an increase in the price of fats and oil. This means that as the price of animal protein foods increased in the rural areas, households tended to allocate more of the relative share of their household food expenditure to fruits and vegetables. Also, when the price of fats and oil rose, households tended to allocate more of the relative share of their food expenditure to animal protein foods.

Furthermore, the significant total food expenditure for cereals, animal protein foods and fats and oil indicated that the response of households' demand for these food groups to increase in expenditure on food groups was non-linear. The household expenditure (which served as a proxy for income) showed that a higher income tended to make households increase their relative food budget share in preference for cereals, animal protein foods and fats and oil.

The age of respondents had a negative effect on the demand for legumes, fruits and vegetables and roots and tubers but a positive effect on the demand for cereals and animal protein foods, indicating that older respondents demanded less roots and tubers, legumes and fruits and vegetables but more cereals and animal protein foods. Also, larger households allocate lower shares of their budget on food to roots and tubers and legumes but a larger share to cereals and fats and oil. In the rural areas, the primary occupation of the household head negatively influenced the demand for roots and tuber; this implies that household heads that were into agriculture demanded less of roots and tubers. The Inverse Mills Ratio (IMR) in the budget share equations for roots and tuber, cereals, legumes, and animal protein foods in the rural areas implies that the estimated model had selectivity bias.

Table 4.25: Determinants of Households' Demand for Food Groups in Rural Areas

Variables	RT	CR	LG	FV	AP	FO
Constant	0.6523***	-1.1383***	0.2531***	0.2170***	0.3868***	0.6291***
	(0.1459)	(0.0706)	(0.0852)	(0.0679)	(0.1015)	(0.1174)
Price coefficients						
Ln price of RT	0.0933***					
	(0.0140)					
Ln price of CR	-0.0644***	0.3149***				
	(0.0214)	(0.0228)				
Ln price of LG	-0.0102*	-0.0071	0.0319***			
	(0.0057)	(0.0136)	(0.0048)			
Ln price of FV	-0.0051	-0.0202**	0.0011	0.0161***		
	(0.0050)	(0.0101)	(0.0028)	(0.0034)		
Ln price of AP	0.0139**	-0.0406***	0.0033	0.0099***	0.0295***	
	(0.0065)	(0.0128)	(0.0036)	(0.0032)	(0.0066)	
Ln price of FO	-0.0275**	-0.1826***	-0.0189**	-0.0019	-0.0161**	0.2471***
	(0.0128)	(0.0199)	(0.0089)	(0.0071)	(0.0077)	(0.0177)
Expenditure and Expenditure squared						
Ln Exp	-0.0159	-0.1621***	-0.0162	0.0104	0.0692***	0.1147***
	(0.0178)	(0.0107)	(0.0103)	(0.0088)	(0.0119)	(0.0129)
Ln Exp2	-0.0002	-0.0047**	-0.0005	-0.0003	-0.0005	0.0062***
	(0.0005)	(0.0005)	(0.0003)	(0.0003)	(0.0004)	(0.0002)
Household characteristics						
AgeHH	-0.0002**	0.0001**	- 0.0001*	-0.0001**	0.0001**	0.0001
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)
HHsize	-0.0009***	0.0005**	-0.0004**	-0.0002	0.0002	0.0007***
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Edu Years	-0.0001	0.0001	0.0001	-0.0001	-0.0003**	0.0001
	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Main Occup	-0.0038*	0.0016	-0.0005	0.0016	-0.0004	0.0015
	(0.0021)	(0.0015)	(0.0010)	(0.0010)	(0.0015)	(0.0014)
Credit Access	-0.0002	0.0020	-0.0001	0.0007	0.0007	-0.0010
	(0.0021)	(0.0014)	(0.0010)	(0.0010)	(0.0015)	(0.0014)
IMR	0.0791***	-0.0189*	0.0315***	0.0021	-0.0812***	-0.0126
	(0.0155)	(0.0108)	(0.0077)	(0.0075)	(0.0121)	(0.0112)

Source: Computed from QUAIDS result, 2014
***, **, * indicate level of significance at 1%, 5%, and 10% respectively, t-ratios is in parenthesis. Dependent variable= budget share of food groups, ln = Logarithm; RT= Root and Tuber; CR= Cereals; LG= Legumes; FV= Fruits and Vegetables; AP= Animal Protein; lnEXPD = logarithm of total food expenditure; $\ln EXP^2$= square of logarithm of total food expenditure; IMR=Inverse Mills Ratio; Age HH= Age of household head; HH size=household size; Edu Years =years of schooling; Main Occup = Main Occupation of household head; Credit Access = access to credit facility.

2. Urban Areas

Households' demand for roots and tubers in the urban areas (Table 4.26) was determined by prices of roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods and per capita expenditure on food group at $p<0.01$. Others include years of education and primary occupation at $p<0.05$. Those factors that did not determine household demand for roots and tubers include the price of fats and oil, age of household head, household size and access to credit facilities.

Factors which influenced the demand for cereals were the price of cereals, price of fats and oil, primary occupation at $p<0.01$ and the price of animal protein foods at $p<0.05$. Factors that did not influence the demand for cereals were the prices of legumes and fruits and vegetables, per capita expenditure on food group, age of household heads, household size, years of education and access to credit facilities.

The demand of households for legumes was influenced by the price of legumes, price of animal protein foods and primary occupation at $p<0.01$. Others were price of fruits and vegetables and household size at $p<0.1$. The factors that did not influence household's demand for legumes were the price of fats and oil, per capita expenditure of food group, age of household heads, years of education and access to credit facilities.

The demand for fruits and vegetables in urban households was determined by the prices of animal protein foods and fruits and vegetables at $p<0.01$; others were per capita expenditure on food group at $p<0.05$ and household size at $p<0.1$. Factors that were not significant were the price of fats and oil, age of household heads, years of education, primary occupation of household heads and access to credit facilities; hence, they did not significantly influence households' demand for fruits and vegetables.

The determinants of households' demand for animal protein foods were the prices of animal protein foods and fats and oil, per capita expenditure on food group at $p<0.01$, age of household head, household size and years of education of household head at $p<0.05$. Factors that did not significantly influence households' demand for animal protein foods were primary occupation of household heads and access to credit facilities.

Households' demand for fats and oil was determined by the price of fats and oil at $p<0.01$. Factors that did not significantly influence households' demand for fats and oil were per capita expenditure on food group, age of household heads, household size, years of education, primary occupation and access to credit facilities.

The significant coefficients of variables in the urban areas had the following implications. Household's budget shares to all food groups (RT, CR, LG, FV, AP, FO) in the urban areas increased with an increase in their own prices, given other factors. That is, as the prices of all food groups increased, households tended to raise the relative share of household food expenditures allocated to them. In the urban areas, the budget share of RT decreased when the prices of animal protein foods, cereals, fruits and vegetables and legumes rose, meaning that as the prices of cereals, legumes, fruits and vegetables and animal protein foods increased, household tended to reduce the relative share of household food expenditure allotted to roots and tubers. The budget share of RT reduced when the price of animal protein foods increased. In other words, as the price of animal protein foods increased, household tended to reduce the share of their budget allocated to roots and tubers. In the urban areas, the budget share of CR decreased when the prices of animal protein foods and fats and oil rose.

The budget share of legumes increased when the prices of fruits and vegetables and animal protein foods rose, meaning that the increase in the prices of fruits and vegetables and animal protein foods tended to increase the relative household expenditure allocated to legumes. Also, the budget shares of fruits and vegetables increased with an increase in the price of animal protein foods while the budget share of animal protein foods decreased with an increase in the price of fats and oil; which means that as the price of animal protein foods increased in the urban areas, households tended to allocate more of the relative share of their household food expenditure to fruits and vegetables. Also, when the price of fats and oil rose, households tended to allocate more of the relative share of their food expenditure to animal protein foods.

Furthermore, the significant total food group expenditure indicated that household demand for animal protein foods, fruits and vegetables and roots and tubers to increase in expenditure on food groups was non-linear. The significant households' expenditure showed that higher incomes tended to make households increase their relative food budget shares to roots and tubers, fruits and vegetables and animal protein foods. In the urban areas, older respondents tended to demand less animal protein foods. Also, larger households allocated lower proportions of their budget on food to legumes and fruits and vegetables which may be as a result of economies of scale in food purchase in larger households (Abdullai and Aubert 2004, Ruel *et al,* 2005, Worako 2009, Ogundari and Arifalo 2013) and a larger share to animal protein foods. This is in line with the findings of Adejobi (2004) whose study revealed that larger households allocate more of their budget to animal protein foods.

The primary occupation of the household heads negatively influenced the demand for roots and tubers and legumes and positively influenced the demand for cereals. This implies that household heads that are into agriculture demanded relatively less of roots and tubers and legumes and more of cereals. In the urban areas, the inclusion of IMR in the QUAIDS model in order to correct selectivity bias caused by non-purchase of some households proved to be worthwhile.

Table 4.26: Determinants of Households' Demand for Food Groups in Urban Areas

Variables	RT	CR	LG	FV	AP	FO
Constant	-0.2915***	-0.0469	0.5410***	0.2932***	0.3760***	0.1282***
	(0.1059)	(0.1033)	(0.0933)	(0.0808)	(0.1033)	(0.1313)
Price coefficients						
Ln price of RT	0.2454***					
	(0.0251)					
Ln price of CR	-0.0771***	0.1279***				
	(0.0132)	(0.0119)				
Ln price of LG	-0.0977***	0.0080	0.0752***			
	(0.0163)	(0.0092)	(0.0139)			
Ln price of FV	-0.0298***	-0.0070	0.0098*	0.0229***		
	(0.0088)	(0.0058)	(0.0057)	(0.0054)		
Ln price of AP	- 0.0322***	-0.0166**	0.0215***	0.0109***	0.0394***	
	(0.0106)	(0.0065)	(0.0071)	(0.0042)	(0.0086)	
Ln price of FO	-0.0087	-0.0350**	-0.0168	-0.0068	-0.0230***	0.0903***
	(0.0153)	(0.0078)	(0.0109)	(0.0055)	(0.0068)	(0.0097)
Expenditure and Expenditure squared						
Ln Exp	-0.1792***	0.0328	0.0199	0.0357**	0.1018***	-0.0110
	(0.0248)	(0.0254)	(0.0203)	(0.0170)	(0.0236)	(0.0282)
Ln Exp2	-0.0149***	0.0096***	0.0060***	0.0015*	0.0003	- 0.0024
	(0.0016)	(0.0011)	(0.0012)	(0.0008)	(0.0009)	(0.0015)
Household characteristics						
AgeHH	-0.0002	0.0001	0.0000	0.0002	-0.0004**	0.0002
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)
HHsize	-0.0004	0.0002	-0.0007*	-0.0009*	0.0002**	0.0002
	(0.0007)	(0.0006)	(0.0004)	(0.0004)	(0.0007)	(0.0007)
Edu Years	0.0008**	- 0.0002	0.0002	-0.0003	-0.0001**	- 0.0005
	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Main Occup	-0.0170**	0.0395***	-0.0120***	-0.0055	-0.0011	- 0.0039
	(0.0083)	(0.0079)	(0.0042)	(0.0044)	(0.0061)	(0.0064)
Credit Access	0.0042	- 0.0032	-0.0005	-0.0002	0.0005	0.0012
	(0.0040)	(0.0037)	(0.0022)	(0.0024)	(0.0037)	(0.0036)
IMR	0.0220	-0.0315	0.1136***	0.0104	-0.0826***	-0.0320
	(0.0294)	(0.0269)	(0.0198)	(0.0164)	(0.0254)	(0.0258)

Source: Computed from QUAIDS result, 2014 ***, **, * indicate level of significance at 1%, 5%, and 10% respectively, t-ratios are in parentheses. Dependent variable= budget share of food groups, ln=Logarithm; RT=Root and Tuber; CR=Cereals; LG=Legumes; FV=Fruits and Vegetables; AP=Animal Protein; lnEXPD= logarithm of total food expenditure; $\ln EXP^2$= square of logarithm of total food expenditure; IMR=Inverse Mills Ratio; AgeHH=Age of household head; HHsize=household size; EduYears =years of schooling; Main Occup= Main Occupation of household head; Credit Access= access to credit facility.

3. Comparative Analysis of Rural and Urban Areas

From the foregoing, the coefficients of variables that significantly influenced the households' demand for food in the rural and urban areas differed from each other, although there are few similarities. The following are the differences.

In the rural areas, as the prices of cereals, legumes and fats and oil increased, households tended to reduce the relative share of household food expenditure allocated to roots and tubers whereas in the urban areas, the budget share of RT decreased when there was a rise in the prices of cereals, legumes, fruits and vegetables and animal protein foods. Unlike in the urban areas where the budget shares of RT reduced when the price of animal protein foods went up, the budget share of RT in the rural areas increased with a rise in the price of animal protein foods, that is when the price of animal protein foods increased in the rural areas, household tended to go for more roots and tubers. Also, when the prices of fruits and vegetables, animal protein foods and fats and oil went up in the rural areas households tended to cut down the proportion of their budget that went to cereals while in the urban areas, the budget share of CR decreased with increases in only the prices of animal protein foods and fats and oil. Also, in the rural areas, the budget share of legumes reduced with a rise in the prices of fats and oil whereas in the urban areas, it increased with an increase in the prices of fruits and vegetables and animal protein foods.

Furthermore, the household expenditure (which serves as a proxy for income) showed that higher incomes tended to make households in the rural areas increase their relative food budget share in favour of cereals, animal protein foods and fats and oil whereas in the urban areas, higher incomes tended to make households increase their relative food budget shares in favour of roots and tubers, fruits and vegetables and animal protein foods. In the urban areas, older respondents demanded relatively less of animal protein foods unlike in the rural areas where they demanded relatively less of roots and tubers, legumes, fruits and vegetables and more of cereals and animal protein foods. Also, in the urban areas, larger households allocate a lower proportion of their budget on food to legumes and fruits and vegetables and a larger proportion to animal protein foods whereas in the rural areas, lower proportion of their budget was allocated to roots and tubers and legumes and a larger proportion to cereals and fats and oil. Household heads that were into agriculture in the urban areas, demanded less of roots and tubers and legumes and more of cereals whereas in the rural areas, household heads that were into agriculture demanded less of only roots and tubers.

The few similarities that exist are, household's budget shares on all food groups (RT, CR, LG, FV, AP, and FO) in both rural and urban areas increased when their own prices increased, given other factors. That is, as all food groups' prices increased, households tended to increase the relative proportion of the household food expenditure allocated to them.

Also in both rural and urban areas, the budget shares of fruits and vegetables increased with an increase in the price of animal protein foods while the budget share of animal protein foods decreased with an increase in the price of fats and oil, meaning that as the price of animal protein foods increased in the study area, households tended to allocate more of the relative share of their household food expenditure to fruits and vegetables. Also, when the price of fats and oil rose, households tended to allocate more of the relative share of their food expenditure to animal protein foods.

The general inference from the foregoing is that the factors that influenced the pattern and direction of changes in the relative budget shares allocated to the various food groups were not exactly the same for both the rural and urban households, thus showing that both groups of households had very distinct and dissimilar patterns of response, although both still share a few common characteristics.

4.6.3 Expenditure elasticities of demand for food groups

In the context of this study, an elasticity coefficient measures the percentage change in the relative share of household food expenditure allocated to a particular food group as household total expenditure changes by 1%.

Table 4.27 shows that expenditure elasticity coefficients were positive for all food groups, implying that all food groups were normal goods, hence the expenditure on these food groups rose with an increase in income. This is consistent with the Consumer Demand Theory and in conformity with the findings of (Okoruwa and Adebayo, 2006 and Obayelu, 2010). The expenditure elasticities values ranges from 0.76 to 1.21. The pooled result shows that the cereals and fats and oil groups had relatively low expenditure elasticity coefficients of 0.84 and 0.76 respectively (that is, expenditure elasticity coefficients were less than unity). Hence, they are said to be expenditure-inelastic with respect to total expenditure. The expenditure elasticity coefficients for legumes, roots and tubers, animal protein foods as well as fruits and vegetables (1.15, 1.17, 1.06 and 1.21 respectively) were greater than unity, hence they are said to be expenditure-elastic with respect to total expenditure. This means that as the household expenditure increased, the shares to these food groups increased more than proportionately and vice versa. Therefore, the demand for these food groups were most responsive to income changes.

In this study, households' per-capita monthly expenditure was used as a proxy for household per-capita monthly income. The coefficients of the income elasticities of all food groups were positive, which indicates that an increase in household income caused an increase in household expenditure for all food groups. The magnitude of the income elasticity coefficient, therefore, reveals how responsive household expenditures were to a change in household income: the larger the magnitude of the income elasticities, the more responsive household expenditures were to a change in household income and vice versa.

Table 4.27 further reveals that the income elasticity coefficients of roots and tubers, legumes, fruits and vegetables and animal protein foods were greater than unity, hence they were luxuries and demand-elastic with respect to income, meaning that an increase in income caused a bigger percentage increase in their demand while the income elasticity coefficients of cereals and fats and oil were less than unity. They were, therefore, necessities as well as demand-inelastic with respect to income.

Table 4.27: Food Groups Expenditure Elasticities (with respect to total food expenditure) in the Study Area

Food Groups	Expenditure Elasticities		
	Pooled	Rural	Urban
Roots and Tuber	1.17 (0.030)	1.22 (0.083)	1.13 (0.041)
Cereals	0.84 (0.021)	0.80 (0.036)	0.42 (0.062)
Legumes	1.15 (0.046)	1.19 (0.070)	1.18 (0.111)
Fruits and Vegetables	1.21 (0.065)	1.35 (0.176)	1.25 (0.105)
Animal Protein Foods	1.06 (0.027)	1.14 (0.074)	1.12 (0.047)
Fats and Oil	0.76 (0.027)	0.76 (0.039)	1.02 (0.078)

Source: Computed from QUAIDS result, 2014. Standard Errors are in parentheses

Rural Areas

The expenditure elasticity coefficients for rural households (Table 4.27) reveals that the expenditure elasticities for cereals and fats and oil were less than unity (0.80 and 0.76 respectively), showing that the food groups were expenditure-inelastic with respect to total expenditure while other food groups had their expenditure elasticities greater than unity, implying that they were expenditure-elastic with respect to total expenditure.

However, households' per-capita monthly expenditure was used as a proxy for household per-capita monthly income. Therefore, in the rural areas, cereals and fats and oil had their income elasticity coefficients less than unity and were necessities and demand-inelastic with respect to income while roots and tubers, legumes, fruits and vegetables and animal protein foods had their income elasticity coefficients greater than unity and were categorised as luxuries and demand-elastic with respect to income.

Urban Areas

The expenditure elasticity coefficients for urban households (Table 4.27) reveals that only the cereals food group had an expenditure elasticity coefficient less than unity (0.42) implying that the food group was expenditure-inelastic with respect to total expenditure.

The expenditure elasticity coefficients for legumes, roots and tubers, fruits and vegetables, fats and oil and animal protein foods were each greater than unity being 1.18, 1.13, 1.25, 1.02 and 1.12 respectively. They were, therefore, expenditure-elastic with respect to total expenditure.

In this study household per-capita monthly expenditure was used as a proxy for household per-capita monthly income. The coefficients of the income elasticities of all food groups were positive, which indicates that an increase in household income caused an increase in household expenditure for all food groups.

Table 4.27 further reveals that the income elasticity coefficients of legumes, roots and tuber, fruits and vegetables, fats and oil and animal protein foods were each greater than unity, hence they were luxuries and demand-elastic with respect to income, meaning that an increase in income caused a bigger percentage increase in their demand. However, the income elasticity coefficient of cereals was less than unity, hence they were necessities and demand-inelastic with respect to income.

Generally, results showed that elasticities estimated for urban areas were significantly lower than those for the rural areas. This is in line with expectations, given that urban dwellers are generally richer and spend a lower share of their income on food items.

4.6.4 Compensated and uncompensated own-price and price-cross elasticities of demand for food groups in the study area

The compensated (Hicksian) and uncompensated (Marshallian) own-price elasticities of demand for food groups in the study area are presented in Tables 4.28 to 4.30. As observed from all the tables, the Hicksian own-price elasticities are, generally, lower than the Marshallian elasticities because the Hicksian own-price elasticities are calculated by maintaining utility level while Marshallian elasticities are calculated by considering the percentage change in the price for a maintained income level. This is in line with findings from other past studies such as in Abdullai and Aubert (2004), Obayelu, (2010) and Ashagidigbi *et al* (2012).

Table 4.28 reveals that all the uncompensated and compensated own-price elasticities show appropriate negative signs, as displayed in the principal axis, which indicates the inverse relationship between prices of commodities and the demand for them. That is, an increase in the price of a food group leads to a decrease in the demand for that food group. In other words, as the prices of the respective food groups rise, the relative share (in percentage) of food expenditure falls more than proportionately for each of the food groups in the study area and vice versa. This finding is consistent with the economic theory. In absolute terms, the Marshallian own-price elasticities of roots and tubers (-0.68), cereals (-0.44), legumes (-0.64), fruits and vegetables (-0.73), animal protein foods (-0.85) and fats and oil (-0.16) were less than unity, indicating a price-inelastic demand for food groups. The Hicksian own-price elasticities of roots and tubers (-0.38), cereals (-0.26), legumes (-0.53), fruits and vegetables (-0.66), animal protein foods (-0.66) and fats and oil (-0.01). (Table 4.28) indicate that all the food groups were price-inelastic; that is, a rise in price means that the fall in the quantity purchased will be relatively smaller than the increase in price, so the consumers total expense on the food groups rises.

The uncompensated own-price elasticity consists of two component effects, which are, substitution and income effect. The estimated uncompensated own-price elasticities of demand for roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods, and fats and oil indicate that a 10% decrease in the prices of these food groups would lead to 6.8%, 4.4%, 6.4%, 7.3%, 8.5% and 1.6% increases in their demand respectively. Of this total increase in demand, 3.8%, 2.6%, 5.3%, 6.6%, 6.6% and 0.1% were completely due to substitution effect as the compensated elasticity implies. The income effect of the reduced price accounts for the remaining 3%, 1.8%, 1.1%, 0.7%, 1.9% and 1.5% respectively for roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods and fats and oil. These increases were due to the increase in real income (purchasing power), although the nominal amount of money income remained unchanged.

Table 4.28 reveals that the Hicksian (compensated) price-cross elasticities were mainly positive, which indicates substitution relationship among food groups. The Marshallian (uncompensated) price-cross elasticities were mostly negative, suggesting that aggregated foods were complementary in their relationship. With respect to roots and tuber, the estimates point out that the price-cross elasticities of legumes, fruits and vegetables, cereals, fats and oil and animal protein foods displayed a complementary relationship. This shows that a percentage change in the prices of these food groups had a strong complementary effect on the demand for the roots and tubers food group but that a percentage change in the price of roots and tubers had no effect on the demand for the former. When the prices of legumes, fruits and vegetables, cereals, fats and oil and animal protein foods reduced by 10%, the households would tend to raise their demand for roots and tubers by 6.8%.

Also, the estimates of the price-cross elasticities of roots and tubers, legumes, fruits and vegetables, animal protein foods, and fats and oil showed complementary relationship with respect to cereals. A reduction in the price of cereals by 10% for example, led to 0.7%, 0.2%, 0.1%, 0.5% and 3.0% increase in the demand for roots and tuber, legumes, fruits and vegetables, animal protein foods and fats and oil respectively. Similarly, all the other five food groups showed complementary relationships with legumes. A drop in the price of legumes by 10%, would lead to 2.3%, 0.2%, 0.2%, 0.1% and 2.3% increase in the demand for fats and oil, fruits and vegetables, cereals, animal protein foods and roots and tubers respectively. All other food groups except animal protein foods displayed complementary relationships with fruits and vegetables while only animal protein foods showed a substitution relationship with fruits and vegetables. The substitution relationship indicates that a rise in the price of fruits and vegetables would result in rise in the demand for animal protein foods. Also, with respect to animal protein foods, roots and tubers, cereals and fats and oil exhibited a complementary relationship while legumes and fruits and vegetables showed a substitution relationship with animal protein foods. Furthermore, all the other five food groups showed complementary relationship with fats and oil. A 10% decrease in the price of fats and oil would lead to 3.1%, 1.6%, 0.2%, 0.7% and 0.5% rise in the demand for cereals, roots and tubers, fruits and vegetables, legumes, and animal protein foods respectively.

The compensated price-cross elasticity reveals the existence of substitution relationships between most of the food groups, except for the cereals and legumes groups with the fats and oil food group. The substitutability implies that as the price of most of the food groups rises, the demand for their substitutes also rises.

Table 4.28: Pooled Own-Price and Price-Cross Elasticities of Food Group in the Study Area (Combined rural and urban)

Food Groups	RT	CR	LG	FV	AP	FO
			Marshallian/uncompensated Elasticity			
RT	-0.6747	-0.1267	-0.0882	-0.0446	-0.0337	-0.2063
CR	-0.0677	-0.4360	-0.0207	-0.0128	-0.0493	-0.2959
LG	-0.2290	-0.0172	-0.6414	-0.0231	-0.0116	-0.2300
FV	-0.2091	-0.1243	-0.0439	-0.7249	0.0436	-0.1492
AP	-0.0186	-0.1066	0.0029	0.0222	-0.8483	-0.1145
FO	-0.1552	0.3088	0.0736	0.0164	0.0474	-0.1577
Hicksian/compensated Elasticity						
RT	-0.3765	0.1259	0.0249	0.0219	0.1771	0.0268
CR	0.1459	-0.2551	0.1016	0.0348	0.1017	-0.1289
LG	0.0637	0.2306	-0.5305	0.0422	0.1953	-0.0013
FV	0.0976	0.1355	0.0724	-0.6565	0.2605	0.0905
AP	0.2513	0.1220	0.1052	0.0825	-0.6575	0.0904
FO	0.0376	-0.1455	-0.0005	0.0266	0.0889	-0.0070

Source: Computed from computer printout of QUAIDS result, 2014

4.6.5 Compensated and uncompensated own-price elasticities of demand for food groups in the rural and urban areas

The results of the compensated and uncompensated own-price elasticities of demand for food groups in the rural and urban areas was discussed in this section.

Rural Areas

The uncompensated and compensated own-price elasticities of demand for food groups in rural areas are presented in Tables 4.29. It reveals that both uncompensated and compensated own-price elasticities for all the food groups in rural areas as shown in the principal axis of the table satisfy the negativity property of own-price effects in the food groups. The implication of this is that the price of a commodity and its demand are inversely related. The estimates suggest that households were completely sensitive to price changes; this finding is in line with the Economic Theory

In Table 4.29, the uncompensated own-price elasticities of food groups in rural households were between -0.14 and -0.88, with the estimate for fats and oil (-0.14) as the lowest and that of animal protein foods as the highest (-0.88). The uncompensated own-price elasticities of roots and tubers (-0.75), cereals (-0.39), legumes (-0.68), fruits and vegetables (-0.75), animal protein foods (-0.88) and fats and oil (-0.14) were less than unity, indicating a price-inelastic demand for the food groups. The Marshallian/uncompensated own-price elasticities of most of the food groups were larger in magnitude in rural households; this implies that rural households were responsive to changes in own-price. Hicksian/compensated own-price elasticities of roots and tubers (-0.44), cereals (-0.21), legumes (-0.58), fruits and vegetables (-0.68), animal protein foods (-0.68) and fats and oil (-0.00) also reveal that all the food groups were price-inelastic. The estimated Marshallian own-price elasticities of demand for roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods, and fats and oil indicate that in rural households, a 10% fall in the prices of these food groups would lead to 7.5%, 3.9%, 6.8%, 7.5%, 8.8% and 1.4% rise in their demand respectively. Of this total increase in demand, 4.4%, 2.1%, 5.8%, 6.8%, 6.8% and 0.0% were purely as a result of the substitution effect as suggested by the Hicksian elasticity. The income effect of the reduction in price accounted for the remaining 3.1%, 1.8%, 1.0%, 0.7%, 2.0%, and 1.4% respectively for roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods and fats and oil.

Urban Areas

The Hicksian and Marshallian own-price elasticities of demand for food groups in urban areas are presented in Tables 4.30. It reveals that both the Hicksian and Marshallian own-price elasticities for each of the food groups in urban areas, as shown in the principal axis of the tables, satisfy the negativity property of own-price effects in the food groups, implying that the price of a commodity and its demand are inversely related. The estimates suggest that households were sensitive to changes in prices; this finding is consistent with the Economic Theory.

Uncompensated (Marshallian) own-price estimates for all the urban households were for roots and tubers (-0.38), cereals (-0.50), legumes (-0.63), fruits and vegetables (-0.74), animal protein foods (-0.84) and fats and oil (-0.60). These results show that they were all price-inelastic, indicating that they responded to own-price changes. Marshallian own-price elasticities of most of the considered groups of food were smaller in magnitude for urban as against rural households; this implies that urban households were not as sensitive to own-price changes as rural households. The compensated (Hicksian) own-price elasticities in urban households (Table 4.30), for roots and tubers (-0.11), cereals (-0.42), legumes (-0.51), fruits and vegetables (-0.67), animal protein foods (-0.63) and fats and oil (-0.38) also reveal that all the food groups were price-inelastic.

The estimated uncompensated (Marshallian) own-price elasticities of demand for the entire groups of food indicate that a 10% decrease in the prices of these food groups would lead to an increase in the demand for roots and tubers (3.9%), cereals (5.0%), legumes (6.3%), fats and oil (7.4%), animal protein foods (8.4%) and fats and oil (6.0%). Of this total increase in demand, 1.1%, 4.2%, 5.1%, 6.7%, 6.3% and 3.8% were purely due to the substitution effect, as suggested by the compensated elasticity; the remaining 2.8%, 0.8%, 1.2%, 0.7%, 2.1% and 2.2% stand for the income effect of the price fall for the food groups respectively. These increases were as a result of the rise in real income (purchasing power), even though the nominal amount of money income did not change.

Comparative Analysis

From the foregoing, it can be concluded that both Hicksian and Marshallian own-price elasticities for all the food groups in rural and urban areas satisfied the negativity property of own-price effects on the food groups, which is that the price of a commodity and its demand are inversely related. The estimates suggest that households in the study area were quite responsive to changes in prices. The compensated own-price elasticity were in general lower than uncompensated own-price elasticity. This implies that the price responsiveness of the different food groups was dependent on income.

4.6.6 Compensated and uncompensated price-cross elasticities of demand for food groups in the rural and urban areas

The results of the compensated and uncompensated price-cross elasticities of demand for food groups in the rural and urban areas was discussed in this section.

Rural Areas

Table 4.30 reveals that for the rural areas, the Marshallian price-cross elasticities were mainly negative, showing that the relationships of food groups were complementary. The compensated price-cross elasticities were, on the other hand, mainly positive, which reveals that the relationship among food groups were substitutionary. In the rural areas, the price-cross elasticities of legumes, animal protein foods, fruits and vegetables, cereals and fats and oil in relation to roots and tubers were complementary. A fall in the prices of these food groups say, by 10% would result in the households increasing the demand for roots and tubers by 7.5%.

Also, roots and tubers, animal protein foods, fats and oil and fruits and vegetables had a complementary relationship with cereals. However, legumes had a substitution relationship with cereals. For example, a reduction in the price of cereals by 10% would give rise to an increase in demand for fruits and vegetables, roots and tuber, animal protein foods and fats and oil by 0.3%, 0.4%, 0.8% and 3.0% respectively while the substitutability indicates that as the price of cereals goes up the demand for legumes also rises. All the other five food groups displayed complementary relationships with legumes; that is, a 10% reduction in the price of legumes would lead in 2.3%, 0.1%, 0.2%, 0.3% and 2.3% increase in the demand for the five other food groups (roots and tubers, cereals, fruits and vegetables, animal protein foods and fats and oil) respectively. Fats and oil, legumes, cereals and roots and tubers exhibit complementary relationship with fruits and vegetables. But animal protein foods show a substitution relationship. That means when the price of fruits and vegetables reduces by 10%, the demand for fats and oil, legumes, cereals and roots and tubers would rise by 1.0%, 0.3%, 2.1% and 2.5% respectively. The price of fruits and vegetables rose with a rise in the demand for animal protein foods. Cereals, legumes and fats and oil also exhibited complementary relationships that are complementary with animal protein foods while roots and tubers and fruits and vegetables showed a substitution relationships animal protein foods. Furthermore, all other food groups showed complementary relationships with fats and oil. A 10% reduction in the price of fats and oil led to 1.5%, 3.6%, 0.7%, 0.0% and 0.4% increase in the demand for all other five food groups (roots and tubers, cereals, legumes, fruits and vegetables and animal protein foods) respectively.

The compensated price-cross elasticities, on the other hand, reveal the existence of substitution relationships between most of the food groups. However, there was a complementary relationship between the fats and oil group and the cereals and legumes group.

Urban Areas

Table 4.30 reveals that the Marshallian price-cross elasticities for urban areas were mainly negative, showing that food groups were complementarily related. The compensated price-cross elasticities were, on the other hand, mainly positive, which implies a substitution relationship among food groups. With respect to roots and tubers, the estimates indicate that the price-cross elasticities of all the other five food groups exhibited complementary relationships in urban areas. This means that when the prices of these other five food groups decreased, say, by 10%, it would result in the households increasing their demand for roots and tubers by 3.9 percent.

Table 4.30 also shows that there was a complementary relationship between roots and tubers and fats and oil with cereals. This suggests that a 10% reduction in the price of cereals would lead to 0.8% and 0.2% increase in the demand for roots and tubers and fats and oil. However, legumes, fruits and vegetables and animal protein foods showed a substitution relationship with cereals, suggesting that a rise in the price of cereals would lead to a rise in the demand for these food groups. However, legumes had a complementary relationship with roots and tubers, cereals, fruits and vegetables and fats and oil. This means that when the price of legumes reduces by 10%, it would result in 5.0%, 0.5%, 0.6% and 1.1% rise in the demand for these food groups respectively. Animal protein foods, on the other hand, showed a substitution relationship with legumes. With respect to fruits and vegetables, all other food groups exhibited a complementary relationship, with the exception of animal protein foods which showed a substitution relationship. With respect to animal protein foods, all other food groups (fats and oil, cereals and roots and tubers) showed a complementary relationship, with the exception of legumes and fruits and vegetables which showed a substitution relationship. With respect to fats and oil, all the other five groups of food displayed a complementary relationship. This means that if the price of fats and oil reduces by 10%, it would lead in

1.2% (roots and tubers), 1.5% (cereals), 0.4% (legumes), 0.2% (fruits and vegetables) and 1.0% (animal protein foods) increase in the demand for these food groups.

The compensated price-cross elasticity on the other hand, reveals the existence of substitution relationships between most of the food groups, except for roots and tuber and legumes.

Comparative Analysis

A critical examination of Table 4.29 and 4.30 reveals a number of general tendencies in the degree of responsiveness of households in their demand for the diverse food groups as the prices of other food groups' change in rural and urban areas. These tendencies are summarised as follows.

1. The uncompensated/Marshallian price-cross elasticities in the study area were mainly negative, showing that the relationships among food groups were complementary while the compensated/Hicksian price-cross elasticities were mostly positive, revealing that food groups in both areas exhibited a substitution relationship.
2. Most of the food groups in the areas exhibit a substitution relationship.
3. The price-cross elasticities of all the other five groups of food in relation to roots and tubers indicate complementary relationships in both rural and urban areas, but these differ in magnitude. A fall in the prices of cereals, legumes, fruits and vegetables, animal protein foods and fats and oil by 10% would result in the households increasing their demand for roots and tubers by 7.5% and 3.9% in the rural and urban areas respectively.
4. The compensated price-cross elasticity reveals the existence of substitution relationships between most of the food groups, except for the cereals and legumes groups with the fats and oil food group in the urban areas. However, the compensated price-cross elasticity reveals the existence of substitution relationships between most of the food groups, except for roots and tubers and legumes in the rural areas.

Table 4.29: Own-Price and Price-Cross Elasticities of Food Groups in the Rural Areas

Food Groups	RT	CR	LG	FV	AP	FO
	Marshallian/Uncompensated Elasticity					
RT	-0.7513	-0.1035	-0.0669	-0.0425	0.0015	-0.1650
CR	-0.0394	-0.3875	0.0312	-0.0272	-0.0771	-0.3000
LG	-0.2255	-0.0086	-0.6843	-0.0190	-0.0310	-0.2248
FV	-0.2516	-0.2110	-0.0364	-0.7449	0.0927	-0.1011
AP	0.0049	-0.1694	-0.0087	0.0357	-0.8771	-0.1091
FO	-0.1495	-0.3557	-0.0719	-0.0035	-0.0403	-0.1387
	Hicksian/Compensated Elasticity					
RT	-0.4394	0.1460	0.0338	0.0184	0.2010	0.0403
CR	0.1819	-0.2105	0.1026	0.0160	0.0644	-0.1544
LG	0.1045	0.2554	-0.5778	0.0454	0.1800	-0.0075
FV	0.0947	0.0661	0.0754	-0.6773	0.3142	0.1269
AP	0.3156	0.0792	0.0916	0.0963	-0.6783	0.0955
FO	0.0606	-0.1877	-0-0041	0.0375	0.0941	-0.0004

Source: Computed from computer printout of QUAIDS result, 2014

Table 4.30: Own- Price and Price-Cross Elasticities of Food Groups in the Urban Areas

Food Groups	RT	CR	LG	FV	AP	FO
	Marshallian/uncompensated Elasticity					
RT	-0.3849	-0.2535	-0.2273	-0.0654	-0.1344	-0.1570
CR	-0.0836	-0.5036	0.0941	0.0255	0.0657	-0.0213
LG	-0.5013	-0.0541	-0.6287	-0.0563	0.0685	-0.1121
FV	-0.2915	-0.0887	-0.1113	-0.7467	0.0072	-0.1337
AP	-0.1523	-0.0730	0.0455	0.0220	-0.8359	-0.1448
FO	-0.1188	-0.1492	-0.0369	-0.0168	-0.1000	-0.6018
Hicksian/compensated Elasticity						
RT	-0.1055	0.0009	-0.0999	0.0076	0.0889	0.1082
CR	0.0131	-0.4156	0.1382	0.0508	0.1430	0.0705
LG	-0.2326	0.2987	-0.5062	0.0138	0.2832	0.1431
FV	0.0158	0.1911	0.0288	-0.6664	0.2727	0.1581
AP	0.1079	0.1639	0.1641	0.0899	-0.6280	0.1022
FO	0.1151	0.0637	0.0697	0.0443	0.0869	-0.3797

Source: Computed from computer printout of QUAIDS result, 2014

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary of major findings from the study, the conclusion, policy implications and recommendations aimed at improving households' food demand in south west Nigeria. A multistage sampling technique was employed to select 304 households for the study. Primary data were used in this study and were obtained through the use of structured questionnaires. Descriptive statistics was used to describe the socioeconomic characteristics of the respondents. Due to the presence of zero expenditure on some food groups, a two-step estimator was employed to correct selectivity bias. To do this, the Inverse Mills Ratio for the various food groups was first estimated, using the Probit regression, and then the Quadratic Almost Ideal Demand System (QUAIDS) model was used in the second stage, incorporating the first-stage result. All the socioeconomic variables included in the QUAIDS model were included in the probit regression.

5.1 Summary of Major Findings

The analysis of the socioeconomic characteristics of households in the study area showed that more than 80% of the households were headed by males and were married. The mean age of household heads in the study area was 48 years and the modal age group was between 46-60 years. The mean household size in the rural and urban areas was 6 and 5 members, with modal household size of 5 and 4 members respectively. Most of the sampled respondents (84.5%) were educated and the majority (69%) engaged in non-agricultural occupations. Also, a higher proportion (61.2%) of the household heads in the study area did not have access to cooperative credit facilities since about 58% of the respondents did not belong to any cooperative group. On the average, a household head in the study area earned ₦45, 292.86 as income monthly.

The analysis of the food expenditure patterns revealed that households allocated the highest share of their food expenditure to roots and tubers (25%), while the least expenditure share was allocated to Other Foods (2.7%). A similar trend was observed among rural and urban households, except that in the rural areas, cereals took the second highest expenditure share of (22%) while fats and oil took the second highest expenditure share of (21%) in the urban areas. It was observed that the expenditure share of fruits and vegetables was the second lowest. Across the income quintiles, households allocated the highest share of their food expenditure to roots and tubers group (24% - 28%) except for the highest income quintile where animal protein foods took the highest share (23%) of the expenditure.

Yam tuber, rice, beans, plantain, fish, palm oil and cocoa drinks accounted for the highest (48%, 52%, 73%, 41%, 38%, 52% and 42%) proportion of food items in the roots and tubers, cereals, legumes, fruits and vegetables, animal protein foods, fats and oil and other foods respectively. The same trend was observed in the rural and urban areas except for in the urban area where vegetable oil had the highest share in the fats and oil group. Across the quintiles, the same trend was also observed with the exception of animal protein foods group where the proportion that went to beef was highest among the relatively rich (3^{rd} to 5^{th}) quintiles and fish was highest among the relatively poor.

The analysis of households' food and non-food expenditures revealed that rural households spent relatively more on food items (59%) than on non-food items (41%). The reverse was the case for urban households. Across the income quintiles, results revealed that income quintiles one and two (the relatively poor) spent more (63% and 59% respectively) on food items than on non-food items (37% and 41% respectively) whereas income quintiles three to five (the relatively rich) spent less(47%, 37% and21% respectively) on food items than on non-food items (53%, 63% and 79% respectively). This shows that as household income increased in the study area, the expenditure on food decreased.

Analysis of factors influencing households' demand for food groups revealed that location, age, household size, educational status, main occupation and composite prices of the different food groups were the key variables that influenced food demand in the study area. Findings from the analysis of elasticity revealed that expenditure elasticity for all food groups were positive. In the rural areas, the expenditure elasticities for cereals and fats and oil were less than unity implying that they are expenditure-inelastic with respect to total expenditure while other food groups are greater than unity implying that they are expenditure-elastic with respect to total expenditure. In the urban areas, only the cereals food group was expenditure-inelastic with respect to total expenditure, all other food groups were expenditure-elastic.

Findings from the compensated and uncompensated own-price elasticities exhibited appropriate negative signs which showed inverse relationship between the price of a commodity and its demand. The uncompensated price-cross elasticity were mainly negative in both areas revealing a complementary relationship among most of the food groups whereas the compensated price-cross elasticities were mainly positive, implying that there was a substitution relationship among food groups.

5.2 Conclusion

Based on the empirical evidence emanating from both the descriptive and inferential statistics employed in this study, the following conclusion has been drawn.

- Roots and tubers were the most preferred and consumed food group among other food groups.
- Yam, rice, beans, plantain and fish ranked highest on the food expenditure allocation scale.
- As household incomes increased in the study area, the expenditure on food decreased.
- Household size significantly influenced the demand for food in the study area.
- The estimates of the cross-price elasticity reveal that the food groups studied showed that some food types were complements while others were substitutes.
- Most of the food groups were expenditure-elastic with respect to total expenditure in the study area.
- Factors influencing household demand for food groups in the rural and urban areas differed and they include the location of the study area, household size, years of education of household head, primary occupation and composite prices of the different food groups.

5.3 Policy Implications and Recommendations

Based on the findings of this study and the conclusions drawn, the following policy implications and recommendations were made.

1. The significant influence of household size on the demand for food in the study area calls for policy measures and programmes directed towards the provision of better family planning services that will ensure moderate family sizes.
2. The most preferred and consumed food group was the roots and tubers group, since the largest percentage of household food expenditure was allotted to it. There is, therefore, the need for an appropriate policy that will increase the production of these food through better access to improved seeds, extension services, processing and storage facilities, good road networks and strategic marketing.
3. Most of the food groups are demand elastic with respect to income in the study area, hence income smoothening policy measures, is a viable policy option for the government

to embark upon.

4. The differences in the significant factors influencing household demand for food groups in the rural and urban areas differed hence policy measures and programmes that will target the different areas should be embarked upon.

5.4 Suggestion for Further Studies

Some insights have been provided as regards the structure of food demand across various food groups as well as the various socio-economic characteristics that influence household food demand in the rural and urban areas. However, the following should be considered for further research.

- Demand for a number of agricultural products varies from one season of the year to another. There is need for further research into the possible effect of seasonal variation on food demand among households.
- The study considered six broad food groups. Efforts could be made to consider the households' demand of various individual food items. The disaggregated elasticities that would be generated would be useful in the evaluation of the welfare effects of domestic food policies, international trade policies, and nutritional or public health programmes. Households' demand for processed food could also be considered.
- Further examinations should focus on identifying food quality and quantity which together define proper unit values.
- A methodology that will address the issue of selectivity bias could be considered.
- A methodology that will capture household income instead of using expenditure as proxy could also be considered.

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APPENDIX TABLES

Appendix 1: Probit regression result for all food groups

Variables	Roots and tuber	Cereals	Legumes	Fruits and Vegetables	Animal protein foods	Fats and oil
LocHH	-0251 (0.735)	0.4257* (0.2431)	-0.7236* (0.4189)	0.1670 (0.1840)	0.1574 (0.2201)	-0.1175 (0.3463)
AgeHH	-0.0609* (0,0325)	0.0010 (0.0087)	-0.0115 (0.0122)	0.0038 (0.0063)	-0.0127* (0.0073)	0.0074 (0.0116)
Marital stat	-0.04800 (0.3334)	0.0415 (0.1382)	0.7481 (0.6274)	0.0098 (0.1067)	-0.1354 (0.1149)	0.0812 (0.2477)
HHsz	-0.0748 (0.0541)	0.0263 (0.0400)	0.1523* (0.0788)	0.0166 (0.0274)	-0.0345 (0.0280)	-0.0494 (0.0404)
Edu years	0.0441 (0.0471)	-0.0079 (0.0208)	0.0159 (0.0307)	-0.0112 (0.0152)	-0.0263 (0.0181)	-0.0031 (0.0268)
Hhincome	0.0001 (3.78e-06)	3.78e-06 (4.67e-06)	-8.48e-06 (7.38e-06)	2.68e-06 (3.39e-06)	1.30e-06 (3.96e-06)	-1.29E-06 (5.86e-06)
compRT		0.000 (0.0002)	-0.0005 (0.0003)	-0.0001 (0.0002)	0.0000 (0.0002)	0.0000 (0.0003)
CompCR	0.0023 (0.00202)		4.10e-06 (0.0031)	0.0003* (0.0002)	-0.0001 (0.0002)	0.0006 (0.0007)
CompLG	-0.0015 (0.00126)	-0.0006 (0.0004)		-0.0002 (0.0001)	0.0001 (0.0004)	-0.0004 (0.0003)
CompprFV	-0.0013 (0.0022)	0.0021*** (0.0008)	-0.0001 (0.0007)		0.0022*** (0.0007)	0.0000 (0.0007)
CompprAP	-0.0002 (0.00040)	0.0001 (0.0001)	-0.0001 (0.0001)	0.0002** (0.0001)		0.0006* (0.0003)
CompprFO	-0.0012 (0.00186)	-0.0006 (0.0004)	0.0004 (0.0006)	0.0001 (0.0003)	0.0004 (0.0004)	
No of observ	304	304	304	304	304	304
LRChi2(11)	24.95	24.80	15.05	16.27	23.79	11.47
Prob>Chi2	0.0093	0.0097	0.1802	0.1314	0.01370	0.4050
Pseudo R2	0.4893	0.1361	0.1856	0.0516	0.1021	0.1212
Loglikelihood	-13.021	-78.74	-33.018	-149.63	-104.58	-41.575

Source:Computed from computer printout of probit regression result, 2014.***, **, * indicate level of significance at 1%, 5%, and 10% respectively. Standard errors are in parenthesis.
ComprRT= Composite price of Roots and Tuber
ComprCR=Composite price of Cereals
ComprLG= Composite price of Legumes
ComprFV= Composite price of Fruits and Vegetables
ComprAP=Composite price Animal Protein foods
ComprFO=Composite price of fats and oil
LocHH= Location of household heads
AgeHH=Age of household heads
HHsize=household size
Edu Years =years of schooling
HHincome=Household income.

Appendix 2: Average Marginal Effects of Variables by Food Groups

Variables	Roots and tuber	Cereals	Legumes	Fruits and Vegetables	Animal protein foods	Fats and oil
LocHH	-0.0056 (0.0164)	0.0601* (0.0344)	-0.0409 (0.0251)	0.0461 (0.0506)	0.0298 (0.0415)	-0.0084 (0.0246)
AgeHH	-0.0014* (0.0007)	0.0001 (0.0012)	-0.0007 (0.0007)	0.0010 (0.0017)	-0.0024* (0.0014)	0.0005 (0.0008)
Marital stat	-0.0011 (0.0075)	0.0059 (0.0195)	0.0423 (0.0363)	0.0027 (0.0295)	-0.0256 (0.0216)	0.0058 (0.0176)
HHsz	-0.0017 (0.0012)	0.0037 (0.0057)	0.0086* (0.0048)	0.0046 (0.0076)	-0.0065 (0.0053)	-0.0035 (0.0029)
Edu years	0.0010 (0.0010)	-0.0011 (0.0029)	0.0009 (0.0017)	-0.0031 (0.0042)	-0.0050 (0.0034)	-0.0002 (0.0019)
Hhincome	1.54e-06 (1.47e-06)	5.33e-07 (6.58e-07)	-4.79e-07 (4.29e-07)	7.40e-07 (9.34e-07)	2.46e-07 (7.47e-07)	-9.19e-08 (4.17e-07)
compRT		3.84e-06 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0001)	5.61e-06 (0.0000)	2.03e-06 (0.0000)
CompCR	-0.00005 (0.0001)		2.31e-07 (0.0000)	0.0001* (0.0001)	-0.0000 (0.0000)	-0.0000 (0.0000)
CompLG	-0.00003 (0.0000)	-0.0001 (0.0001)		-0.0001 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)
CompprFV	-0.00003 (0.0001)	0.0003*** (0.0001)	-5.42e-06 (0.0000)		0.0004*** (0.0001)	9.37e-07 (0.0001)
CompprAP	-4.69e-06 (9.04e-06)	0.0000 (0.0000)	-5.74e-06 (6.58e-06)	0.0001** (0.0000)		0.0000* (0.0000)
CompprFO	-0.00004 (0.0000)	-0.0001 (0.0001)	0.0000 (0.0000)	0.0000 (0.0001)	0.0001 (0.0001)	
No of observ	304	304	304	304	304	304
LRChi2(11)	24.95	24.80	15.05	16.27	23.79	11.47
Prob>Chi2	0.0093	0.0097	0.1802	0.1314	0.01370	0.4050
Pseudo R2	0.4893	0.1361	0.1856	0.0516	0.1021	0.1212
loglikelihood	-13.021	-78.74	-33.018	-149.63	-104.58	-41.575

Source:Computed from computer printout of probit regression result, 2014.***, **, * indicate level of significance at 1%, 5%, and 10% respectively. Standard errors are in parenthesis.
ComprRT= Composite unit price of Roots and Tuber
ComprCR=Composite unit price of Cereals
ComprLG= Composite unit price of Legumes
ComprFV= Composite unit price of Fruits and Vegetables
ComprAP=Composite unit price Animal Protein foods
ComprFO=Composite unit price of fats and oil
LocHH= Location of Household head
AgeHH=Age of household head
HHsize=household size
Edu Years =years of schooling
HHincome=Household income.

Appendix 3: Table of Analysis of Objectives

Objectives	Analysis of Objectives	Types of Data Required	Source of data	Analytical technique
1. To profile the food expenditure patterns of rural and urban Households	Compare and Contrast food expenditure pattern amongst rural and urban households. To examine the share of expenditure for each of the food group out of the total food expenditure.	Information on: Type and groups of food, quantity of food item consumed by Households Budget share of each food items. Unit price of each food items, demographic variables e.g family size.	Primary data obtained via enumerative survey	Narrative or Descriptive analysis : Frequency, Percentage, Mean, t-test
2. To determine the expenditure patterns of food across income quintiles	Compare and Contrast food expenditure pattern across income groups. To examine the share of expenditure for each of the food group out of the total food expenditure.	Information on: Type and groups of food, quantity of food item consumed by Households Budget share of each food items. Unit price of each food items, demographic variables e.g family size.	Primary data obtained via enumerative survey	Narrative or Descriptive analysis : Frequency, Percentage, Mean, t-test
3. To assess factors affecting Households' demand for various food groups in the study area.	To find the percentage of household income spent on food item/group, to identify the structure of household income and how they differ amongst rural and urban areas. And to assess the effect of demographic and socioeconomic variable on food demand.	Information on type and groups of food purchased or consumed, quantity of food item consumed/purchased by household, unit price of each food items Budget share of each food items	Primary data obtained via enumerative survey	Descriptive analysis and QUAIDS model used

4. To estimate expenditure and price elasticities of demand for food groups in the study area	To use the estimate of elasticities to identify the complementarity of food. Estimate and compare the elasticities of demand for different food items.	Total expenditure on food by households, Budget share of each food items, Unit price of each food items, Quantity of food items purchased/consumed *Demographic variables: Gender, age, marital status, family size, educational level, primary occupation of household head, household size.	Primary data obtained via enumerative survey and focus group discussions will be used.	Quadratic Almost Ideal Demand System will be used

Appendix 4: Grain Equivalent Conversion Factor

Commodity	Conversion Factor
Maize	1.00
Millet	0.93
Sorghum	0.96
Rice	1.00
Wheat	0.92
Other cereals	0.90
Cassava	0.30
Sweet potato	0.30
Irish potato	0.25
Yam	0.25
Cocoyam	0.25
Plantain	0.24
Groundnut	0.21
Beans	0.96
Other legumes	1.10
Melon seed	1.55
Others	1.04
Vegetables	0.06
Fruits	1.10
Palm oil	2.40
Groundnut oil	2.40
Other oil	2.20
Sugar	1.07
Beef	0,62
Goat meat	0.60
Mutton	0.67
Poultry meat	0.30
Pork	1.09
Offal	0.40
Game meat	0.40
Eggs	0.45
Fresh fish	0.25
Milk	0.40
Butter	2.45
Cheese	0.75
Animal oil and fat	2.22
beverages	0.20

Source: Adapted from Kormawa, P. M. (1999)

Appendix 5: FAO FOOD PRICE INDEX- NOMINAL AND DEFLATED (REAL)

1970	38.4	128.3
1971	41.0	130.1
1972	44.3	128.8
1973	60.0	150.5
1974	86.2	177.4
1975	92.0	170.5
1976	79.5	145.5
1977	79.0	133.9
1978	87.9	128.2
1979	98.0	128.1
1980	109.1	129.7
1981	106.6	126.5
1982	93.8	114.8
1983	89.1	111.9
1984	91.9	118.1
1985	83.1	107.8
1986	82.4	93.0
1987	85.0	87.6
1988	95.9	92.8
1989	101.1	98.4
1990	107.2	100.4
1991	105.0	98.7
1992	109.2	101.1
1993	105.5	97.1
1994	110.3	101.3
1995	125.3	105.3
1996	131.1	113.7
1997	120.3	111.3
1998	108.6	105.6
1999	93.2	92.6
2000	91.1	92.4
2001	94.6	101.0
2002	89.6	96.2
2003	97.7	98.1
2004	112.7	105.0
2005	118.0	106.8
2006	127.2	112.7
2007	161.4	134.6
2008	201.4	155.7
2009	160.3	132.8
2010	188.0	150.7
2011	229.9	166.0
2012	213.3	155.0
2013	209.8	153.2
2014	201.8	149.6
2015	164.0	134.6
2016	161.5	138.0
2017	174.6	149.2
2018	172.4	147.3

UNIVERSITY OF IBADAN

DEPARTMENT OF AGRICULTURAL ECONOMICS

HOUSEHOLD SURVEY QUESTIONNAIRE ON FOOD DEMAND STRUCTURE IN SOUTHWEST NIGERIA

Dear Respondent,

This questionnaire is designed to collect data for a research project on food demand structure in south west Nigeria.

Kindly supply the following information about your general household characteristics, farming activities, off-farm activities and food and non-food consumption. All responses given shall be treated with absolute confidentiality.

Thank you.

Adetokunbo Adeyemi

1.0 GENERAL HOUSEHOLD CHARACTERISTICS

1.1 State ___________________________________

1.2 Local Government Area ___________________________________

1.3 Village ___________________________________

1.4 Name of Household's head (optional)___________________________________

1.5 Name of Respondent (optional) ___________________________________

1.6 Relationship of respondent to the household head if not the head ___________________________________

1.7 Name of Interviewer ___________________________________

1.8 Date of Interview ___________________________________

1.9 Questionnaire number ___________________________________

1.10Location: Rural( ) Urban ( )

1.10 HOUSEHOLD COMPOSITION: Please list here all your household members (Household refers to all people who usually eat from the same pot and sleep together under the same roof)

H/hold Member	Name of household member	Relationship to the head of Household (a)	Sex M = 1 F = 2	Age (Years)	Level of education attained	Years of schooling	Marital Status (c)	Main Occupation	Religion (b)	Participate in farm work Yes = 1, No = 2
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

(c) Marital status
Married = 1
Single = 2
Divorced/separated = 3
Widowed/widower = 4

(b) Religion
Christianity = 1
Islam = 2
Traditional = 3
No religion = 4
Other = 5

(a) Relationship with Household head
Head = 1
Spouse = 2
Son/daughter = 3
Father/mother = 4
Sister/brother = 5
Grandchildren = 6
Grandparents = 7
Step children = 8
Step parent = 9
Father/mother-in-law = 10
Sister/brother-in-law = 11
House girl = 12
Farm labourers = 13
Other relatives = 14

Educational level

No formal education = 1

Quranic education = 2

Primary education = 3

Secondary education = 4

Tertiary education = 5

(Circle appropriately)

1.11 Are you the owner of the house you are living in now?

Yes	(1)
No	(2)

1.12 If No, what is the ownership status of your present house?

Rented	(1)
Family house	(2)
Government free house	(3)
Inherited house	(4)
Others ___________________	(5)

1.13 Do you own any house anywhere including the one you live in now?

Yes	(1)
No	(2)

1.14 What type of wall is your present house made up of? (Tick one)

Cement/block wall	(1)
Wooden wall	(2)
Mud/brick wall	(3)
Iron wall	(4)
Straw thatched wall	(5)
Other specify __________________________	(6)

1.15 What are the means of cooking food in your household? (Tick only one per column)

	Means of cooking food	Most common method	Second common method
1	Firewood		
2	Kerosene stove		
3	Charcoal		
4	Saw dust		
5	Gas cooker		
6	Others		

1.17. What is the primary source of drinking water and domestic water for your household?

(Tick as appropriate)

	Sources	Drinking water	Domestic water
1	Pond/lake water		
2	Spring/river water		
3	Well water		
4	Bore hole water		
5	Pipe-borne (Tap) water		

2.0 FARMING ACTIVITIES

2.21. For how long have you been farming? (Years)________________________________

2.22. What are your reasons for going into farming? (Tick only one option per column)

	Reasons for going into farming	Most important	Second most important	Third most important
1	To meet family food requirement			
2	As a primary source of cash income			
3	As additional source of cash income			
4	To minimize family expenses on food			
5	To be self employed			

2.23. Farm land owned and cultivated during the last 12 months

	Land Ownership	Size (hectares/heaps)
1	Agricultural land owned	
2	Land cultivated	
3	Land rented in	
4	Land rented out	

2.24 Do you consume all that your household produces?

Consumed all produced ( )

Sold little part ( )

Sold all produced ( )

2.25. Revenue from crop production during the last 12 months

Groups of crops		Type of crops	Size (hectares / heaps)	Total harvest (kg)	How much was sold (kg)	Market price (N/kg)	Home consumed (kg)	Total quantity as gift (kg)	Total quantity wasted (kg)
Food crops	1	Maize							
	2	Rice							
	3	Millet							
	4	Sorghum							
	5	Cowpea							
	6	Soybean							
	7	Yam							
	9	Cocoyam							
	10	Cassava							
	11	Wheat							
	12	Yam flour (elubo)							
	13	Cassava flour (lafu)							
		Others							
	14								
	15								
	16								

Fruits and vegetables	17	Groundnut							
	18	Plantain							
	19	Pepper							
	20	Banana							
	21	Tomato							
	22	Garden egg							
	23	Okra							
	24	Melon							
	25	Green leaeves							
	26	Onions							
	27	Mangoes							
	28	Cashew							
	29	Oranges							
		Others							
	30								
	31								
Fat and oil	32	Palm oil							
	33	Palm kernel oil							
	34	Groundnut oil							
	35	Soya bean oil							
	36	shea butter oil							
	37	Melon oil							
		Others							
	38								
	39								

2.26 Cost from crop production during the last 12 months

	Type of crops	Land rent (N)	Fertilizer used		Family labour (man-days)	Hired labour		Seed used	
			Qty (kg)	Cost (N)		Man-days	Cost (N)	Qty (kg)	Cost (N)
1	Maize								
2	Rice								
3	Millet								
4	Sorghum								
5	Cowpea								
6	Soybean								
7	Yam								
8	Cocoyam								
9	Cassava								
10	Wheat								
11	Sweet potatoes								
12	Yam flour (elubo)								
13	Cassava flour (lafu)								
	Others								
14									
15									
16									
17	Groundnut								
18	Plantain								
19	Pepper								
20	Banana								
21	Tomato								
22	Garden egg								
23	Okra								
24	Melon								
25	Green leaves								
26	Onions								
27	Mangoes								
28	Cashew								
29	Oranges								
	Others								
30									
31									
32	Palm oil								
33	Palm kernel oil								
34	Groundnut oil								
35	Soya bean oil								
36	Shea butter oil								
37	Melon oil								
	Others								
38									
39									

Continuation

	Type of crops	Pesticides used		Manure used		Machinery used		Cost of other inputs	
		Kg or liter	Cost (N)	Qty (kg)	Cost (N)	hours	Cost (N)		
1	Maize								
2	Rice								
3	Millet								
4	Sorghum								
5	Cowpea								
6	Soybean								
7	Yam								
8	Cocoyam								
9	Cassava								
10	Wheat								
11	Sweet potatoes								
12	Yam flour (elubo)								
13	Cassava flour (lafu)								
	Others								
14									
15									
16									
17	Groundnut								
18	Plantain								
19	Pepper								
20	Banana								
21	Tomato								
22	Garden egg								
23	Okra								
24	Melon								
25	Green leaves								
26	Onions								
27	Mangoes								
28	Cashew								
29	Oranges								
	Others								
30									
31									
32	Palm oil								
33	Palm kernel oil								
34	Groundnut oil								
35	Soya bean oil								
36	Shea butter oil								
37	Melon oil								
	Others								
38									
39									

2.26. Revenue from livestock/fish production during the last 12 months

	Products sold or Consumed	Total production (kg)	How much was sold (kg)	Market price (N/kg)
1	Chicken as meat			
2	Goats as meat			
3	Rabbit as meat			
4	Pig as meat			
5	Duck as meat			
6	Guinea fowl as meat			

7	Pigeon as meat			
8	Eggs (pieces)			
9	Fish			

2.27. Livestock/Fish production cost during the last 12 months

	Category	No of heads	Fodder Cost (N)	Veterinary Cost (N)	Hired labour Cost (N)	Other inputs Cost (N)
1	Goats					
2	Sheep					
3	Pigs					
4	Chicken					
5	Rabbit					
6	Duck					
7	Guinea fowl					
8	Turkey					
9	Pigeon					

2.28. For the food produce from your farm, where do you normally sell them?

(Tick one option per column)

	Point of selling farm produce	Most common point	Second most common point
1	Farm gate		
2	The local village market		
3	The urban city market		
4	At home		

2.29. Indicate in the table below means of transporting your food produce from the farm to the selling point and the cost of transportation

	Methods of transporting food produce	Cost of transportation Per unit of the produce (per Bag/Kg/Basket/Pickup)
1	Head portage	
2	Bicycle	
3	Motorcycle	
4	Lorry/Bus	

2.30. Are you a member of any Cooperative Society?

Yes (1)

No (2)

2.31. If yes what type of Society is your own?

Credit and thrift cooperative (1)

Multipurpose cooperative (2)

Group farmers' cooperative (3)

Producers cooperative (4)

Consumers cooperative (5)

Others specify ___________________________ (6)

2.32. What type of benefits have you enjoyed from this Society in the last 12 months?

____

____

____

2.33. please indicate the sources of credit and the amount in the last One year? (Please fill as appropriate)

	Sources of credit	**Agricultural credit**		**Off-farm business credit**		**Consumption credit**	
		Amount taken (N)	Interest paid (N)	Amount taken (N)	Interest paid (N)	Amount taken (N)	Interest paid (N)
1	Bank						
2	Money lender						
3	Cooperatives						
4	Government loan						
5	Relatives						
	Others						
6							
7							
8							
9							

2.34 How long does it take to pay back the loan

2.35 What are the terms of payment of the loan

2.36 How long does it take for the loan to be granted

2.37. HOUSEHOLD'S ACCESSIBILITY TO SOCIAL INFRASTRUCTURES (please indicate by ticking as appropriate, whether the following facilities are available in this village and answer whether you have access to them or not)

Social facilities		**Available in this village Yes = 1 No = 0**	**If available does your household have access to it? Yes = 1, No = 0**	**Distance to the nearest (km)**	**Cost to travel there (N)**
1	Primary school				
2	Secondary school				
3	Clinic/Maternity				
4	Electricity				
5	Tap water				
6	Bank				

7	Public Toilet				
8	Tarred road				
9	Public Transport				
10	Agric extension Agent				
11	Agricultural input market				
12	Agricultural product Market				
13	Modern market Others				

3.0 SOURCES OF INCOME (FARMING AND OFF FARM)

3.1 Does your household have any sources of off-farm income?

Yes (1)

No (2)

3.2 If not, why don't you participate in off-farm income activities? (Please tick one option per column)

Reasons for non-participation		Most important	Second most important	Third most important
1	We don't have enough money			
2	We don't have enough time			
3	We don't have enough education and training			
4	The income from farming is enough to meet our needs			
5	Our culture forbids us			
6	Other specify			

3.3 If yes, then please complete the table below: (Household members are the people listed on page 2)

Income sources		Income obtained by household members during the last 12 months (N/year)					
		Household Head	H/Hold Member 2	H/Hold Member 3	H/Hold Member 4	H/Hold Member 5	H/Hold Member 6
1	Income from wage employment outside Agriculture						
2	Wage from agricultural labour supply on other people's farms						
3	Income from self- employment or own business						
4	Income from machinery service for other farms						
5	Remittances received from family members and relatives						
6	Pensions/share dividend/government bonus						
7	Revenue from leasing out land and other resources						
8	Income from crop farming						

Income sources		Income obtained by household members during the last 12 months (N/year)					
		Household Head 7	H/Hold Member 8	H/Hold Member 9	H/Hold Member 10	H/Hold Member 11	H/Hold Member 12
1.	Income from crop farming						
2.	Income from livestock farming						
3.	Income from Non-timber forest products						
1	Income from wage employment outside Agriculture						
2	Wage from agricultural labour supply on other people's farms						
3	Income from self-employment or own business						
4	Income from machinery service for other farms						
5	Remittances received from family members and relatives						
6	Pensions/share dividend/government bonus						
7	Revenue from leasing out land and other resources						
8	Other sources (Please specify)						

3.4. What would you say was the impact of the off-farm income on the following household's characteristics for the past 12 months?
(Tick one option per row please)

Household characteristics		Increased	Decreased	Unchanged	I cannot say
1	Household disposable income				
2	Household total farm production				
3	Household food consumption				
4	Household demand for quality food				
5	Household cash expenditure on food				
6	Household cash expenditure on Non-food				
7	Household accessibility to medical facilities				
8	Household productive assets				
9	Household family labour supply				
10	Household hired labour demand				
11	Agricultural yield				

3.5 Please itemize here the various income generating activities that your household usually adopts in time of cash shortage.

(Please tick only one option per column)

	Income generating Activities engage in by the household members	**Most Important option**	**Second most Important option**	**Third most important option**
1	Sell household's assets			
2	Lease out household's assets			
3	Sell household's food crops			
4	Engage in agricultural wage labour supply			
5	Engage in migration labour supply			
6	Collect remittances from other relatives			
7	Borrow money from other people			
8	Borrow money from the Bank			

4.0 FOOD AND NON-FOOD CONSUMPTION AND EXPENDITURE DATA

4.1 In the past seven days indicate how much of the following food items your household consumed and the prices in naira (This is for all food consumed, including own-produced, bought, and by all household members)

	Food Items consumed	**Qty in kg, liter or local units (Please indicate units of measurement for each item)**	**Value in naira**	**Amount Willing to buy**		**Food Items consumed**	**Qty in kg, liter or local units (Please indicate units of measurement for each item)**	**Value in naira**	**Amount Willing to buy**
	Staple foods					**Other staple Foods (Please specify)**			
1	Cassava Tuber				30				
2	Cassava flour				31				
3	Cassava chips				32				
4	Garri				33				
5	Yam Tuber				34				
6	Yam flour				35				
7	Yam chips					**Vegetables**			
8	Sweet potato				36	Okra			
9	Sweet potato chips				37	Tomato			
10	Irish potato				38	Pepper			
11	Cocoyam				39	Onion			
12	Maize green				40	Carrot			
13	Maize grain				41	Egg plant			
14	Maize flour				42	Cabbage			
15	Sorghum green				43	Cucumber			
16	Sorghum grain				36	Cochorus/ Ewedu			
17	Sorghum				44	Spinach			

	Flour								
18	Millet grain				45	Bitter leaf			
19	Millet flour				46	Water leaf			
20	Rice				47	Pumpkin			
21	Wheat grain				48	Other Vegetables (Please specify)			
22	Wheat flour					**Fruits**			
23	Cowpea (beans)				50	Orange			
24	Ground nut				51	Mango			
25	Soybeans				52	Pawpaw			
26	Soybean flour				53	Pineapple			
27	Melon (shelled)				54	Apple			
28	Plantain				55	Coconut			
29	Banana				56	Guava			
					57.	Others specify			

	Food Items consumed	Qty in kg, liter or local units (Please indicate units of measurement for each item)	Value in naira	Amount Willing to buy		Food Items consumed	Qty in kg, liter or local units (Please indicate units of measurement for each item)	Value in naira	Amount Wiling To pay
57	Sugar cane				92	Local beer			
	Other fruits				93	Bottled beer			
58					94	Other beer			
59					95	Wine			
60						**Other drinks**			
61					96				
62					97				
	Meat and animal Products					**Condiments and spices**			
63	Cow meat				98	Maggi			
64	Goat meat				99	Salt			
65	Sheep meat				100	Locust bean			
66	Pork				101	Curry			
67	Bush meat				102	Thyme			
68	Chicken				103	Ginger			
69	Turkey				104	Other spices			
70	Fish					**Sugar and Sweets**			
71	Snail				105	Sugar			
72	Shrimps				106	Chocolate			
73	Crayfish				107	Other sweet			
74	Crabs					**Fat and Oil**			
75	Eggs (pieces)				108	Red oil			
76	Other meat				109	Groundnut oil			
	Dairy products				110	Coconut oil			

77	Milk				111	Sheer butter oil			
78	Cheese				112	Butter			
79	Yoghurt				113	Margarine			
80	Ice cream				114	Other oil			
81	Other dairy product					**Snacks**			
	Beverages				115	Bread			
82	Cocoa				116	Biscuit			
83	Tea (leaves)				117	Popcorn			
84	Tea (liquid)				118	Cashew nut			
85	Coffee (powder)					**Other snacks**			
86	Coffee (liquid)				119				
	Drinks				120				
87	Soft drinks								
88	Orange juice								
89	Apple juice								
90	Pineapple juice								
91	Other juice								

4.2. FOOD CONSUMED BY HOUSEHOLD MEMBERS AWAY FROM HOME IN THE LAST 7 DAYS (e.g., in schools, in restaurants, during ceremony etc) Household members are the people listed in page 2.

Household member 1			Household member 2			Household member 3		
Food items eaten Outside	Qty eaten	Value in Naira	Food items eaten Outside	Qty eaten	Value in Naira	Food items eaten Outside	Qty eaten	Value in Naira

Household member 4			Household member 5			Household member 6		
Food items eaten Outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira

FOODS CONSUMED BY HOUSEHOLD MEMBERS AWAY FROM HOME IN THE LAST 7 DAYS CONTINUE:

Household member 7			Household member 8			Household member 9		
Food items eaten Outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira

Household member 10			Household member 11			Household member 12		
Food items eaten Outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira	Food items eaten outside	Qty eaten	Value in Naira

4.3 NON-FOOD EXPENDITURE BY HOUSEHOLD IN THE LAST ONE MONTH OR IN THE LAST ONE YEAR (Whichever is easier)

	Items of expenditure	In the last 1 Month	In the last 12 months
		Amount spent in naira	Amount spent in naira
1	Clothing (fabric, clothes, towels, beddings)		
2	Shoes and foot wares		
3	Education (school fees, books, school uniform)		
4	Health (medicines, glasses, doctor's charges)		
5	Kitchen utensils(pot, cups, plates, knife etc)		
6	Personal care (soap, shampoo, barber& saloon cost, cosmetics, toothpaste, tailoring, laundry)		
7	Furniture (beds, tables, chairs, rugs etc)		
8	Home repairs (painting, window, roofing)		
9	Transportation cost (public transport)		
10	Purchase of cars		
11	Purchase of Bicycle, motorcycle etc		
12	Repairs of cars, vehicles/motorcycle/bicycle		
13	Petrol and Engine oil for cars		
14	House rent, water bill, electricity bill, telephone bills		
15	Other taxes and levies (community levies, night watcher fees, income tax, land and property tax)		
16	Kerosene, charcoal, firewood, gas cost		
17	Newspaper, magazines, postal charges		
18	Alms, offering, tithe, charity		
19	Cigarettes, tobacco, kolanut		
20	Remittances payment to other relatives		
21	Legal charge (License, notary services)		
22	Deposits to savings accounts		
23	Debt repayment (for cooperatives, local contribution)		
24	Ceremony and entertainment (wedding, naming ceremony, funerals, graduation etc)		

4.4 How do you normally eat food in this household? (Tick one)

Food is usually shared to household members based on age (1)
Food is usually shared to Household members based on sex (2)
Food is usually shared to household members based on age and sex (3)
Food is usually shared to Household members based on first come first serve (4)
No specific method of sharing food (5)
Others specify ____ (6)

4.5 Who takes decision as to what type of food to eat in this household? (Tick one)

The household head alone (1)
The wife (2)
All the children together (3)
The male children alone (4)
The female children alone (5)
The house girls (6)
Others specify ____ (7)

4.6 What determines the type of food to be eaten in this household? (Tick one)

- The type of food that we produce from our farm (1)
- The type of food that we can afford to buy in the market (2)
- The type of food that will give us balanced diet (3)
- The type of food that we can get (4)
- Others specify ____ (5)

4.7 What determines the quantity of food to be eaten in this household? (Tick one)

- The total amount of food that we have in the household (1)
- The number of people in the household (2)
- The amount of money we have to buy food in the market (3)
- The amount of food we ate during the last meal (4)
- Others specify ____ (5)

4.8 Do you give special attention to children when sharing food? Yes (1) No (0) _________

4.9 If yes, what type of attention? (Tick one)

- More food quantity is given to children (1)
- More quality food is given to children (2)
- Children are served first and they always get enough food (3)
- Others specify ____ (4)

4.10 LIVELIHOOD STRATEGIES (Please indicate here the options that you will take in order of importance, when there is limited food in your household to solve the problem. Tick one option per column)

	Food Related Coping strategies	Most Important option	Second most Important option	Third most important option
1	Consumption of less preferred food			
2	Consumption of less expensive food			
3	Borrow money to buy food			
4	Borrow food stuffs			
5	Purchase food stuffs on credit			
6	Reduce number of meals per day			
7	Reduce quantity of meal serve to men			
8	Reduce quantity of meal serve to women			
9	Reduce quantity of meal serve to Children			
10	Skip a whole day without eating			

4.11 HOUSEHOLD ASSETS (Please indicate the number and value of under-listed items you have in your household

	Items in the household	**No**	**Total value in naira**		**Items in the household**	**No**	**Total value in naira**
	Durable Items				**Tools and Implements**		
1	Television			32	Tractor		
2	Radio/Cassette Player			33	Carts/Truck		
3	Fan			34	Sprayer		
4	Video recorder			35	Irrigation pumps		
5	Refrigerator			36	Grinding machine		
6	Generator			37	Hoes		
7	Telephone			38	Cutlasses		
8	Car			39	Sickle		
9	Motorcycle			40	Fishing equipments		
10	Bicycle			41	Wheelbarrow		
11	Sewing machine			42	Files		
12	Pressing Iron				**Others**		
13	Stove			43			
14	Wall clock			44			
15	Camera			45			
16	Blender			46			
17	Gas cooker			47			
18	Computer			48			
19	Deep freezer			49			
20	Air conditioner			50			
21	Bed			51			
22	Buckets			52			
23	Pots			53			

THANK YOU FOR YOUR PATIENCE