PATTERNS AND DETERMINANTS OF FRUIT AND VEGETABLE CONSUMPTION IN URBAN AND RURAL AREAS OF ENUGU STATE, NIGERIA.

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CERTIFICATION

Agwu, Nnanna Mba, a post graduate student in the Department of Agricultural Economics and with registration number PG/Ph.D/02/33667, has satisfactorily completed his thesis for the award of the degree of Doctor of Philosophy (Ph.D) in Agricultural Economics (Agricultural Marketing and Agribusiness) option. The work embodied in this thesis is original and has not been submitted in part or full for any Diploma or Degree of this University or any other University.

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DEDICATION

This work is dedicated to the memories of Late Chiefs Kalu Agwu and Fidelis Mba Agwu.

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ABSTRACT

The main objective of this study was to evaluate the patterns and determinants of fruit and vegetable consumption in urban and rural areas of Enugu State, Nigeria. The study was articulated based on the fact that despite the relatively cheap and abundant sources of micro nutrients found in fruits and vegetables, there abound wide spread cases of micro nutrient deficiencies. The data was collected from primary sources through a set of questionnaire administered to 240 respondents. The study employed both purposive and random sampling technique in the selection of the respondents. The data collected were analysed using descriptive statistics, Working –Leser functional form of regression and z-test statistic. Citrus, mango, plantain/banana, pineapples, papaya, star apple were the major types of fruits consumed, while, telferia, tomatoes, onions, garden eggs, okra and oha were the major vegetables consumed by the households. The result also showed that the average monthly consumption of fruit per household during the dry season was 17.8kg and 9.8kg for urban and rural areas, respectively while the average monthly consumption per household of fruits during the rainy season was 15.32kg and 12.87kg for urban and rural areas, respectively. It was 8.68kg for urban and 23.29kg for rural areas for vegetables during the dry season while it was 6.98kg for urban areas and 28.43kg for rural areas per monthly per household during the rainy season. The average budget share was 0.0849 for vegetables for households in the urban areas and 0.0690 for those in the rural areas. When pooled together; it was 0.0828 for fruits and 0.0769 for vegetables. Household's monthly expenditure, number of adult females, age of household head, educational attainment of the household head, price, season and sex were determinants of fruit consumption in the urban areas. Total monthly expenditure, number of children, number of adult females, age of household head, educational attainment of household head and sex were determinants of vegetable consumption in the urban areas. In the rural areas, number of children, age of the household head, educational attainment of the household head, price of fruits and season were determinants of fruits consumption, whereas, total expenditure, number of adult males, number of adult females, age of household head, educational attainment of the household head and price of vegetables were determinants of vegetable consumption. All these variables were significant at various levels of probability ranging from one to ten percent with different signs. Income elasticities were below one; ranging from 0.47 to 0.70. The income elasticity for fruit in urban areas was 0.60 and 0.47 in the rural areas. It was 0.60 for vegetables in the urban areas and 0.49 in the rural areas. It is therefore recommended that there is need to put in place policies to promote and support fruit and vegetable consumption. Secondly, attention should focus on the processing of fruits and vegetables into forms that can be stored. This will

reduce post – harvest losses as well as making fruits and vegetables available in all the seasons. Again, education and behaviour change programmes to promote fruit and vegetable consumption should be mounted. Fruit and vegetable production should be encouraged particularly in the rural areas. In the same vein, feeder roads should be built and already built ones maintained. This will help transport these produce to the urban areas. This will also promote availability and affordability of these products.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Low fruit and vegetable intake is the main contributor of micronutrient deficiencies in the developing world especially in population with low intake of animal protein foods such as meat and dairy products. World Health Organization (WHO) (2003) estimated that low intake of fruits and vegetables caused about 19% gastro- intestinal cancers, about 31% of ischemic heart disease and 11% of stroke. Of the global burden attributable to low fruit and vegetable consumption, about 85% was from Cardiovascular Diseases (CVD) and 15% from cancers. It estimated that about 2.7 million deaths were recorded yearly arising from these chronic diseases.

The implication of the emerging scenario is that 2.7 million lives could be saved each year with sufficient global fruit and vegetable consumption. According to the WHO/FAO (2003), the set population nutrient goals and recommended intake was put at a minimum of 400g for fruits and vegetables per day for the prevention of chronic heart diseases, cancer, diabetes and obesity. The report also stated that there was convincing evidence that fruits and vegetables decreased the risk of obesity and evidence abound also that they probably decreased the risk of diabetes. Furthermore, there is convincing evidence that fruits and vegetables lower the risk of CVD.

Micro-nutrient deficiency resulting from low fruit and vegetable intake has been associated with various economic consequences. This is exemplified in a study in Ethiopia, (Croppenstedt and Muller, 2000). The result showed that nutritional status affected agricultural productivity and elasticities of labour productivity. Thus proving that there is a significant link between health and nutritional status and agricultural productivity.

However, in spite of this growing body of evidence highlighting the protective effects of fruits and vegetables, their intakes are still grossly inadequate both in developed and developing countries (IARC, 2003).

Analyses of family budgets suggest that the poorer the family, the greater is the proportion of the total expenditure on food thus obeying Engel's law (Blissard *et al*, 2003). Engel's Law states that as income rises, percentage of income spent on consumption rises slower as compared to rise in income. According to (Blissard *et al*, 2003), many analyses of family budgets conclude that the proportions of income devoted to various groups of commodities not only change with increasing income as stated in Engel's law but also vary systematically.

Fruits and vegetables have been known to exhibit substantial heterogeneity with regard to demand, supply and trade characteristics (Damianos and Demoussis, 1992). On the demand characteristics, most fruits and vegetables exhibit higher income elasticities than that for overall food consumption. This implies that as

income rises, the share of fruits and vegetables within the food budget also rises. The overall demand for fruits and vegetables are income elastic despite the relatively high share of fruits and vegetables in the food budget.

Fruit and vegetable production are characterized by a strong seasonal dimension, leading to substantial price fluctuation and income instability during the marketing period. This is basically because as horticultural plants, they exhibit price elasticity supply responses. A small increase in price can result in huge production increases (Damianos and Demoussis, 1992). If prices were allowed to fall to accommodate the increased supply, fruits and vegetables that exhibit inelastic demand would record a reduction in income. If, on the other hand, the demand is elastic, a drop in prices caused by increased supply will be followed by a more than proportional increase in the quantity demanded (Bergman, 1984). Low income households are more responsive to price changes for vegetables, but less responsive to fruits (Dong and Lin, 2009). On the other hand, it is estimated that most countries in the sub- Saharan Africa have income elasticities for fruits greater than the elasticities for vegetables (Ruel *et al*, 2004).

1.2 Problem Statement

Low fruit and vegetable intake is among the top risk factors contributing to about 2.7 million deaths globally (WHO, 2003). In Nigeria, micronutrient malnutrition has been identified as a wide spread problem with serious

economic consequences. These include, cognitive losses, work losses, low productivity, etc (Adish, 2009). This dismal picture of the micronutrient status spells serious consequences. In fact, estimated levels of current fruit and vegetable intake vary considerably around the world ranging from levels less than 100g/day in less developed countries to about 450g/day in Western Europe (WHO, 2003). Internationally, representative data on fruit and vegetable consumption in 21 countries, most of which are from the developed world, show that average intake reached the WHO/FAO minimum recommended level of 400g per capita per day (Israel, Italy and Spain) (IARC,2003). Specifically, in Nigeria, the 2007 estimated production of fruits and vegetables was 977.799 million tonnes and 8.082 million tonnes, while their consumption was estimated at 15.44 g/capita/day and 47.52 g/capita/day for fruits and vegetables respectively (FAO, 2008).

In Enugu State, statistics showed that between 2001 and 2007, 4.364 million tonnes of vegetables were produced (PCU, 2008). However, there are no available statistics for fruit production as well as their consumption in the area. In a study (Kushwala *et al*, 2007), only the determinants of vegetable consumption was considered. The study did not consider fruits as well as their various elasticities. From the fore going, certain questions come to mind: What are the types and quantities of fruits and vegetables consumed by the households? What are the share of fruits and vegetables in the household's food

budget? What are the factors that shape consumption behaviour in relation to fruits and vegetables?

The diets of urban dwellers are generally more diverse than those of their rural counterparts (Regmi and Dyck, 2001; Ruel and Garret, 2003; Smith *et al*, 2003; Smith, 2004). It is believed that this is due to a combination of factors including the availability of a wider variety of foods in urban markets, the availability of storage facilities, changes in life styles and cultural patterns and the need for convenience leading to the purchase of more processed food. According to Fabiosa and Soliman (2008), urban households show larger differentials in the elasticities for food and non-food items with much smaller elasticities for the food categories. Rural households on the other hand, show higher elasticities in the food categories, especially for meat, fish and dairy. However, urban households are less responsive to income changes than are rural households in the food categories; and more responsive in the non-food category.

Hence, this study to examine the patterns and determinants of fruit and vegetable consumption in the urban and rural areas of Enugu State, Nigeria.

1.3 Objectives of the study

The broad objective of this study was to evaluate the patterns and determinants of fruit and vegetable consumption in urban and rural areas of Enugu State, Nigeria. The specific objectives were to:

i. describe the household level fruit and vegetable consumption patterns in Enugu State in relation to the socio-economic attributes;

ii. describe the types and quantities of fruits and vegetables consumed by the households;

iii. compare the consumption patterns in urban and rural areas of the state;

iv. estimate the share of fruits and vegetables in the household's food budget;

v. analyze the determinants of demand for fruits and vegetables in the state;

vi. compare the demand elasticities of these fruits and vegetables in urban and rural areas.

1.4 Hypotheses

The following null hypotheses were tested;

HO_1. there is no significant difference between the consumption of fruits and vegetables in urban and rural areas of Enugu State of Nigeria;

HO_2. the determinants of the consumption of fruits and vegetables are not the same in urban and rural areas;

HO_3. there is no significant difference in the demand elasticities for fruits and vegetables in urban and rural areas of Enugu State; and

HO_4. households' socio-economic characteristics have no significant effect on the consumption of fruits and vegetables in the study area.

1.5 Justification for the study

It is known that low fruit and vegetable consumption is among the top 20 risk factors contributing to attributable mortality and up to 2.7 million lives could be saved each year with sufficient global fruit and vegetable consumption. This excludes, however, vitamin A deficiency (VAD), iodine deficiency diseases (IDD) and iron deficiency anaemia (IDA). Abundant intake of fruits and vegetables is clearly a positive solution to problems of poor diet quality in the developing world. They are relatively cheap sources of essential micronutrients and are therefore a cost effective way to prevent micronutrient deficiencies and protection against the main killers associated with micronutrient deficiencies in the world today.

Many previous studies have addressed socio-economic differentials in the nutritional status of people in either rural or urban areas (Levin, 1996; Prasad and Prasad, 1991). However, the magnitudes of socio-economic differentials in rural and urban population have seldomly been compared. The danger of using such comparisms according to Menon *et al*, (2000) is that they mask the enormous differentials that exist between socio-economic groups in both urban and rural areas. It is expected that the study will:

Firstly, help to broaden the understanding of household level factors that influence the demand for fruits and vegetables in urban and rural areas in Enugu State. The result will assist in the promotional efforts to foster fruit and

vegetable consumption in future. This is because these efforts can only be sustainable if such factors were properly analyzed.

Secondly, help create awareness on the need for the consumption of locally available fruits and vegetables bearing in mind the essential benefits of fruits and vegetables to human health. The study will also suggest strategies for improving fruits and vegetables consumption among the two demographic divide in Enugu State, vis-a-vis the nutritional and economic importance of fruits and vegetables.

Again, the findings will go a long way in providing information to guide future policy initiatives to promote and facilitate greater consumption of fruits and vegetables in the study area and help policy makers in planning and managing micronutrient malnutrition problems. Finally, it will help other researchers wishing to go into related areas of study.

1.6 Limitations of the Study

The following challenges were faced in the course of this study:

1. Some of the respondents particularly, those in the rural areas were not able to say for sure the quantity of each of the fruits and vegetables consumed in standard measurements, example, kilogrammes, and grammes. Given this, the enumerators had to rely on verbal descriptions as reference measures.
2. In some areas, during the collection of the data, the enumerators had to visit

many times before they could be attended to. This became so worrisome because these respondents had earlier indicated interests to participate in the exercise when reconnaissance visits were made to the areas.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

This chapter dealt with the review of literature related to the study. They were reviewed under the following headings:

2.1.1 The Meaning of Fruits and vegetables

2.1.2 Importance of Vegetables

2.1.3 Importance of Fruits

2.1.4 Demand and Consumption Theory

2.1.5 Household Fruit and Vegetable Consumption Pattern

2.1.6 Expenditure Elasticity of Food

2.1.7 Household Budget Share

2.1.8 Household Income

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2.2.0 Prices and Availability of Fruits and Vegetables

2.2.1 Consumer Preferences

2.2.2 Costs and Feasibility of On-Farm Production

2.2.3 Intra household Decision –Making Process

2.2.4 Theoretical and Conceptual Framework

2.2.5 Analytical Framework.

2.1.1 The Meaning of Fruits and Vegetables

Fruits are defined botanically as the ripened ovary of a seed bearing plant that contains the seed(s) (IARC, 2003). By this definition, zucchini, tomatoes, peppers, peapods, and even the seed pods of deciduous trees are fruits. Fruit is more commonly defined as the sweet, fleshy, edible parts of plants that contain the seed(s), excluding the non-sweet examples as zucchini, tomatoes and pepper.

Vegetables, on the other hand, are broadly defined as the edible portions of a plant (excluding fruits and seeds), such as the roots, tubers, stems and leaves, a common definition which excludes sugar crops such as sugarcane and sugar beet as well as starchy root crops such as cassava, yams, and taro.

Nwabueze (1995) defined vegetables as annual or perennial herbaceous plants whose edible parts are characterized by very high moisture content of 80% or above. Ihekoronye and Ngoddy (1985) described green vegetables as living entities that can respire when harvested freshly. They have high content of water and an abundance of cellulose. The cellulose is in a form which, although not digested, serves a useful purpose in the intestine as roughage, thus promoting normal elimination of waste products. They stated that because of their high content of water, leafy vegetables are low in energy values.

2.1.2 Importance of Vegetables

According to Ihekoronye and Ngoddy (1985), the chief nutritive value of vegetables is their richness in minerals and vitamins. The vitamin content is influenced by certain factors; the cultivar, maturity and source of light. It is expected that crops that mature during autumn contain higher vitamins (in the form of carotene) than those that mature in poorer light of winter (Selman, 1994). Cassava leaves contain up to 1010ug retinol (10,000 i.u. of carotene) (Uwaegbute, 1988). Vegetables are known to be good sources of ascorbate (Fafunso and Bassir, 1978). The value of ascorbic acid should not be ignored. It performs many biochemical functions. The abnormalities of connective tissue observed in scurvy have long suggested that the ascorbate is involved in the synthesis of collagen or mucopolysacharides (Pike and Brown, 1975). Importance of ascorbic acid has been demonstrated in the transfer of plasma iron to the liver and its incorporation into the iron storage compounds (Masur, 1961). Ascorbic acids in varying concentrations in such important foods as citrus fruits, potatoes, tomatoes and leafy vegetables. Josyln and Hortztzer (1985) reported that an average glass of orange juice contains 50mg/100g of ascorbic acid and raw cabbage has 50mg/100g of ascorbic acid. Okolie (1978) observed that ascorbic acid content of spinach is on the average 30mg/100g. The green leafy vegetables contain some quantity of riboflavin. However niacin

and folate are present in reasonable amount (Fafunso and Bassir, 1978, Ifon and Bassir, 1979, Oguntona, 1985).

Most of the earlier studies by Oke (1968), and Onyenuga (1968) indicate that Nigerian green leafy vegetables contain appreciable amounts of minerals. Some of the factors influencing mineral composition include soil fertility or the type of fertilizer used (Oke, 1968). Latude-Dada (1991), for example, found that the total iron contents differed significantly ranging from 29.4mg to 92.6mg/kg due to wide variation in soil types. In almost all the cases of studies, the different vegetables were low in sodium (Ifon and Bassir, 1979). However they were relatively high in potassium.

Ifon and Bassir (1977) suggested that some of the vegetables contain comparatively high levels of sulphur and other minerals. Zinc and calcium are abundant in vegetables. Spinach is exceptionally high in calcium, up to 600mg/100g (Duckworth, 1979). Okro has good nutritional value, rich in protein, ascorbic acid and high in calcium (Oyenuga, 1968).

The carbohydrates in vegetables consist mainly of indigestible fibrous materials such as cellulose, semi-cellulose and lignin in addition to small quantities of sugar, such as glucose, fructose and, in some cases starch. Vegetables are not good sources of dietary energy. This is reflection of the low dry matter content of many of these leaves. Vegetables promote satiety because large bulks of them

are usually taken. This, with their low-energy value, makes them useful in the prevention and treatment of obesity (Davidson and Truswell, 1975).

Overall, fresh green leafy vegetables have crude protein content ranging from 1.5 to 1.7% although some workers (Aletor and Adeogun, 1995) have obtained a mean of 4.2% for 17 of such vegetables. When dried samples were used, the crude proteins can range from 15.0 to 30% although again the mean is usually rounded to 20%.

There are very few reports on the protein quality of green leafy vegetables. FAO/WHO (1993) reported that the amino-acid pattern of green leafy vegetables is relatively low in sulphur containing amino-acids. Although the protein content is low, however, it is very valuable because of its high cysteine (Uwaegbute, 1988). Thus, vegetables can enhance the nutritional value of diets based on edible roots, tubers and legumes.

Green leafy vegetables contain small quantities of riboflavin. Niacin and folate are present in a reasonable amount (Fafunso and Bassir, 1978). The fat content of green leafy vegetables (GVL) is relatively low. It is unusual to find levels of either extract exceeding 1.0% in fresh leafy vegetable. However dry samples have values that range from 1-30%.

The green leafy vegetables (GLV) contain appreciable amounts of anti-nutrient compounds, which include phytate and Oxalic acids. These are important

compounds as they have significant consequences on the nutritive value of the materials. Higher levels of either phytate or oxalate have long been known to inhibit the absorption and utilization of minerals by animals including man (Taylor, 1995). For instance *T. triangulae* contain 20mg and 190mg per 100g respectively of oxalic acid and phytic acid and *T. occidentalis* contain 40mg and 80mg per 100g respectively of oxalic and phytic acids (Aletor and Adeogun, 1995, Oke, 1968).

2.1.3 Importance of Fruits

In Nigeria, fruits are important during pregnancy and lactation. Analysis of national household data in Nigeria revealed that fruits had high caroteniod and vitamin A values, but were ignored in nutrition education (Singleton *et al*, 1989).

Secondly, fruits are regular components of diets of millions in 1992 (Pipes and Trahms, 1993). As documented in this review, fruits provide broad range micronutrients and in some geographical areas, reliance upon such fruits is critical especially during months preceding harvest of domesticated field crops. Such species also play prominent roles in sustaining humans during period of social unrest and military conflict, as well as during drought and other natural catastrophies (Pollack, 2001).

Among the Hausa of Nigeria, fruits are considered as both food and medicine and many species are consumed for their roles in curing gastrointestinal

diseases (Aletor and Adeogun, 1995). In eastern Nigeria, settled Fulani agro-pastoralists used fruit species high in protein and micronutrients to maintain dietary quality during periods of low rainfall. Further, Fulani use of fruits species for both food and medicine was critical during drought (Latude-Dada, 1991). Some rural Fulani's use fruits during pregnancy and lactation because of perceived benefits especially leaves of *veronia_colorate* and fruits of *lennea schiniperi* (Latude-Dada, 1991).

Some fruits like citrus, which are rich sources of vitamins, minerals and dietary fibre (non-starch polysaccharides), are essential for normal growth and development and overall nutritional well-being. However, it is now beginning to be appreciated that these and other biologically active, non-nutrient compounds found in citrus and other plants (phytochemicals) can also help to reduce the risk of many chronic diseases (Harats *et al*, 1998).

Vitamin C is one of the essential water-soluble vitamins, which play a key role in the formation of collagen, a primary component of much of the connective tissues in the body. Adequate collagen synthesis is essential for strong ligaments, skin, blood vessels and bones and for wound healing and tissue repair. The weakening of these tissues is a symptom of vitamin C deficiency. Vitamin C is an important element in the absorption of inorganic iron; it has also been used in the treatment of anemia and stress. Contrary to popular belief,

vitamin C does not seem to prevent the onset of common cold, but in some studies it has been reported as the length and severity of the symptoms.

Contemporary interest in vitamin C centres on its ability to perform antioxidant functions. As an antioxidant, it can help prevent cell damage done by "free radical" molecules as they oxidize protein, fatty acids and deoxyribonucleic acid (DNA) in the body. Free radical damage has been implicated in the progression of several diverse and important diseases including cancer, cardiovascular disease and cataract formation (Block *et al*, 1992). Being a good source of antioxidants, if regularly consumed, citrus can be an important part of a diet aimed at reducing the risk of such chronic disease.

Folate is also a water-soluble vitamin essential for new cell production of DNA and ribonucleic acid (RNA) and mature red blood cells, which ultimately prevent anaemia (Center for Diseases Control and Prevention, 1992). Potassium is an essential mineral that works to maintain the body's water and acid balance. As an important electrolyte, it plays a role in transmitting nerve impulse to muscles, in muscle contraction and in the maintenance of normal blood pressure (Center for Disease Control and Prevention, 1992).

Phytochemicals are naturally occurring compounds found in plants and have a wide range of physiological effects and may help to protect against various chronic diseases, including cancer and heart diseases. The wide variety and

number of known photochemical continue to grow as does understanding of their role and importance in the diet (Steinmetz and Potter, 1991).

2.1.4 Demand and Consumption Theory

Consumer demand is defined as the various quantities of a particular commodity that an individual consumer is willing and able to buy as the price of that commodity varies with other factors that affect or influence the demand held constant (Tomek and Robinson, 1991).

Many factors are known to affect or influence the demand for a product. These factors include own price of the product, prices of other products, consumer's income, tastes and preference (Koutsoyiannis, 1980). Other factors or determinants of demand include distribution of income, total population and its composition, government policy, weather, credit availability, advertising, past levels of demand and habits (Koutsoyiannis, 1980, Baumol, 1977)

According to Pagot (1992), factors like availability of various commodities, eating traditions and relative prices also affect demand. Example, for commodities like fruits and vegetables, Bokeshemi and Njoku (1997) had contended that because the availability of fruits and vegetables are so well spread throughout the year, there are always some fruits and vegetable in abundance in any given period of the year and hence adequate consumption even among low income households. Aromolaran and Igharo (1998) and Agwu (2000) had also noted that in addition, household size, monthly income of

household, total monthly expenditure on food and educational level of household head affect meat consumption in particularly although to them, the most important single factor affecting meat consumption is the real income. However, very little is known about these variables on the consumption of fruits and vegetables. Pagot (1992) is of the opinion that the price difference between species vary considerably from region to region. To him, this contributes to the orientation of demand towards one type of products rather than another.

The consumer is assumed to be rational in his decisions (Koutsoyiannis, 1980; Henderson and Quandt, 1980) and as such will prefer more or less of a particular commodity and that given his income and the market price at the various commodities, he plans to maximize his utility or satisfaction.

Consumer demand analysis is primarily aimed at analyzing the relationship between consumption of different commodities expressed in terms of quantities or expenditures and disposable income or total consumer expenditure (Okorji, 1989). According to Davis (1982), consumer demand theory investigates the food-expenditure relationships through Engel's demand curve, which is a functional relationship between households in a given period.

The slope of Engel's curve measures the expenditure (income) elasticity of demand. A positive, negative, or zero elasticity implies normal, inferior and neutral goods respectively. Engel's curve shows how purchases of food commodities change when income changes. Engel ascertained that the lower the

consumer's money income, the greater the proportion of that income spent on food (Davis, 1982).

Market demand and consumer demand are often distinguished from each other. The individual consumer demand analysis is the unit that makes economic decisions about its own consumption and expenditure (Paris and Houthakkar, 1955). This according to them, are usually the part or all of what is known as family or household while market analysis investigate the price-quantity or expenditure- income relationship from individual consumers.

2.1.5 Household Fruit and Vegetable Consumption Patterns

Many literatures on the demand for food are concerned primarily with an understanding of the consumption behaviour of households and individuals. There is a growing concern for the nutritional consequences of a given level of fruit and vegetable consumption (WHO, 2003; Pollack, 2001; IARC, 2003).

To measure poverty level thus welfare, one must measure what and how much individuals consume (Deaton and Case, 1981; World Bank, 1996). According to Timmer e*t al*, (1983), once these variations in food consumption patterns and the sources of access to food are understood, points of potential vulnerability of poor people and opportunities for government intervention to improve and stabilize food intake begin to emerge.

Some studies have indicated that mainly children and pregnant women particularly those in poor households suffer micronutrient malnutrition mainly

as a result of inadequacy of fruit and vegetable consumption (WHO, 2003; World Bank, 1996, Minot, 2002). According to them, this is probably because of high cost of these fruits and vegetables, and besides fruits and vegetables is regarded as very expensive sources of energy compared to other starchy staples like garri, rice, yam, etc.

The main energy – yielding nutrient in some fruit like citrus is carbohydrates (sugars) fructose, glucose and sucrose as well as citric acid which contain no starch poly-saccharides (NSP), commonly known as dietary fibre, which is a complex carbohydrate with important health benefits (Bandura, 1986).

However, in many populations, even among people who know that fruit is nutritious, the consumption of fruits is often very low. The reasons for this are varied. (Nestle *et al*, 1998).

i. Individual's food preferences and previous experiences with a given food.

ii. Cultural values

iii. Perceptions, attributes and societal influence

iv. Availability, taste and price of food item.

Bokeshemi and Njoku (1997) had contended that consumption patterns of fruits and vegetables depends on local availability, seasonal availability, social preferences and the importance of commodity to the people. Njoku (1989) had observed that urban households consume more of yellow vegetables than rural households. This according to him may be due to the differences in income

levels as the yellow vegetables are more expensive than the green vegetables. Similarly, Njoku (1989) stated that green vegetables are necessities in the diets of people, since they are inelastic with respect to income. Fruits are elastic in demand indicating the expensive nature of it and therefore consumed by the high income groups. However, he stated that there is a negative relationship between the age of the household head and the consumption of fruits. This means that household head value less of fruits than younger ones since their tastes and preference favour more of starchy staples than of fruits. Education also is a key determinant of fruit consumption, since educated households know the value of fruits in their nutrition, and hence consume more of them than uneducated households. However, clear strategies are more likely to modify behaviour and improve health if they are directed towards the relevant influences and barriers (Bandura, 1986).

2.1.6 Expenditure Elasticity for Food

Household expenditure on food has been studied extensively in many developing countries. By extending the Engel function, Rimmer and Powell (1996) developed a model called Directly Addictive Demand System (AIDADS). Cranfield, *at al.* (1998) used the AIDADS model and estimated income elasticity for demand of food in Ethiopia, Pakistan, Senegal, Korea, France, and USA was 0.97, 0.77, 0.76, 0.55, 0.26, and 0.15 respectively. It shows that poorer countries are more likely to spend more of their income on

food, which is effectively the overcoming of the under-nutrition associated with poverty. While Yuen (1994) estimated food income elasticity for 24 countries from 1961 to 1994 via Working-Leser single equation. The results comply with "Engel's law", with decreasing food income elasticity from year to year as the countries developed.

Previous studies in Brazil (Simões and Brandt, 1981; Alves, *et al.*, 1982; and Thomas, *et al,* 1989; Asano and Fiusa, 2003) calculated the elasticities using cross-sections data. Recently, Menezes, *et al.* (2005) used a two-stage budgeting system via Linear Approximate Almost Ideal Demand System (LA/AIDS) to estimate income and price elasticities for groups of Products, such as food, housing, clothing, personal expenditure, transportation & communication, and health. It was found that income elasticity for demand of food in Brazil was 0.301. More specifically, it was 0.109 and 0.454 among the deciles of 50% richest population and the deciles of 50% poorest population in Brazil. Such findings imply that poorer households are expected to increase their expenditure on food in response to increase in income more rapidly than richer households. Similarly, Elsner (1999) analyzed Russian food expenditure pattern by using a two-stage budgeting system. Total expenditure allocation on food and non-food was analyzed using Working's Engel model in the first stage. The Working's Engel model estimated income elasticity for demand of food was 0.81 in Russia. Also, income elasticity for demand of food was estimated to be 0.98 and 0.78

among Russian households in rural areas and urban areas respectively. Another study by Brosig (2000) estimated a two stage model of Hungarian households' food demand. Demand for food was estimated by a Working - Leser single equation model in the first stage. The study found that income elasticity for demand of food was 0.60 in Hungary. It also showed that differences existed between food demand behaviors across specific socio-demographic groups. It was estimated that income elasticity for demand of food was 0.65 and 0.58 among Hungarian households in rural areas and urban areas respectively. Both of these studies indicate that households in rural areas are expected to increase their expenditure on food in response to increase in income more than those households in urban areas.

On another hand, numerous studies (Thomas, 1987; Blundell, *et al*., 1993; Fan, *et al*., 1995; Gao, *et al*., 1996; Tiffin & Tiffin 1999; Dey, 2000) estimated food income elasticity in the first stage of multi-stage budgeting system via Working-Leser model. Most recent study by Dey (2000) found that lower income groups are expected to increase their share of expenditure on food more than higher income groups. Further to the Working-Leser model specification, Huang and Bouis (1996) and Haley (2001) argued exclusion of demographic and socio-economic factors may have the effects of income on food demand have been overestimated. Kang and Chern (2001) compared the performance of Working-Leser model with and without incorporation of the demographic variables. The

study indicates that the treatment of translating demographic effects is important in improving the performance of the model.

2.1.7 Household Budget Share

The study of household budget allocation —i.e., how the budget of a household is allocated to buy different commodities— is one of the most traditional topics in economics (Paris and Houthakker, 1955). Household budget shares contain useful information to shed light on this issue. Indeed, the household budget share for a given commodity category *g* is defined as the ratio between the expenditure for the commodity category *g* and total household resources —as measured by, e.g., total expenditure or total income.

In the last decades, this topic has received a lot of attention by applied economists. In particular, many efforts have been devoted to develop statistical demand functions for homogeneous groups of commodities, e.g. by relating the expenditure of consumers or households for a given commodity category to prices and individual-specific variables as total expenditure or income, household size, head-of-household age, and so on. Such a research program has been mostly characterized by a theory-driven approach (Attanasio, 1999). In fact, the parametric specifications that are employed in the estimation of each specific demand function are in general taken to be consistent with some underlying theory of household expenditure behavior, which very often is the standard model based on utility maximization undertaken by full-rational

agents. Furthermore, no matter whether parametric or non-parametric techniques are employed, the estimation of demand systems or Engel curves compresses household heterogeneity —for any given income or total expenditure level— to the knowledge of the first two moments (at best) of household expenditure level or budget share distribution for the commodity category under study.

This of course is fully legitimate if the aim of the researcher is to empirically validate a given theoretical model, or if there are good reasons to believe that the distribution under analysis can be fully characterized by its first two moments. However, from a more data-driven perspective, constraining in this way the exploration of the statistical properties of the observed household expenditure patterns may be problematic for a number of reasons.

The first study of this kind was made by Engel (1857), who empirically studied the relation between German households' total income and expenditure for different commodities (Moneta and Chai, 2005). First, heterogeneity of household consumption-expenditure patterns is widely considered as a crucial feature because, as Pasinetti (1981) notices: "At any given level of per capita income and at any given price structure, the proportion of income spent by each consumer on any specific commodity may be very different from one commodity to another". This suggests that, in order to fully characterize such heterogeneity, one should perform distributional analyses that carefully

investigate how the shape —and not only the first two moments— of household consumption expenditure and household budget share distributions change over time and between different commodity categories. Second, understanding heterogeneity may be important to build sound micro-founded, macroeconomic; consumption models that go beyond the often disputable representative-agent assumption (Kirman, 1992; Hartley, 1997; Gallegati and Kirman, 1999). Third, adopting a more theory-free approach focused on distributional analysis may help to discover fresh stylized facts related to how households allocate their consumption expenditures across different commodity categories. In fact, theory-free approaches aimed at searching for stylized facts are not new in economics and econometrics (*Kaldor, 1961*; Hendry, 2000). More recently, this perspective has been revived in the field of econophysics, where the statistical properties of many interesting micro and macro economic variables (e.g., firm size and growth rates, industry and country growth rates, wealth and personal income, etc.) have been successfully characterized by using parametric techniques. These studies show that, despite the turbulence typically detected at the microeconomic level (e.g., entry and exit of firms; positive and negative persistent shocks to personal income, etc.), there exists an incredible high level of regularity in the shape of microeconomic cross-section distributions, both across years and countries. Notwithstanding such successful results, similar distributional analyses have not been extensively performed, so far, on

consumption-related microeconomic variables such as household consumption expenditures and budget shares, for which reliable and detailed cross-section data are also available.

Caselli and Ventura (2000) show that models based on the representative-agent assumption impose almost no restrictions on household consumption expenditure and budget share distributions. On the contrary, Forni and Lippi (1997) demonstrate that heterogeneity is crucial when aggregating individual behavior in macro models.

2.1.8 Household Income

The demand for fruits and vegetables increases with higher incomes; although the share of total expenditure allocated to fruits and vegetables tends to decline (IARC, 2003). This implies that at low-income levels, the demand for fruits and vegetables is small. This is largely due to the fact that low-income households must prioritize the fulfillment of their basic energy requirements to avoid hunger and that fruits and vegetables tend to be an expensive source of energy. A study in Rwanda, for example, showed that starchy staples such as sorghum; cassava; sweet potatoes and cooking bananas were the cheapest sources of energy; whereas goat and beef were five times more costly, and tomatoes 12 times more expensive (Minot, 2002). In a study in Enugu metropolis of Enugu State, Nigeria, a household's monthly expenditure on meat was a significant proportion of household expenditure compared to other food items (Agwu,

2000). In conclusion, he stated that due to poverty it had become impossible for households to feed well and consume the required quantity of meat viz-a-viz protein. The same could be applied to fruits and vegetables. Similarly, a study in Cambodia found that vegetables cost between 10 and 40 times more per kilocalorie than rice, while certain fruits were up to 100 times more expensive than rice per unit of energy (Prescott and Pradham, 1997).

The fact that fruits and vegetables are an expensive source of energy is an important constraint for poor households. For example, the poor in Cambodia must allocate half of their budgets to low-quality rice just to reach the recommended energy intake of 2200 kcal per person per day. Given the need for other foods to contribute protein and fat to the diet and the need for non-food goods and services; it is clear that fruit and vegetable consumption will be quite limited. At these income levels, large quantities of grains and starchy staples and few fruit and vegetables are consumed (Minot, 2002).

One of the most ambitious attempts to examine international food demand patterns is provided by Seale and colleagues (Mueller *et al*, 2001). They used data of 114 countries from the International Comparison Project (1CP), to estimate the effect of price and income on the demand for different food and non-food categories; where each country represented one observation. According to the ICP data, the budget share allocated to fruits and vegetables represented 10 –25% of the food budget of most countries. The average budget

share declined from 20%, among the low-income countries, to 18% in the middle-income countries and 15% in high-income countries. The income elasticity of fruit and vegetable demand is 0.60-0.70 in most African and South Asian countries (low-income countries), 0.30-0.44 in most Latin American countries (middle-income countries); and 0.20-0.37 in industrialized countries. Thus, rises in income are associated with greater increases in the demand for fruits and vegetables in poorer countries compared to wealthier countries; and income increases are generally associated with larger increases in the demand for fruits than for vegetables (as suggested by the larger income elasticities of demand for fruits than for vegetables). Increase in household's total expenditure increase the consumption of most items. A case of meat is a good example (Agwu, 2000).

Higher income is associated not only with an increase in the volume of fruits and vegetables consumed; but also with an increase in the diversity of fruits and vegetables. For example, a 1993 household survey data from Viet Nam show that the average number of distinct fruit and vegetables consumed rises from 4.5 out of 10 in the lowest income quintile to 6.9 in the highest income quintile (Minot, 2002).

2.1.9 Market Supply for Fruits and Vegetables

Agricultural products differ from manufactured goods in terms of supply and demand. Agricultural products supply including horticultural crops like fruits

and vegetables are different because of the very seasonal biological nature while their demands are comparatively constant throughout the year.

In economic theory, it is stated that human being is always under course of action of choice from a number of options. The basis for the decisions could be issues ranging from household characteristic to the exogenous unmanageable factors.

The analysis can identify factors that determine market supply. A clear understanding of the determinants helps to know where to focus to enhance production and marketable supply. The study of market supply helps fill the gap for success of commercialization. There are different factors that can affect market supply. According to Wolday (1994) market supply refers to the amount actually taken to the markets irrespective of the need for home consumption and other requirements where as the market surplus is the residual with the producer after meeting the requirement of seed, payment in kind and consumption by peasant at source.

Marketable surplus is the quantity of produce left out after meeting the farmer's consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. This marketable surplus shows the quantity available for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale (Thakur *et al.,* 1997).

Neway (2006) indicated two options for commercialization. The most common form in which commercialization could occur in peasant agriculture is through production of marketable surplus of staple food over what is needed for own consumption. Another form of commercialization involves production of cash crops in addition to staples or even exclusively. At the farm household level, commercialization is measured simply by the value of sales as proportion of the total value of agricultural output. At the lower end, there would always be some amount of output that a subsistence farmer would sale in the market to buy basic essential goods and services. For this reason, the ratio of marketed output up to a certain minimum level cannot be taken as a measure of commercialization. Neway (2006) proposed the proportion to be 20 percent of marketable surplus in the Ethiopia as a cut of rate for commercialization.

Marketed surplus is defined as the proportion of output that is marketed (Harris, 1982). Marketed surplus maybe equal to marketable surplus, but may be less if the entire marketable surplus is not sold out and the farmers retain some stock and if losses are incurred at the farm or during the transit (Thakur *et al.,* 1997). In the case of crops that are wholly or almost wholly marketed, the output and marketed surplus will be the same (Reddy *et al.,* 1995).

Empirical studies of supply relationships for farm products indicate that changes in product prices typically (but not always) explain a relatively small proportion of the total variation in output that has occurred over a period of years. The

weather and pest influence short run changes in output, while the long run changes in supply are attribute to factors like improvement in technology, which results in higher yields.

The principal causes of shifts in the supply are changes in input prices and changes in return from commodities that compete for the same resources. Changes in technology that influence both yields and costs of production/efficiency, change in the prices of joint products, changes in the level of price/yield risk faced by producer, and institutional constraints such as acreage control programs also shift supply (Tomek and Robinson, 1991).

A study made by Moraket (2001) indicated households participating in the market for horticultural commodities are considered to be more commercially inclined due to the nature of the product. Horticulture crops (fruits and vegetables) are generally perishable and require immediate disposal. As such, farmers producing horticulture crops do so with intent to sell. In his study it was found that 19% of the sample households are selling all or a proportion of their fruits and vegetables harvest to a range of market outlets varying from informal markets to the large urban based fresh produce markets. Typically, many of the households producing fruits and vegetables also have access to a dry land plot where they commonly produce maize and/or other field crops.

Harris (1982) also verified empirically the relationship between marketed surplus and output and income. She obtained negative relationship between

marketed surplus and variables like family size and distance to market. Farm size was not found as a direct causal variable, but production was as Harris (1982) put it.

A similar study was conducted by Holloway *et al* (1999). Their study wanted to identify alternative techniques for effecting participation among per-urban milk producers in the Ethiopian highlands. They found that cross breed cow type, local breed cows, education level of household head, extension contact, and farming experience of household head positively affected quantity of milk sold while distance to the market affected the volume of sale negatively.

The behvaiour of marketed surplus to changes in prices and non price factors like irrigation, acreage and productivity is of critical importance. The most important factor, which increases marketed surplus significantly, is the increased production or output followed by consumption and payments in kind which should be reduced to keep up the quantity of marketed surplus of food grains (Thakur *et al.,* 1997).

A similar study on cotton by Bossena (2008), also indicate that four variables affect cotton marketable supply. Owen oxen number, access to credit, land allocated to cotton, productivity of cotton in 2005/2006 were the variables affecting positively cotton supply. Similar study on sesame by Kindei (2007), also pointed out six variables that affect sesame marketable supply. Yield, oxen number, foreign language spoken, modern input use, area, time of selling were

the variables affecting positively sesame supply and unit cost of production was found to negatively influence the supply. Similarly, Abay (2007) in his study of vegetable market chain analysis identified variables that affect marketable supply. According to him, quantity production and total area owned were significant for onion supply but the sign for the coefficient for total area of land was negative. For tomato supply, quantity of production, distance and labor were significant. Similarly, Rehima (2007), in her study of pepper marketing chain analysis identified variables that affect marketable supply. According to her, access to market, production level, extension contact, and access to market information were among the variables that influence surplus. Another study by Gizachew (2006), on diary marketing also captured some variables that influence diary supply. The variables were household demographic characteristics like sex and household size, transaction cost, physical and financial wealth, education level, and extension visits. Household size, spouse education, extension contact, and transaction cost affects positively while household education affects negatively.

According to Moti (2007), a farm gate transaction usually happens when crops are scarce in their supply and highly demanded by merchants or when the harvest is bulk in quantity and inconvenient for farmers to handle and transport to local markets without losing product quality. For crops like tomato, farm gate transactions are important as grading and packing are done on the farm under

the supervision of the farmers. Therefore, households are expected to base their crop choice on their production capacity, their ability to transport the harvest themselves and their preferred market outlet.

From these little reviews, it is possible for households to decide where to focus to boost production and knowing the determinants for these decisions will help choose measures that can improve the marketing system in sustainable way.

2.2.0 Prices and Availability of Fruits and Vegetables

Prices of many agricultural commodities follow a definite pattern within a one year period. Commodities which exhibit this seasonal price pattern are those for which the production varies substantially over the year.

Using the International Comparison Project Data on 114 countries, Seale and colleagues (Mueller *et al*; 2001) also estimated price elasticities of demand for fruits and vegetables. Their analysis showed own-price elasticities of demand for fruits and vegetables ranging from – 0.35 to – 0.50 among most African and South Asian countries, - 0.35 to – 0.45 in most Latin American countries, and between – 0.10 and – 0.30 in the industrialized nations. This confirms the conventional wisdom that low-income households are more sensitive to prices than higher-income households. It also suggested that policies to reduce the market price of fruits and vegetables can have a significant impact on fruit and vegetable consumption, particularly for low-income households. However, according to Houthakkar and Taylor (1970), consumers may continue to make

purchases on the basis of habit even if prices have changed. This according to them is costly for consumers to remake consumption decisions every time and this results in delay responses towards price change.

Given the perishability of fruits and vegetables and the limited infrastructure in many developing countries, another constraint to fruit and vegetable consumption is the fact that many are not available at all during part of the year. Technologies to extend the harvest period or to facilitate storage are particularly important for fruit and vegetables (Ali and Tsou, 1997), as well as preservation methods such as solar drying, to extend their period of availability throughout the year (IVACG 1993). Bokeshemi and Njoku (1997) had noted that in Imo State, differences in distance had implications for the prices and consumption of fruits and vegetables. The result according to the study was that for those that were abundantly available, their prices were low, thereby permitting easy access to most consumers. For those that were scarce or relatively available, prices were high thereby reducing access. However, they were of the opinion that since the availability of fruits and vegetables was so well spread out throughout the year, that there were always some fruits and vegetables in abundance at any period of the year. According to them, this might explain the ability of most low income households to have adequate consumption of fruits and vegetables for adequate nutrition.

Fruit and vegetable prices are also affected by trade policy. Import tariffs or highly restrictive sanitary and phytosanitary requirements are sometimes established at least partly for the purpose of protecting domestic producers. An unintended consequence is that they reduce fruit and vegetable consumption by raising domestic prices.

2.2.1 Consumer Preference

Factors like income, prices and availability, affect what consumers *are able to* purchase or consume. Consumer preferences shape the decisions that consumers make regarding what they *choose to* purchase or consume. Until the physiological need to satisfy hunger is met, households have little choice but to focus on cheap sources of energy such as grains and starchy staples. Once they have satisfied their basic energy needs, households start diversifying their diets by including animal source foods, dairy products and fruits and vegetables. At this stage, the role of consumer preferences in shaping food consumption patterns becomes more important Fruit and vegetable consumption have clear health and nutrition benefits. They are a relatively cheap source of essential micronutrients and they protect against chronic diseases. The vast majority of consumers, however, are unaware of the health benefits of consuming fruits and vegetables in abundance, even in developed countries. In the United States of America, health awareness and knowledge of the number of fruit and vegetable servings recommended per day have been associated with greater fruits and

vegetable intakes. Other important factors included taste and preference, and having developed the habit of eating these products during childhood (Prescott and Pradham, 1997). Several demographic factors such as gender, age, education, income and non-smoking status are also associated with greater fruit and vegetable intake in this population *(*Subar *et al*; 1995; Nayga, 1995). A recent review, also focusing on developed countries, highlighted the importance of several non-economic factors in determining fruit and vegetable consumption choices; these included sensory appeal, familiarity and habit, social desirability, personal and food ideology, convenience and media and advertising (Pollard, Kirk, and Cade, 2002).

Advertising is known to be effective in increasing the volume of products purchased by loyal buyers of a particular product but less effective in winning new buyers (Kotler, 2001). However, Tellis (1998) had argued that advertising appears unlikely to have some cumulative effect that leads to loyalty; rather features, displays and especially price have a stronger impact on response than does advertising. Changes in tastes and preferences obviously affect the demand and consumption of food. Tastes and preferences of individuals may change for a variety of reasons such as age, education, health, experience and advertisement. For example, consumer education about health and nutrition may influence the types of food purchased. According to Scearce and Jenson (1978), general education of the household head has a positive and significant effect on

household nutritional status. However, very little is known about how preferences regarding fruits and vegetables affect consumption in low-income countries. Taboos and cultural beliefs are likely to play a significant role in many populations, especially for selected physiological or age groups such as pregnant and lactating women or young infants. Mangoes, for example, are believed to cause diarrhoea in young children in many cultures, and therefore, intake of this excellent source of vitamin A by young children – who are also at highest risk of vitamin A deficiency – is often constrained. Dietary restrictions during lactation – another period of high vulnerability to micronutrient deficiencies – are also widespread in developing countries and often include several fruits and vegetables because of their perceived harm either to the mother or to her young infant (Pollack, 2001).

Maternal education has been consistently associated with positive child health and nutrition outcomes as well as with better child feeding and care practices. In certain cases, maternal knowledge has been found to mediate the effect of maternal education on child outcomes Smith *et al,* (2003) whereas in others, knowledge appeared to be a stronger predictor of child health than formal education (Block, 2002). The role of maternal education or knowledge in shaping food consumption patterns, however, is not well documented. In Haiti, maternal education was associated with greater dietary diversity in young children's diets, but no information is available on the association between

maternal education and household dietary quality or fruit and vegetable consumption (Menon and Ruel, 2003). One study in Indonesia, however, showed that mothers who had greater nutrition knowledge devoted the same share of their budgets to food, but allocated a larger share of their food budget to foods that were rich in micronutrients, including fruits and vegetables (Block, 2002).

2.2.2 Costs and Feasibility of on-Farm Production

If markets are efficient and transportation costs are only a small share of food prices, then consumption patterns depend on total income, prices, and preferences, but not on production opportunities. In this scenario, fruit and vegetable consumption would not be related to whether the household could grow fruits and vegetables. The fact that urban fruit and vegetable consumption are sometimes higher than rural consumption is a confirmation of this idea. However, in the presence of large transaction costs that impede market transaction, household consumption patterns will be affected in part by what the households can produce for itself.

There is little research on the degree to which fruit and vegetable consumption are affected by home production, after controlling for income and prices. Ali and Tsou (1997) reported that a programme to promote home gardens in Bangladesh significantly increased the volume of vegetable consumption compared to those that did not participate.

Although it is difficult to control for selection bias in a voluntary programme such as this, it seems plausible that, in areas where markets work imperfectly, the promotion of home gardens could be an effective means of increasing fruit and vegetable consumption. Ample evidence exists to support that theory, mostly from experience with small-scale home gardening initiatives to promote vitamin-A intakes. These studies show that promotional efforts, especially those that combine production interventions with strong education and behaviour change activities, translate into greater consumption of the targeted vitamin A-rich fruits and vegetables.

The constraint on home production of fruits and vegetables is not the land requirement. Ali and Tsou (1997) showed that even a $16m^2$ garden could meet 40% of a family's calcium needs and almost all its vitamin C requirements. Rather, the constraints were more likely to be labour, water, and information. Vegetable production is significantly more labour-intensive than most field crops because of water requirements and pest control. Fruits and vegetables also tend to be more water-intensive and management-intensive than other crops.

2.2.3 Intra-household Decision-Making Process

Research on the intra-household allocation of resources indicates that households in which women have more control over resources (due to legal rights, greater inheritance, high share of assets, or simply the absence of the husband) or higher social status tend to place a higher priority on child health

and nutrition in allocating household resources. For example, Smith, *et al* (2003), using data from 36 demographic and health surveys, showed that women's status had a positive and statistically significant effect on the nutritional status of the children. This appeared to be due to the better health of higher-status women and their use of better child-care practices. Several studies in developing countries also showed that a higher share of assets held by women increased food budget shares of household total energy intake (Quisumbing, 2003).

Female-headed households may be considered a case where women have full decision-making power, shedding light on differences in food consumption patterns between men and women. A study of household budget data from Rwanda found that female-headed households allocated a larger share of their budget to fruits and vegetables (4.5%comparad to 3.1%) than male-headed households (Ministere du Plan, 1988).

Female-headed households also spent a larger share on pulses and tubers, but a smaller share on animal products and beverages. An econometric analysis focusing on selected food products found that the consumption of leafy greens was significantly greater among female-headed households than male-headed households, even after controlling for income and other household characteristics. A study in Viet Nam, however, found no statistically significant

difference between fruit and vegetable consumption patterns among male-and female-headed households (Minot, 2002).

2.2.4 Theoretical and Conceptual Framework

In order to examine the determinants of fruit and vegetable consumption in developing countries in which the study intends to do using Enugu State of Nigeria as a case study, it is useful to begin with a review of the economic theory of household decision making. In the standard household model, households use their resources (labour, skills, land and equipment) to achieve the highest level of utility (satisfaction) possible. These decisions result in a certain level of income, although this may not be the highest possible income since the household may choose to sacrifice some income for more leisure and/or to have a more stable income flow (Ruel *et al*; 2004). In practice, households that are near the margin of subsistence probably cannot "afford" much leisure and are likely to be close to the maximum income feasible with their resources and skills.

Consumption patterns are determined by the combination of three main factors: the income level, preferences of the household, and market prices. Preferences are, in turn, affected by the composition of the household, its members' knowledge and education, habits and cultural norms, personal experience, and, in the case of food, the biological factors that affect hunger (Ruel *et al*; 2004). Production and consumption decisions are "separable" in the sense that

production decisions do not depend on consumption preferences. Consumption decisions depend on total income but not on the composition or source of income.

Two key assumptions of the separable household model are: buying prices and selling prices are the same; and the household resources are pooled and the household has a single set of preferences. In recent decades, these two assumptions have been relaxed, leading to more complex but more realistic models of households who grow food and face large costs in getting goods to and from the market (IVACG, 1993). These transaction costs create a gap between the buying and selling prices of the same item. As a result, for a range of market prices, the household does not participate in the market for the item, producing only for its own consumption needs and that consumption is partly dependent on production opportunities. Fruits and vegetables are highly perishable, so the cost of getting them to or from the market will be high for households in remote rural areas. Thus, the consumption of some fruits and vegetables may be constrained by whether or not they can be grown by the household. Access to water, seeds, and information on horticultural production methods may limit both production and consumption of fruits and vegetables.

Second, the assumption that households pool resources and have a single set of preferences have been questioned by research on intra-household allocation of resources and gender roles within the household. Empirical research has shown

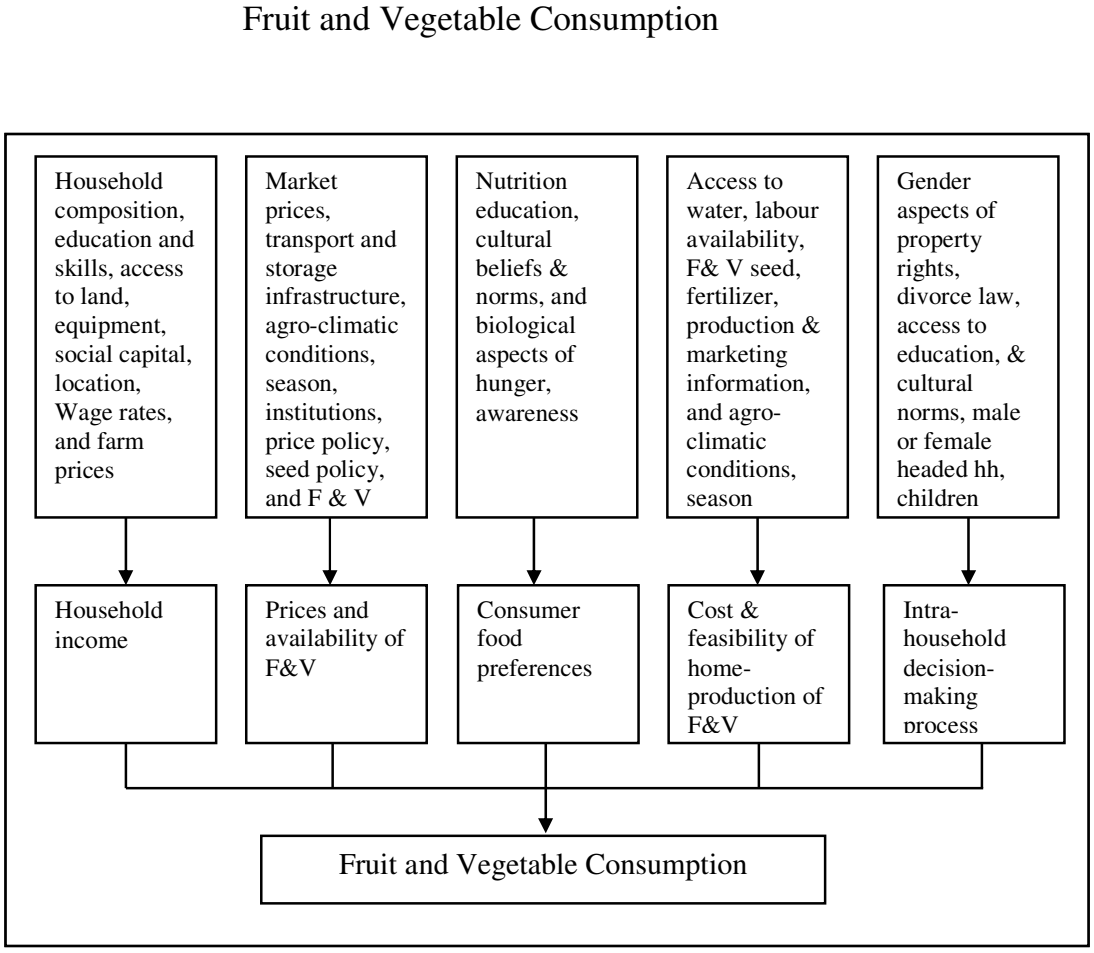
that husbands and wives often have unequal control over resources, that they may not pool income, and that their consumption priorities may differ. Some alternative household models assume a cooperative solution in which the distribution of benefits depends on the bargaining position of each based on the threat of non-cooperation or separation. Other models assume a non-cooperative solution in which each partner maximizes utility (satisfaction) subject to the decisions of the other. In either case, the consumption patterns will depend partly on the legal and socioeconomic status of each partner and their ability to monitor each other's behaviour (Quisumbing, 2003).

Applying the standard household model and the two extensions to fruit and vegetable consumption, the following factors are the main influences on consumption:

- Household income,
- The prices and availability of fruits and vegetables relative to other prices,
- Household members' preferences,
- The cost to the household and feasibility of fruit and vegetable production, and
- The decision-making power of women relative to men in the household.

These five hypothesized determinants of fruit and vegetable consumption are illustrated in Figure 1, along with some of the policy and non-policy factors that may affect them.

Figure 1: Conceptual framework of determinants of fruit and vegetable Consumption



Adapted from: Ruel *et al;* (2004).

2.2.5 Analytical framework

In food consumption and demand analysis, a number of models are used.

Typical theoretical models used in the papers are the Almost Ideal Demand System (AIDS) model and its variations, Rotterdam, Working and Leser models and Linear Expenditure System (LES) model. AIDS, Rotterdam, Working and Leser models and LES allow estimating demand equation separately. Demand System model by Deaton and Muellbauer (1980) is derived from cost and expenditure function and does not depend on the utility function explicitly. It is not linear, but for estimation log-linear form of AIDS can be used. It is based on consumer demand theory and in case of aggregation over Consumers, the result are consistent (Dhehibi and Gil 2003). However, AIDS nearly approximates any demand system and it requires summing up the weights of total expenditure to one, and that zero homogeneity in prices and symmetry condition holds. Slutsky symmetry and zero homogeneity conditions can be additionally examined by AIDS model by putting some restrictions on the parameters of the model.

The single equation approach to demand modeling changed with the introduction by Stone (1954) of the linear expenditure system (LES). The LES was among the first attempts to derive utility-based demand models. The derivation of LES imposes theoretical restrictions of adding-up, homogeneity, and symmetry. Among the implications of the LES are that goods cannot be inferior and that all goods must be substitutes, which obviously makes it too

restrictive a functional form to model demand, except for cases where commodities are grouped into very broad categories so that it is reasonable not to expect inferiority or complementarity among them. Also, while the imposition of the theoretical restrictions helps generate degrees of freedom, it also forces the analyst to take theoretical restrictions as given (because these restrictions are embedded in the model). An interesting alternative is one that allows restrictions to be tested empirically.

The Rotterdam model proposed by Theil (1965) and estimated by Barten (1969) allows for restrictions to be tested statistically. In many ways, the approach followed in deriving the Rotterdam model is similar to Stone's, except the Rotterdam model is specified using variables in first-differences. Like the LES, the derivation of the Rotterdam model emphasized the use of theoretical restrictions to generate degrees of freedom. Among the limitations of the Rotterdam model are that it imposes constant price and expenditure elasticities and that it typically does not satisfy theoretical restrictions when applied to data (Deaton and Muellbauer, 1980).

It became apparent that specifying functional forms using theoretical restrictions to generate degrees of freedom did not offer much promise. It was partly for this reason that research in the 1970s focused on developing flexible functional forms. This approach entailed approximating the direct utility function, the indirect utility function, or the cost function with some specific functional form

that has enough parameters to be regarded as a reasonable approximation to whatever the true unknown function might be. Important contributions in this regard were the transcendental logarithmic (translog) model of Christensen *et al*., (1975) and the almost ideal demand system (AIDS) model of Deaton and Muellbauer (1980).

The indirect translog model (as originally proposed by Christensen *et al*. (1975)) is derived by applying Roy's identity to a function that approximates the unknown indirect utility function by a quadratic form in the logarithms of the price to expenditure ratios. Unfortunately, the demand functions derived from this indirect utility function are complicated and difficult to estimate. Its modified version (Jorgenson *et al*., 1982), the direct translog model, makes the discomforting assumption that, for all goods, prices are determined by quantities rather than the other way round.

Working assumes the same set of prices for households thus omitting them from the model. Since 1943 the model has been improved a lot. It has been used for cross-country analysis and the assumption about similar prices is no longer relevant. As a result, prices are included in the model. The final model, Florida, requires the information about prices, income level, budget share for good and substitution term (Theil *et al*., 1989). Absolute prices are converted into relative ones by dividing by the geometric mean. The form of income variable in Florida's model is the same as in the AIDS model. The model consists of linear,

quadratic and cubic terms (Regmi and Seale, 2010). In addition the model has the same assumptions as AIDS, and other demand models. However, the authors have not developed the extension to the model where other explanatory variables can be included.

The empirical model applied in this study is the Working-Leser model. The original form of the Working-Leser model was discussed by Working (1943) and Leser (1963). In the Working-Leser model, each share of the food item is simply a linear function of the log of prices and of the total expenditure on all the food items under consideration. The model is a simple model with desirable properties which expresses the household's budget share of each item t, as a linear function of the logarithm of household expenditures (Castaldo and Reilly, 2007). The model is also known to be consistent with household utility – maximization.

The model provides information on the tendency of households at different income levels and with different characteristics to allocate expenditures among different budget categories. Demographic characteristics were added to the model.

The model in its most austere form is expressed as:

$W_{it} = A_{it} + B_{it} \log M_T$

Where: w = budget share
i = commodity and
t = time

The budget share which was derived as:

$$W_{it} = \frac{P_{it} Q_{it}}{M_T}$$

W_{it} = Budget share of commodity i at time t

P_{it} =Price of commodity i at time t

Q_{it} =Quantity of commodity i at time t

M_T= Total expenditure at time t

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

The study area is Enugu State. The state is one of the 36 States that make up the Federal Republic of Nigeria, and was created in 1991. It is located in the south east geopolitical zone of Nigeria. The state is made up of 17 Local Government Areas. The Local Government Areas are Aninri, Awgu, Enugu East, Enugu North, Enugu South, Ezeagu, Igbo-Etiti, Igbo-eze North, Igbo eze South, Isiuzo, Nkanu East, Nkanu West, Nsukka, Oji-River, Udenu, Udi and Uzo-Uwani. The state is also divided into three senatorial zones namely, Enugu East, Enugu North and Enugu West. Generally, four Local Government Areas viz: Enugu North, Enugu South, Nsukka and Oji-River Local Government Areas are regarded as urban areas in the state given the infrastructural, demographic and socio-economic considerations while the rest are rural.

It has a land area of about 8,022.95km^2, and is bounded on the East by Ebonyi State, on the North by Benue and Kogi States, on the South by Abia State and on the West by Anambra State. The state is located between latitudes $5^0$56' and 7^0 06'N and longitudes $6^0$53' and $7^0$55'E (Ezike, 1998; INEC, 2008). According to NPC (2007), the population is about 3,257,298 persons.

The climate is tropical, with an annual rainfall of about 1500mm. The rainfall is concentrated within seven to eight months of the year (Iloeje, 1981). The major

occupation of the people is agriculture. Major crops grown are cassava, yam, maize, rice, melon, groundnut, palm oil and a variety of fruits and vegetables. Some of these fruits and vegetables are available all year round, though to varying degrees. These include oranges (*Citrus spp.*), pineapple (*Ananas comosus)*, paw-paw (*Carica papaya)*, garden eggs (*Solanum melongena),* banana (*Musa balbisiana)*, plantains (*Musa paradisca)* and tomatoes (*Lycopersicon*). However, plantains, tomatoes and star apple are more abundant during the dry season months of November to March. Leafy vegetables such as Fluted pumpkin (*Telfeiria occidentalis*), Bitter leaf (*Veronica amygdalina*), Water leaf (*Talinum triangulare*) and Okazi (*Gnetum africana* or *G.buchhoizium)* are most available during the rainy season months of April to September. Oha (*Pterocarpus milabreadi)* is an exception here, which is mostly abundant between November and December. There are also small herds of sheep and goats, poultry and piggery.

3.2 Sampling Procedure

Multi-stage sampling techniques were used for this study. Firstly, two urban and two rural areas were purposively selected. The two urban areas were Enugu North and Enugu South Local Government Areas, while the rural areas were Nkanu East and Isi-Uzo Local Government Areas. Also, two residential zones were purposively selected from the urban areas and these were New Heaven and Uwani, so also Eha-Amufu and Ugbawka were purposively selected for the rural areas. A sample frame of 360 respondents was drawn from these areas. After this, 60 households were randomly selected from each of the areas. A list of these households, who had earlier indicated interest in participating in the study during the reconnaissance visit to the area, formed the sampling frame. In all, 240 respondents were used for the study.

3.3 Data Collection.

Primary source of data was used for the study. The data were collected through questionnaire administered to the households by some trained enumerators who assisted the researcher. Data collection was carried out between May and August, 2008 for rainy season and November, 2008 and March, 2009 for dry season. In each of the seasons, two visitations were made.

3.4 Data Analysis

Objectives (i), (ii) and (iii) were realized by means of descriptive statistics using measures of central tendency such as means, percentages, and standard

deviation. Objective (iv) was achieved using budget share analysis as previously used by Deaton and Muellebeur (1980), while the Working – Leser functional form which was subjected to the Ordinary Least Squares (OLS) and employed to achieve objective (v).This follows the methods employed in the past by Njoku (1989), Okorji (1989), Blundell *et al;* (1993), Yeong-Sheng (2008). Since elasticities are involved, it is more convenient to use double logarithmic functions. The coefficients of the variables become the elasticities. This method has been used in the past by Deaton and Muellebauer (1980); Njoku (1989); Okorji, (1989); Ruel *et al;* (2004) and Hoddinott and Yohanner (2002). Z-test statistic was also employed in testing of the differences in consumption patterns in the urban and rural areas.

3.5 Model Specification

The Budget share model is specified as follows:

$$W_{it} = \frac{P_{it}Q_{it}}{M_T} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Where:

W_{it} = Budget share of commodity i at time t

P_{it} = Price of commodity i at time t

Q_{it} = Quantity of commodity i at time t

M_T = Total expenditure at time t

In this case, commodity i is either fruit or vegetable per month.

The restricted budget share model is specified as:

$$W_{it} = A_{it} + B_{it} \log M_T + B_{2it} (\log M_T)^2 + 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Household characteristics and composition, and seasonality were included in the model to eliminate bias in the expenditure elasticity estimate that may arise if not included.

Thus the full model is

$$W_{it} = A_{it} + B_{1it} \log M_T + B_{2it} (\log M_T)^2 + B_3 C_t + B_4 AM_T + B_5 AF_t + B_6$$

$$AGEHD + B_7 SEX\ HD + B_8 EDUCHD + M\ B_t \frac{SEA_t}{\sum} + \frac{M\ B_t}{\sum t=1} \log p_t \ldots\ldots\ldots (3)$$

Where:

W_{it} = Budget share of commodity i at time t

A_{it} = Intercept

$\log M_T$ = Log of total expenditure

$(\log M_T)^2$ = Log of total expenditure squared

C_t = Number of children who are members of the household at time t.

AM_T = Number of adult male members of the household at time t.

AF_t = Number of adult female members of the household at time t.

AGEHD = Age of the household head in years.

EDUCHD = Education of the household head in years.

SEX =Dummy(Male -1; Female - 0)

SEA = Dummy for season (Dry season -1; Rainy season – 0).

Log P_{it} = Log of price of commodity i at time t and

B_1-B_8 = are parameters to be estimated.

If the total expenditure is positive then the item is a normal food (fruit and vegetable), if the expenditure elasticity is negative, then it is inferior. However, it becomes a luxury, if expenditure elasticity coefficient is more than one and a necessity if less than one.

The Z - test statistic used in testing hypothesis one is specified as:

$$Z = \frac{\bar{X}_1 \bar{X}_2}{\sqrt{\frac{S^2_1}{n_1} + \frac{S^2_2}{n_2}}}$$

Where:

Z = z- statistic

X_1 = mean quantity of fruit or vegetable consumed in the urban areas

X_2 = mean quantity of fruit or vegetable consumed in the rural areas

S_1 = sample variance of the quantity of fruit or vegetable consumed in the urban areas

S_2 = sample variance of the quantity of fruit or vegetable consumed in the rural areas

n_1 = sample size of respondents in the urban areas

n_2 = sample size of respondents in the rural areas

While hypotheses (ii) – (iv), were tested using the differences between the t-values from the regression results and the tabulated t- values.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

The results and discussions made in the study are presented in this chapter. The results were based on the analysis from the data which were collected through a set of questionnaire administered on 240 respondents, 120 each from both the urban and rural areas of Enugu State. All the respondents returned their questionnaire and so were all used for the analysis. The presentation followed the stated objectives for the study which had the sub-headings below:

4.1 Households socio-economic characteristics.

4.2 Types and quantities of fruits and vegetables consumed by the households.

4.3 Consumption patterns in urban and rural households.

4.4 Paired sample test of the differences between the consumption of fruits and vegetables in urban and rural areas of Enugu State.

4.5 Budget shares of fruits and vegetables in urban and rural households.

4.6 Determinants of fruits and vegetables consumption among urban and rural households in Enugu State.

4.7 Demand elasticities for fruits and vegetables in Enugu State.

4.1 Households' Socio-economic Characteristics of the Respondents.

The households' socio-economic profile of the respondents in both urban and rural areas of Enugu State is presented below.

Table 4.1: Socio-economic characteristics of the urban respondents in Enugu State.

Variables	Minimum	Maximum	Mean	Standard deviation N=120
Amount spent on f & v (₦)	300.00	3200.00	1617.00	773.00
Total expenditure (₦)/month	20000.00	110000.00	54850.00	26047.00
No of children	0.00	6.0	2.0	1.3
No of adult males	0.00	13.0	1.4	1.5
No of adult females	1.0	5.0	1.3	0.80
Age of household head (years)	32.0	60.0	47.0	8.0
No. of years spent in formal education by household head (years)	6.0	16.0	12.0	3.4

Source: Computations from Field Survey, 2008/2009.

As shown in Table 4.1, among the urban respondents, the average amount of money spent by households in the consumption of fruits and vegetables was ₦1617.08, with a minimum of ₦300.00 and a maximum of ₦3200.00 on fruits and vegetables per month. The minimum monthly expenditure was ₦20, 000.00 while the maximum monthly expenditure was ₦110, 000.00. The households had a mean expenditure of ₦58, 850.00. The urban households had a maximum of six children, having an average of 2 children, and a standard deviation of 1.3. The average number of adult males was one (1.4) while that of females was also one (1.3). The minimum age of the household head was 32 years while the maximum was 60 years, having an average of 47 years. The average educational

attainment or number of years spent in school by the household heads in the urban areas was 12.7, having attended a minimum of six years and a maximum of 16 years in school. From the result, it could be inferred that the urban respondents had monthly income exceeding the minimum wage of the Nigerian worker, average family size, the household head was of average age and had acquired or spent a reasonable number of years in school, an average of them having a secondary school certificate and made purchases of at least to the tune of ₦1500.00 per month.

Table 4.2: Socio-economic characteristics of the rural respondents in Enugu State

Variables	Minimum	Maximum	Mean	Standard Deviation N=120
Amount spent on f & v (₦)	00.00	1900.00	579.7917	348.36
Total expenditure (₦)/month	15000.00	78000.00	42937.50	20709.99
No of children	0.00	6.0	1.9	1.3
No of adult males	1.00	8.0	1.4	1.4
No of adult females	1.00	5.0	1.4	0.9
Age of household head (years)	35.0	62.0	45.0	7.3
No. of years spent in formal education by household head (years)	6.0	14.0	10.2	3.1

Source: Computations from Field Survey, 2008/2009.

In the rural areas, as shown in Table 4.2, the respondents spent an average of ₦579.79 per month on fruits and vegetables. Their minimum monthly expenditure was ₦15, 000.00 and maximum expenditure was ₦78, 000.00 with

an average of ₦42937.50. The average number of children was approximately 2, with a standard deviation of 1.3. The minimum number of adult males was one while the maximum number was eight. The rural respondents had a minimum number of one and maximum number of five adult females. The average age of the household head was approximately 45 years with a maximum age of 62 years. The minimum number of years spent in school by the household head was six years; the maximum was 14 years while the average was 10 years. By implication, the households in the rural areas possessed a minimum monthly income which was also above that of the minimum wage of an average civil servant in Nigeria, had a maximum number of eight adult males, five adult females, with an average household head age of 45 years who can at least read and write.

4.2: Types and Quantities of Fruits and Vegetables Consumed by the Households.

In the study area, some common fruits and vegetables which are generally consumed were studied. The types and quantities consumed are presented below.

Table 4.3: Types and quantities of fruits and vegetables consumed by households.

Fruits	Average Qty(Kg)		Vegetables	Average Qty(Kg)	
	Urban	Rural		Urban n=120	Rural n=120
Citrus	32.16	24.26	Telferia	30.0	38.09
Mango	30.88	23.34	Tomatoes	27.02	30.42
Plantain/Banana	28.20	19.63	Onions	30.42	26.43
Pineapples	30.33	15.25	Garden eggs	23.07	25.20
Papaya	32.18	13.10	Okra	20.0	27.88
Star apple	13.32	10.15	Oha	8.55	12.68

Source: Computations from Field Survey, 2008/2009.

Among the fruits, citrus was the most consumed in the urban areas. It recorded an average of 32.16 kg/month as against 24.26kg/month in the rural areas. This was closely followed by mango with an average consumption of 30.88 kg in the urban areas and 23.34kg in the rural areas. The urban households consumed an average of 28.20 kg of plantain/banana, while, in the rural areas it was 19.63kg. Pineapples, papaya and star apple consumption recorded an average of 30.33kg, 32.18kg and 13.32 kg respectively in the urban areas, whereas, it was 15.25kg, 13.10kg and 10.15kg for pineapples, papaya and star apples respectively in the rural areas. Although, the respondents indicated to have consumed other types of fruits like cashew, guava, avocado pear, local pear, including some they described as “bush fruits”, they could not ascertain the level of consumption of these ones.

Telferia accounted for the highest consumed vegetable among the rural households. On the average 38.09 kg per month was consumed, while in the

urban areas, it was 30.0kg per month. The respondents in the urban households indicated to have consumed 27.02 kg of tomatoes, while, their rural counterparts consumed 30.42kg. Onions recorded an average consumption of 30.42 kg per month in the urban areas and 26.43kg in the rural areas. Garden eggs, okra and oha consumption was 23.07 kg, 20.0kg and 8.55 kg respectively in the urban areas,25.20kg, 27.88 kg and 12.68kg respectively in the rural areas. Like in the case of fruits, households also consumed some other vegetables like lettuce, cabbage, spinach, bitter leaf, okazi and cucumber sometimes, but cannot actually estimate the quantities consumed per month. By implication, households in the urban areas consumed more of fruits than vegetables while those in the rural areas consumed more of vegetables than fruits.

4.3 Fruit and Vegetable Consumption Patterns in Urban and Rural Households of Enugu State, Nigeria.

The consumption patterns which included the season, quantities, amount spent on the purchase of the fruits and vegetables as well as the prices of the fruits and vegetables in the urban and rural areas of Enugu State is presented in Table 4.4 below.

Table 4.4: Fruit and vegetable consumption in urban and rural households in Enugu State.

	Dry season		Rainy season	
Fruits	Urban N=120	Rural	Urban	Rural N=120
Average amount spent (₦)	970.42	445.67	979.58	447.67
Average Quantity kg/hh (month)	17.8	9.8	15.32	12.87
Average Price of fruits (₦)	905.25	259.75	925.72	280.45
Total expenditure (₦) hh (month)	40,848.33	33,463.33	40,848.33	33,463.33
Vegetables				
Average amount spent (₦)	863.75	965.50	820.77	850.52
Average Quantity (kg/hh)	8.68	23.29	6.98	28.43
Average Price of vegetables (₦)	692.21	765.83	703.42	690.54
Total expenditure (₦) (hh/month)	55,725.00	40,316.67	55,725.00	40,316.67

Note: All values are mean values

Source: Computations from Field Survey, 2008/2009.

The result in Table 4.4 has shown that the average quantity of fruits consumed per household per month in the urban areas was higher than that consumed in the rural areas in both the rainy and dry seasons. However, the situation was different for vegetable consumption as the quantity consumed was higher in the rural than in the urban areas.

The result could be interpreted to mean that larger quantities of fruits are moved from the rural areas, where they are produced, to the urban centres whereas the

bulk of the vegetables produced are consumed in the rural areas because of their high perishability. Price differences also indicate that average prices for fruits are higher in the urban areas than in the rural areas. Given this result, it is implied that since prices of fruits were higher in the urban centres, those at the rural areas preferred to take them there in order to make more money.

However, this result must be interpreted with caution because the average price of vegetables was also higher in the urban areas same as the fruits. It might be plausible to conclude that the higher consumption stemmed from better knowledge of the nutritional and health benefits of fruits by the urban dwellers who were better informed. However, higher income maybe a factor. There were also seasonal differences. There seemed to be higher consumption of fruits in both the urban and rural areas during the dry season than during the rainy season. Whereas, consumption of vegetables was higher during the rainy season than that of fruit.

4.4 Paired Sample Test on the Differences between the Consumption of Fruits and Vegetables in both Urban and Rural Areas of Enugu State.

The result of the paired sample differences which employed the paired z-statistic in testing the differences in the consumption of fruits and vegetables in the urban and rural areas of Enugu State is shown below.

Table 4.5: Paired sample test on the differences between the consumption of fruits and vegetables in both urban and rural areas of Enugu State.

Fruits variable	Individual mean	Paired mean Difference	95% confidence	Interval of the difference Lower	Upper
Urban	505.000				
		-781.08333	-8.638	960.13138	602.03525
Rural	1286.0833				
Urban	42.2250	-4.18333	-4.799	-5.90948	-2.45719
Rural	46.4083				

Source: Computations from Field Survey, 2008/2009.

Table 4.5 showed that there were significant differences in the individual means for fruit and vegetable consumption in urban and rural areas of Enugu State, with a mean difference of 781.083 and 4.183 respectively. Given this result, hypothesis (i) which stated that there was no significant difference between the consumption of fruits and vegetables in urban and rural areas of Enugu State of Nigeria has been rejected.

4.5: Budget Shares of Fruits and Vegetables in Urban and Rural Households in Enugu State.

The budget share estimates obtained using the approach proposed by Deaton and Muellebauer (1980) is presented below.

Table 4.6: Estimated budget share of fruits and vegetables among households in urban and rural areas.

	Urban		Rural
Fruits	0.0985		0.0671
Vegetables	0.0849		0.0690
All Fruits (pooled)		0.0828	
All Vegetables (pooled)		0.0769	

Note: All (pooled) stands for both urban and rural areas.

Source: Computations from Field Survey, 2008/2009.

Table 4.6 shows the estimated budget shares by households on fruits and vegetables in Enugu State. From the result, it could be seen that the household budget share for both fruits and vegetables were less than 10 percent. This suggests that households do not allocate much of their income on the consumption of fruits and vegetables. According to Mueller *et al*;(2001), the ICP data on fruits and vegetables account for 11 percent of the budget for low income countries, defined as those whose income are less than 15 percent of that of the United States of America. The result also indicated that the budget shares for fruits and vegetables were higher in the urban areas than in the rural areas. This may be as a result of differences in income. Many studies have shown that income levels are higher in the urban areas compared to those in the rural areas (World Bank, 1994; Mueller *et al;* 2001 and Minot, 2002). Besides, given the fact that fruits and vegetables are regarded as expensive sources of energy compared to other staples like garri, yam, etc, it therefore, seems

unlikely that these households, particularly, those in the rural areas allocated more of their budgets to these fruits and vegetables. This result, indicating a lower budget share for fruits and vegetables, particularly in the rural areas did not come as a surprise.

Furthermore, the result showed that households allocated more of their budgets to fruits than vegetables. This might be because fruits seem to be more expensive than vegetables.

4.6: Determinants of Fruit and Vegetable Consumption among Urban and Rural Households in Enugu State.

The estimates of the determinants of fruit and vegetable consumption among the urban and rural households using the Working – Leser model are presented below. The presentations were as follows:

4.6.1 Determinants of fruit consumption among the urban households of Enugu State.

4.6.2 Determinants of vegetable consumption among the urban households of Enugu State.

4.6.3 Determinants of fruit consumption among the rural households of Enugu State.

4.6.4 Determinants of vegetable consumption among the rural areas of Enugu State.

4.6.1 Determinants of fruit consumption among the urban households of Enugu State.

The estimates of the determinants of fruit consumption among urban households obtained using the Working – Leser functional form is presented below:

Table 4.7: Estimates of the determinants of fruit consumption among urban households in Enugu State, Nigeria.

Variable	Coefficient	Standard error	t-values
Constant	-9770.31	1123.774	-8.694***
Total monthly expenditure (₦)	777.968	90.468	8.600***
Number of children (persons)	-69.690	58.492	-1.157
Number of adult males (persons)	40.883	56.213	0.727
Number of adult females (persons)	-283.890	101.648	-2.793***
Age of household head (years)	509.774	151.770	3.359***
Education of household head(years)	-280.766	102.681	-2.734***
Price (₦)	267.531	46.429	5.762***
Season (dummy)	-516.217	83.359	-6.193***
Sex (dummy)	310.340	64.782	4.791***
R^2	0.916		
Adjusted R^2	0.909		
F-ratio	123.870		
SE estimate	227.935		

Note: *10% level of significance; **5% level of significance;***1% level of significance
Source: Computations from Field Survey, 2008/2009.

The estimates of the determinants of fruit consumption among the urban households indicated that total monthly expenditure, number of adult females, age of the household head, educational attainment, price of fruits, season and sex were all significant at one percent probability level with different signs.

Total monthly expenditure was positive and significant at 99 percent confidence level. This meant that any increase in the monthly expenditure of these households would lead to increases in the budget share for fruits. By implication, the coefficient of 777.968 means that any 7 percent increase in expenditure would lead to a one percent increase in the consumption of fruits. This result consolidates that of Damianos and Demousssis (1992) in their study on the consumption of Mediterranean fruits and vegetables. Similarly, given the positive coefficients, fruits could be regarded as normal goods.

The coefficient of adult females was negative but significant at one percent level. This implied that as the number of adult females increased, there would be a decrease in the budget share for fruits. This could probably mean that as adult female members increases, there is the tendency to allocate more of the family budgets to other items outside fruits.

Age of the household head was positive and significant at one percent probability level. This result meant that with increasing age of the household head, there is the probability of increased budget share for fruits in the urban areas of Enugu State. The result is consistent with that of Correaleita *et al;*

(2003) in their study on dietary and nutritional patterns in an elderly population in Italy.

Educational attainment of the household head was significant at one percent probability level with a negative sign. Although education exposes people to nutritional benefits of different types of food including fruits, however, the negative sign in this result may mean that increasing responsibilities such as fees for children's education, rent, feeding, etc, must be addressed first and thus a reduction in the budget share for fruits.

The coefficient of price was also significant at one percent probability level with a positive sign. This could be interpreted to mean that an increase in the price of fruits would to an increase in the household budget share for fruits in the study area.

Seasonal variable which was dummied exhibited significance at one percent level but had a negative sign. This implied that budget shares for fruits tended to reduce with season, in this case during the dry season. Some studies have shown that availability of fruits and vegetables is influenced by season, abundance of fruits during the dry season and vegetables during the rainy season (Omueti and Adepoju, 1998; Nelson, 1990; Bokeshemi and Njoku, 1997). The implication is that because the abundance of fruits at peak periods, the price of fruits could fall which could in turn lead to a reduction in budget share for fruits.

Sex which was also dummied had a significant and positive relationship at one percent level of probability. This suggested that the more males in the household, the higher the budget share for fruits. In other words, males consumed more fruits than females. This result is similar to that obtained in Iran by Mohammadifard *et al*; (2006), where they reported that married men and single women consumed greater amounts of fruits and vegetables compared to married and single women respectively. This result is in contrast with some other previous studies like Tippet *et al*; (1995); Krebs- Smith *et al ;*(1996); Wenlock (1987) and Raynolds *et al*; (1999).

The R^2 value was 0.916 while the adjusted R^2 was 0.909. This implied that 91.6 percent of the variables in the dependent variable were explained in the model, whereas 90.9 percent of the dependent variable can be based on the predictors which are the independent variables. The F- ratio was 123.870 and is significant at one level and this measured the overall significance of model confirming it as a good fit for the model.

4.6.2 Determinants of vegetable consumption among the urban households of Enugu State.

The determinants of vegetable consumption among urban households obtained using the Working – Leser functional form is presented below:

Table 4.8: Estimates of the determinants of vegetable consumption among urban households in Enugu State, Nigeria.

Variable	Coefficient	Standard error	t-values
Constant	6.625	0.115	57.576***
Total monthly expenditure (₦)	0.599	0.039	15.179***
Number of children (persons)	-0.033	0.010	-3.359***
Number of adult males (persons)	-0.007	0.013	-0.562
Number of adult Females(persons)	-0.040	0.014	-2.791***
Age of household head (years)	-0.010	0.002	-5.275***
Education of household head(years)	0.032	0.006	5.260***
Price (₦)	-3.24E-005	0.000	-0.954
Season (dummy)	-0.097	0.061	-1.579
Sex (dummy)	0.118	0.059	1.991*
R^2	0.946		
Adjusted R^2	0.942		
F-ratio	214.347		
SE estimate	0.13005		

Note: *10% level of significance; **5% level of significance; ***1% level of significance
Source: Computations from Field Survey, 2008/2009.

Estimates of the determinants of vegetable consumption among households in the urban areas of Enugu State, indicated that total monthly expenditure, number of children, number of adult females, age of the household head, education of the household head and sex were significant at different levels of probability with different signs.

Total monthly expenditure was significant at one percent level of probability with a positive sign. By implication, the coefficient of 0.599 indicated that any 0.059 percent increase in expenditure will lead to a one percent increase in budget share for vegetables among households in the study area. This result is in line with Damianos and Demoussis (1992).

The coefficient for number of children was significant at one percent level with a negative sign. This meant that there is a negative relationship between the number of children and budget share for vegetables. Given this result, as the number of children increased, budget share for vegetables reduces. Similarly, the number of adult females was significant at one percent probability level with a negative sign, also, implying a negative relationship between the variable and budget share for vegetables. This negative relationship was also found by Kushwaha *et al*; (2007) in their study on the current trends in vegetable consumption in Nigeria: a case study of consumption pattern in Kano State.

Age of the household head was significant at one percent level with a negative sign. This implied that with increasing age of household heads, budget shares

for vegetables would reduce. This result is in conformity with Rasmussen *et al*; (2006), but in contrast with Correalleita *et al*; (2003).

Educational attainment of the household head was significant at one percent level of probability with a positive sign. This means that with increasing educational attainment of the household head, the probability of household's budget share for vegetables increases. For the fact that education enabled people to have access to greater information on the nutritive values of different food types including vegetables, the result is expected and is consistent with Babatunde *et al*; (2007) and Njoku (1989). The coefficient of sex was significant at 10 percent level and with a positive sign. This meant that males consumed more vegetables than females and thus more budget shares for vegetables than females. The result is in line with Mohammadifard *et al* ;(2006) and Blanck *et al*; (2007).

The R^2 value is 0.946, implying that 94.6 percent of the variability was explained in the model. The adjusted R^2 was 0.942 which means that 94.2 percent of the dependent variable was based on the predictors of the independent variables. The F- ratio was 214.347 and is significant at one percent level, signifying the overall significance of the model.

4.6.3 Determinants of fruit consumption among the rural households of Enugu State.

The estimates of the determinants of fruit consumption among rural households obtained using the Working – Leser functional form is presented below:

Table 4.9: Estimates of the determinants of fruit consumption among rural households in Enugu State, Nigeria.

Variable	Coefficient	Standard error	t-values
Constant	3.023	1.920	1.575
Total monthly expenditure (₦)	-0.471	0.260	-1.815*
Number of children (persons)	-0.085	0.042	-2.024*
Number of adult males(persons)	-0.004	0.070	-0.056
Number of adult females(persons)	0 .072	0.093	0.767
Age of household head (years)	0.876	0.451	1.942*
Education of household head(years)	0.779	0.268	2.907***
Price (₦)	-0.689	0.065	-10.713***
Season (dummy)	-0.641	0.272	-2.357**
Sex (dummy)	-0.125	0.121	-1.031
R^2	0.744		
Adjusted R^2	0.716		
F-ratio	27.064		
SE estimate	0.36660		

Note: *10% level of significance; **5% level of significance;***1% level of significance
Source: Computations from Field Survey, 2008/2009.

Among the rural households, number of children, age of the household head, education of the household head, price of fruits and season were all significant at various levels of probability with different signs.

The coefficient of number of children was significant at 10 percent level of probability with a negative sign. This implies that as the number of children increased, the less the budget share for fruits in the rural households of Enugu State. Given the fact that children engaged in indiscriminate harvesting of these fruits in the rural areas, particularly at peak periods, and the tendency of getting satisfied outside homes, the result seems plausible.

Age of household head was also significant at 99 percent confidence level with a positive sign. This result meant that increasing age of the household head could lead to increase in the budget share for fruits. According to Thompson *et al*; (1999); Whichelow and Prevost (1996) and Correaleita *et al*; (2003), with increasing risk of chronic diseases especially cardiovascular diseases at older ages, people find additional incentive to consume fruits for their health benefits. However, this findings contradicts that of Rasmussen *et al* ;(2006).

Educational attainment of the household head was also significant at one percent level of probability with a positive sign. This result implied that there is a positive relationship between education of the household head and budget share for fruits among rural households. This result consolidates those of Babatunde *et al*; (2007) and Njoku (1989).

The coefficient of price was significant at one percent probability level. However, this result exhibited a negative relationship with budget share. The coefficient of 0.698 means that any 0.0698 percent increase in price of fruit could probably lead to a one percent reduction in the household budget share for fruits. Given the fact that starchy foods were major staples, it seemed unlikely that households, particularly those in the rural areas, would be able to increase their spending on fruits; and so would not prefer to substitute fruit consumption for these other starchy foods.

The coefficient of season was negatively signed but significant at one percent probability level. This meant that as rainy season sets in, the households' budget share for fruit increases. This probably could be as a result of price increase arising from not being abundant. This result is in line with previous studies as (Omueti and Adepoju, 1998; Nelson, 1990; and Bokeshemi and Njoku, 1997). This result is also the same as that obtained in the urban areas. The R^2 value was 0.744, implying that 74.4 percent of the variability has been explained in the model. The adjusted R^2 was 0.716, meaning that 71.6 percent of the predictors were based on the independent variables. The F- ratio was 27.064 which is significant at one percent level and shows the overall performance of the model.

4.6.4 Determinants of vegetable consumption among the rural households of Enugu State.

Below are the estimates of the determinants of vegetable consumption among rural households obtained using the Working – Leser functional form.

Table 4.10: Estimates of the determinants of vegetable consumption among rural households in Enugu State, Nigeria.

Variable	Coefficient	Standard error	t-values
Constant	-16.774	2.494	-6.725***
Total monthly expenditure (₦)	1.189	0.202	5.892***
Number of children (persons)	-0.107	0.124	-0.685
Number of adult males (persons)	2.200	0.540	4.074***
Number of adult females(persons)	-0.864	0.254	-3.400***
Age of household head (years)	0.505	0.127	3.976***
Education of household head(years)	1.763	0.231	7.626****
Price (₦)	0.408	0.140	2.747***
Season (dummy)	-0.166	0.140	-1.181
Sex (dummy)	-0.166	0.128	-1.296
R^2	0.644		
Adjusted R^2	0.602		
F-ratio	15.280		
SE estimate	0.498		

Note: *10% level of significance; **5% level of significance; ***1% level of significance

Source: Computations from Field Survey, 2008/2009.

Among the rural households, total monthly expenditure, number of adult males, number of adult females, age of the household head, education of the household head, and price of vegetables were all significant all 99 percent confidence level with different signs and therefore major determinants of vegetable consumption in the study area.

Total monthly expenditure was significant at one percent level with a positive sign. This implied that as household's total monthly expenditure increases, budget share for vegetables increases; and thus increases in consumption among households. This result is in line with Damianos and Demoussis (1992), and those in the urban areas in this present study.

Number of adult males was also significant at one percent probability level with a positive sign. This meant that more number of males in the household leads to a higher consumption of vegetables and thus higher budget share for vegetables. This result is consistent with Blanck *et al*; (2007) who stated that males consumed more fruits and vegetables than women in their study on fruit and vegetable consumption among adults.

Number of adult females was also significant at one percent probability level but with a negative sign. This implied that as the number of females increases, budget share for vegetables reduces and so consumption. This is in line with Kushwaha *et al*; (2007).

Age of the household head was a significant determinant of vegetable consumption among the rural households at one percent probability level with a positive sign. This meant that increased consumption of vegetables is increased with increasing age of the household head. It has been known that with increasing risk of chronic diseases especially cardiovascular diseases at older ages, people find additional incentive to consume fruits and vegetables for their health benefits. Similar results have been found in the past by Thompson *et al*; (1999); Whichelow and Prevost (1996) and Correaleita *et al* ;(2003) in their studies on the health education authority's health and lifestyle survey 1993: who are the low fruit and vegetable consumers; dietary patterns and their association with demographic lifestyle and health in a random sample British adults and dietary and nutritional patterns in an elderly population in northern and southern Italy: a cluster analysis of food consumption respectively.

The result showed a positive association between education of the household head and the budget share of households for vegetables at one percent probability level. This suggested that increasing education of the household head would lead to increase in the budget share for vegetables. This result is in line Rasmussen *et al*; (2006) in their study on the determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part 1 qualitative studies and Pollack (2001) in a study on consumer

demand for fruit and vegetable: the USA example. Changing structure of global food consumption and trade.

The coefficient of price was significant at one percent level and possessed a positive sign. This indicates that as prices increased, budget shares for vegetables increased. The coefficient of price being 0.408 also implied that price increase of 0.041 percent would lead to a one percent increase in the budget share for vegetables. R^2 value was 0.644, adjusted R^2 0.602 and the F-ratio 15.280. These values implied that 64.4 percent of the variability was explained by the explanatory variables in the model; 60.2 percent of the dependent variable was based on the predictors of independent variable and the 15.280 for the F-ratio was significant at one percent level which measured the overall performance and goodness of fit of the model respectively.

In testing hypothesis (ii) and (iv), which stated that the determinants of the consumption of fruits and vegetables are not the same in the urban and rural areas, and households' socio-economic characteristics have no effect on the consumption of fruits and vegetables in the study area, the significant variables in the regression results were used. Given that the calculated t-test in the variables were greater than the t-tabulated, the hypotheses were therefore rejected.

4.7. Income Elasticities for Fruits and Vegetables in Urban and Rural Areas of Enugu State.

The results of the income elasticities which were derived from the coefficients of the regression are presented in the Table 4.11below.

Table 4.11: Income elasticities for fruits and vegetables in Enugu State.

	Urban	Rural
Fruits	0.60	0.47
Vegetables	0.60	0.49
*All fruits (pooled)	0.70	
*All vegetables (pooled)	0.51	

*****All stands for both urban and rural areas.

Source: Field Survey, 2008/2009.

In Table 4.11, the income elasticities of demand for fruits and vegetables in urban and rural areas as well as combined fruits and vegetables are presented. In all, income elasticities of demand for fruits and vegetables both in urban and rural and those of combined were lower than one. They ranged between 0.47 and 0.70.This implied that a one percent increase in income was associated with a 0.47 percent to 0.70 percent increase in the total budget share allocated to fruits and vegetables. Income elasticity of 0.60 was the same for both fruits and vegetables in the urban areas; while they were 0.47 and 0.49 for fruits and vegetables, respectively, in the rural areas. These findings suggested that fruits

and vegetables were normal goods but necessities. It also meant that as income increased spending on fruits and vegetables increased less in proportion to the income increase. This result is consistent with Ruel *e t al,* (2004) and Claro *et al*, (2007). The estimated expenditure (income) elasticities for fruits in urban and combined fruits were greater than those of fruits and vegetables in the rural areas and combined vegetable. This scenario suggested that as income increased, the demand for fruits was likely to increase faster than the demand for vegetables. This is particularly true because as shown in table 4.11, one percent increase in income was likely to cause an increase in the demand for fruits by between 0.60-0.70 percent as against the demand for vegetables which was likely to increase by between 0.49 and 0.51 percent. The income elasticity was higher in the urban areas for both fruits and vegetables than in the rural areas. The differences ranged between 0.11and 0.13.

In testing hypothesis (iii) of the study, t-calculated was 8.600 and greater than t-tabulated of 2.617. Using the decision rule which stated that if the absolute value of calculated test statistic is greater than the absolute value of the tabulated test statistic; null hypothesis will be rejected in favour of the alternate hypothesis (Eboh, 2009). Following this, the hypothesis (iii) above which stated that there is no significant difference in the demand elasticities for fruits and vegetables in urban and rural areas have been rejected.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS.

5.1 Summary

This study was carried out with the view to evaluate the patterns and determinants of fruit and vegetable consumption in urban and rural areas of Enugu State, Nigeria. Two urban and two rural areas were selected for the study; one hundred and twenty respondents each from the urban and rural areas bringing the total number of respondents to two hundred and forty respondents.

Descriptive statistics, budget share analysis, Working –Leser functional form which was subjected to OLS and paired z-statistic were used in analyzing the data. The variables considered in the study were budget share for fruit and vegetable as dependent variable, while total monthly expenditure, number of children, number of adult males, number of adult females, age of household head; education of household head, price of commodity, season and sex were the independent variables.

The major findings were: The average number of children were two, average number of adult males and females one, average age of the household head was 45 years, average number of years spent in school by the respondents was 11 years, average total expenditure was ₦48, 020.00,and average price of products ₦755.95. Citrus, mango, plantain/banana, pineapples, papaya, and star apples were the mostly consumed fruits, recording an average of 32.16kg,

30.88kg, 28.20kg, 30.33kg, 32.18kg, and 13.32kg, respectively in the urban areas. It was 24.26kg, 23.34kg, 19.63kg, 15.25kg, 13.10kg, and 10.15kg, respectively for those households in the rural areas. Telferia, tomatoes, onions, garden eggs, okra, and oha were the major vegetables consumed, recording an average consumption of 30.0kg, 27.02kg, 30.42kg, 23.07kg, 20.00kg, and 8.55kg among the urban households. Among the rural households, telferia recorded an average of 38.09kg; tomatoes had 30.42kg; 26.43kg for onions; garden eggs recorded 25.20kg; okra with an average of 27.88kg and oha having an average of 12.68kg. The average monthly consumption of fruit per household during the dry season was 17.8kg and 9.8kg for urban and rural areas, respectively while the average monthly consumption per household of fruits during the rainy season was 15.32kg and 12.87kg for urban and rural areas, respectively. It was 8.68kg for urban areas and 23.29kg for rural areas for vegetables during the dry season while it was 6.98kg for urban areas and 28.43kg for rural areas per monthly per household during the rainy season. The average budget share of fruits was 0.0985 for urban and 0.0671 for rural areas. The budget share was 0.0849 for vegetables for households in the urban areas and 0.0690 for those in the rural areas. When pooled together, it was 0.0828 for fruits and 0.0769 for vegetables.

Household's total monthly expenditure (income), number of adult females, age of household head, education attainment of the household head, price, season

and sex which were dummied was major determinants of fruit consumption in the urban areas. While total monthly expenditure (income), number of children, number of adult females, age of household head, educational attainment of household head, and sex were major determinants of vegetable consumption in the urban areas. In the rural areas, number of children, age of household head, educational attainment of the household head, price of fruits and season were determinants of fruits while the total monthly expenditure (income), number of adult males, number of adults females, age of household head, educational attainment of the household head, price of vegetables were major determinants for vegetable consumption. All these were significant at various levels ranging from 1 – 10 percent with different signs.

Income elasticities were below one; ranging from 0.47 to 0.70. The income elasticity for fruit in urban areas was 0.60 and 0.47 in the rural areas. It was 0.60 for vegetables in the urban areas and 0.49 in the rural areas. All fruits were 0.70 and all vegetables were 0.51.All, in this case means both urban and rural areas. The result of the hypotheses showed that there is a significant difference between fruit and vegetable consumption in urban and rural areas, there is significant difference in the demand elasticities for fruits and vegetables in urban and rural areas and that the socio-economic characteristics of the respondents have effects on the consumption of fruits and vegetables in the study area.

5.2 Conclusion

The study has also shown that fruits and vegetables were normal goods, given that their income elasticity was positive though less than one.

Furthermore, the results have shown some of the determinants of fruit and vegetable consumption and budget share for fruits and vegetables among households in urban and rural areas of Enugu State, Nigeria and there exist a significant difference in consumption of fruits and vegetables in the urban and rural areas of the state.

5.3 Recommendations

i. There is a need for policies to promote and support fruit and vegetable consumption. This could be in the form of education and behaviour change programmes to promote fruit and vegetable consumption. Such should be based on local knowledge regarding the demographic and socio-cultural factors that may affect consumer choice.

ii. Given the fact that many households especially poor households allocate a large share of their income to the purchase of starchy staples, there is need for efforts to be intensified towards increasing the income of the people. Arising from the findings of this study that an increase in the income could lead to an increase in the budget share for fruit and vegetable, there is then the tendency that an increase in income will reflect in greater consumption. It seems very unrealistic to

advise poor households to spend their scarce resources on fruit and vegetable as against satisfying their daily household energy requirements and other needs.

iii. Attention should focus on the processing of fruits and vegetables into forms that can be stored. This will reduce post-harvest losses as well as making fruits and vegetables almost available all seasons and affordable.

iv. Fruit and vegetable production should be encouraged particularly in the rural areas. In the same vein, feeder roads should be built and already built ones maintained. This will help transport these produce to the urban areas. This will also promote availability and affordability of these products.

v. It is also recommended that further studies should be made on the subject matter, particularly in the area of quantity of fruits and vegetables consumed by each member in the household as well as their consumption according to their ages.

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APPENDIX

Department of Agricultural Economics,
University of Nigeria, Nsukka.
Enugu State.

Dear Respondent,

I am a postgraduate student in the Department of Agricultural Economics, University of Nigeria, Nsukka. I am conducting a research on "Patterns and Determinants of Fruits and Vegetable consumption in Enugu State, Nigeria".

You have been chosen as one of the respondents to provide information needed for the research. Your response will be treated in strict confidence as no names will be mentioned in the report.

Thank you.

Yours Sincerely,
Nnanna Agwu.

SECTION A

Socio-economic characteristics of the Household. (Please, tick (√) as appropriate)

1.

1.01 Location (i) Urban L.G.A ☐ (ii) Rural L.G.A ☐

1.02 Sex: (a) Male ☐ (b) Female ☐

1.03 Position of the Respondent in the family
(a) Husband ☐ (b) Housewife/Homemaker ☐

1.04 Married status of the Respondent.

(a) Married ☐ (b) Single ☐

1.05 If single, indicate whether,

(a) Spinster ☐
(b) Widow ☐
(c)Divorced ☐

1.06 Indicate the primary occupation of the household head.
(a) Trading/Business ☐
(b) Public Service ☐
(c) Artisan ☐
(d) Labour ☐

1.07 What is the age of the House Head? ……

1.08 What are the ages of adult members in the household?.
(a) ……(b)…… (c) …… (d) ……..
(e) …… (f) …… (g) …… (h) …….
(i) …… (j) …….

1.09 What is the educational attainment of the Household Head?

(a) Did not attend school at all ☐
(b) First School Leaving Certificate (FSLC) ☐
(c) Secondary School Certificate (WASCE or SSC) ☐
(d) Posting-Secondary School Certificate.
(i) OND /NCE …….. (ii) HND /B.Sc …….
(iii) MBA /Ph.D ……..

1.10 What are the highest educational attainments of adult members of your household?
(a)…… (b)……(c)……(d) …….
(e) …….. (f) …… (g) …….
(h)…….
(i) ……. (j) ……

1.11 What is the total Household size? (Number of persons in the family?). .....

1.12 What is the Secondary occupation of the Household head, if any ……..

1.13 Estimate the total household monthly expenditure ₦ ……..

SECTION B

2.0 Household Consumption of Fruits and Vegetables

2.01 Estimate the total household monthly recurrent expenditure on
(a) Food items ₦ ……..
(b) Vegetable ₦ …….
(c) Fruits ₦ ……..

2.02 Estimate your monthly expenditure on other items apart from food items example cloths, Energy, bills ,water, etc.

₦……,……,……,……,……,……
……

2.03 Indicate the quantity, number of times of purchase, price and expenditure on each or group of fruits and vegetables consumed by your household monthly.

Type of fruits/vegetable	Quantity (kg)	Number of times of purchase	Price/Unit ₦	Expenditure ₦
Citrus				
Mango				
Banana/plantain				
Paw-paw				
Star apple				
Garden eggs				
Telferia				
Bitter leaf				
Water leaf				
Oha				
Onions				
Others				

2.04 What is your source of purchase of these fruits and vegetables or each?

(a) Market Center ☐
(b) Hawkers ☐
(c)Farm gate ☐

(d) Other places, specify ……

2.05 Estimate the quality of each you buy from the market …… (kg)/week

(a) Citrus …….. (a) Garden eggs ……..
(b) Mango …… (b) Telferia……...
(c) Banana/plantain …… (c) Bitter leaf ……..
(d) Paw-paw …… (d) Water leaf …….
(e) Star apple …….. (e) Onions ……..
(f) Others…….. (f) Others…….

2.06 Estimate the quantity of each item collected from your garden/ backyard/ Surroundings per week/month (kg)

(a) Citrus …….. (a) Garden eggs……

(b) Mango …….. (b) Telferia ……
(c) Banana/plantain ……(c) Bitter leaf ……
(d)Paw-paw …… (d) Water leaf ……
(e)Star apple …… (e) Onions ……
(f) Others…….. (f)Others…….

2.07 At what period of the year do you buy these items more (Rainy or Dry season).
(a) Citrus …… (a)Garden eggs ……
(b)Mango …… (b)Telferia …….
(c)Banana/plantain …… (c)Bitter leaf ……
(d)Paw-paw …… (d) Water leaf ……
(e) Star apple …… (e)Onions ……

2.08 Identify the quantities consumed in each period/season and the prices.
Rainy Season (April – October)

Item consumed	**Unit price ₦**	**Quantity consumed(kg)**	**Total Expenditure ₦**
Citrus			
Mango			
Banana/plantain			
Paw-paw			
Star apple			
Garden eggs			
Telferia			
Water leaf			
Oha			
Onions			

Others

2.09 **DRY SEASON (NOVEMBER – MARCH)**

Item consumed	Unit price ₦	Quantity consumed (kg)	Total Expenditure ₦
Citrus			
Mango			
Banana/plantain			
Paw-paw			
Star apple			
Garden eggs			
Telferia			
Water leaf			
Oha			
Onions			

Others

3.01 Identify why you consumed ant item more during rainy /dry season.

(a) They are abundant ……
(b) They are cheap ……
(c) They are readily available ……..
(d) Place of purchase is near my house ……
(e) I grow them in my backyard/garden ……
(f) Other reason(s), specify ……..

3.02 Indicate the problem associated with the consumption of these items.

(a) Price ……
(b) Seasonality ……..
(c) Others, specify …….