Empirical Analysis of Demand for Apple and Watermelon in Kwara State, Nigeria

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ABSTRACT
In spite of the health benefits of fruits, world statistics reflect under-consumption in many parts of the world, especially in developing countries. This study was therefore carried out to analyse the determinants of demand for apple and watermelon fruits in Ilorin metropolis, Kwara state, Nigeria. Using a well-structured questionnaire, a two-stage random sampling technique was used to select 120 respondents for the study. The major analytical tools employed for the study were descriptive statistics and the Almost Ideal Demand System (AIDS) model. The result of the analysis showed that the price of apple and watermelon, level of education of the respondents, the total fruit expenditure and the price of other fruits were the major factors influencing the demand for both apple and watermelon fruits in the study area. The study therefore recommends that the government should provide an enabling environment to the producers and traders for increased production and marketing of fruits to allow for a possible reduction in prices of the fruits.

Key words: Demand; AIDS Model; Apple; Watermelon; Kwara

INTRODUCTION
The link between micronutrient deficiency and food security illustrates the challenges in using food properly in Sub-Saharan Africa. In many countries, the common diets lack diversity and the traditional food consists mainly of cereal or root staples with very little micronutrient-rich animal-source proteins, vegetables and fruits. Fruits provides nutritionally important quantities of the water-soluble vitamins, especially folic and ascorbic acids, carotene (the precursor of vitamin A), and minerals. Nutritionists have advised that eating at least five portions of fruits and vegetables a day can help people to maintain good health throughout their lives, protecting them from heart disease and cancer, type 2 diabetes and kidney stones (USDA, 2003; WHO, 2003). Watermelon (*Citrullus Lanatus*) and apple (*Malus domestica*) are two important fruits consumed in the country. Both fruits are sources of vitamin A. Consuming watermelons and apples provide rich sources of water. While watermelon is a rich source of iron, which strengthens and protects all the body organs, apples have also been confirmed to improve memory and learning and slow down ageing.

The consumption pattern of a country does not only depict the aggregate demand of goods and services in the country but also serve as a measure of welfare and poverty that a nation is experiencing (NBS, 2012). Studies have shown that low-income households are found to consume even fewer fruits and vegetables than high-income households (Dong and Lin, 2009). This phenomenon can be attributed to existing economic, cultural and agricultural conditions in the developing countries (WHO, 2003).

Apart from the fact that Nigerians generally have a poor attitude to the consumption of fruits, to the average Nigerian, fruits such apple and watermelon is expensive especially during the off-season leading to a restriction in the consumption of fruits. Fruits consumption in the country has been discovered to be very low. According to NBS (2012), total household expenditure on fruits in 2010 was only 0.7 percent in Kwara State where this study was carried out. A study aimed at providing quantitative information on demand of the different

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types of fruits at the household level and for different segments of the population is therefore very essential. This is to assist policy makers with making informed decisions. Assessment of fruits demand behavior and consumption pattern may help describe households' dietary practices and hence increase the consumption of fruits and vegetables. If effective policies and programmes to promote adequate consumption of fruits are to be designed and implemented, then policy makers must be aware of how specific target groups perceive, acquire and use fruits. This study was therefore carried out to achieve the following objectives:

i. To identify and describe the socio economic characteristics of respondents in the study area;

ii. To determine the factor that influences the consumption of apple and watermelon fruits and

To estimate the demand elasticities of apple and watermelon in the study area.

MATERIALS AND METHODS

Study Area

This study was conducted in Ilorin metropolis in kwara state, north-central, Nigeria. Ilorin is the capital city of Kwara state which shares boundaries with Oyo, Ekiti, Kogi, Niger and Osun states. The geographic area of Ilorin is an estimated 50.2 km^2, approximately 400 km from the Federal Capital Territory, Abuja. The city is located on Latitude $8^0 30'$N and Longitude $4^0 35'$E. The 2006 national census report indicates that human population in Kwara state was 2,371,089. Among this is Ilorin city alone that has a total of 777,667 persons (NPC, 2006). At present, the city of Ilorin cuts across three (5) Local Government Areas namely Ilorin West, Ilorin East, Ilorin South, Asa and Moro Local Government Areas. The city has a good combination of the three major ethnic groups in the country: Hausa, Igbo and the Yorubas. Fruits such as apple, watermelon oranges, pineapple, garden eggs, cashew and mango are the major fruits produced and consumed in the state.

Sampling Technique

The target population for the study was the consumers of watermelon and apple fruits in Ilorin metropolis. Ilorin metropolis was selected because of the abundance of the two types of fruits in the area. Being the capital of the state, majority of the fruit sellers usually come to Ilorin to sell their products in the markets, educational institutions, government parastatals and the private sector. The sample for this study was obtained from educational institution, Government parastatal, the private sector and market men and women. A two stage random sampling technique was employed to select the sample for the study. The first stage involved a random selection of one educational institution, one government parastatal, one private organization and one market in the city. The second stage was a random selection of 30 respondents from each of these four units, such that the respondents cut across the five local government areas in Ilorin metropolis. In total, 120 respondents were randomly selected from the study area.

Data Analysis

The data for the study was obtained using a well structured questionnaire administered to the respondents. The study employed different analytical tools based on the study objectives. Descriptive statistics and the Almost Ideal Demand System (AIDS) model were the major analytical tools employed for the study. While descriptive statistics was employed to analyze the socioeconomic characteristics of the respondents, the AIDS model was used to analyze the demand system for apple and watermelon fruits in the study area.

The Almost Ideal Demand System (AIDS) model was developed by Deaton and Muellbauer (1980). During the last two decades, consumer demand analysis has moved toward system-wide approaches. The AIDS model, developed by Angus Deaton and John Meullbauer can be seen as the most recent major breakthrough in demand system generations. The estimated coefficients can be converted to generate estimates of elasticities, which can throw light on price and expenditure responses of the consumers. Other advantages of the AIDS model include that it automatically satisfies the adding-up restriction, and with

simple parametric restrictions, homogeneity and symmetry can be imposed. In addition, the nonlinear Engel curves of the AIDS model imply that an increase in income will decrease the share of income allocated on a particular commodity as well as the income elasticity of that goods if the income elasticity of the good is less than one. The relationship of consumer's income and prices of different items to the portion of total expenditure can be expressed as:-

$$w_i = \alpha_0 + \sum_k \delta_{ik}\eta_k + \sum_j \gamma_{ij}\ln(p_j) + \beta_i \ln\left(\frac{x}{p}\right) + \mu_i$$

Where:

w_i = the budget share of commodity i

α_0 = the average value of the budget share of item in the absence of price and income effects.

β_i = effects of real income on the budget share of item i.

x = the total expenditure of the goods in question

p_j = the price of good j

RESULTS AND DISCUSSION
Socioeconomic Characteristics of the Respondents

A summary of the socioeconomic characteristics of the respondents is given in table 1. The results of the survey showed that 75.5% of the respondents were males. The average age of the respondents was 53 years.
As much as 72.6% of the respondents were married and the educational distribution of the respondents showed that about 42% of them had tertiary education. However, as much as 12% of the respondents had no formal education. Employment status distributions of the respondents showed that majority of the respondents (about 37.7%) were self-employed, while 8.5% had retired and only about 1.9% of the respondents were unemployed. The av-

erage household size of the respondents was 5 and the modal age range was 1-5. In terms of awareness on the nutritional value of fruits, as much as 98.1% of the respondents were aware of the nutritional value of consuming fruits while about 1.9% claimed ignorance of the nutritional value of fruits

Table 1: Socioeconomic characteristics of the Respondents

Characteristics	Frequency	Percentage
Gender		
Male	80	75.5
Female	26	24.5
Total	**106**	**100**
Age		
<= 30	8	7.5
31-40	32	30.2
41-50	28	26.4
>50	38	35.8
Total	106	99.9
Marital Status		
Single	6	5.7
Married	77	72.6
Widowed	7	6.6
Separated	16	15.1
Total	**106**	**100**
Educational Status		
No Formal Education	5	12.8
Primary Education	4	11.8
Secondary Education	35	33.0
Tertiary Education	62	42.4
Total	**106**	**100**
Employment Status		
Permanent	25	23.6
Casual	30	28.3
Unemployed	2	1.9
Retired	9	8.5
Self-employed	40	37.7
Total	**106**	**100**
Household Size		
1-5	70	66.0
6-10	35	33.0
11-15	1	0.9
Total	**106**	**100**
Awareness on Fruits' Nutritional Value		
Aware	104	98.1
Not Aware	2	1.9
Total	**106**	**100**

Determinants of Demand for Apple

The R-squared value of 0.7635 implies that the model is a good fit for the study. The result indicated that the independent variables explained about 76.35% of the variations in the demand for apple (table 2). The result of the analysis showed that the Level of education of the respondents, the total fruit expenditure, the price of apple, and the price of other fruits were the major factors influencing the demand for apple fruit in the study area. This result is similar to that obtained by Subaratty and Jowaheer (2001). The positive and significant coefficient of the education parameter implies that a unit increase in years spent in schooling increases the share of apple expenditure in the total fruit expenditure. Education has been reported to increase the level of exposure; therefore an increase in the educational level of the respondents increases the demand and consumption of apple. The total fruit expenditure was also found to have a positive and significant effect on the share of apple expenditure in the total fruit expenditure. This implies that as the total fruit expenditure increases, more budgetary allocation will be in favour of apple in the total fruit expenditure. This result however, is in contrast to that obtained by Oguniyi *et al* (2012), in which an inverse relationship existed between household expenditure and the budget share of processed fruit. The negative and significant coefficient of the price of apple implies that an increase in the price of apple will cause the households to reduce their budgetary allocation to apple by the value of the coefficient (0.218). The price of other fruits also had a negative and significant effect on the share of total fruit expenditure allotted to the purchase of apple. This means that if the prices of other fruit increases, the household would decrease the quantity of apple demanded by reducing its expenditure share in the total fruit expenditure.

Table 2: Coefficient of Determinants of De-

Variables	Coefficient	T-value
Constant	1.804128***	4.94
Apple price	-0.21844***	-6.07
Pineapple price	0.02563	0.35
Watermelon price	-0.03448	-0.91
Banana price	-0.00961	-0.23
Orange price	0.01182	0.33
Pawpaw price	0.03850	1.60
Mango price	0.00973	0.34
Garden Egg price	0.04344	1.57
Cashew price	-0.01399	-0.66
Price of Other fruits	-0.03215**	-1.97
Educational status	0.00725**	2.52
Household Size	-0.00134	-0.25
Total fruit expenditure	0.00004***	9.88
R-square	0.7635	

***=sig at 1%,   **=sig at 5%

Determinants of Demand for Watermelon

The R-squared value of 0.7625 implies that the model is a good fit for the study. This implies that the independent variables explained about 76.25% of the variations in the demand for watermelon (table 3). The price of watermelon, price of other fruits, educational level of the respondents and total fruits expenditure was found to have a significant effect on the demand for watermelon in the study area. This implies that an increase in the real value of watermelon expenditure will cause the households to reduce their budgetary allocation to the purchase of watermelon and hence its demand. Just as was the case with apple, the price of watermelon was also significant with a negative sign. This implies that an increase in the price of watermelon will cause the households to reduce their budgetary allocation to watermelon by the value of the coefficient 0.216. Earlier study by Irala-Estevez et al (2000) had also proved that there is a positive association between high level of education and a greater consumption of fruit. Muhammad-Lawal *et al*, (2011) also obtained similar result to this study.

Table 3: Coefficient of Determinants of Demand for Watermelon

Variables	Coefficient	T-value
Constant	2.28636***	6.98
Apple price	-0.05627	-1.81
Pineapple price	-0.00695	-0.10
Watermelon price	-0.21598**	-5.95
Banana price	0.02531	0.66
Orange price	0.00928	0.28
Pawpaw price	0.01298	0.60
Mango price	-0.00993	-0.38
GardenEgg price	0.02515	1.00
Cashew price	-0.02969	-1.53
Price of Other fruits	-0.00640**	-0.43
Educational status	0.00591**	2.20
Household Size	-0.00792	-1.63
Total fruit expenditure	0.00004***	9.36
R-square	0.76250	

***=sig at 1%,   **=sig at 5%

Estimating Elasticities
Own and Cross price Elasticities

The estimated parameters of the AIDS equation form the basis of elasticities which are important for assessing the impact of policies on quantities demanded. The Marshallian Own price and Cross price elasticities are given below (table 4 and 5)

Table 4: Own Price Elasticity

Fruits	Own Price
Apple	-1.777
Pineapple	-2.602
Watermelon	-1.761
Banana	-1.777
Orange	-0.014
Pawpaw	-1.808
Mango	-1.793
Garden egg	-1.378
Cashew	-2.378
Other fruits	-4.032

The own price elasticity of the fruits are found to be negative, consistent with theoretical expectation. The fairly large magnitude of the price elasticities of the fruits, except for orange showed that they are fairly elastic and sensitive to their own price. This result is in line with earlier findings by Han and Wahl (1998), Huang and Lin (2000). Both studies recorded negative own-price elasticity for fruit from household data. The estimates of cross price elasticities of other fruits under study in response to changes in the price of apple show prevalence of substitution between apple fruits and other fruits (such as pineapple, watermelon, orange etc.). The estimates of Marshallian elasticities shown on table 5 therefore indicate that 10% rise in the price of apple fruit will increase the demand of pineapple, watermelon and orange by 22.1%, 3.6% and 15.0% respectively.

Table 5: Cross Price Elasticity

Fruits	Cross Price
Apple and Pineapple	0.221
Apple and Watermelon	0.036
Apple and Banana	0.095
Apple and Orange	0.150
Apple and Pawpaw	0.229
Apple and Mango	0.078
Apple and Garden egg	0.287
Apple and Cashew	-0.042
Apple and Other fruits	-0.103

Income Elasticity

Table 6 shows the income elasticities of the fruit under study. The estimates show that if the income of the respondents increases by a unit naira, the demand for apple will increase by 0.146. for example, if the income of the respondents increases by 10%, the demand for apple, watermelon, banana, orange and garden egg will increase by 14.6%, 1.9%, 16.4%, 1.4% and 53.0%. The strong influence of income on the demand for garden egg could be attributed to more access to the fruit being relatively cheaper than the other fruits in the study area especially when 0n-season. Also, the demand of pineapple, pawpaw, mango and cashew will decrease by 6.0%, 38.0%, 4.6% and 42.9% if income of the respondents increases by 10%. This though was not expected but could be because these groups of fruits are less preferred in the study area compared to the other types of fruits during the on-season. Ogundari and Arifalo (2013) also obtained positive income elasticities in their study of household demand for fruits and vegetables in Nigeria.

Table 6: Income Elasticity

Fruits	Income Elasticities
Apple	0.146
Pineapple	-0.060
Watermelon	0.019
Banana	0.164
Orange	0.014
Pawpaw	-0.380
Mango	-0.046
Garden egg	0.530
Cashew	-0.429
Other fruit	-1.473

CONCLUSION

The result of the study has shown that the demand for fruit in the study area is influenced by price of the fruits, the level of education of the people, their income and total expenditure on fruits. The government should help to provide an enabling environment to the producers and traders for increased production and marketing of fruits to allow for a possible reduction in prices of the fruits. The government should also device means to increase the in-

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