

Determinants of Supply and Demand of African Star Apple (*Chrysophyllum albidum*) in Abeokuta North Local Government Area of Ogun State, Nigeria

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ABSTRACT— *The thrust of this paper was to determine the supply and demand for Chrysophyllum albidum in Abeokuta North Local Government Area of Ogun state Nigeria, with the view to establishing a causal relationship between selected factor variables that affect supply and demand. Primary data were gathered through the use of interview and semi structured questionnaire from marketers in Abeokuta North Local Government Area of Ogun State. Sampling techniques employed were purposive, systematic and availability. Descriptive statistics and regression analysis were employed in analyzing the generated data. The findings show that the factors considered in the model explained 61% of variation in quantity of C. albidum supplied in the area. The R² value of 0.62 implied that the factors considered in the model explained 62% of variation in quantity of C. albidum demanded in the area. Analysis of variance was also applied to test the overall significance of the F-ratios. The ANOVA results show F-ratio of 13.97 for supply and 16.56 for demand of C. albidum respectively. Further, C. albidum was found to be of economic importance in the study area as an accomplishment before meals, in-between of after meals, as well as source of income and employment. Factors found to affect supply include prices, distance between production farms and market as well as previous years' price. Market price and quality affected demand. It was recommended that supply of C. albidum needs to be stepped up in order to meet the demand for the crop. Further, transportation network should be improved for ease of moving fruits from farm to market.*

Keywords— Abeokuta, African Star apple, *Chrysophyllum albidum*, demand, supply

1. INTRODUCTION

The *Chrysophyllum albidum* (linn.) commonly called African star apple, cherry, *udala*, *osan*, *agbalomo* is highly valued as a food product in Nigeria. It is seen as a food crop that is capable of rolling back food insecurity (Leaky, 1999). This is even more significant in a country like Nigeria that has a teeming population of about 140million. The importance of this crop cannot be overemphasized. The seeds, flesh and kernels have culinary and economic value locally, regionally and internationally (Obasi, 2001). *C. albidum* forms an important part of the East and Central African nutrition, providing carbohydrate, protein and minerals. It has been reported that the fleshy pulp of the fruit is eaten especially as snack and relished by both young and old (Adisa, 2000). Apart from its culinary uses, *C. albidum* have been found to have other economic uses Oyelade, Odugbenro, Abioye & Raji (2005). Its medicinal properties, source of timber and industrial uses are widely reported (Houessou, et al (2012). *C. albidum* is consumed in large quantities in South Western Nigeria where many households have this economic tree. To the ultimate consumer, it is a measure against food insecurity and malnutrition while to the producers and marketers; it is a source of income.

The economic potentials of *C. albidum* are largely underestimated although farmers have identified the potentials of this fruit and have started domestication and cultivation. *C. albidum* is classified as a Non-wood Forest Product (NWFP). It is primarily a forest tree species and its natural occurrences have been reported in diverse ecozones in Nigeria (Bada, 1997). One of the challenges in NWFP is how to estimate their contribution to household economies. This is hinged on the challenges in estimating the quantities produced and marketed. Consequently, this paper was designed to quantify the supply and demand of *C. albidum* in the study area. The major objective of the study was to determine factors that affect

the supply of and demand for *C. albidum* in Abeokuta North Local Government Area of Ogun State. The specific objectives were to: elicit the importance of *C. albidum* in the study area, determine the factors affecting supply of *C. albidum* and determine the factors affecting demand for *C. albidum*.

Hypotheses tested during the study were:

H₀₁: *C. albidum* is not of economic importance in the study area

H₀₂: Quantity of *C. albidum* supplied is not affected by any identified factor

H₀₃: Quantity of *C. albidum* demanded is not affected by any identified factor

This paper however adopts the multiple regression technique to estimate the determinants of demand and supply.

2. METHODOLOGY

The study was carried out in Abeokuta North Local Government Area of Ogun State, Nigeria. The local government has an estimated population of 210,940 (Census 2006, Bureau of Land and survey, Ogun State Government). Abeokuta North has a total land area of 723.80 square kilometers. It is bounded on the North by Elegu and Asoro, on the West by Isale-Itoko and Oke-Keesi, on the South by Quarry and Saje and on the east by Ago-oko, Sapon and Oke-Itoku. It has a tropical climate with the raining season starting about March and ending in November, followed by the dry season. The vegetation here falls under the tropical rainforest belt. This type of habitat is favorable for the growth of *C. albidum*.

Primary data was used for the study. Data were generated on relevant information on the supply of and demand for *C. albidum* in the study area. Marketers were interviewed to elicit information on the supply of *C. albidum* while final consumers were interviewed to elicit information on the demand of the commodity. At the first stage, purposive sampling technique was used to select three towns which have large markets for *C. albidum* namely Lafenwa, Itoku and Elegu. The second stage was the selection of marketers using systematic sampling while final consumers were selected by employing availability sampling technique. To obtain information on supply, a total of 60 marketers were interviewed while for information on demand, a total of 90 consumers were interviewed. This gave a total of 150 respondents. The analysis of data collected was based on the specific objectives to be achieved during the research. To rate the importance of *C. albidum*, simple descriptive statistics such as frequency distribution, percentages and bar charts were used. Factors affecting the supply of and demand for *C. albidum* were achieved using multiple regression analysis while Analysis of Variance (ANOVA) was used to test the overall significance.

Model Specification

The model to determine the factors affecting supply was

$$Y_s = f(X_1, X_2, X_3, X_4, X_5, X_6)$$

$$Y_s = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + \mu$$

Where:

Y_s = Quantity supplied of *C. albidum*

b_0 = Intercept

X_1 = Supply price of *C. albidum* (N/unit)

X_2 = Distance between production centers and market (km)

X_3 = Quality of fruit

X_4 = Price of substitute

X_5 = Market prices for year t-1 (N/unit)

X_6 = Mid season market price of *C. albidum* (N/unit)

μ = Error term

The model to determine the factors affecting demand was

$$Y_d = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$$

$$Y_d = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + \mu$$

Where:

- Y_d = Quantity demanded of *C. albidum*
- b₀ = Intercept
- X₁ = Initial Market price of *C. albidum* (N/unit)
- X₂ = Mid season market price of *C. albidum*
- X₃ = End of season market price of *C. albidum*
- X₄ = Distance between market and consumption centers (km)
- X₅ = Quality of fruit (Grade ranked from A to C)
- X₆ = Effect of taste (1 for yes, 0 otherwise)
- X₇ = Income Level (N)
- μ = Error term

3. RESULTS AND DISCUSSION

3.1 The Economic importance of *C. albidum* in the Study Area

The economic importance of *C. albidum* was identified as source of income as well as employment for the inhabitants of Abeokuta North as fruits were on sale from December to April. Supply of the fruits during the season was not a problem to the farmers as owners of *C. albidum* trees harvested the fruit and sold them in the local market of to middlemen. Some middlemen bought the trees with the fruit when in season, harvested when matured and had it sent to the local market. In some cases where fruiting of *C. albidum* was not to the satisfaction of the middlemen, further deals were made with the owners with respect to the prices of trees for the next season. Other economic uses identified were medicinal sources and as accomplishments.

Results as presented in Table 1 shows that about 75% of the total number of respondents consumes *C. albidum* as accomplishment i.e. taken before, in-between or after meals. 20% indicated that they consume it for medicinal purposes while about 4% utilize the seeds for craft and local games.

Table 1: Uses of African star apple in Abeokuta North Area of Ogun State

Uses of African star Apple	Frequency of uses	Percentage
Accomplishment	68	75.6
Medicinal Purposes	18	20.0
Craft & Local Games	4	4.4
Total	90	100

3.2 Factors affecting the supply of African star apple

Three functional forms of supply functions were tried to determine the factors that affect the supply of African star apple in the study area. The forms were linear, semi-log and double log models. The significance of the parameters was tested at 5% level. On the basis of the R² and the number of significant variables in line with a-priori expectations, the semi log functional form was selected as the lead equation as presented in Table 2.

Three variables (Supply price X₁, distance between production centers and market X₂, previous year's price X₃) were statistically significant on supply of African star apple. These factors are further discussed.

Table 2: Regression Results of Supply of African star apple

Variable	Linear Form			Semi log Form Adjusted R ² = 0.61			Double log Form		
	Coefficient	Std. error	t-value	Coefficient	Std. error	t-value	Coefficient	Std. error	t-value
Constant	-909.67	1359.66	-0.67	2.30	0.54	4.25	3.75	1.79	2.09
Price	134.69	50.54	2.67	6.881E-02	0.02	3.40*	1.16	0.38	3.08
Distance	-10.0	34.70	-0.30	-0.22	0.14	-2.00*	-1.05	1.08	-0.97
Quality	85.82	128.17	0.67	4.65E-0.2	0.51	0.79	1.899E-03	0.18	0.11
Subs. Price	0.69	2.17	0.32	3.051E-04	0.00	0.35	-4.827E-02	0.09	-0.54
Price t-1	25.08	11.22	2.24	1.189E-02	0.14	2.65*	-0.23	0.18	-1.27
Mid Price	-28.04	35.71	-0.79	-1.624E-0.2	0.01	-1.14	-.028	0.26	-1.10
*Significant at 5%									
R ² =	0.43		0.61		0.56				
F-Ratio=	6.59		13.79		11.17				

Supply price (X₁)

The coefficient of the supply price of African star apple is positive and significant. This is in line with a-priori expectation that the higher the price the more the quantity supplied of a commodity. The implication of this is that a unit change in price of African star apple brings about an increase in supply of 6.9 African star apples.

Distance between production centers and market (X₂)

The coefficient of the distance between production centers and market is negative with a significant value of -0.127. This conforms to a-priori expectation that the further the distance, the less the supply. Transportation cost may account for the reduction in the market margin.

Market price for previous year t-1 (X₃)

The coefficient of market prices for year t-1 is positive and significant with a value of 1.189 E-02. This shows that with a good price for the previous year, supply is likely to increase in the present year.

The overall significance was tested using the F-ratio. The ANOVA results as presented in Table 3 shows a high F-ratio of 13.97. Since the F-ratio is greater than the theoretical F (3.12), the null hypothesis which states that the quantity of *C. albidum* supplied is not affected by any factor is rejected and the alternative hypothesis accepted.

Table 3: The ANOVA Table showing the F-statistics on the supply of African star apple

	Degree of freedom	Sum of square	Mean square	F-Ratio	F-Tab
Regression	6	2.501	0.147	13.971	3.12
Residual	53	1.581	2.984E-02		
Total	59	4.038			

3.3 Factors affecting the demand of African star apple

Three functional forms of demand functions were tried to determine the factors that affect the supply of African star apple in the study area. The significance of the parameters was tested at 5% level. On the basis of the R² and the number of significant variables in line with a-priori expectations, the double log functional form was selected as the lead equation as presented in Table 4. Three variables (Market price X₁, distance between market and consumption centers X₂, Quality of fruits X₃) were statistically significant on demand of African star apple out of the eight variables regressed against quantity demanded. Each significant factor is further discussed.

Market price (X₁)

The coefficient of the prices of African star apple is negative as expected. The implication of this is that at high market price, quantity demanded is low.

Distance between market and consumption centers (X₂)

The coefficient of the distance between market and consumption center is negative and significant. This indicates that the further the distance, the lesser the demand for African star apple.

Table 4: Regression Results of Demand for African star apple

Variable	Linear Form			Semi log Form Adjusted R ² = 0.61			Double log Form		
	Coefficient	Std. error	t-value	Coefficient	Std. error	t-value	Coefficient	Std. error	t-value
Constant	99.61	19.963	4.99	3.442	0.395	8.72*	9.194	1.74	5.28
Price	-0.35	0.42	-0.84	-2.93E-02	0.01	-3.43*	-0.73	0.28	-2.59*
Distance	-2.98	0.65	-4.59	-8.35E-02	0.01	-6.33*	-5.19	0.28	-4.75
Quality	0.46	2.87	-0.16	2.02E-02	0.06	0.36	0.69	0.13	5.37*
Taste	2.09	3.53	0.82	5.36E-02	0.07	0.77	1.92E-02	0.03	-0.57
Income	-2.34E-07	0.00	-0.21	-8.44E-09	0.00	-0.27	4.09E-02	0.10	-0.42
Sex	-1.20	3.38	-0.36	-5.15E-02	0.07	-0.78	-1.67E-02	0.03	-0.54
Age	0.18	0.23	0.77	5.44E-03	0.01	1.19	0.78	0.53	1.49
Substitute	-3.06E-02	0.01	-0.38	-3.19E-05	0.00	-0.20	2.18E-02	0.06	0.36

*Significant at 5%

R² = 0.38 0.66 0.62
F-Ratio= 6.23 19.08 16.56

3.4 Quality of fruits (X3)

The main determinants of quality of fruits were physical appearance and size. Those with high quality attracted high demand. The overall significance was tested using the F-ratio

The ANOVA result in Table 5 shows a high F-ratio of 16.56. Since the F-ratio is greater than the theoretical F which is 2.66, the null hypothesis which states that the quantity of *C. albidum* demanded is not affected by any factor is rejected and the alternative hypothesis accepted.

Table 5: The ANOVA Table showing the F-statistics on the demand for African star apple

	Degree of freedom	Sum of square	Mean square	F-Ratio	F-Tab
Regression	8	21.846	2.733	16.556	2.66
Residual	81	13.371	0.165		
Total	89	35.23			

4. CONCLUSION

The results of the study highlight the importance of African star apple as an accomplishment to consumers and income as well as employment to marketers or supplies. The economic potentials have been exploited as shown by its awareness on medicinal uses. Further, factors considered in the model explains 61 percent of variation in the quantity of African star apple supplied while 62 percent of variation in quantity of African star apple demanded was explained by factors considered in the model in the study area.

The essential recommendation of this study is that government should foster the underestimated economic potentials of this indigenous crop. This could be achieved through: Stepping up the supply of *C. albidum* in order to meet the increasing demand for the crop, improvement of transportation network for ease of moving *C. albidum* from farms to markets, processing of *C. albidum* fruits into juice as well as jam to reduce post-harvest loss.

5. REFERENCES

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