



## Consumer Willingness to Pay for Health Benefits of *Moringa Oleifera* Products in Ogun State

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### ABSTRACT

In recent times, Nigeria and most developing countries have witnessed an increase in malnutrition and health challenges. There are several natural sources/resources for attaining good nutrition for the achievement of good health; one of the scientifically proven resources is *Moringa oleifera*. Therefore, this study assessed consumers' willingness to pay for health benefits of *Moringa oleifera* Products in Ogun State. A total of 150 respondents were interviewed in 2 Local Government Areas of the State which were purposively selected to reflect the three classes of consumers the study is interested in. Data were analyzed using Descriptive statistics and Logit regression model. The Contingent Valuation Method was used to determine the consumers' willingness to pay for *Moringa oleifera* Leaf Powder and *Moringa oleifera* Seed. Results revealed that 54.0% of the respondents were females, 44.0% civil servants with a mean age of 42 years and mean monthly income of ₦106,607.00. Logit model revealed that bid ( $p < 0.01$ ), education ( $p < 0.05$ ), awareness level ( $p < 0.01$ ) and age ( $p < 0.01$ ) were significant determinants of willingness to pay for *Moringa oleifera* leaf powder while education, household size, awareness level and income were significant factors influencing willingness to pay for *Moringa oleifera* seed. The mean willingness to pay for 100g of *Moringa oleifera* leaf powder and seed was ₦610 and ₦517 respectively. The study concluded that majority of the respondents were willing to pay for *Moringa oleifera* products. The study therefore recommends that there is the need for enlightenment programmes to enhance consumer knowledge on advantages and health benefits of MOP consumption as well as design of empowerment programme target at increasing household income.

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### Introduction

Health related issues have continued to occupy a prominent position on the front burner of economic discuss world over, and developing Nations are faced with a number of challenges regarding nutrition, health and standard of living. UNICEF (2010) reported that an average of 22,000 children die each day due to health related conditions, while WHO (2008) puts the number of malnourished people in the world at 925million, meaning that about one out of every seven person is malnourished. It further reported that 98% of the world malnourished people live in developing countries majorly Asia, Pacific and sub-saharan Africa. MDG report of 2010 confirmed that a child dies from hunger related diseases every five seconds. FAO (2010) reports that 50% of hungry and malnourished people are farm families in rural communities.

Protein deficiency leads to a limitation of caloric expenditure with pathological changes that progress through several steps thus leading to protein-energy malnutrition, the most common type of malnutrition affecting approximately 800million people in the world (Golden, 2002; Tomkins, 2000). Protein-energy malnutrition results in people being under weighted or stunted and contributes considerably to mortality in areas where it is prevalent (Blossner and De Onis, 2005). Such malnutrition prevents as many as one third of the world's people from their physical and mental potential. Malnourished bodies have weak immune systems and are more susceptible to infection and disease. Particularly vulnerable are children whose

growth is stunted or wasted as a result of protein-energy malnutrition. Sub-Saharan Africa has 40% of its 500million people with less than US\$1 a day to live on (editorial; Lancet, 1997) and since malnutrition is both a cause and consequence of poverty (Gillispie and Haddad, 2001) it is therefore not surprising that protein malnutrition is highly prevalent in that region.

Lack of economic sustainability for minimum standards of living among the stricken poverty people of the rural communities and the quest for survivability makes them rely on natural products and utilize them in all aspects of their life. (Omotesho *et al.*, 2013) reports that some herbs sellers at a local market in Kwara state, Nigeria revealed that many trees and their products are being utilized by rural dwellers for phytotherapy, cosmetics, cooking food and beverages *et.c.* For examples; Neems Tree popularly called 'Dongoyaro Tree' and its various parts (leaves, stem bark, roots), are used in preparation of traditional mixture for treatment of malaria, combination of cotton leaf and garlic onion mixture are used to suppress high blood pressure, mango tree bark, leaves and root are used for preparation of blood tonic. A product of shea butter tree fruits (popularly called ori among the Yorubas) is used as hair and body cream, Sobo drinks prepared from the Calyx of the roselling is a favourite drink among the rural and urban dwellers, while Cashew leaf stalk and Jathropha gum are used as chewing stick and remedy for tooth decay respectively. But the use of *Moringa oleifera* tree and its products were rarely

mentioned, this corroborates the findings of Odeyinka *et al.* (2008) that 61.87 % of farmers in south western Nigeria were not aware of the *Moringa Oleifera* plant.

According to the National Research Council of Nigeria (2006), *Moringa oleifera* has the potential to improve malnutrition; boost food security; foster rural development; support sustainable land use; improve the health status (Healing potential) and it may be used as forage for livestock, a micronutrient liquid, and a natural anthelmintic and possible adjuvant (Makkar *et al.*, 2007; Mahajan *et al.*, 2007).

*Moringa oleifera* is especially promising as a food supplement in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce (Fahey, 2005). *Moringa oleifera* has numerous applications in cooking throughout its regional distribution. *Moringa oleifera* and other plants grown in home gardens found in dooryards and agricultural fields provide rural families with income, food, nutritious vegetables, animal feed, etc. This helps the communities to lead self-sufficient lives. The extract from the plant could be used for water treatment, particularly by people in the rural areas where there was limited access to portable water. *Moringa oleifera* serves as a source of income to the rural inhabitants and therefore it is increasingly becoming an important source of livelihood for a number of people as several people have started nurseries to grow *Moringa oleifera* in large quantities for sale within and outside the country.

Peoples' reasons for planting and perceptions of benefits varied across the country. Four of the most common and most important reasons are the need for: food; an important medicine for home consumption; cash earning enterprise and the diversity of other uses. Cultivation of this multiple-use species is an economic proposition unlike many slower growing and more habitat specific medicinal plant species. *Moringa oleifera* is already a popular tree for indigenous agro forestry in Nigeria and a multiple use species with similar potential in Africa.

There has been a clamour for the cultivation and utilization of lesser known indigenous plant species like *Moringa oleifera* in farming systems. *Moringa oleifera*, because of its socio-economic, cultural and environmental importance as a drought tolerant plant is raising a growing international interest among NGOs, Scientist, Public and private sectors (Torimiro *et al.*, 2009). It is imperative to know that while a number of studies have been carried out on the origin, morphology and chemistry of *Moringa oleifera*, little or no efforts have been made to unearth the willingness to pay for its consumption. *Moringa oleifera* on a global scale can be a basis for sustainable and predictable global progress and development and above all, people need to be made aware of the beneficial role played by *Moringa oleifera* in order to enjoy the full benefit attached to its use.

Willingness to pay for foods is naira value a consumer places on the perceived health benefits of the food item, and thus it could be used to measure the benefits of the products to consumers, (Golan and Kuckler, 1999). The willingness to pay function identifies the price a consumer is willing to pay for a given quantity of food given specific levels of price and utility. Since such ideological benefits as food safety and nutrition are hard to measure, the use of willingness to pay is important in placing the perceived value that consumers place on the ideological benefits. It is also important in the food industry.

Willingness to pay for foods is affected by factors that include socioeconomic characteristics of the consumers, product attributes and government regulation. Socioeconomic factors such as age, gender, income, education and household sizes

determine consumer willingness to pay, (Govindasamy and Italia, 1999, Kikafunda, 2007). Product quality and other attributes also determine the levels of willingness to pay for functional foods, (Van Ravensway and Wohl, 1995, Lancaster, 1966). The study used both the Contingent Valuation method in examining the willingness to pay of consumers for the health benefits derived from moringa leaf powder and the seed. Willingness to pay is the naira amount a consumer is willing to give up or pay in order to acquire a good or service. It could also be described as the sum that represents the difference between a consumer surplus before and after making an improvement in the said attribute of the food product. The objective of the study are; describe the socioeconomic characteristics of the consumers, examine the factors that influence consumers' willingness to pay for health benefits of *Moringa oleifera* powder and seed as well as the mean willingness to pay.

#### Methodology

The study will be conducted in Ogun State which is situated in the tropics between Latitude 6.2<sup>0</sup> and 7.8<sup>0</sup> North and between Longitude 3.4<sup>0</sup> and 5.0<sup>0</sup> East, covering 16,762 square km landmass (National Population Commission, 2005). The overall population is 3,728,098 according to National Population Census 2006. The study made use of data obtained mainly from primary sources. The source involves the use of structured questionnaires which were administered.

#### Sampling procedures

A multi stage sampling technique was employed for the study. At the first stage, Purposive sampling technique was used to select two Local Government Areas out of the 20 LGAs in Ogun state which are Abeokuta South Local Government and Sagamu local Government Areas. The second stage involved simple random selection of 8 wards each in the Local Government Areas. At the third stage, stratified random sampling was used to divide the households from the wards into 3 strata which are high income class, middle income class and low income class based on their location. At the last stage, systematic sampling technique was employed to select 25 households each from the high income class, middle income class and low income class in each of the LGAs. This gives a total of 75 households per LGA and a sample size of 150 households that was used for the study.

#### Method of Data Analysis

The analytical methods used in this study include Descriptive Statistics, Contingent Valuation and the Logistic Regression Method. Descriptive statistics such as frequency tables, percentages and means were used to analyze respondents' socio-economic characteristics while logistic regression was used to analyze factors affecting willingness to pay for health benefits of *Moringa oleifera* powder and seed. The double-bounded contingent valuation model was used to narrow down the willingness to pay of respondents by asking a series of questions about their willingness to pay. This method has been shown to generate more efficient estimates than those based on a single question or those that ask an open-ended question about willingness to pay [Hanemann *et al.* (1991), Watson and Ryan, (2007)].

To identify the factors influencing willingness to pay for health benefits of *Moringa oleifera* powder and the seed, consumers' responses to the willingness to pay question was regressed against the prices they were willing to pay and other socio-economic characteristics. The logit regression model is specified as;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \dots \dots \beta_{10} X_{10} + u_i$$

Where Y is the dependent variable, representing consumers' willingness to pay in naira,  $\beta$  stands for estimated parameters explaining the participatory variables respectively,  $X_i$  is a vector of respondents' characteristics relevant in explaining their demand for and willingness to pay for *Moringa oleifera* products while  $u_i$  represents the error term.

#### Dependent variable

Y = Consumers' willingness to pay for health benefits of *Moringa oleifera* leaf powder and seed (willing to pay = 1, 0 otherwise)

Independent variables include;

$X_1$  = Bid offered to the respondents (naira)

$X_2$  = Age (in years)

$X_3$  = Age squared (years)

$X_4$  = per capital household income (N/per month)

$X_5$  = Marital status (Married=1, others =0)

$X_6$  = Level of awareness (aware=1, 0= Otherwise)

$X_7$  = Occupation (Government employee = 1, 0 = Otherwise)

$X_8$  = Sex (Male=1, 0= Otherwise)

$X_9$  = Level of education (in years)

$X_{10}$  = Household size (Number of dependents)

$\beta_0$  = Constant

$\beta_1 - \beta_{11}$  = Coefficients of the explanatory variables  $X_1 - X_{11}$

e = error term

The mean willingness to pay for 100g of *Moringa oleifera* leaf powder and seed by consumers was estimated using the coefficient estimates from the Logistic Regression Model specified above following Adepoju and Omonona (2009), Adepoju and Salimonu (2010) and Oviahon *et al.*, (2011).

$$\text{Mean WTP} = \frac{1 * \ln(1 + \exp \beta_0)}{|\beta_1|}$$

Where  $\beta_0$  and  $\beta_1$  are absolute coefficient estimates from the logistic regression.

#### Results and Discussion

##### Socio-economic characteristics of the respondents

The socioeconomic characteristics like age, marital status, religion, education and household size were examined. The results of the distribution of the respondents by their age, marital status, education and household size are presented in table 1. The age distribution shows that most (40%) of the respondents are between the age of 30-39 and the mean age in the study area was approximately 42 which implies that majority of the respondents are in their active working age. The gender distribution of the respondents shows that 54% of the respondents are female while 46% are males. The result in terms of marital status distribution shows that greater percentages (70.7%) of the respondents are married while 29.3% are single and divorced.

Looking at the educational status of the respondents, the result indicates that majority (79.3%) have tertiary education, 14% have secondary education, 5.3% have primary education and 1.3% has no formal education. This is a reflection that the consumers have high educational status which is expected to raise their level of awareness of the health benefits of *Moringa oleifera* products. The mean household size is approximately 4 persons. Most (34%) of the respondents earn income that is above N110,000. This implies that most of the respondents had some level of income which they could perhaps easily part with certain proportion to purchase *Moringa oleifera* products.

##### Factors Influencing Willingness To Pay for *Moringa oleifera* Leaf Powder in the Study Area.

Table 2 shows the result of willingness to pay for health benefits of *Moringa oleifera* leaf powder using a logistic

regression. The Chi-squared values for the logistic regression model and their statistical significance show that the model is well fitted. The result reveals that the log likelihood ratio is significant at 1%. Five of the variables have significant coefficients at various levels of significance. The bid (negative) representing the price for 100g of moringa leaf powder is a significant ( $p < 0.01$ ) determinant of willingness to pay for moringa leaf powder. This implies that increasing the bid by one unit would reduce the probability of the willingness to pay of the consumer by approximately 0.14 units. This is consistent with the findings of oni *et al.*, (2005), Yusuf *et al.*, (2007) and Oviahon *et al.*, (2011) that increase in price reduces consumers' willingness to pay for food commodities. Educational level is positive and has a significant ( $p < 0.05$ ) effect on willingness to pay. This implies that an additional year gained in acquiring formal education will increase the probability of willingness to pay by 0.13 units. The result also reveals that household size of the respondents is positive and significant at 10%. This implies that increasing household size by one unit increases the probability of willingness to pay by 0.02 units. Awareness level of the health benefits of consuming *Moringa oleifera* leaf powder would increase the willingness to pay of the household by 0.67 units. Table 2 further reveals that the coefficient of age has the expected sign (positive) and is significant. This implies that as a consumer grows older, the willingness to pay for the health benefits of *Moringa oleifera* leaf powder increases. The mean willingness to pay for 100g of *Moringa oleifera* leaf powder is N610.

No of observation = 150, LR  $\chi^2(10) = 24.42$ ,

Prob> $\chi^2 = 0.0000$ ,

Log likelihood = -44.79, Pseudo  $R^2 = 0.214$

Mean willingness to pay = N610

##### Factors Influencing Willingness to Pay for *Moringa oleifera* Seed in the Study Area

Table 3 shows the result of willingness to pay for health benefits of *Moringa oleifera* seed using a logistic regression. The result reveals that the log likelihood ratio is significant at 1%. The chi-squared values for the logistic regression model and their statistical significance show that the model is well fitted. Four of the variables have significant coefficients at various levels of significance. The coefficient of education is positive and statistically significant at 5% level of significance. This implies that having tertiary education increases the probability of willingness to pay by 0.12 units.

The logistic regression further shows that household size of the respondents is positive and statistically significant at 10% level of significance. This implies that increasing household size by one unit increases the probability of willingness to pay for *Moringa oleifera* seed by 0.02 units. Awareness level is also positive and significant at 10%  $\alpha$ -level. Therefore awareness of the health benefits of consuming *Moringa oleifera* seed would increase the probability of the willingness to pay of the consumer by 0.76 units. These emphasises the importance of the level of awareness and education being significant could be attributed to the high literacy level of respondents. Income is significant and positively affects the likelihood of willingness to pay for health benefits of *Moringa oleifera* seed. This imply that the higher the income of the respondents, the higher the likelihood to be willing to pay for *Moringa oleifera* seed. These findings corroborate the work of Henson (1996) in a study of consumers' willingness to pay for healthy food in the UK. The estimated mean willingness to pay for 100g of *Moringa oleifera* seed is N517.

**Table 1. Socioeconomic characteristics of the respondents**

| Variables                   | Frequency | Percentages |
|-----------------------------|-----------|-------------|
| <b>Age</b>                  |           |             |
| <30                         | 17        | 11.3        |
| 30-39                       | 60        | 40          |
| 40-49                       | 38        | 25.3        |
| 50-59                       | 23        | 15.2        |
| 60-69                       | 9         | 6.0         |
| >70                         | 3         | 2.1         |
| Total                       | 150       | 100         |
| Mean                        | 42        |             |
| <b>Gender</b>               |           |             |
| Male                        | 69        | 46          |
| Female                      | 81        | 54          |
| Total                       | 150       | 100         |
| <b>Marital status</b>       |           |             |
| Single                      | 42        | 28.0        |
| Married                     | 106       | 70.7        |
| Divorce                     | 2         | 1.3         |
| Total                       | 150       | 100         |
| <b>Education attainment</b> |           |             |
| No formal education         | 2         | 1.3         |
| Primary                     | 8         | 5.3         |
| Secondary                   | 21        | 14.0        |
| Tertiary                    | 119       | 79.3        |
| <b>Total</b>                | 150       | 100         |
| <b>Income</b>               |           |             |
| 10,000 – 30,000             | 39        | 26          |
| 30,001 – 50,000             | 25        | 16.7        |
| 50,001 – 70,000             | 8         | 5.3         |
| 70,001 – 90,000             | 11        | 7.3         |
| 90,001 – 110,000            | 16        | 10.7        |
| >110,000                    | 51        | 34          |
| Total                       | 150       | 100         |
| <b>Household size</b>       |           |             |
| 1 – 3                       | 43        | 28.0        |
| 4 – 6                       | 103       | 68.6        |
| 7 – 9                       | 4         | 2.6         |
| Total                       | 150       | 100         |
| Mean                        | 4.2       |             |

Source: Field Survey, 2014

**Table 2. Logit regression showing factors influencing Willingness To Pay for Moringa leaf powder in the Study Area**

| Variables        | Coefficients  | Z-statistics | Marginal effect |
|------------------|---------------|--------------|-----------------|
| Bid              | -0.0268784*** | -3.41        | 0.138234        |
| Education        | 1.933196**    | 2.42         | 0.13179         |
| Occupation       | 12.62327      | 0.01         | 0.9535213       |
| Household size   | 0.4099763*    | 1.68         | 0.0153603       |
| Gender           | -16.62525     | -0.01        | 0.9118919       |
| Awareness level  | 17.70136***   | 2.96         | 0.6658594       |
| Income per month | 1.925102      | 1.53         | 0.695404        |
| Marital status   | -0.1233937    | -0.14        | -0.0045178      |
| Age              | 0.1617377***  | 2.87         | -0.0060597      |
| Age square       | 0.0019321     | 0.68         | 0.0000724       |
| Constant         | -16.37183     | -0.01        |                 |

\*\*\*Denotes statistically significant at 1%, \*\*statistically significant at 5%, \*statistically significant at 10%

**Table 3. Logit regression showing factors Influencing Willingness To Pay for Moringa Seed in the Study Area**

| Variables        | Coefficients | Z-stat | Marginal effect |
|------------------|--------------|--------|-----------------|
| Bid              | -0.03285     | 0.55   | -0.003082       |
| Education        | 1.537716**   | 2.18   | 0.117823        |
| Occupation       | 14.35959     | 0.01   | 0.9848358       |
| Household size   | 0.3933625*   | 1.69   | 0.0193066       |
| Gender           | 18.23231     | 0.01   | 0.9596678       |
| Awareness level  | 18.52974*    | 1.79   | 0.7628829       |
| Income per month | 1.748152*    | 1.81   | 0.723171        |
| Marital status   | -0.547703    | -0.69  | -0.0244164      |
| Age              | -0.1170242   | -0.50  | -0.0057436      |
| Age square       | 0.0016542    | 0.62   | 0.0000812       |
| Constant         | -16.991      | -0.01  |                 |

\*\*\*Denotes statistically significant at 1%, \*\*Statistically significant at 5%, \*Statistically significant at 10%

No of observation = 150, LR  $\chi^2(10) = 21.01$ ,  
 Prob> $\chi^2 = 0.0000$   
 Log likelihood = -50.24, Pseudo  $R^2 = 0.1730$   
 Mean willingness to pay = N517

#### Conclusion and Policy Recommendation

The study concludes that Income, education, awareness of health benefits, gender and the bid representing the hypothetical price were found to be important determinants of willingness to pay for *Moringa oleifera* leaf powder and seed. Based on the findings from the study, the study recommends that;

1. Since most of the respondents were willing to pay for *Moringa oleifera* products, effort should be made to make *Moringa oleifera* products available and accessible to all. People should be empowered to partake in marketing of the products as this will help in employment generation and poverty alleviation.
2. It is recommended that marketers and potential marketers of *Moringa oleifera* products pay careful attention to the price that the products will be sold. Proper attention should be given to price stabilization of *Moringa oleifera* products as well as the design of empowerment programmes targeted at increasing household income since the premium price (bid) and household income exerted negative and positive effects on households' willingness to pay for *Moringa oleifera* leaf powder and seed respectively.
3. Based on the findings from the study, education is a significant factor affecting willingness to pay for *Moringa oleifera* products. Therefore, there is the need to enhance knowledge on *Moringa oleifera* by incorporating its benefits into basic educational curriculum.

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