

Households' Willingness-to-Pay for Value Addition in *Azadirachta indica* (Neem) Based Products in Ibadan Metropolis

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Abstract

Azadirachta indica popularly referred to as Neem plant is one of the plants found in almost all parts of the world. In Nigeria, the plant is famously consumed in its raw form, but efforts have been made to present the products in a variety of forms through processing. Despite this value addition, however, little research has been done in assessing the readiness of the consumers to pay more for the extra entrepreneurial labour in presenting the product in a more acceptable way. Thus, this study investigates household's willingness-to-pay (WTP) for value addition in Neem-based products in Ibadan, Oyo State, Nigeria. Primary data were collected from one hundred and twenty-one (121) respondents using multi-stage sampling procedure. Data were analysed using descriptive statistics, contingent valuation method and logit regression model. Results show that 57.85% of the respondents were willing to pay highest amount for NAFDAC certification (\bar{X} : ₦615.57±116.48) followed by Brand name (53.72%; \bar{X} : ₦538.92±328.26). Respondents were also mostly familiar with Neem powder (58.67%) and Neem soap (53.71%). However, this did not translate to usage. Age, gender, education level, occupation type and monthly expenditure were some of the factors determining WTP. The study recommends creating adequate awareness on the benefits of Neem-based products as well as formulation of policies that guarantee safety of product consumption.

Key words: *Azadirachta indica* (Neem); household consumption, Willingness-to-pay, entrepreneurship.

1. Introduction

Neem plant is found in almost all parts of the world, but common to Asia (India, Pakistan, Bangladesh and Nepal) where it forms a very important component of alternative medicine for preventive and therapeutic purposes (Alzohairy, 2016). Neem is a fast-growing tree that belongs to the family *Meliaceae* and is very versatile, judging from the usage of its leaves, seeds, roots and bark for diverse purposes. It is also very promising for organic farming due to its pesticidal properties (Campos *et al.*, 2016). Neem trees are resistant to drought and they also serve as windbreakers in rural enclaves of West Africa (Jhariya *et al.*, 2013). Although Neem might seem a common plant because of its abundance and day-to-day use, it could bring enhanced economic benefits through value addition.

Value addition means taking raw produce to the next stage in the production process. It has traditionally been associated with processing of raw materials though in recent times has included enhancing values of agricultural produce through identity characteristics which might not be physical (Lu and Dudensing, 2015). Many value additions have been done to make Neem more attractive to the consumers through products such as Neem powder, Neem soap, Neem jelly, Neem oil and Neem cake. This entails extra cost to the consumers.

However, readiness of consumers to pay extra cost for value addition in Neem products remains unproven.

Many studies have been carried out on ecological, medicinal and pesticidal values of Neem (Jhariya *et al.*, 2013; Shannag *et al.*, 2015; Doshi *et al.*, 2020). However, there is little focus on creating awareness for the households to embrace its products. In addition, there is limited research regarding WTP for value addition of Neem-based products in Ibadan. Most of the studies on willingness-to-pay for value addition looked at other food and non-food products such as bread (Anyam *et al.*, 2013), organic food (Eyinade *et al.*, 2021; poultry input and products (Ofuoku and Akusu, 2016; Johnson *et al.*, 2020) and solid waste management (Patrick *et al.*, 2017; Omilani *et al.*, 2019). This research aims to create awareness concerning the value-added products of Neem among the populace in Ibadan metropolis. In addition to contributing to sparse literature in willingness-to-pay for value addition in commercial products, the study will also aid in respect of policies surrounding marketing and usage of plant-based products. Based on the foregoing, this study seeks to answer the following questions:

- What are the socioeconomic characteristics of the respondents?
- What is the level of awareness of respondents about Neem-based products?
- To what extent are the households willing to pay for value addition of Neem-based products?
- What are the factors affecting households' willingness to pay for the value-added products?

The major objective of this study is to examine household's willingness-to-pay for value addition in Neem-based products. The specific objectives are to: describe the respondents by their socioeconomic characteristics, assess the level of awareness of the respondents about Neem-based product, determine the mean willingness to pay for additional value(s) of Neem-based products in Ibadan metropolis and identify the factors which influence the households' willingness to pay for value-added Neem products.

2. Materials and Methods

2.1 Study Area

The study was carried out in Ibadan North East Local Government Area (LGA) of Oyo State. The area was selected because of its level of development. The LGA is bounded in the east by Egbeda and Ona-Ara Local Governments; in the west by Ibadan North and Ibadan North-West LGAs; in the north by Lagelu LGA and in the south by Ibadan South-East LGA. The LGA has an approximate area of 18km² and a population of 425,516 inhabitants (2017 estimate). Though a Yoruba-speaking area, the LGA has diverse ethnic nationalities which include the Igbo, Urhobo, Itsekiri, Ijaw and Hausa.

2.2 Sampling Procedure

A multi-stage sampling technique was used to select respondents for the study. The local government was purposively selected because of its metropolitan nature and was divided into 12 units based on political wards. Each ward consists of more than five communities but only 3 communities were randomly selected per ward. Four respondents were randomly selected from each community. Thus, a total of one-hundred and forty-four (144) respondents were selected for the study and the instruments were administered on them. However, one hundred and twenty-one (121) copies of the questionnaires were returned and used for the study.

2.3 Data and Analysis

Data were analysed with descriptive statistics such as frequency counts and percentages and the logit regression model. Dichotomous-Choice Contingent Valuation Method (DC-CVM) was used to determine the mean willingness-to-pay for value addition of Neem-based products in the study area. In order to identify factors that influence households' current usage of Neem-based products, the 'yes' or 'no' responses were regressed on the prices for the products. The logit regression model used is stated as:

$$y_i = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \quad \dots (1)$$

where,

- y_i is response of the i^{th} household to WTP question which is either 1 if yes or 0 if no
- $\beta_0 =$ constant; $\beta_1 =$ coefficients of the independent variables
- $X_i =$ price that i^{th} households was willing to pay for value-added Neem product

The coefficient estimates were then used to calculate the mean WTP of the households, in line with Yusuf *et al.* (2007).

$$Mean\ WTP = \frac{1}{\beta_1} \ln (1 + \exp \beta_0) \quad \dots (2)$$

For the willingness-to-pay determinants, the household's responses were regressed against their socio-economic characteristics. The logit regression model used is:

$$Y = \frac{1}{1 + \exp^{-Z_i}} \quad \dots (3)$$

where,

- Y is response of the households to WTP question which is either 1 if yes or 0 if no,
- Z_i equals $\beta_0 + \beta_1 X_i$.

Linearizing equation (3),

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n \quad \dots (4)$$

Y= Willingness of households to pay for value-added Neem products,

$\beta_0 =$ constant; $\beta_1 \dots \beta_n =$ coefficient of explanatory variables $X_1 \dots X_n$

$X_1 =$ Age of respondent (years); $X_2 =$ Sex of respondent (female=1, male=0)

$X_3 =$ Household size; $X_4 =$ Monthly expenditure (₦);

$X_5 =$ Monthly expenses on herbal medicine (₦); $X_6 =$ Distance to point of sales (km)

Educational level dummies ($X_7 - X_8$)

$X_7 =$ Secondary (D=1, 0 if otherwise); $X_8 =$ Tertiary (D=1, 0 if otherwise)

Marital status dummies ($X_9 - X_{11}$)

$X_9 =$ Married (D=1, 0 if otherwise); $X_{10} =$ Divorced (D=1, 0 if otherwise)

$X_{11} =$ Widowed (D=1, 0 if otherwise)

Primary occupation dummies ($X_{12} - X_{14}$)

X_{12} = Artisan (D=1, 0 if otherwise); X_{13} = Other self-employed (D=1, 0 if otherwise)
 X_{14} = Civil servant (D=1, 0 if otherwise)

For each of the dummy groups, a variable was used as the baseline *vis.*: primary (educational level), single (marital status) and farming (primary occupation). Other categories are explained in relation to the baselines.

3. Results and Discussion

This section presents results of the data analysis and the discussions. It consists of discussions on households' socioeconomic characteristics, households' awareness of the Neem-based products and the mean values of willingness-to-pay (WTP) together with its determinants.

3.1 Frequency distribution of socioeconomic characteristics

The result in Table 1 shows the distribution of respondents by socio-economic characteristics. The results show that 55.37% were male while 44.63% were female. Majority (42.15%) of the respondents were artisans while 19.0% each were farmers and civil servants. Also, 19.83% were engaged in other self-employment occupations. Most (52.89%) of the respondents had tertiary education while others had either primary or secondary education. It shows that all the respondents were literate.

The result in Table 1 also shows that most (56.20%) of the respondents were married. The mean age of respondents was 46.14 years. It implies that most of the respondents were young and are expected to embrace innovations on value addition. The mean household size of respondents was 4.23.

Table 1: Socio-economic characteristics of respondents

Household Characteristics	Frequency	Percentage (%)
Sex		
Male	67	55.37
Female	54	44.63
Primary Occupation		
Farmer	23	19.00
Artisan	51	42.15
Civil servant	23	19.00
Other self-employed	24	19.83
Educational Status		
Primary	36	29.75
Secondary	21	17.36
Tertiary	64	52.89
Marital Status		
Single	16	13.22
Married	68	56.20
Divorced	12	9.92
Widowed	25	20.66
Age (years)		
21 – 30	9	7.44
31 – 40	32	26.44
41 – 50	37	30.58
51 – 60	26	21.49
Above 60	17	14.05
Household Size (persons)		
1 – 3	59	48.76

4 – 6	43	35.54
7 – 9	14	11.57
>9	5	4.13
Nearness to point of sales of NBP (km)		
0-5km	14	11.57
>5km	107	88.43

Source: Field survey, 2018

3.2 Household Awareness on Neem-Based Products

The awareness levels of consumers about different types of Neem-based products are presented in Table 2. It is obvious that households were mostly familiar with Neem powder. This may be due to more availability in comparison with other Neem-based products. More than half of the population was also familiar with Neem soap. Also, from the table, less than one-third of the respondents that were familiar with Neem powder and Neem soap had used both products in the past. This may be because there was no adequate awareness on the benefits of these products. Furthermore, approximately half of the respondents were not familiar with other products like Neem oil, Neem cream, Neem lubricant, Neem germicide and Neem cosmetic. Among these products, Neem germicide had the highest level of familiarity or usage. This may be due to its usefulness for agricultural purposes. It is quite obvious that levels awareness for these products were poor, which might affect willingness to pay values.

Table 2: Distribution of respondents by awareness of Neem-based products

Awareness	Neem powder	Neem soap	Neem oil	Neem germicide	Neem cream	Neem cosmetic	Neem lubricant
Familiar	71(58.67)	65(53.71)	43(35.54)	45(37.19)	42(34.71)	42(35)	42(35)
Used	16(13.22)	11(9.09)	11(9.09)	17(14.05)	10(8.26)	12(10)	12(10)
Familiar and used	16(13.22)	13(10.74)	10(8.26)	2(1.65)	10(8.26)	10(8.33)	10(8.33)
Not familiar and not used	18(14.87)	32(26.44)	57(47.11)	57(47.11)	57(48.76)	56(46.67)	56(46.67)

Source: Field Survey, 2018. Percentages are in parentheses

3.3 Distribution of respondents by WTP for different values of Neem-based products

The distribution in Table 3 revealed that more respondents were willing to pay for NAFDAC certification and brand name but fairly equally divided between payment and non-payment with respect to nutritional label. The table shows highest WTP for NAFDAC certification. This implies that respondents really valued food safety. They also tended towards purchasing branded products as seen in the WTP value with respect to brand name.

Table 3: Average WTP for different values of Neem-based products

Values of Neem-Based Products		Freq. (Percent)	Mean WTP (Std. dev.)	Min.	Max.
NAFDAC Certification	Yes	70 (57.85)	₦615.57 (116.48)	₦500.00	₦780.00
	No	51 (42.15)			
Brand Name	Yes	65 (53.72)	₦538.92 (328.26)	₦500.00	₦1,600.00
	No	56 (43.28)			
Nutritional Label	Yes	60 (49.59)	₦533.50 (261.64)	₦500.00	₦900.00
	No	61 (50.41)			

Source: Field Survey, 2018.

3.4 Determinants of WTP for Value-Additions of Neem-Based Products

The different factors influencing each of the value addition variables with respect to Neem-based products are presented in this section. The factors are discussed under three (3) headings – NAFDAC certification, brand name and nutritional label.

3.4.1 NAFDAC certification

The determinants of WTP for value addition in terms of NAFDAC certification (Table 4) show that eight (8) variables were significant out of the fourteen (14) variables. Age ($p \leq 0.01$), being female ($p \leq 0.05$), acquiring secondary ($p \leq 0.05$) and tertiary education ($p \leq 0.10$), being married ($p \leq 0.01$) or divorced ($p \leq 0.05$) were positively related to WTP while monthly expenditure ($p \leq 0.05$) and being widowed ($p \leq 0.10$) were negatively related to WTP for NAFDAC certification. With a year increase in age, the likelihood of willingness to pay for certification increased by 0.012 while having secondary and tertiary education increased the likelihood by 0.338 and 0.196, respectively. On the other hand, a unit (100%) increase in monthly expenditure reduced the likelihood of WTP for NAFDAC certification by 34.4%. The implications were as follow: as people age, they seemed to know the benefits of alternative medicine. Older respondents were also willing to pay for Neem-based products.

Table 4: Parameter estimates of the determinants of WTP for value addition in Neem-based products

	NAFDAC certification			Brand name			Nutritional label		
	Coeff (Robust s.e.)	z-stats	dy/dx	Coeff (Robust s.e.)	z-stats	dy/dx	Coeff (Robust s.e.)	z-stats	dy/dx
Age	0.203*** (0.076)	2.67	0.012	0.081** (0.035)	2.30	0.013	-0.002 (0.0543)	-0.04	-2.13e-04
Sex									
Female	13.874** (5.543)	2.50	0.470	1.829** (0.789)	2.32	0.246	5.522** (2.701)	2.04	0.417
Education									
Secondary	7.120** (3.017)	2.36	0.388	2.882*** (0.837)	3.44	0.422	3.827 (2.721)	1.41	0.427
Tertiary	3.599* (2.036)	1.77	0.196	2.509** (2.509)	2.02	0.365	1.967 (1.338)	1.74	0.224
Marital status									
Married	10.385*** (3.963)	2.62	0.373	2.482** (1.026)	2.42	0.340	3.954* (2.173)	1.82	0.436
Divorced	7.164** (3.407)	2.10	0.260	-	-	-	2.616 (2.034)	1.29	0.272
Widowed	-8.080* (4.445)	-1.82	-0.267	-0.584 (1.411)	-0.41	0.063	-3.038** (1.330)	-2.82	-0.195
Primary occupation									
Artisan	0.040 (1.824)	0.02	0.002	0.897 (1.136)	0.79	0.144	-2.137** (1.086)	-1.97	-0.225
Self employed	-0.715 (1.881)	-0.38	-0.033	-1.802 (1.235)	-1.46	-0.258	-2.236** (0.903)	-2.48	-0.236
Civil servant	-6.248 (4.560)	-1.37	-0.327	0.060 (1.553)	0.04	0.009	-2.016 (1.916)	-1.05	-0.213
Nearness to Point of Sales	0.022 (0.206)	0.11	0.001	-0.188** (0.084)	-2.24	-0.029	-0.096 (0.137)	-0.70	-0.010
Household size	0.067 (0.202)	0.33	0.003	0.070 (0.111)	0.64	0.010	0.208* (0.121)	1.71	0.023
Total monthly expenditure	-5.819** (2.534)	-2.30	-0.344	-2.494** (1.020)	-2.44	-0.386	1.781 (1.906)	0.93	0.198
Amount spent on herbal medicine	3.333 (2.533)	1.32	0.197	-0.469 (0.491)	-0.96	-0.072	1.430* (0.778)	1.84	0.159
Constant	23.465 (21.291)	1.10		21.388** (10.021)	2.13		-31.934 (23.626)	-1.35	
	Wald chi ² (14) = 51.59 Prob > chi ² = 0.0000 Log pseudo likelihood = -23.46 Pseudo R ² = 0.7152 y = Pr (nafdacwtp) (predict) = 0.6348			Wald chi ² (13) = 26.31 Prob > chi ² = 0.0155 Log pseudo-likelihood = -50.86 Pseudo R ² = 0.3264 y = Pr (brandwtp) (predict) = 0.5433			Wald chi ² (14) = 35.90 Prob > chi ² = 0.0011 Log pseudo-likelihood = -41.94 Pseudo R ² = 0.4999 y = Pr (nutritionwtp_) (predict) = 0.4912		

Level of significance: ***1%, **5% and *10%; dy/dx= marginal effects.

This may be due to health issues since ageing is accompanied with diminishing energy level. Also, respondents with high income might have perceived Neem as inferior good thereby settling for orthodox medicine while educated individuals knew the benefits of certification (quality and safety) because of their levels of exposure.

3.4.2 Brand name

From Table 4 Seven (7) variables were significant for WTP for value addition in terms of brand name. Age, being female, secondary education, tertiary education and being married were positively related to WTP for brand name. These variables positively influenced WTP for brand name of Neem-based products by 0.013, 0.246, 0.422, 0.365 and 0.340 respectively. In contrast, monthly expenditure and nearness to point of sales were negatively related to the WTP by 0.386 and 0.029 respectively. This shows the importance of access in influencing willingness to pay for value of Neem-based products. Since majority of the respondents reside in urban centre where mobility is easy, an increase in distance may make people assume that the product is of high quality.

3.4.3 Nutritional label

Nutritional label has been noted by Anyam *et al.* (2013) to be an important determinant in willingness to pay for value addition in a key food product, bread. The determinants of WTP with respect to nutritional label in Neem-based products showed seven significant variables among which were: being female, being married, household size and amount spent on herbal medicine. These variables positively determined WTP for nutritional label and increased its value by 0.417, 0.436, 0.023 and 0.159 respectively. On the other hand, being widowed, being an artisan and self-employment in other occupations negatively affected the WTP by 0.195, 0.225 and 0.236 respectively.

4. Conclusion and recommendation

The study affirmed that many respondents were aware of the medicinal but not nutritional benefits of Neem and over 80% of the respondents did not use Neem-based products. The average amount spent on Neem-based products by households in the area was considerably low and this may be explained by low frequency of consumption of the products. On the average, seven (7) variables significantly affected WTP for each of the value addition categories. Age, gender, education, monthly income, nearness to point of sales and amount spent monthly on herbal medicine were the important factors explaining WTP. The independent variables predicted 63.4%, 54.3% and 49.1% of the outcomes in the WTP equations for NAFDAC certification, brand name and nutritional values, respectively.

Aside the fact that most respondents did not consume Neem-based products, they were also not willing to pay since the awareness about the benefits is not enough. Based on the findings, the study recommends that producers of Neem-based products should map out strategies for creating adequate awareness on their benefits. Since the households were willing to pay more if there is guarantee of safety in the consumption of these products, producers should liaise with appropriate government agency on quality control that will ensure approval of their products and labelling to that effect. This will bring a win-win situation at both ends: for government that has the responsibility of protecting its citizens and for producers who will generate more revenue from sales. Producers should also take the mean household WTP into cognizance for price setting.

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