DETERMINANTS OF AWARENESS AND WILLINGNESS TO PAY FOR MORINGA LEAVE AS VEGETABLE IN SOUTH WEST NIGERIA

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ABSTRACT

Moringa oleifera is a nutritious tree plant that has several uses. Moringa leaves contain Vitamin A, Vitamin C, Calcium, Iron, Potassium, and it has good quality protein. Moringa leave could be used in treating malnutrition. It also contains antioxidants which could help in treating certain diseases. This study examined the factors influencing awareness and willingness to pay for moringa. A multistage sampling procedure was used in selecting the respondents. Data were analyzed using Recursive Bivariate Probit Model. The result shows that mean age of respondents was 44 years and the mean household size was 5. The result further revealed that 80.5 percent of the respondents were aware of moringa while 80.1 percent were willing to pay for moringa. The result of the model of awareness of moringa revealed that awareness increases willingness to pay for moringa (p<0.01). The factors that influences awareness were age and occupation of the respondents, knowledge of the nutritive benefits of moringa, perception of respondents that moringa vegetable is too expensive and respondents preference for other vegetable while the factors that influences willingness to pay for moringa were occupation of the respondents, knowledge of other uses of moringa, respondents perception that moringa vegetable is sweet, non availability of fresh moringa vegetable and respondents preference for other vegetable. There is need to increase the awareness of nutritive benefits of moringa vegetable and encourage the availability of fresh moringa foe sale in the local markets.
Keywords: Moringa, Awareness, Willingness to pay, Recursive Bivariate Probit

INTRODUCTION

Moringa oleifera belongs to the family *Moringaceae. It is native to India , Africa, Arabia, Southeast Asia, South America, the Pacific and Caribbean (Iqba and* Bhanger, 2006) The plant can grow in a wide range of environmental conditions from hot and dry to hot ,humid, wet conditions. It is a multipurpose tree with virtually every part used as food or with medicinal or therapeutic purpose (Anwar *et al 2007). Due to its wide range of acceptability and uses, the plant has been given different type of name such as* horseradish tree, drumstick tree, ben oil tree, miracle tree, and "Mother's Best Friend". Moringa tree grow more rapidly reaching a height of 5-12 m. It has an open umbrella-shaped crown, straight trunk and a corky, whitish back. It has leaflet that are 1-2 cm in diameter and 1.5-2.5 cm in length. Moringa tree crop and grows well even in the dry season. The leave can be consumed as vegetable. During the dry sea-

son when most of the other vegetable are not available or expensive it can be obtained fresh with ease. It has the potential to combat food insecurity considering its availability all year round.

The nutritional quality of Moringa cannot be denied as this has been supported by scientific literatures. It has been found that Moringa leaves contain more Vitamin A than carrots, more calcium than milk, more iron than spinach, more Vitamin C than oranges, and more potassium than bananas," and its protein quality compete favourably well with that of milk and eggs. The leaves are not just vegetable. The tree can be referred to as food as it contains the essential nutrients and vitamins needed by the body (Coppin, 2008). It has the potential to combat malnutrition. Due to high level of vitamins present in the plant it could be used to correct vitamin and nutrient deficiency in malnourished children, combat stunting, wasting and failure-to-strive in infants and children. It could also be used in treating protein-energy malnutrition. In addition, it also has some medicinal uses. It contains antioxidants which help in the prevention of cancer and other disease such as cardiovascular disease, age-related macular degeneration and the formation of cataracts (Lakshminarayan et al, 2005; Bowman and Morbarhan, 1995; Krichevsky, 1999). It could be use to combat chronic infectious diseases (Fahey, 2005, 2006).

Moringa leave could be eaten raw, use as tea, cooked as stew vegetable or cooked with porradge. It could also be dried (in a shade) and stored for months without losing its nutritional value and used as supplement. The Moringa tree is a valuable tree which every household most have in their compound and consume it at least once a week. Moringa leaves are not usually found displayed in the market like other vegetables. Several studies have been carried out on Moringa, but the focus has been on its origin, morphology, chemistry and medicine (Fuglie 2001; Olson, 2001), gender analysis and socio-cultural perception of farmers of Moringa (Torimiro et al., 2009), use of Moringa as concentrate supplement in animal feed (Nouala et al., 2006). Others include, Odeyinka et al, 2007 which looked into the perception of moringa by livestock farmers in Southwest Nigeria. The benefit of Moringa is numerous, but it can only be useful if the consumers are aware of it. It is the awareness that will determine willingness to pay for Moringa product. This is supported by the findings of Dipeolu et al, 2009 on the awareness of consumers and willingness to pay for organic vegetables. The study observed that the level of awareness of certified organic vegetables was low in the same vein, only one third of the respondents were willing to pay extra for organic vegetables and the mean premium customers were willing to pay ranged from 23% for cucumber to 73% for ugwu (fluted pumpkin). It is therefore necessary to know awareness level of the Moringa vegetable, examine the willingness to pay for it as well as to determine the factors influencing willingness to pay for the vegetable.

MATERIALS AND METHODS
Study Area
This was carried out in Lagos and Oyo States. Shomolu Local Government Area and Ibadan North East Local government were randomly selected from each of the state. Shomolu is one of the local governments in the Ikeja Division of Lagos State while Ibadan North East is one of the local government in Ibadan metropolis. The land area and population of the two local govern-

ments are 12 km² and 18 km² and 402,673 and 330,399 (2006 Census) respectively. Headquarters of the two Local Government Areas are Shomolu and Iwo Road respectively.

Sampling Procedure

A multistage sampling technique was used. The first stage was random selection of two states (Lagos and Oyo) in the south west. The second stage was random selection of one Local Government Area in each State (Shomolu and Ibadan North East Local Government Areas). The third stage was random selection of five locations in each of the Local Government Areas. The locations selected in Shomolu were Gbagada, Akoka, Bariga, Shomolu, Igbo-iganmu while the locatins in Ibadan North East were Bashorun, Abayomi/Iwo Road, Olorunsogo, Agugu and Oke Irefin. The final stage was a random selection of 150 respondents in the five locations in each Local Government. A structured questionnaire was used to collect information on socio-economic characteristics, awareness, perception and willingness to pay for the vegetable. A total of 300 questionnaires were administered out of which only 277 was used for the analysis due to omission of important variable by these respondents.

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Estimated Model

Seemingly Unrelated Bivariate Probit (SUBP) was used to determine the factors that influence the probability of awareness and willingness to pay for Moring leaves as vegetable. It was observed that willingness to pay and awareness can operate in a recursive manner, which implying that one of them is endogenous dependent variable. We first tested the endogeneity of awareness in the willingness to pay model, which statistical insignificance of rho rejected. Hence, It

was proposed that willingness to pay could be influenced by awareness. Since, awareness influences willingness to pay therefore, estimated parameters from Probit regression will not meet the conventional conditions for being Best Linear Unbiased Estimate (BLUE). We estimated a recursive bivariate model based on propositions by Maddala (1983). The structural form of the model can be stated as

$$P_{i1} = \alpha + \beta_i \sum_{i=1}^{n} X_i + v_i \qquad 1$$

$$P_{i2} = \rho + P_{i1} + \varphi_i \sum_{i=1}^{n} X_i + u_i \qquad 2$$

P_{i1} and P_{i2} are latent variables of willingness to pay and awareness about Moringa respectively. These variables are dummy variables with values of 1 if willing to pay for Moringa and 0 otherwise for equation 1 and values of 1 if aware of Moringa and 0 otherwise for equation 2. Also, are the estimated parameters and Xi are the socio-economic variables of households. Included explanatory variables are sex (male =1, 0 otherwise), age (years), married (yes = 1, 0 otherwise), no education (yes=1, 0 otherwise), civil servant (yes = 1, 0 otherwise), aware of the nutritive benefit of moringa (yes=1, 0 otherwise), total monthly earnings (₦), ever consume moringa (yes = 1, 0 otherwise), knowledge of other use of moringa (yes = 1, 0 otherwise), sweet (yes = 1, 0 otherwise), expensive (yes = 1, 0 otherwise), fresh vegetable not available (yes = 1, 0 otherwise), prefer other vegetable (yes = 1, 0 otherwise). The error terms of the model are dependent and distributed as a bivariate normal such that: *var(vi) = var (ui)* = 1 and The Wald test, which is reflected by statistical significance of was used to determine whether the models would be best estimated jointly in a recursive manner or

not.

RESULTS AND DISCUSSION

Table 1 shows the socioeconomics of the respondents. The mean age was 44 years with standard deviation of 13.51, most of the respondents (58.1%) were within the age range of 31-50 years while 28.9 percent of the respondents falls within the age range of 21-30 years. Those in the age range of 61-70 and >70 were 2.9 percent respectively. This implies that most of the respondents are still in the active age group. The finding is in line with that of Kola-Oladiji *et al*, (2014) which revealed that most of their respondents were aged 31-40 years thus in their active age in which they can still enjoy the several benefits of Moringa.

The mean household size was 5 with standard deviation of 2.79. 48 percent of the respondents were within the household size range 5-9. This means that most of the households are large sized; contrary to the finding of Kola-Oladiji *et al*, 2014 among rural dwellers in Ibadan where most households were low (less than 4). Majority of the respondents were female (56 percent); implying that females are more involved in the use of Moringa when compared to males (Kola-Oladiji *et al*, 2014). Moreover, there were more married respondents (68.6%) than those single (30%). Most of the respondents had tertiary (62.8 percent) education. The result is in line with that of Obayelu et al, 2015 which observed that 92.7% of the consumers had tertiary education. This implies that most of the respondents are educated and thus able to acquire more information about the various uses of Moringa (Kola-Oladiji et al, 2014). It also shows that 74.4 percent were Christian while 21.3 were Muslim. The occupational status of the respondents shows that 45.5 percent were civil

Table 1: Socio-economic Characteristics of the respondents

Age	Frequency	Percentage
11-20	7	2.5
21-30	39	14.1
31-40	80	28.9
41-50	81	29.2
51-60	54	19.5
61-70	8	2.9
>70	8	2.9
Household size		
1-4	126	45.5
5-9	133	48.0
10-14	12	2.2
>14	6	2.2
Sex		
Male	122	44
Female	155	56

Marital Status		
Single	83	30
Married	190	68.6
Divorced	4	1.4
Education		
No formal	23	8.3
Primary	17	6.1
Secondary	57	20.6
Tertiary	174	62.8
Adult	6	2.2
Religion		
Christian	206	74.4
Muslim	59	21.3
Traditional	12	4.3
Occupation		
Farming	21	7.6
Civil Servant	124	45.8
Trading/Business	100	36.1
Students	29	10.5

Source: Field Survey 2013

servants while 36.1 percent were traders/businessmen. 10.5 percent were students and 7.6 percent were famers.

Table 2 shows the percentage of respondents that are aware of moringa leaves as vegetable. It shows that 80.5 percent of the respondents were aware of moringa leaves as vegetable while 19.5 percent were not aware of it. This is in line with the findings of Farinola *et al*, 2014 which revealed that about 81% of respondents were aware (highly or lowly aware) about

Table 2: Awareness of Moringa leaves as vegetable

Awareness	Frequency	Percentage
Yes	223	80.5
No	54	19.5
Total	277	100

Source: Field Survey 2013
Moringa leaves as vegetable. Only about 19% of them claimed they were not aware about the inclusion of Moringa in the diet.

Table 3: Willingness to Pay for Moringa

Willing	Frequency	Percentage
Yes	222	80.1
No	55	19.9
Total	277	100

The results on Table 3 reveals that most of the respondents were (80.1%) willing to pay for moringa leave as vegetable. This however implies that majority of the respondents were aware about Moringa.

The result of econometric analysis of the determinants of awareness and willingness to pay for moringa leaves as vegetable is shown on Table 4. The model produced a good fit of the data as evidence by statistical significance of the Wald Chi square parameters ($p < 0.01$). Inclusion of willingness to pay variable in the awareness model as an explanatory variable is also justified by the statistical significance of rho ($p < 0.05$). This implies that estimation of the models as ordinary Probit regression would have yielded inefficient parameters. The result of the model of awareness of moringa revealed that awareness increases willingness to pay for moringa ($p < 0.01$). This implies that those that were aware of moringa were willing to pay for it.

The awareness model also revealed that age is negative and statistically significant ($P < 0.05$). It implies that increasing age reduces awareness of moringa. It shows that as age increases the level of awareness of the respondents' decreases. This implies that moringa is well known among the middle-aged respondents as observed in the descriptive statistics on socio-economic status that reveals that 58.1% of the respondents are aged between 31-50 years.

The occupation of the respondents were statistically significant in the two models with positive and negative signs and significant level of ($P < 0.05$) and ($P < 0.10$) respectively. It implies that been a civil servant increases awareness and reduces willingness to pay. It implies that the civil servants were aware of moringa than their counterparts who were not civil servant but they were less willing to pay for moringa. Knowledge of the nutritive benefit has a positive sign and statistically significant ($P < 0.05$) in the awareness model. This implies that nutritive benefit of moringa increases awareness. The result is in accordance with that of Obayelu et al, 2014 which revealed that knowledge of nutrition and health index variable, was significant for labelled moringa spice/powder ($p < 0.10$). This is expected because the benefit that could be derived from moringa can make people inform others about it. The variables knowledge of other uses, sweet and non-availability of fresh moringa vegetable were negative and statistically significant ($P < 0.05$) in the willingness to pay model. It implies that knowledge of other uses, being sweet and non-availability of fresh moringa vegetable reduces willingness to pay. The respondents that have knowledge of other uses and testified that it is sweet were not willing to pay for it.

Preference for other vegetable is statistically significant ($P < 0.05$) in both models however, with different signs. The preference for other vegetables increases awareness while it

reduces willingness to pay for moringa. Thus, since other vegetables were preferred than moringa, the respondents may not be willing to pay for it.

Table 4: Recursive bivariate results of factors influencing awareness and willingness-to-Pay for Moringa

	Awareness			Willingness to pay		
Variables	Coefficient	Std Error	t-stat	Coefficient	Std Error	t-stat
Willingness-to-pay	2.264286***	.1523695	14.86	-	-	-
Sex	-.1159768	.1612344	-0.72	-.1421007	.1676162	-0.85
Age	-.0118407**	.0057569	-2.06	-.0044042	.0059748	-0.74
Married	-.1007324	.1803996	-0.56	.0662303	.1786679	0.37
Householdsize	-.0067987	.0321661	-0.21	.0426119	.0335385	1.27
No Education	-.1618488	.2487578	-0.65	-.3688892	.268179	-1.38
Occupation	.3785967**	.168082	2.25	-.2838017*	.169942	-1.67
Nutritive benefit	.4805746**	.1994518	2.41	-.0762157	.242702	-0.31
Monthly income	2.08e-07	4.47e-07	0.47	3.36e-08	4.60e-07	0.07
Ever consume	.2997063	.187861	1.60	-.2362013	.2000389	-1.18
Knowledge other use	.3295897	.2404015	1.37	-.7019149**	.2748974	-2.55
Sweet	.1892104	.1603536	1.18	-.3995631**	.1679523	-2.38
Expensive	.3724172**	.1635728	2.28	-.1347966	.1752304	-0.77
Fresh vegetable not available	.1936898	.1673033	1.16	-.3905172**	.1774908	-2.20
Prefer other vege-table	.3713187**	.1590821	2.33	-.408993**	.1597734	-2.56
Constant	-1.972462***	.4471297	-4.41	2.54964***	.4630355	5.51
Athrho	-14.22918	537.7207	-0.03			
Rho	-1	9.40e-10				

Likelihood-ratio test of rho=0: chi2(1) = 6.27808 Prob > chi2 = 0.0122

Wald chi2(29) = 294.99 (Prob > chi2 = 0.0000)
Log likelihood = -237.04633
Number of obs = 277

*** Significant at 1%   ** Significant at 5%   * Significant at 10%

CONCLUSION

Moringa leaves contain some essential nutrients and vitamins needed by the human body and has some medicinal values. The level of awareness of moringa is high while its awareness increases willingness to pay for moringa. Other factors that affect willingness to pay for moringa were occupation, knowledge of other uses of moringa, sweetness of moringa, non-availability of fresh moringa, and preference for other vegetable. On the other hand, factors influencing awareness were age, occupation, nutritive benefits derivable from moringa, expensiveness of moringa and preference for other vegetable. There is need to increase the availability of fresh moringa vegetable and increase the level of awareness among the various occupational groups.

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