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Market Potentials for Selected Organic Leafy Vegetables

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ABSTRACT

Increased consumer awareness has raised concerns over food safety and production methods. In Nigeria, consumption of organic produce is low. This study assessed consumer willingness to pay for selected organic leafy vegetables. Data from 129 respondents were obtained using a simple random sampling technique. Conjoint analysis and contingent valuation were used to analyze willingness to pay and determinants of willingness to pay. Contingent valuation indicated that 84.5%, 76%, and 62.8% of the respondents were willing to pay extra for *Amaranthus cruentus* L., *Celosia argentia* L., and *Cochorus olitorius* L., respectively. Average willingness to pay a price premium was 46%, 42.4%, and 35.8% for *A. cruentus, C. argentia*, and *C. olitorius*, respectively. Conjoint analysis indicated that quality was the most valued attribute of leafy vegetables with relative importance of 42.2%. Income, health status, and work experience were key determinants of willingness to pay; all increasing the likelihood of willingness to pay. Income was significant with marginal effects of 0.005 and 0.006 for *A. cruentus* and *C. olitorius*, respectively. Health status was significant with marginal effects of 0.366 and 0.225 for *A. cruentus* and *C. olitorius*, respectively. Work experience was significant for all species. There is strong market potential for organic leafy vegetables, especially if quality is high and prices are reasonable.

KEYWORDS

Conjoint analysis; contingent valuation; willingness to pay; Nigeria

Pesticides and other synthetic chemicals used in conventional agriculture are mainly applied to suppress pests and improve crop and animal productivity. However, repeated and intensive application of these chemicals leads to loss of biodiversity and possibly increases health hazards (Pesticides Action Network Europe, 2010). According to Lumpkin (2005), use of conventional chemicals in vegetable production is a major health risk and a cause of extensive environmental damage in conjunction with intensive conventional vegetable cultivation. Organic agriculture is an alternative to conventional cultivation incorporating factors to safeguard human health and promote environmental sustainability (United Nations Environment Programme–United Nations Conference on Trade and Development Capacity Building Task Force on Trade, Environment and Development, 2010). Use of organic

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production is a trade and sustainable development opportunity and a powerful tool for achieving goals related to poverty reduction and environment.

In Nigeria, the market for organic products is not well developed and no market statistics are available. Prices of organic products are generally higher than those of conventional products due to increased cost of production. Therefore, price may hinder low-income earners from buying organic products. Other concerns such as consumer perception and health status can affect purchase and consumption of organic leafy vegetables.

Willingness to pay could be defined as the sum of money representing the difference between consumer surplus before and after adding or improving a product attribute. Models estimating consumer willingness to pay (WTP) when adding or enhancing a given quality attribute are based on the Lancaster approach, which maintains that consumers directly derive satisfaction from the attributes of goods (Dipeolu et al., 2009).

To measure WTP, primary data can be derived from surveys. These methods are based on elicited and revealed preference (Lee and Hatcher, 2001). Methodologies on consumer-elicited preferences include contingency valuation (CV), conjoint analysis (CA) and experimental auctions. Hedonic prices are based on consumer-revealed preferences. Elicited preference is the most well-known method involving the use of indirect sources to infer consumer WTP.

The first two methods are hypothetical valuation methods utilizing survey responses. Experimental auction is where the researcher interacts with respondents to determine a response for a given product or attribute (Arcadio et al., 2012; Boever, 2006). In its place, CV and CA methods are used. The CA method complements the CV method because it enables breakdown of stated individual utility into different attributes.

Previous studies indicate that consumers are willing to pay a premium of 5%–50% for organic products (Akgüngör et al., 2007; Bhatta et al., 2009; Kamal et al., 2009; Rodríguez et al., 2008). In Nigeria, Dipeolu et al. (2009) measured WTP using contingent valuation; 64% to 84% of respondents were willing to pay a premium for organic vegetables. Philip and Dipeolu (2010) reported that consumers are willing to pay a premium from 23% to 73% for organic vegetables. Piyasiri and Ariyawardana (2002) reported the influence of socioeconomic characteristics on average additional WTP. The report indicated that income, years of education, and environmental education were significant factors influencing payment for organic vegetables.

There is little information on WTP for organic products, particularly leafy vegetables in Nigeria. The study was undertaken to assess consumer WTP and determine factors affecting WTP for selected organically produced leafy vegetables.

Materials and methods

The study was conducted in Ibadan North Local Government area, Oyo State, Nigeria, at 8°00′ N 4°00′ E. The climate is equatorial with dry and wet seasons and relatively high humidity. The location was selected due to farmer involvement in organic production.

Data collection

Primary data were gathered using questionnaires to obtain information on respondents' socioeconomic characteristics and WTP for organically produced leafy vegetables. One hundred twenty-nine respondents were randomly selected from the local government area. Data were analyzed using descriptive statistics, CA, and CV.

Method of analysis

The CA method is based on consumers assessing the value of a product by combining the values provided by each attribute. It is possible to elicit consumer preferences regarding attributes of modified food characteristics. To determine total utility, an additive, or part-worth, model (Green and Srinivasan, 1978; Steenkamp, 1987) is commonly used. Preference elicitation was used in the study because of its ability to measure mean WTP for various attributes attached to the chosen sets.

The attributes price, method of production, and quality with respect to organically produced leafy vegetables were used. The price attribute relates to the price differences in conventionally or organically produced vegetables. The method of production relates to the environmental benefits derived from vegetables, and the quality attributes relate to taste and shelf-life benefits. With three attributes, two of which are associated with two corresponding levels (method of production and quality), the price attribute is associated with three levels; the factorial design was done to obtain the possible numbers of outcome.

The main goal was to maximize efficiency of the survey to extract information from respondents. Possible combinations of attributes were estimated to produce 12 product profiles (Table 1). Due to the limited number of product choices, a full-factorial design was used for conjoint analysis. The estimated part-worth with ordinary least squares regression was used and model fitness measured using Kendall's tau-b and Pearson's correlation. The marginal WTP for each attribute was calculated as the ratio between the negative of the coefficients of each attribute and the price attribute (Gan and Luzar, 1993).

Table 1. Attributes and corresponding levels for organic vegetables.

Attribute	(₦)[a]	Vegetable profile[b]
Price·kg^{-1}	50	OG50, OG65, OG80
	65	OP50, OP65, OP80
	80	IG50, IG65, IG80
		IP50, IP65, IP80
Method of production	Organic (O), Inorganic (I)	
Quality	Good (G)	
	Poor (P)	

[a]₦ = Naira, Nigerian currency, 1$US = ₦ 157.
[b]Profile made up of method of production, quality of vegetable and price level at market.

The contingent valuation method creates a hypothetical market situation for a good or service. It tends to quantify the value consumers confer to products by associating that value with the sum of money they are willing to pay (Kawagoe and Fukunaga, 2001; Rodríguez et al., 2008). Two approaches were used: first, the maximum amount consumers were willing to pay was used to estimate mean WTP. For the second approach, consumer response to WTP for selected organically produced vegetables was characterized as a dichotomous response. The logit model was used to analyze determinants of WTP. In this model, WTP (the dependent variable) was specified as 1 if willing and 0 if otherwise. Variables included in the model were gender, age, education level, work experience, household size, environmental education, health status, awareness of health benefits, and awareness of environmental benefits.

Results and discussion

Conjoint analysis of WTP

Utility (part-worth) scores were assigned for each attribute level (Table 2). A higher utility value implies greater preference; the utility estimate indicates preference for good quality and then the chosen vegetables are listed. A

Table 2. Conjoint analysis estimations of utility for ranking model.

Attribute	Level	Utility estimate	Relative importance (%)
Method of production	Inorganic	−1.671	37.96
	Organic	1.671	
Quality	Poor	−1.870	42.21
	Good	1.870	
Price	N50[a]	−2.959	19.83
	N65	−3.846	
	N80	-4.734	
Constant		10.346	

Price coefficient (β) = −0.059; Marginal Willingness to Pay for organic vegetables = 28.32; Pearson's R = 0.961, significant at 1%; Marginal Willingness to pay for good quality = 31.69; Kendall's tau = 0.848, significant at 1%.
[a]$1US = N157.

negative utility produces a negative utility score. The price coefficient reflects an inverse relationship between price level and utility, indicating consistency of models with reality. The Pearson's rank correlation and Kendall's tau coefficients were significant at a level indicating a strong correlation between observed preferences and those estimated by the model, indicating a high predictive validity of the model values for this statistic and the respective significance level.

The relative importance index, computed by taking the utility range for each factor separately and dividing by the sum of the utility ranges for all factors, indicates that quality had the highest relative importance; method of production and price were less important. This indicates that quality is the most important factor determining consumer choice although individuals are willing to pay an additional amount for organic leafy vegetables. It further implies that people in the study area value quality attributes of taste and freshness in purchasing vegetables. Based on the conjoint analysis results, there is a strong market potential for organic leafy vegetables provided that the quality is good and the price is not too high.

Willingness to pay for selected vegetables

Average WTP per vegetable indicated that consumers are willing to pay price premiums for *A. cruentus, C. argentia*, and *C. olitorius* (Table 3).

Determinants of WTP for selected organic vegetables

Key determinants of WTP were income, health benefits, and work experience, all increasing the likelihood of WTP as they increase (Table 4). The logit regression analysis for WTP for *A. cruentus* at N80 indicated that three variables were significant in the model (N is Naira, Nigerian currency; US$1 = 156.15N). Income level, work experience, and health status

Table 3. Comparative distribution of respondents based on the price premium they are willing to pay for selected organic leafy vegetables.

	Celosia argentia (celosia, Quail grass)		*Amaranthus cruentus* (amaranth)		*Cochorus olitorius* (Tete jute)	
Premium (%)[a]	Frequency	Percent	Frequency	Percent	Frequency	Percent
0	31	24	20	15.5	48	37.2
1-20	1	0.8	19	14.8	17	13.2
21-40	43	33.3	31	24	21	16.3
41-60	27	20.9	38	27.9	17	13.2
61-80	7	5.4	2	1.6	7	5.4
81-100	12	15.6	21	16.3	19	14.7
Total	129	100	129	100	129	100

[a]Average premium for *A. cruentus* = 46%; average premium for *C. argentia* = 42.4%; average premium for *C. olitorius* = 35.8%.

Table 4. Logit regression result.

	Amaranthus cruentus			*Celosia argentia*			*Cochorus olitorius*		
Variable	Coefficient	Marginal effect	Z value	Coefficient	Marginal effect	Z value	Coefficient	Marginal effect	Z value
Gender	0.544	0.013	0.12	−1.031**	−0.219**	−2.08	−0.749	−0.128	−1.22
Age	−0.049	−0.011	−1.17	−0.056	−0.013	−1.40	0.017	0.003	0.36
Education									
Secondary	0.104	0.025	0.13	1.087	0.2568	1.16	0.956	1.93	−0.87
Tertiary	0.758	0.175	0.99	1.067	0.23	1.13	1.09	1.90	−0.95
Household size	−0.1	−0.024	−0.99	0.012	0.003	0.13	0.267**	0.049**	2.22
Income N1000 [a]	0.236**	0.005**	2.40	0.027***	0.006***	2.74	0.01	0.002	0.97
Work experience (years)									
1-9	0.250	0.060	0.4	1.0*	0.23*	1.65	0.387	0.074	0.50
10-19	1.549**	0.369**	2.04	0.546	0.130	0.62	2.82***	0.074***	2.68
≥20	−0.395	−0.090	−0.44	0.811	0.1948	0.91	0.8497	0.176	0.74
Aware of health benefits	−0.845	−0.202	−1.43	−0.572	−0.134	−0.95	−1.96***	−0.393***	−2.46
Environmental education	0.209	0.049	0.44	0.155	0.036	0.31	0.411	0.075	0.68
Health status	0.921*	0.244*	1.7	−0.867	−0.181	−1.43	1.691***	0.366***	2.65
Aware of environmental benefits	0.838	0.200	1.34	−0.827	0.194	1.31	1.839**	0.356**	2.16
Constant	−0.187			−0.827			−4.87***		−2.61
	LR chi^2 (18) = 30.79			LR chi^2 (18) = 29.7			LR chi^2 (18) = 53.7		
	Prob. > chi^2 = 0.0036			Prob. > chi^2 = 0.0052			Prob. > chi^2 = 0.0000		
	Pseudo R^2 = 0.1770			Pseudo R^2 = 0.1724			Pseudo R^2 = 0.3362		
	Log likelihood = −71.585			Log likelihood = −71.279533			Log likelihood = −53.02		

*, **, *** significant at 10%, 5% and 1%, respectively; N = 129; for categorical variables, bases were omitted.
[a]$1US=156.15 N.

were significant. Income positively and significantly affected WTP for amaranths with a significant marginal effect. Health status had a significant and positive effect on WTP for *A. cruentus* with a significant marginal effect. Working experience of 10–19 years was positively and significantly related to WTP for *A. cruentus* with a significant marginal effect.

Income level, gender, and work experience were significant for *C. argentia*. In the logit model, income had a positive and significant marginal effect on WTP. Gender had a significant effect on WTP. Females were more likely to pay for organic vegetables than males. Work experience of 1–9 years had a positive, significant relationship with WTP with a significant marginal effect.

For *C. olitorious*, work experience of 10–19 years, health status, awareness of health benefits of organic vegetables, household size, and awareness of environmental benefits of organic vegetables were significant in the logit model. Awareness of environmental benefits had a positive, significant effect on WTP at the bid price. Health status had a significant, positive effect on WTP with a significant marginal effect. Work experience of 10–19 years had a positive, significant relationship with WTP with a significant marginal effect. Household size had a positive, significant effect on WTP with a significant marginal effect. Awareness of a health benefit had a negative, significant effect on WTP bid price. This may be a result of the relatively low preference for this vegetable in the study area.

Consumers were willing to pay for organic leafy vegetables provided that the quality is very good and the price is not too high. Organically produced *A. cruentus* had the highest potential. All organically produced leafy vegetables have market potential because most people are willing to pay a premium. Improved well-being could increase the value placed on environment and health. This may subsequently increase the WTP for products with proven health benefits. Organic vegetable production is quality driven, and good production and management practices are needed to increase the market share of organic leafy vegetables. The relative importance of price was low, and organic vegetable producers need to maintain product prices at affordable levels. High prices will likely reduce willingness to pay, especially for vegetables like *C. olitorius*, which has low a preference. Because the market for organic products is not well developed, farmers willing to produce organic leafy vegetables should produce *A. cruentus* because it has the highest potential.

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