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Measuring Market Potential for Fresh Organic Fruit and Vegetable in Ghana

By

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Measuring Market Potential for Fresh Organic Fruit and Vegetable in Ghana

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Abstract
This paper examines the market potential for fresh organic lettuce and water melon with a recently collected data on consumers from Kumasi metropolis of Ghana. Using a double-bounded dichotomous choice contingent valuation technique, consumer's willingness to pay is estimated with a Tobit model to address the zero willingness to pay responses in the sample data. As much as 71% of the consumers are willing to pay over 50% price premiums for organic vegetables and over 82% are willing to pay 1%–50% price premiums for organic fruits. The empirical results indicate that human capital, product attributes and consumer perception influence consumers' willing to pay for organic food products. The estimated market potential for organic fruit is GH¢32,117,113 (US$ 26,453,433) per annum and that of organic vegetable is GH¢1,991,224 (US$1,640,083) per annum suggesting a huge market potential for organic fruits in Ghana.

Keywords: Willingness to Pay, Price Premium, Organic Products, Consumer Perception, Market Potential, Africa.

1. Introduction

The demand for fresh fruits and vegetables from sub-Saharan Africa by consumers worldwide has been increasing of late. The competitiveness of prices quoted by suppliers from African countries whose market positions depend on low cost of production has contributed immensely in assisting them to diversify their export base that have predominantly depended on few traditional export crops (Takane, 2004). Evidence

provided by Norman (2007) suggests that a huge market potential exist for fresh organic fruits and vegetables in Ghana. Due to this great potential there has been an increase in the production of several horticultural commodities in the country. In the organic sub-sector, the land area under organic cultivation has increased from an estimated 5,453 hectares in 2003 to 19,132 hectares in 2006 (IFOAM and FiBL, 2006). The export values have also increased substantially from US$11.5 million in 1995 to US$75.64 million in 2006 where stakeholders are engaged in production, processing and marketing of fresh organic fruits and vegetables. Locally, urban and peri-urban vegetable production and marketing play important roles in the socio-economic development of Ghana as they ensure employment generation, wealth creation and poverty alleviation through provision of raw materials for local food industries and fast growing restaurants in most cities in the country (Nouhoheflin et al., 2004; Norman, 2007).

Gyau and Achim (2007) argue that the domestic market for organic produce and the future development of the organic sub-sector in Ghana would rely on the organic trading links with established export markets all over the world. In the US food industry, organic food products speedily emerged as far back as the early 1980s (Thompson, 1998). The market value of organic produce in Europe has also been increasing in the last few years, (Datamonitor, 2008; Briz and Ward, 2009). Organic farming system involves the production of agricultural produce without the use of chemical fertilizers and pesticides. Production and consumption of organic products are now high on the agenda of most policy makers worldwide due to food safety and environmental quality concerns. Nouhoheflin et al. (2004) argues that the consumption of fresh organic food products is seen as one of the best remedies toward the prevention of numerous health hazards associated with consumption of conventional foods in Africa. The risk to consumers, Nouhoheflin et al. (2004) note could be traced to inappropriate use of chemical pesticides and inorganic fertilizers by producers who may or may not be aware of the health hazards associated with chemical residue in vegetables and fruits.

Michaelidou and Hassan (2010) point out that the range of organic produce continues to expand as a result of the growing market potential. In spite of the numerous advantages from consuming organic food products, information on market demand and prospects appear to be limited (Wang and Sun, 2003). Lack of awareness of organic agriculture,

combined with dispersed supply, means that domestic markets for organic products are small, albeit growing. Various studies have considered development of the Ghanaian fresh fruit and vegetable industry and in particular, the prospects for smallholders and nontraditional exports under the economic liberalization in general (Takane, 2004; Achuonjei et al., 2005). Although we come across quite substantial consumer surveys on organic products from developed economies (Wier and Calverly, 2002; Cranfield and Magnusson, 2003), fewer studies exist on the willingness to pay for organic fruits and vegetables in Ghana and other developing economies (Piyasiri and Ariyawardana, 2002; Nouhoheflin et al., 2004; Rodriguez et al., 2007.Aryal et al., 2009). Using a double-bounded dichotomous choice technique, we estimate consumer's willingness to pay for organic fruits and vegetables with a Tobit model as the empirical strategy to address the possible distorted mean willingness to pay estimates when the contingent valuation survey data is characterized by zero willingness to pay responses. Based on these estimates, the market potentials for the organic fruits and vegetables are computed. Estimating the market potentials is critical in evaluating the viability and the maximum total sales potential for the market of organic fruits and vegetables in Ghana (Wolfe, 2006). This paper expands our understanding on the market potential for organic fruits and vegetables, as well as the attitudes and perception of consumers on organic food products in Ghana.

The next section briefly discusses willingness to pay and market potential. Section 3 presents the conceptual framework. Section 4 describes the data. Section 5 discusses the empirical results. Section 5 provides some conclusions.

2. Willingness to Pay and Market Potential

Several studies have investigated consumers' demand and willingness to pay for organic products. Gil et al. (2000) employed contingent valuation and found higher willingness to pay premiums for organic fruits and vegetables by Spanish consumers. Misra et al (1991) and Boccaletti and Nardella (2000) also used contingent valuation methods to analyze willingness to pay for pesticide-free fruits and vegetables in Italy and

United States of America. Usually hypothetical markets are set up in such contingent valuation surveys to solicit consumers' willingness to pay (Carson, 2002; Lusk and Hudson 2004) where respondents are asked to value their products, contingent on the available market of the produce (Quagrainie, 2006; Kimenju and De Groote, 2008). Qingbin and Junjie (2003) examined consumer preference and demand for organic apples and milk using a conjoint analysis. Nouhoheflin et al. (2004) employed hedonic pricing approach, which is an indirect method of valuation to assess consumers' perceptions and willingness to pay for organic vegetable in Benin and Ghana where results revealed a willingness to pay of more than 50% price premium for chemical free vegetables.

None of these studies however provided quantitative measures of the potential of these produce on the market. Market potential which is the maximum reasonable sales attainable under a given set of conditions within a specified period of time is critical in determining the economic feasibility of the product and maximum total sales potential for a given market (Lehmann and Winer, 2005). As Wolfe (2006) rightly points out, the market potential for a new product determines whether the market is large enough to support the viability of the product. The total value of the product is estimated by multiplying the mean willingness to pay by the number of population depending on the sample unit used (Asafu-Adjaye, 2000; Lehmann and Winer, 2005; Wolfe, 2006). Setting an upper boundary on the market size, the estimated market potential could be expressed in either units or sales (Wolfe, 2006). Estimating the market potential for a product requires specific information such as the number of potential buyers, an average selling price, and an estimate of the purchasing rate for a specific period of time.[1]

3. Conceptual Framework

As already indicated, the market potential for an organic product depends on the number of potential buyers, the frequency of purchase of the product and how much consumers are willing to pay (Lehman and Winer, 2005). Based on the random utility theory, willingness to pay could be considered as a consumer choice problem where consumers choose from a bundle of fresh organic and conventional food products that

[1] Once these information are obtained, the empirical market potential, M is computed as, $M = N \times P \times A$ where $N =$ Number of potential buyers, $P =$ average willingness to pay, and $A =$ Average annual purchasing.

provide them with the highest utility (Cranfield and Magnusson, 2003; Magnusson and Cranfield, 2005). If the utility of the organic food product does not change, then a rational consumer will not be willing to pay, as an increase in the price results in a lower level of utility compared to the base level utility. If the utility increases, the consumer may be willing to pay more for the product, on the basis that the price increase does not lower the utility beyond the base level.

If the expected utility of consuming the organic food product $E[\Gamma(\gamma^1)_i]$ is positive or exceeds the expected utility of consuming a conventional food product $E[\Gamma(\gamma^0)_i]$ then the consumer i would be willing to pay more for the organic food product. The parameters of this decision however are usually unobservable but could be represented by a latent variable:

$$E[\Gamma(\gamma^1)_i = 1] \text{ if } E[\Gamma(\gamma^1)_i] > E[\Gamma(\gamma^0)_i] \quad \text{and}$$

$$E[\Gamma(\gamma^1)_i = 0] \text{ if } E[\Gamma(\gamma^1)_i] < E[\Gamma(\gamma^0)_i] \tag{1}$$

The utility from consuming the organic food product, $\Gamma(\gamma)$ can then be related to a set of explanatory variables, X' such that:

$$\Gamma(\gamma) = \alpha' X_i' + \xi_i \tag{2}$$

where

X_i' is a vector of consumer specific and socioeconomic characteristics, product attributes and consumer perceptions, α' denotes a vector of parameters, and ξ_i is the error term with zero mean and constant variance. The probability that the consumer would be willing to pay for the organic product is formally expressed as:

$$\begin{aligned} \Pr(\Gamma(\gamma)_i = 1) &= \Pr\{E[\Gamma(\gamma^1)_i]\} > \Pr\{E[\Gamma(\gamma^0)_i]\} \\ &= \Pr(\xi_i > -\alpha' X_i') = 1 - \Omega(-\alpha' X_i') \end{aligned} \tag{3}$$

where Ω is a cumulative distribution function for ξ_i.

As indicated in (1), the consumers' willingness to pay is specified as a function of the change in utility arising from the consumption choice:

$$WTP = \phi[\Delta\Gamma(\gamma)] \tag{4}$$

where $\Delta(\Gamma)$ is the change in utility and $\phi' > 0$.

In this present paper, the consumers' willingness to pay stated in (4) is obtained through the double-bounded dichotomous choice framework proposed by Hanemann et al. (1991) in which two consecutive bids are proposed to consumers, with the second bid contingent on the response to the first bid.[2] The consumer who responds "YES" to the first bid P_i^1 is presented with a second higher bid, P_i^{2H} $(P_i^{2H} > P_i^1)$. If the response to the first bid was "NO", the respondent is presented with a second lower bid, P_i^{2L} $(P_i^{2L} < P_i^1)$ giving four possible responses; "$YES-YES$" (YY),"$YES-NO$" (YN),"$NO-YES$" (NY) and "$NO-NO$"(NN).

The log-likelihood function for the double-bounded dichotomous choice is given as:

$$\ln L(\Phi) = \sum_{i=1}^{n}\Big\{F_i^{YY}\ln\Pi^{YY}(P_i^1,P_i^{2H}) + F_i^{NN}\ln\Pi^{NN}(P_i^1,P_i^{2L}) + F_i^{YN}\ln\Pi^{YN}(P_i^1,P_i^{2H}) + F_i^{NY}\ln\Pi^{NY}(P_i^1,P_i^{2L})\Big\} \quad (5)$$

where F_i^{YY}, F_i^{NN}, F_i^{YN} and F_i^{NY} are binary variables denoting 1 in each case if the statement is true and 0 otherwise.

As already noted in (2) and (4), the consumer chooses an alternative γ^1 over γ^0 if the change in utility is positive, $\Delta\Gamma = \Gamma(\gamma^1) - \Gamma(\gamma^0) > 0$ for all $\gamma^1 \neq \gamma^0$ and without loss of generality; the consumers' willingness to pay can be expressed as:

$$Q_i = \boldsymbol{Z}_i\beta + \varepsilon_i \quad (6)$$

$$\text{where } Q_i = \begin{cases} 1, \text{ if consumer responded } YES-YES, \text{ or } YES-NO \text{ or } NO-YES \\ 0, \text{ if consumer responded } NO-NO \end{cases} \quad (7)$$

$\boldsymbol{Z}_i = Z_{\tau^1} - Z_{\tau^0}$, and $\varepsilon_i = \varepsilon_{\tau^1} - \varepsilon_{\tau^0}$. The matrix $\boldsymbol{Z}_i$ includes consumer specific and household characteristics since WTP is likely to vary among consumers (Cranfield and Magnusson, 2003). Also included in the matrix are consumer preferences for organic product attributes such as color, freshness, and size, and consumer perceptions on organic food products. The choice of the consumer is not deterministic given that ε_i is unobservable and stochastic. If the error term ε_i is assumed to be logistic distributed, then the parameters of the model are obtained through maximum likelihood estimation.

[2] Double-bounded approach provides a more tighter confident interval of willingness to pay estimates and is considered more superior to the single bound approach.

Estimating an ordered probit model also allows the computation of predicted probabilities for each WTP category and marginal effects (Cranfield and Magnusson, 2003).

One of the main goals of a contingent valuation survey is to obtain an estimate of the mean willingness to pay (Yoo and Yang, 2001; Carson, 2002; Kimenju and De Groote, 2008). As indicated in (7), the sample consisted of two groups of respondents; those who were willing to pay for the two proposed bids ($YES-YES$, $YES-NO$ and $NO-YES$ responses) and those who were unwilling to pay for any of them ($NO-NO$). To estimate the mean willingness pay as well as parameters of the WTP model efficiently, the tobit model is estimated to address the censored dependent variable which comprised of zero willingness to pay among respondents (Werner, 1999; Carlsson and Johansson-Stenman, 2000; Yoo et al., 2001; Greene, 2008).

4. Data description

The data used in the present paper was obtained from a contingent valuation survey among 429 consumers in the Kumasi metropolis of Ghana in 2008. Based on the income status of the households in the metropolis, a direct face-to-face interview was undertaken with respondents in charge of food purchases in the households.[3] The income stratification of suburbs by the Kumasi Metropolitan Assembly comprises of low (50.7%), middle (30%) and high (19.3%) income residential areas (GLSS, 2000). A total of 218 respondents were randomly selected from 10 suburbs in the low income category, 127 respondents from 6 suburbs in the middle income category, and 84 respondents from 4 suburbs in the high income category. The prices of organic lettuce and water melon were collected from the food markets in Asafo and Central markets of Kumasi metropolis. The hypothetical bid prices for 0.5kg of lettuce was estimated at GH¢0.15 and 3.50kg of water melon was GH¢1.80. Consumers exhibited varying WTP responses (table 1). Compared to conventional food products, the proportion of consumers who were willing to pay 1%–50% price premiums for organic water melon were relatively higher than organic lettuce. The double-bounded dichotomous choice responses from consumers to the proposed price bids also indicated not much significant between

[3] Carson (2002) has pointed out that direct face-to-face interviews are more reliable approach in contingent valuation studies.

$YES-YES$, $YES-NO$, $NO-YES$ and $NO-NO$ responses for organic water melon and organic lettuce, although the $YES-YES$ response for organic water melon was slightly higher than that of organic lettuce.

Table 1. WTP for Price Premium for Organic Products

	Lettuce	Water Melon
Weight of products (kg)*	0.15	3.50
Hypothetical bids (GH¢)	0.15	1.80
Not willing to pay	13.1% (56)	13.5%(58)
Willingness to pay 1% – 50% premium	16.3% (70)	82.0%(352)
Willingness to pay above 50% premium	70.6% (303)	4.5%(19)
YES–YES responses	63.2% (271)	62.2% (267)
YES–NO responses	9.3% (40)	9.8% (42)
NO–YES responses	14.0% (60)	14.2% (61)
NO–NO responses	13.5% (58)	13.8% (59)

Note: Figures in parentheses are frequencies of respondents.
1 US Dollar ($) =1.2141 Ghana New Cedi (GH¢) in 2008.
Source: Author's calculations

Over 70% of the consumers had completed junior and senior high school education. The average number of years of education of 8 years indicates that the study captured more educated consumers.[4] Lower income earners were 51% and higher income earners were 42% (table 2). Consumer's awareness on organic products was relatively high with most of them acquiring this knowledge through the media, relatives and friends. For example, 47% had knowledge on organic products and as much as 93% considers consumption of conventional food as risky to one's health. Freshness (62%) and color (49%) of lettuce were the most relevant product attributes to the consumers. Also about 48% of them consider freshness and color before they purchase organic water melon.

Table 2. Variables used in the regression models

Variable	Definition of variable	Mean	S. d
Dependent Variables			
WTPLETT	Willingness to pay for organic lettuce	0.87	0.44
WTPWMLN	Willingness to pay for organic water melon	0.86	0.33
Independent Variables			
Socio-economic characteristics			
AGE 1	1 if consumer's age is less than 35 years, 0 otherwise	0.51	0.43

[4] The average number of years of education in Ghana is about 5.16 (GLSS, 2000).

AGE 2	1 if consumer's age is from 35 – 49 years,0 otherwise	0.33	0.47
AGE 3	1 if consumer's age is above 50 years , 0 otherwise	0.16	0.37
FEMALE	1 if consumer is a female, 0 otherwise	0.93	0.26
CHILD	Children less than 15 years	3.37	2.25
NEDU	1 if consumer has no formal education, 0 otherwise	0.13	0.34
JHSMEDU	1 if consumer has junior high education, 0 otherwise	0.50	0.50
SECOLL	1 if consumer has senior high education, 0 otherwise	0.24	0.43
TEREDU	1 if consumer has tertiary education, 0 otherwise	0.03	0.17
INCOMELOW	1 if consumer's average monthly income is up to Gh¢100, 0 otherwise	0.51	0.50
INCOMEMID	1 if consumer's average monthly income is between Gh¢100 and Gh¢200, 0 otherwise	0.07	0.26
INCOMEHIGH	1 if consumer's average monthly income is more than Gh¢200, 0 otherwise	0.42	0.49
Awareness and perceptions			
ORINFO	1 if consumer is aware of organic products, 0 otherwise	0.47	0.50
BENFTPERC	Benefit perception	0.76	0.43
QUALTPERC	Quality perception	0.60	0.44
Vegetable attributes			
COLOUR	1 if consumer considers vegetable colour, 0 otherwise	0.49	0.43
FRESHNESS	1 if consumer considers vegetable freshness, 0 otherwise	0.62	0.48
SIZE	1 if consumer considers vegetable size, 0 otherwise	0.40	0.24
INSDAMF	1 if consumer considers insect damage to vegetable , 0 otherwise	0.44	0.27
Fruit attributes			
COLOUR	1 if consumer considers fruit colour, 0 otherwise	0.48	0.50
FRESHNESS	1 if consumer considers fruit freshness, 0 otherwise	0.48	0.50
SIZE	1 if consumer considers fruit size, 0 otherwise	0.32	0.46
INSDAMF	1 if consumer considers insect damage to fruit, 0 otherwise	0.24	0.43

Note: 1 US Dollar ($) =1.2141 Ghana New Cedi (GH¢) in 2008
Source: Field Survey

consumption. Consumer's perception on the quality and benefits from consuming organic fruits and vegetables were also explored (Hughner et al., 2007). The responses from the

Table 3. Consumers' attitude and perception on organic products

Perception statements	Benefit			Quality		
	Organic products are healthier	Organic products are tastier	Benefit perception index (BPI)	Organic products have no harmful effects	Organic products have superior quality	Quality perception index (QPI)

Number of consumers						
Strongly disagree (score = -1)	10	9		4	32	
Disagree (score =- 0.5)	23	15		26	38	
Neutral (score = 0)	12	18		12	18	
Agree (score=0.5)	85	88		155	140	
Strongly Agree(score = 1)	299	299		232	201	
Mean score						
Consumer Aware	0.67	0.69	0.68	0.58	0.5	0.54
Consumer not aware	0.81	0.83	0.82	0.77	0.52	0.65
Overall	0.75	0.76	0.76	0.68	0.51	0.60

Source: Author's calculations

perception statements were measured on a five point likert scale with score from -1 for "strongly disagree", -0.5 for disagree, 0 for "neutral" to 0.5 for agree and +1 for "strongly agreed". Consumers' perception on organic fruits and vegetables were generally positive giving benefit and quality perception indices of 0.76 and 0.66 respectively (table 3).

The dependent variables in the logit models were binary indicating 1 if the consumer is willing to pay for organic lettuce or water melon, and 0 otherwise in each case. In the ordered probit model where predicted probabilities and marginal effects were computed, the dependent variable was measured on an ordinal scale comprising of WTP categories of consumers who were not WTP any price premium for the organic products, those who were WTP 1% – 50% price premiums and those who were willing to pay above 50% price premiums for organic lettuce and water melon. As already noted, mean WTP estimates for organic lettuce and water melon were obtained by estimating a Tobit model which has a censored dependent variable consisting of both continuous and zero observations. Consumers with higher education are expected to appreciate issues of preventive health care through the consumption of chemically-free food products better than the less educated (Piyasiri and Ariyawardana, 2002). The income variables are

expected to be positively related to the WTP for organic fruits and vegetables in order to agree with economic theory (Asafu-Adjaye, 2000).

5. Empirical Results

The maximum likelihood estimates of the logit models explaining consumer's WTP for organic lettuce and water melon are provided in table 4. The age and income variables were all positive but insignificant in the WTP models for lettuce and water melon. This empirical finding agrees with Smith et al. (2008) for US consumers but contrast with studies which indicated a negative relationship between age and WTP for organic products (Misra et al. 1991, Loureiro and Hine, 2002; Arbindra et al., 2005). The results on the gender variable indicate that females are more sensitive to food safety problems than their male counterparts (Arbindra et al., 2005). The coefficient of JHSMEDU and TEREDU were positive and statistically significant in the WTP model for organic lettuce. These empirical findings are consistent with the preposition by Piyasiri and Ariyawardana (2002) that highly educated consumers are more WTP for organically produced vegetables. For organic water melon, the variables representing no education and junior high school were rather positive and significant indicating that both the educated and the less educated tend to consume more organic fruits in Kumasi metropolis. This empirical result agrees with the studies by Du Toit et al. (2003) for consumers in South Africa and Akgüngör et al. (2007) for Turkish consumers which showed a positive correlation between education and WTP for organic fruits.

All the income variables had the positive hypothesized signs in the models for organic lettuce and water melon but none was statistically significant. As Asafo-Adjaye (2000) points out, income variable is expected to have a positive relationship with WTP in order to agree with economic theory. The variable representing CHILD was positive and significantly related to consumers' WTP for organic lettuce and water melon. The empirical results thus indicate that consumers with more children (less than 15 years) are likely to pay more premiums for organic fruits and vegetables. The presence of larger number of children in a household is likely to have a positive association with consumers' WTP for organic food products because of their superior quality and health

Table 4. Maximum likelihood estimates on consumers' WTP for organic products

Variable	Lettuce			Water melon		
	Coefficient	z-value	Marginal probabilities	Coefficient	z-value	Marginal probabilities
CONSTANT	-2.4305***	-2.60				
Socio-economic characteristics						
AGE 1	0.1396	0.39	0.0252	0.3074	0.86	0.0249
AGE 2	0.0420	0.11	0.0076			
AGE 3				0.5088	0.96	0.0356
FEMALE	0.5475	1.24	0.1104	-1.2008	-1.50	-0.0646
CHILD	0.1338**	2.41	0.0241	0.1806**	2.29	0.0145
NEDU	0.7613	1.55	0.1170	1.2083*	1.79	0.0691
JHSMEDU	0.9083**	2.33	0.1636	0.8886*	1.88	0.0729
SECOLL	0.5812	1.35	0.0964	0.0716	0.14	0.0057
TEREDU	1.7317*	1.80	0.1912	0.8503	0.73	0.0497
INCOMELOW				0.0572	0.10	0.0046
INCOMEMID	0.2044	0.43	0.0352			
INCOMEHIGH	0.2358	0.87	0.0421	0.3364	0.55	0.0265
Awareness and perceptions						
ORINFO	0.0773	0.30	0.0140	0.7952**	2.13	0.0635
BENFTPERC	1.3596**	2.12	0.3047	1.4415	1.29	0.1921
QUALTPERC	0.7780	1.28	0.1628	2.7856**	1.95	0.0981
Product attributes						
COLOUR	-0.6951***	-2.70	-0.1205	0.2649	0.84	0.0214
FRESHNESS	0.5626**	2.11	0.1027	1.0375***	2.99	0.0829
SIZE	0.3687	1.37	0.0651	-0.6715*	-1.85	-0.0594
INSDAMF	-0.8667**	-2.14	-0.1820	-0.1301	-0.36	-0.0108
Observations	429			429		
Log-likelihood	-221.90			-142.92		
Pseudo R^2	0.0991			0.1301		

*** =significant at 1%; ** =significant at 5%;*= significant at 10%
Source: Author's calculations

benefits of consuming organic food. Knowledge of consumers on organic food products had a positive significant effect on willingness to pay for organic water melon agreeing with a U.S. consumer survey by Govindasamy et al. (2006). The variable representing awareness on organic products (ORINFO) exhibited the expected positive signs in both models suggesting that consumers who are aware of organic products are likely to pay higher premiums for them. This finding concurs with the study by Govindasamy et al. (2006) for U.S. consumers. The benefit perception variable, BENFTPERC was positive and statistically significant for organic lettuce indicating that consumer's perception on improved taste of organic vegetables for instance, is one of the relevant factors which

could influence WTP for organic vegetables (Nouhoheflin et al., 2004). The quality perception variable, QUALTPERC indicating harmful effects of consuming conventional food products, had a significant negative relationship with WTP for organic water melon, which supports the notion that relative to conventional crops, consumers place higher premium on the quality of organic fruits.

The predicted probabilities for the three WTP categories indicate a strong likelihood that the average consumer is willing to pay some premium for organic food products.[5] It is however interesting to note that for the age variable, we have positive marginal effects of WTP categories (i.e. not WTP and WTP 1%–50% premium) for organic lettuce while the marginal effect of WTP for over 50% premium is negative. The marginal effects for the education variable show negative marginal effects for organic lettuce for the first two WTP categories but the third category show a positive marginal effect. The same cannot be said about organic water melon as the category representing not WTP gave negative effects with the rest exhibiting positive marginal effects. Also revealing is the fact that for the education variable, marginal effects of all the three WTP categories for organic lettuce are higher than that of organic water melon. Similar signs were obtained for the income variables. Product attributes such as colour and freshness have positive marginal effects for water melon for the second and third WTP categories but negative for not WTP for any premium. For organic lettuce, the marginal effects of the first two WTP categories are negative but consumers WTP for over 50% rice premium is positive.

The estimates on factors influencing how much consumers are willingness to pay for organic lettuce and water melon are presented in table 5. From the likelihood ratio test, the null hypothesis that the estimated coefficients are jointly equal to zero is rejected at

Table 5. Tobit estimates on the extent of consumers' WTP for organic products

	Lettuce		Water melon	
Variable	Coefficient	t-value	Coefficient	t-value
CONSTANT	-0.1435*	-1.83	1.6667***	5.16
Socio-economic characteristics				
AGE 1	-0.0038	-0.13	0.1031	1.14

[5] In the interest of brevity, the estimated results on the ordered probit models for organic lettuce and water melon are not reported here, but are available upon request from the authors.

AGE 2	-0.0131	-0.44		
AGE 3			0.1201	0.97
FEMALE	0.0274	0.73	-0.1725	-1.10
CHILD	0.0087**	2.23	0.0476***	2.90
NEDU	0.0487	1.21	0.2744*	1.63
JHSMEDU	0.0588*	1.74	0.2866**	2.05
SECOLL	0.0443	1.20	0.0884	0.57
TEREDU	0.0957	1.54	0.3218	1.23
INCOMELOW			0.0189	0.12
INCOMEMID	0.0258	0.69		
INCOMEHIGH	0.0233	1.10	0.0900	0.57
Awareness and perceptions				
ORINFO	0.0047	0.23	0.1630*	1.88
BENFTPERC	0.1467**	2.53	0.3395	1.44
QUALTPERC	0.0794	1.52	0.3421	1.58
Product attributes				
COLOUR	-0.0449**	-2.27	0.0590	0.73
FRESHNESS	0.0491**	2.38	0.2114***	2.61
SIZE	0.0276	1.33	-0.1683*	-1.88
INSDAMF	-0.0729**	-2.03	0.0065	0.07
Mean WTP	0.1890		1.9920	
Number of observations	429		429	
Log-likelihood	-221.90		-517.09	
LR $\chi^2(18)$	48.84(0.0001)		37.38(0.0047)	
Pseudo R^2	0.0991		0.0349	

*** =significant at 1%; ** =significant at 5%;*= significant at 10%
Source: Author's calculations

1% in each model for organic lettuce and organic water melon. Interestingly, the Tobit estimates do not differ much from the maximum likelihood estimates from the logit model in terms of signs and significance of the variables investigated. The estimated mean WTP for organic lettuce is GH¢0.189 (US$0.156) and that of organic water melon is GH¢1.992 (US$1.641). Based on the empirical mean WTP estimates, and information on the number of potential buyers and average annual purchasing, the market potentials of the organic food products were computed (Asafu-Adjaye, 2000; Wolfe, 2006). The total market size for organic lettuce as reported in table 6 is estimated at GH¢1,991,224 (US$1,640,083) and that of organic water melon is GH¢32,117,113 (US$ 26,453,433) indicating a huge market potential for organic fruits in Ghana compared to organic vegetables.

Table 6. Empirical estimates on market potential of organic products

Variable	Lettuce	Water melon
Frequency of purchase per month	3.79	5.80
Frequency of purchase per year	45.48	69.60
Potential buyers of products	231653	231653
Empirical mean WTP (GH¢)	0.1890	1.9920
Estimated market potential (GH¢)	1,991,224.33	32,117,113.21
Estimated market potential (US$)	1,640,082.63	26,453,433.17

Note: 1 US Dollar ($) =1.2141 Ghana New Cedi (GH¢) in 2008
Source: Author's calculations

6. Conclusions

This paper investigated the market potential of organic lettuce and water melon with a recently collected data among 429 consumers in Kumasi metropolis of Ghana. Consumer knowledge and perceptions on organic products were assessed, as well as the WTP to pay for some selected organic products. Using a double-bounded dichotomous choice contingent valuation technique, consumer's mean WTP was estimated with a Tobit model to take care of the possible distorted mean willingness to pay estimates when zero WTP responses are allowed in dichotomous choice contingent valuation. As much as 71% of the consumers are willing to pay over 50% price premiums for organic vegetables and over 82% are willing to pay 1%–50% price premiums for organic fruits. The empirical results indicate that human capital, product attributes and consumer perception influence consumers' WTP for organic food products. Consistent with other existing studies, our empirical findings revealed that socioeconomic factors, environmental and health concerns are relevant in consumer preferences for organic products. In addition, the study finds product attributes important for consumers to pay higher price premiums for organic products. The estimated market potential for organic fruit and vegetable per annum is GH¢32,117,113 (US$ 26,453,433) and GH¢1,991,224 (US$1,640,083) suggesting a huge market potential for organic fruits in Ghana.

Organic products are considered worldwide as superior in quality to conventionally produced products in terms of health and environmental benefits. Some policy measures need to be put in place by governments, non-governmental organizations and other stakeholders to promote consumption of organic products. These include creating awareness on the relevance of consuming organic products through effective marketing

and educational campaigns. Efforts should also be made to differentiate organic fruits and vegetables from the conventional products through labelling in order to assist consumers who are willing to pay realistic price premiums for organic fruits and vegetables on the market. Since market potential for organic products exist in Ghana, producers and retailers should be assisted and provided with the technical expertise on how to maintain freshness and wholesomeness of their organic products so as attract the maximum price premium from consumers and also increase patronage.

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