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Assessment of developing-country urban consumers' willingness to pay for quality  
of leafy vegetables: The case of middle and high income consumers in Nairobi,  
Kenya

By

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**Assessment of developing-country urban consumers' willingness to pay for quality of leafy vegetables: The case of middle and high income consumers in Nairobi, Kenya**

**Abstract**

*The improvement in income in developing countries has led to emergence of middle and high income consumers in urban centers. Improvement in income usually causes the shift to consumption of non-staples including leafy vegetables. Thus in major developing country urban centers there has been rapid expansion of the grocery sections featuring leafy vegetables in leading retail stores. Specialty stores have also emerged featuring broad range vegetables. Many middle and high income consumers shop these stores. This study examines the willing of the middle and high income consumers who shop specialized stores to pay for quality of leafy vegetables and drivers of willingness to pay for quality. The study uses contingent valuation and the payment card method in eliciting consumers' WTP. It considers a broad range of quality attributes including safety, nutrition, environmental friendliness, hygiene in handling. The study finds that mean willingness to pay for quality is higher among high income consumers (>60%). It also finds that income, age of children the consumer has, access to information of food safety are among the significant drivers of kale consumers' willingness to pay for quality of kales. The study concludes that there is demand for quality of leafy vegetables and discusses policy implications.*

**Key words:** Willingness to pay, food safety, urban consumers, leafy vegetables, Kenya

## **1. Introduction**

Half of the world's population lives in cities and towns with many poor urban dwellers facing problems in gaining access to adequate supplies of nutritionally balanced food. The main source of food to urban population is urban and peri-urban agriculture. In particular, rapidly growing cities in Sub-Saharan Africa (SSA) are increasingly relying on small scale peri-urban agriculture for provision of fresh food, especially perishable vegetables. Studies in Uganda and Rwanda have shown positive correlations between food production and improved nutrition, owing to higher and more stable access to food virtually throughout the year (Gordon, 2006).

In the policy arena, pesticide and fertilizer residues in food are at top among the food safety concern (Okello and Swinton, 2007). Use of sewage and polluted waste water is emerging issue in food policy. The use of wastewater for irrigation without adequate regulations and technology, however, generates major health risks to farmers, farm families, domestic consumers, farm animals, as well as to wildlife. Studies show that the use of untreated waste water generates several health risks associated with internal parasites, bacterial and viral infections, and can cause both acute and chronic illness (Scott et al., 2004; Shan et al., 2008; Arora et al., 2008). Use of sewage water also results in excessive accumulation of heavy metals in soils which in turn leads to elevated heavy metal uptake by crops, which may affect food quality and safety (Muchuweti et al., 2006).

The demand for produce with specific physical attributes such as, color, shape, size and spotlessness by consumers has encouraged farmers to rely increasingly on the use agrochemical in particular pesticides to control pests and diseases (Thrupp et al., 1995; Okello and Swinton,

2010). Throughout developed countries, food quality and safety have become increasingly important attributes driven by consumers' lifestyle changes and income among other factors (Okello et al, 2009; Mergenthaler et al., 2009). As consumers' lifestyle changes, so are the changes in demand for products with a bundle of specific attributes that often include the safety of the produce (Freidberg, 2003; Henson and Reardon, 2005). Consumer concerns about the safety of the vegetables arise from the increase in the food borne illnesses.

In many developing countries, a significant proportion of fresh produce consumed in the urban areas are grown in the urban and peri-urban plots. Some of these farms depend on waste water and or water sources likely to be contaminated by municipal wastes for irrigation containing loads of pathogens and non-microbial contaminants (IMWI, 2006; IFPRI, 2008). Other production-level hazards associated with fresh produce consumed in urban centers are likely to emanate from contaminants originating from industrial wastes, vehicle exhaust, dusts from the roads and the use of uncured animal manure (Hide et al., 2001). At the same time, the demand by consumers for aesthetic attributes (e.g., spotlessness and good looking produce) by urban consumers has encouraged excessive use of pesticides and chemical fertilizers (Karanja et al., 2008). From food safety perspective there are concerns that accompany health hazards or risks arising from such contaminants that could undermine nutritional and social development benefits of urban and peri-urban agriculture.

In many developing-country urban centers, the recent improvements in income have led to emergence of middle and high income consumers that are more concerned about medical health and safety of their food (Regmi and Gehlhar, 2005). Increasing proportion of this middle and high income groups consumes fresh produce (especially leafy vegetables) as salads, or cooked,

blanched, and juiced. These emerging group of consumers are also concerned about the safety of vegetables they consumer. At the same time, many low income households still depend on leafy vegetables sold in the wet/spot markets because they are generally inexpensive. While leafy vegetables sold in wet markets are cheaper, the middle and high income consumers generally tend to do their purchases in higher more specialized retail places. Is decision of these middle and high income consumers to shop in the specialized retail stores driven by their concern for the quality of leafy vegetables retailed in wet markets? Are they willing to pay for safety of vegetables they consume? If so, how much and what affects their willingness to pay for the produce?

A number recent studies have examined consumers' willingness to pay (WTP) for food quality and safety (Batte et al. 2006; Poole and Gimenez, 2006; Carlson et al., 2007; Liu et.al, 2009). Most of these studies have, however, mainly focused on developed countries. Some studies have examined consumer valuation of the safety of food production processes in developing countries (Akgüngör, et al., 2007; Lacaze et. al., 2009; Mergenthaler et al., 2009; Lippe et al., 2010). However, studies that assess the willing to pay by developing countries remain scarce. At the same time most of them have focused on a narrow range of quality attributes such as pesticide residue alone (Hammit et al., 1999; Nouhoheflin et al., 2004) and environmental friendliness (Schmidt and Vani-Anunchai, 2004). Yet, in commodities such as leafy vegetables, the quality is often a bundle of many attributes in which these pesticides residue and environment as just a subset. Our study differs from earlier ones by examining consumers' willingness to pay for a whole range of quality attributes that comprise the quality bundle in kales. Knowing consumers' willing to pay to avoid hazards associated with contaminants can be helpful in formulating policies for regulating vegetable production, transportation and retailing. Hence the overall

purpose of the study is to assess the urban consumer's willingness to pay (WTP) for quality of leafy vegetables. The specific objectives of the study are to:

- (i) Assess Nairobi consumers' WTP for the safety of leafy vegetables they consume
- (ii) Examine the factors influencing Nairobi consumers' WTP for the safety of leafy vegetables.

This study focuses on kales produced in peri-urban areas for sale in Nairobi supermarkets and specialty stores. Kales are the most important green leafy vegetables consumed by households in Nairobi and play an important role in nutritional balance (WHO/FAO, 2003). However, kales entail various food safety risks, including microbial pathogens, heavy metals, and pesticide and fertilizer residues which pose public health risks to urban consumers. Kales are a very perishable produce hence a significant amounts sold in Nairobi emanate from the peri-urban. At the same time, to keep it fresh and appealing, most retailers of kales sprinkle or moisten it with unclean and sometimes polluted water (Irungu and Mburu, 2007). The rest of the paper is organized as follows: Section 2 present the conceptual framework. Section 3 presents the study methods while Section 4 presents the results. Section 5 concludes.

## **2. Conceptual framework**

This study uses contingent valuation technique to elicit urban consumers WTP for safety of kales and the drivers of WTP. In contingent valuation, WTP approaches draw upon stated preferences to estimate the value people place on non-market goods. Similar to analysis based on revealed preferences, WTP analysis is based on utility maximization theory. WTP has conventionally been used for the valuation of public goods (e.g. environmental services). Recently, it has also

been applied in market research for private goods (Lusk and Hudson, 2004; Carlos, 2007). In this study, WTP can be interpreted as an indicator of demand for safe leafy vegetables (that is, vegetables characterized by low pesticide and nitrogenous fertilizer residue levels, heavy metals and pathogens). Other than assessing the market potentials for specific products, WTP analysis provide better understanding of general market trends and identify appropriate policy responses.

We assume that each person  $i$  has a willingness to pay for safer leafy vegetables and their attributes from peri and urban areas  $Y_i^*$  and is related to the person's characteristics  $X_i$  in the following way:

$$Y_i^* = X_i\beta + \varepsilon$$

where  $\beta$  is a vector of coefficients,  $\varepsilon_i$  is the stochastic term assumed to be mean zero and normally distributed. The model was estimated using Tobit regression with left censored at  $WTP \leq 0$ . The Tobit model uses MLE to estimate both  $\beta$  and  $\varepsilon$ . The maximum likelihood function command in STATA 10 was used. Bootstrap standard errors (200 replications) are used to calculate the 95% confidence interval.

### 3. Methods

#### 3.1 Empirical method

This study employs valuation scenarios elicited as stated preferences. Stated preferences are more reliable for products that respondents are familiar with. Two product scenarios were developed. The scenarios presented to consumers were as follows:

**Product scenario 1 (the status quo):** Kales are sourced from peri-urban areas and grown using sewer water and harvested even after pesticides have just been applied. It is washed/dipped/sprinkled/moisten with brown (dirty) water contained in a bucket in the market. Sellers don't wash their hands before handling the product and keep/display the product in dirty areas.

**Product Scenario 2 (hypothetical scenario):** Clean water is used for irrigation. The amount of residues from pesticides, herbicides, fertilizers and water sources are within acceptable levels from a human health perspective. The product is washed in running portable/tap water during retailing at the market and covered during transportation. The product is hygienically stored, handled, and presented in the market.

The CV market simulation approach employed used a payment card method due to its simplicity and ability to obtain precise WTP estimates. It was also selected so as to minimize the probability of starting point bias found in interactive bidding techniques. The respondents were asked to state their willingness to pay some pre-chosen amount in payment card ranging from zero to sixteen shilling per bundle above their original purchase price of one bundle. They were advised to select the additional payment only if they were prepared to pay it regularly.

Table 1 provides the summary statistics of the variables used in examining the drivers of kale consumers' willingness to pay for quality of kales.

**Table 1: Summary statistics of variables used in empirical estimations (n =150)**

Variables	Mean	Standard deviation	t-test	p-value
WTP (Kenya Shilling)	8.48	5.42	19.21	0.000
Age (years)	34.93	11.26	38.11	0.000
Gender ( 1=male, 0=female)	0.41	0.49	10.22	0.000
Year of schooling (years)	14.00	3.21	53.59	0.000
Kids less than 2 years of age	0.34	0.47	8.75	0.000
Kids of age 2-5years	0.42	0.49	10.36	0.000
Kids between age 5-16	0.40	0.49	10.08	0.000
Income level (Kenya Shillings)	154410.60	207051.02	9.16	0.000
Social org. membership (1=member, 0=not a member)	0.45	0.50	10.97	0.000
Access to information on food safety (1=has access, 0= does not have access)	0.25	0.57	13.494	0.000

The mean willingness to pay for quality is Ksh 8.5 indicating the kale consumers are willing to pay, on average, Ksh 8.5 more than the retail price for the quality of the kale they consume. The summary statistics further show that the average age and years of education of the consumers are 35 and 14 years, respectively. This indicates that most of the shoppers in supermarkets and specialty stores are in their middle ages and have college education or more.

### 3.2 Data

The study focused on two market segments namely the high-end (specialty) stores and supermarkets which are becoming increasingly important grocery retail outlets for the middle

and high income consumers in developing country urban areas. The segments were selected to represent socioeconomic classification. The study sites were first purposively selected to represent the medium income (supermarkets) and high income (specialty store) shopping areas. These areas formed the 2 strata used in this study. Systematic random sampling was then used to pick respondents in each stratum in purchase points. Every third kale buyer was sampled and interviewed until the quota for the target store was attained. Substitution method was used in case of the rejection. Probability proportion to size sampling techniques was used to determine the number of respondents to interview in each of the strata. Data was collected through personal interviews using pre-tested questionnaires between April and May 2010. A total of 150 responses are used in this study. The data collected included socioeconomic and demographic characteristics, perceptions and ranking of various attributes of quality and consumers' willing to pay for leafy vegetables safety.

## **4. Results**

### **4.1 Characterization of sampled consumers**

Table 2 presents the characteristics of the consumers interviewed in this study by market segment. As shown, approximately 62 percent females in the sample purchase kales in the supermarkets. On the other hand, 53% of the respondents who purchased kales in specialty (high-end) stores were male. In overall 59% were female indicating that female consumers are more careful about the quality of kales they consume. Majority of these supermarket and specialty store shoppers were married. Results also indicated that approximately 40% and 60% of the consumers that purchase their kales in supermarkets and specialty stores, respectively, have university education or higher. These findings corroborate those of Kimenyu (2008) and indicate that consumers with higher education are more discerning about the safety/quality of the

vegetable they consume. They also conform with our theoretical expectations since more educated people are likely to earn higher incomes with is associated with demand for food safety. Indeed, the results show that 69% and 62% of the respondents who purchase kales in supermarkets and specialty stores, respectively, are in full-time permanent employment. That is, kale consumers who shop this two market segments are of high social status. Results however show that, overall, there is less participation in social organizations by consumers who purchase their kales in supermarkets and specialty markets.

**Table 2: Consumer characteristics by markets segment (%)**

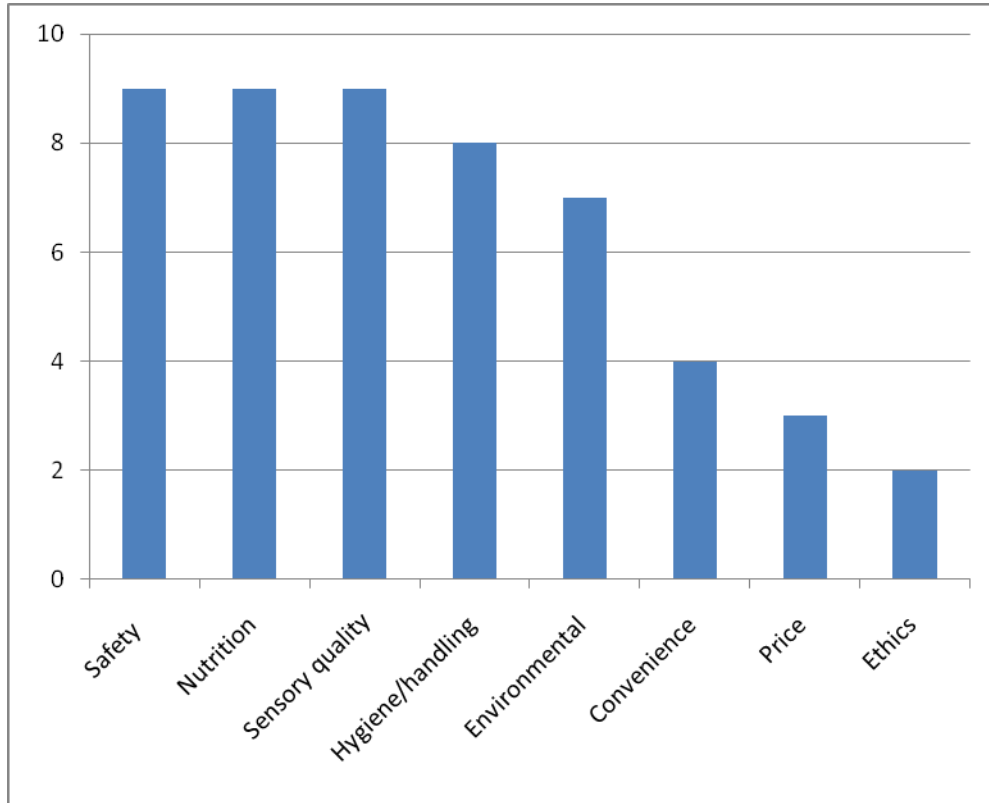
Variable	category	Market segment		% respondent
		Supermarkets	Specialty store	
Gender	Female	62	47	59
	Male	38	53	41
Years of education	Primary education	15	3	12
	Secondary education	24	6	19
	College	22	17	21
	University	39	67	46
	PhD or equivalent	0	8	2
Status of employment	Full time employed	62	69	64
	Part time employed	11	3	9
	Self employed	11	11	11
	Student	10	8	9
	Retired	5	3	5
	Unemployed	2	6	3
	On retirement benefits	0	0	0
Sample size (n)		114	36	150

## **4.2 The importance quality attributes to the kales buyers**

Discussions with consumers revealed that majority of those who shopped supermarket and specialty stores associated these stores with good quality. They in general assumed that kales offered for sale in these stores came from controlled sources. Majority believed that the stores had control over the kinds and quantities of pesticides applied, the quality of water used for irrigation, the suitability of the soil and manure used and the kind of handling and transportation. The consumers generally believed that the kale sold in supermarket and specialty stores were grown using safe (i.e, non toxic pesticides or bio-pesticides) and that the soils in which they were grown was free from harmful heavy metals and pathogens. In addition, they believed that water used for irrigation and for washing/ moistening kales in the farm and the stores was free from harmful pathogens (especially those that cause typhoid, cholera, and amoebiosis). The consumers further believed that kales sold in the supermarket and specialty stores were hygienically handled and transported to reduce contamination with pathogens or smoke from vehicle exhausts, respectively.

Based on the above beliefs, we investigated the importance kale consumers attach on the quality of kales they purchase. The quality attributes considered were safety, nutritional content, sensory quality, hygiene and handling, environmental friendliness, convenience, unit price and ethics. Figure 1 presents consumers' mean ranks attached to various quality attributes by the consumers interviewed. As shown, safety and hygiene are highly ranked compared to price and convenience. These results support earlier findings that consumers who shop supermarket and specialty markets attach great significance to the safety when deciding where to purchase kales. Other quality attributes that are highly ranked by consumers were nutrition, environmental friendliness and sensory quality. These attributes are referred to as credence attributes because

they are not observed either upon consumption or not at all. Previous studies indicate that consumers who value such attributes to be more educated and possess higher incomes.



**Figure 1: Ranking of importance of quality attributes by Nairobi kale consumers**

Majority of consumers use different kinds of signals of food safety during the purchase. Consumers who purchase kales in supermarkets and specialty stores indicated that they do so because they treat kales sold in such stores as being safer than those in the wet markets. Other kale consumers use organic-labels on the produce as signal that the kale is safe. As expected, majority (62%) of the kale consumers indicated that they have never purchased certified kales. Kales labeled as safe, organic or compliant with international food safety standards are very rare in Nairobi. However, 28% of the respondents indicated that they have bought labeled kales before. Such respondents treated stores or labeled shelves as brands/labels of quality.

### 4.3. Mean WTP for leafy vegetable safety

The bundles of kale sold in the various market segments vary in weight. In supermarkets bundles averaging 0.62Kg sells at Kshs 22 while in specialty stores, bundle averaging 0.61Kg sold at Kshs 16-18. The average WTP for kale consumers was computed as:

$$MWTP = \frac{1}{n} \sum_{i=1}^n y_i$$

Where  $n$  = sample size,  $y_i$  = WTP for consumer  $i$ .

The mean WTP for safety by kale consumers who purchase their kales in supermarkets is Kshs 7.5 indicating that such consumers are willing to pay a price premium more than 34% for safe kales (i.e., kales free from pesticide residues, fertilizer residues and water-borne pathogens). In specialty store, the mean WTP for safe kales was Kshs 11.50. That is, kale consumers who shop in specialty stores are willing to pay a price premium of more than 66% for safer kales. The overall mean WTP for leafy vegetable safety was Kshs 8.5 which represents a price premium of greater than 42%.

### 4.4 Drivers of willingness to pay for safety of kales by urban consumers

Table 3 presents the results of a Tobit model estimated to assess the factors conditioning kale consumers' willingness to pay for safety of kales. Tobit model was selected in this study because some of the responses on WTP for quality of the kale were zeros. Hence we censor the WTP at zero.

**Table 3: Factors conditioning expected WTP for safe kales by urban consumers: Results of Tobit regression**

Dependent variable = mean WTP	Coefficient	p-value
Age (years)	0.001	0.882
Gender	2.13	0.016
Years of schooling	0.17	0.297
Kids less than 2 years of age	2.49	0.095
Kids of age 2-5years	1.57	0.079
Kids between age 5-16	0.51	0.595
Income level	0.07	0.018
Membership in social organizations	-253.73	0.058
Access to information of food safety	2.54	0.059
Constant	256.00	0.056
Prob >chi2 = 0.0012		
Log likelihood = -444.189		
Pseudo R <sup>2</sup> = 0.0278		
Number of observation = 150		

As expected, income of the consumer affects kale consumers WTP for safety. Results also indicate that gender of the buyer affects WTP for quality suggesting that females are on average willing to pay more for safer produce. This finding supports the earlier argument that females shoppers of supermarket and specialty stores are more discerning about quality of the kales they consume. Age of the children the kale consumer has also has a significant effect on the WTP for safe produce. Conditional on WTP being positive, having young children less than 5 years of age is estimated to increase the expected willingness to pay for quality of kale by approximately 2 Kenya shillings. This indicates that consumers with very young children are very selective in the kind of kales they consume. They are therefore willing to pay significantly higher premium for safe kales than otherwise. Results also indicate that income of the consumer (a proxy for

lifestyle) increases the WTP for quality of kales consumed. Conditional of WTP being positive, the increase in income by 1 unit increases the expected willingness to pay for quality of kales by approximately 7 Kenya cents. This finding corroborates those of past studies that indicate that income level of consumers increases their consumption behavior and especially the demand for credence attributes such as safety, hygiene, ethics and environmental friendliness involved in the production and marketing process (Freidberg, 2003; Regmi and Gehlhar, 2005). Other factors that affect urban kale consumers' WTP for safety of kales are membership in social organizations and access to information on food safety. Contrary to our expectations, membership to social organizations reduces kale consumers' willingness to pay for safety. This finding is probably because most of the organizations the respondents belonged to tended to deal with social issues. On the other hand, access to information increased the WTP for quality. Conditional on WTP being positive, access to information on food safety increases the expected WTP for quality of kale by Kshs 2.5. The finding that consumers who have access to information on food safety are more discerning about the quality of kale they consume reveal the importance of providing credible information on food safety to urban consumers.

## **6. Summary and conclusions**

Past studies have suggested that the mean WTP for products that are free of agrochemical residues is relatively low in developing countries (Mergenthaler, 2009). Such studies argue that developing country consumers are more concerned about the produce price than safety. However, more recent studies have indicated that consumers' WTP for safety of the food they eats could be relatively high. For example Mergenthaler (2009) shows that the mean WTP for safety of leafy vegetables among Vietnamese consumers is 60% and income has positive impact

on WTP. Hammitt et al., (1999) mean WTP of 46% and 75% for a leafy vegetable with low pesticide residues in Taiwan. Schmidt and Vani Anunchai (2004) estimated mean WTP to be almost 100% for ‘environmentally friendly’ produced Chinese cabbage in Thailand. Krishna and Qaim (2008) found a WTP for pesticide residue-free vegetables of 57% in India. Nouhoheflin et al. (2004) shows that mean WTP for bio-vegetables (free of pesticides) was 57% and 50% for cabbage and tomatoes, respectively, in Ghana. In Benin results shows that mean WTP was 66% for bio-cabbage and 56% for bio-tomatoes and income levels had positive impacts on WTP. Lippe et al., (2010) found a WTP chemical free cabbage of 91% in Thailand while income and gender positively influence WTP.

In this study we examined consumers’ willing to pay for a broad range of quality attributes than these previous studies (namely pesticide and fertilizer residue free kales, as well as free from water and soil-borne pathogens). Our results suggest that the mean WTP for safety is in the range of 50-60%. Our findings are therefore within the range of other studies. The results also indicate that WTP for safer kales by urban consumers is conditioned by income, the age of the children the consumer has and whether the consumer has had information on safety of food.

The implication of these finding is that there is demand by leafy vegetable consumers for food safety. Since the quality attributes demanded are credence attributes, there is need for government regulation of the leafy vegetable production and retailing practices. The market for credence attributes fails because it is hard for consumers to know, except at high cost, the quality of the produce before they consume it. Therefore direct public intervention will be needed. The private sector can also play a role in streamlining the production, handling and transportation

practices (supply chain regulations) to ensure the safety of leafy vegetables that retail in urban markets. Credible standards and certification a system is required for farm produce in Kenya. Evidence from Latin America indicates that private retailers can enact and enforce regulations that control the production, handling and transportation practices used by suppliers of retail supermarkets and specialty stores.

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