

## **Consumers' Perception and Willingness to Pay for Cassava Leaves as a Leafy Vegetable in the Ejisu - Juaben Municipality, Ghana**

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### **Abstract**

Cassava leaves, as a leafy vegetable and highly nutritious food, is not a common traded leafy vegetable on the local markets of Ghana. The study assessed consumers' perception and willingness to pay for cassava leaves as a leafy vegetable in the Ejisu-Juaben Municipality, Ghana. A multistage sampling technique was used to select 200 respondents. The results showed that 67% of respondents were willing to pay for cassava leaves at various bids. Overall agreeing perception index was 64.6%, implying that respondents accept the cassava leaves to be sold at the local market as a leafy vegetable. On average, for every 500 grams bunch of cassava leaves, respondents were willing to pay GHS1.61 (USD0.32), below the value of its close substitute, spinach, at an initial bid of GHS2.00. An empirical tobit regression model revealed that consumers' monthly income, educational level, and perception to sell cassava leaves as a leafy vegetable have significant influence on their WTP for cassava leaves as a leafy vegetable. The study recommends the need for farmers and other stakeholders to develop and promote the market for cassava leaves, as an alternative source of leafy vegetable for consumers and also as source of income to farmers. There is also the need for sensitization on the nutritional benefits and training on value addition to the produce to boost its patronage in the country.

**Keywords:** Cassava leaves; Perception; Willingness to pay; Tobit model; Ghana.

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### **INTRODUCTION**

Cassava (*Manihot esculenta*) is one of the largely grown and consumed staple food crops in most part of the world. The crop has suitable characteristics to tolerate drought and thrive well in areas rendered infertile for production of alternative crops. African countries such as Nigeria, Ghana, DR Congo and Cameroon have prioritized cassava

production as an important food security crop and source of income for most households. For instance, half of the world's cassava production comes from the African continent with Nigeria as a leading producer of 19 percent, and Ghana is rated as the sixth largest producer of cassava with about 14,547,279 metric tons and has steady to extend annually due to

continuous production, thus, cassava is all year round and its by-products are on high demand (FAOSTAT, 2014). Ghana has eight totally different improved cassava varieties including; Afisiafi, Abasafitaa, Tekbankye, Agbelifia, and Sikabankye. Of these varieties have shown prime quality and mostly produced by rural farmers on a large scale.

Currently, cassava is the major agricultural commodity produced in Ghana and represents 22 percent of Agricultural Gross Domestic Product (AGDP) compared to 13.1 percent for plantain, 3.8% cereal crops, 10 percent for cocoa, 10 percent for forestry and logging, 6 percent for fisheries and 7 percent for livestock [Ministry of Economic and Industry (MEI), 2020]. Consumption of cassava tubers is more prevalent in most developing countries, like, Ghana. However, the consumption of cassava leaves as a leafy vegetable is rare due to little or no awareness about its nutritional and economic benefits. Cassava leaves have little market value in Ghana and not generally accepted/consumed as a leafy vegetable. Used in other parts of the country as a substitute leafy vegetable, farmers could earn extra income from the sale of the leaves to encourage production of the crop. Moreover, as a substitute to other leafy vegetables, consumers can benefit from its consumption for an improved and sustained healthy lifestyle. In Ghana, majority of the people consume cassava leaves to fill a seasonal gap within the absence of other vegetables due to its ability to tolerate unsuitable

ecological and soil condition as compared with alternative vegetables. Cassava leaves is a significant source of potential alternative protein and other essential nutrients needed by the human body and animals for growth (Morgan & Choct, 2016; Oresgun et al., 2016). Moreover, cassava leaves are found to have high nutrient value which can effectively boost the nutrition for animal production when preserved as hay, thus, assisting in formulating and processing of simple adoptable and low-cost feed resource strategy during dry season when there is scarcity of forage (Wanapat & Kang, 2015).

Consumers usually do not have much knowledge about cassava leaves as a leafy vegetable which is rich in protein, minerals, vitamins and carotenes. As a result, the benefits of cassava leaves consumption are underestimated. Additionally, vegetable sellers are unaware of ready cassava leaves as a leafy vegetable on the market as whether or not individuals are willing to pay an amount for cassava leaves as a leafy vegetable just like other leafy vegetables such as cocoyam leaves, cabbage, lettuce, spinach and among others are consumed by people due to available information about the nutritional benefits. Consequently, most consumers regard cassava leaves as an inferior commodity, thus, undeserving for purchase and consumption. Consumers are of the opinions that cassava leaves have high cyanide content and its consumption have effects on human health. In sight of this, there has been under utilization of

cassava leaves as farmers considered as waste or feed for animals at the expense of inadequate nutritional requirements for the majority of the population (Asare *et al.*, 2016). Stunted growth levels and anaemia conditions reported among several children and women of productive age is as a result of lack of essential nutrients such as vitamins and iron, which can be obtained in cassava leaves (Ghana Health Service, 2014). The bottlenecks related to the consumption of any product determine the rate of intake of such commodity (Nimoh *et al.*, 2018). Where consumers have a positive perception about a product, they will be willing to pay for it. A positive perception of any commodity implies an encouraging approach to consumption of such commodity (Nimoh *et al.*, 2018). Therefore, assessing consumers' perception and willingness to pay for cassava leaves as a leafy vegetable can provide relevant information and business opportunity for food processors, farmers, and other stakeholders along the cassava value chain.

Willingness to pay is defined as the amount of money an individual is willing to sacrifice to obtain a good or service (Freeman, 2011; Gomes *et al.*, 2018). Rational consumers' aim at maximizing utility from each unit of product consumed. The price at which consumers' will be willing to buy a product depends much on the amount of satisfaction (utility) derived from the product and income of consumers. Therefore, the consumer takes prices,

income and preferences and maximizes utility through the choice of the available commodities.

Consumers' Willingness to Pay for Cassava has been analyzed using Bivariate Probit Model, Contingent valuation method, CVM double-bounded contingent valuation model and other methods to determine factors that influence consumers' willingness to pay and their mean willingness to pay for bread made from cassava flour inclusion to wheat flour (Erih *et al.*, 2015).

Some factors, however, affect willingness to pay for a product significantly while others do not. Also, the assessment of market potential and marketing prospects of organic fruits and vegetables in Kumasi Metropolis of Ghana showed that, age, education, income, gender, and household size significantly influence consumers' WTP for organic fruits and vegetables (Mamat *et al.*, 2013). Several studies have showed that consumers' attitude and perception towards a product have influenced WTP significantly (Adamu *et al.*, 2015; Rosenberger *et al.*, 2012).

## **METHODS**

### **Description of the study area**

The study was conducted in Ejisu-Juaben Municipality lies within Latitudes 1° 15' N and 1° 45' N and Longitude 6° 15' W and 7° 00' W, occupying a land area of 582.5 km<sup>2</sup> and a population of 143,762. The Municipality lies in central part of the Ashanti Region, sharing boundaries with six districts in the region. The

Municipality lies in the semi-deciduous forest zone of Ghana. Majority of the people in the municipality are into farming. Crops grown include; maize, rice, cassava, plantain, cocoyam and vegetable as well as tree crops. It recorded two-folds rainfall seasons with major season from March to July and minor season from September and later part of November. The average annual rainfall of the municipality is 1200mm with fairly moderate relative humidity regarded as the best for crops cultivation.

#### **Data Collection and Sampling method**

Multistage sampling technique was employed for this study with the rationale to ensure fair representation within the study area. Ten (10) communities were randomly sampled for the study. The ten communities were purposively selected because of the growing demand for leafy vegetables in those communities. At least two of every three homes in the communities engaged in some form of backyard farming” (Darkey et al., 2014). The systematic random sampling technique was used to select twenty (20) respondents from each of the ten communities at a regular interval, making a total of two hundred (200) respondents for the study. A face-to-face interview with structured questionnaire was used to collect data from respondents for the study.

#### **Conceptual framework and empirical model specification**

Satisfaction derived from a product is what consumers always consider before they make purchase decisions.

Following the theory of consumer utility maximization, given consumer's income and a set of prices, the consumer chooses the affordable bundle that maximizes his or her utility (Freeman, 2011). The type of good in question also determines the utility consumers expect to derive from the product and the price they will be willing to pay for it. Different authors have used different methods to measure consumer willingness to pay for certain products. However, these methods can be differentiated whether they measure consumers' hypothetical or actual willingness to pay or whether they measure consumer willingness to pay directly or indirectly. For this study, the contingent valuation approach which is a method of estimating the value that a person places on a good where people (consumers) directly report their willingness to pay (WTP) to obtain a specified good was employed to estimate consumers' willingness to pay for cassava leaves as a leafy vegetable in the study area. The contingent valuation works is dependent on a specific hypothetical scenario and description of product. Using the Tobit model, the price that consumers stated as willing to pay for cassava leaves as a leafy vegetable, relative to other leafy vegetables, was regressed on their demographic and socioeconomic factors as well their perception of cassava leaves as a leafy vegetable. The double-bounded contingent valuation model was used,

as it generates more efficient estimates than those based on a single question or those that ask open-ended question to narrow down to ask respondents a series of questions about their willingness to pay (Erih et al., 2015; Dickson, 2013).

The double-bounded contingent valuation framework gives the consumer opportunity to be presented with two bids; as the second bid contingent upon the response to the first bid (Dickson, 2013). Suppose that the individual responds “yes” to the first bid, the second bid is greater than the first bid, if the individual responds “no” to the first bid, the second bid, is smaller than the first bid; a four possible outcomes to the questions: a “yes” to the first bid followed by a “yes” to the second bid; a “yes” followed by a “no” ; a “no” followed by a “yes” ; and with both answers as “no” (Erih et al., 2015; Dickson, 2013).

Considering the willingness of individual to pay or not to pay for cassava leaves as a leafy vegetable can be expressed with a distinct set of variables. Assumption was made following the equations below;

$$C_{WTP} = Z\beta_{WTP} + \varepsilon_{WTP} \tag{1}$$

$$C_{WTP} > Z, \text{ if } WTP=1 \tag{2}$$

$$C_{WTP} < Z, \text{ if } WTP=0 \tag{3}$$

Where;  $C_{WTP}$  signifies consumers’ willingness to pay for cassava leaves as

a leafy vegetable;  $Z$  signifies price bid consumers will offer to obtain the product;  $\beta_{WTP}$  signifies vector of explanatory relevant in explaining consumers’ price bid for cassava leaves; and  $\varepsilon_{WTP}$  signifies error term.

Willingness to pay for cassava leaves as a leafy vegetable were regressed against socioeconomic characteristics and overall perception statement about selling cassava leaves as leafy vegetable. This was expressed as;

$$WTP = \beta_0 + \beta_{1\_aget} + \beta_{2\_sexi} + \beta_{3\_edulevi} + \beta_{4\_mthinci} + \dots + \varepsilon_i \tag{4}$$

$WTP$  indicates the dependent variable (in Ghana Cedi);  $\beta$  indicates the estimated parameters explaining the dependent variable; and  $\varepsilon_i$  indicates the error term. The explanatory variables are presented in Table 1.

Consumers’ perception of cassava leaves as a leafy vegetable was estimated using the perception index (PI), and was computed as;

$$OPI = \sum \left( \frac{ms(CS + UT + MI + SE + N)}{5} \right) \tag{5}$$

Where;  $OPI$  denotes Overall Perception Index,  $ms$  denotes Mean Scores,  $CS$  denotes Cassava sold,  $UT$  denotes Utilization of cassava,  $MI$  denotes Market income,  $SE$  denotes Source of employment, and  $N$  denotes Nutrition.

**RESULTS AND DISCUSSION**

**Socio-economic characteristics**

Table 2 presents the socioeconomic characteristics of respondents. The results show that more than half of the

respondents interviewed (80%) were females with an average age of 40 years (Table 2). This appraises an economically active and young respondents. The respondents had an average of eight years of formal education. The average household size was about five persons and the average monthly income was GHS326.15. However, only 13% of the interviewed respondents was unemployed, implying that the majority employed could afford to purchase cassava leaves as a leafy vegetable.

#### **Consumption of leafy vegetable and awareness of cassava leaves as a leafy vegetable**

Table 3 below depicts the types of leafy vegetable consumed by the respondents, their awareness of cassava leaves as a leafy vegetable, and mode consumption of cassava leaves as a leafy vegetable, respectively. It was found that majority of the respondents (73%) consume cocoyam leaves. Cocoyam

leaves consumed are of high content of vitamins, minerals, secondary metabolites and fiber (Ahmed et al., 2020; Lebot & Legendre, 2015).

Also, cocoyam leaves are found to be one of the few leaves offer source of non-animal zinc which prevent zinc deficiency (Lebot & Legendre, 2015; Reichstädter, 2020). Majority of the respondents interviewed were aware of cassava leaves as a leafy vegetable (95%) and as nutritious leafy vegetable (63.5%). These findings revealed that more of the respondents were aware of cassava leaves as a nutritious than what (Nimoh et al., 2018) reported that about 23.9% of the respondents were not aware of cassava leaves as nutritious leafy vegetable. However, more than of half (63.5%) of the respondents were not consuming cassava leaves. In addition, only 5% and 36.5% of the respondents were not aware of cassava leaves as a leafy vegetable and

**Table 1:** Explanatory variables used in the model

Variable	Unit of measurement	A-priori exp
WTP	Consumers' willingness to pay (GHS)	
Income	Monthly income (GHS)	+
Occupation	Whether consumer is employed or not (1= employed and 0=otherwise)	+
Education	Formal education (years)	+
Age	Age of respondent (years)	-
Gender	Gender of respondent (1=Male; 0=Female)	-
Household size	Number of individuals economically dependent on respondent (Number)	+/-
Perception about selling	Respondents' perception about selling cassava leaves (1=Agree and 0=otherwise)	+
Nutritional perception	Respondents' awareness of nutritional value of cassava leaves (1= yes and 0=otherwise)	+/-

nutritious, respectively. Thus, 76.1% (higher) of the respondents were not aware of cassava leaves as a nutritious leafy vegetable (Nimoh et al., 2018). Further, majority of the respondents (44%) consumed cassava leaves through "Stew" with only few respondents representing 1% and 2% consumed as "Tubani" and Vegetable salad," respectively. About 16% and 8% of the respondents consumed cassava leaves

as soup and medicine, respectively. This was attributed to the fact that other leafy vegetables are commonly used for stews and soups, hence, most respondents consumed cassava leaves by preparing as stew and soup more than in any other food. Also, respondents believed that cassava leaves taste better when used to prepare stew or soup and are well cooked

**Table 2.** Socio-economic characteristics of respondents

Variable	Category	Frequency (N=200)	Percentage (%)	
Gender	Male	40	20	
	Female	160	80	
Occupation	Employed	174	87	
	Unemployed	26	13	
Continuous variable	Minimum	Maximum	Mean	Std. Deviation
Age (years)	21	81	40.02	13.09
Years of education	0	16	8.49	3.93
Household size (number)	1	15	4.89	2.95
Monthly income (GHS)	0	1000	326.15	264.52

Source: Field survey, 2017

**Table 3:** Consumption of leafy vegetable and awareness of cassava leaves as a leafy vegetable

Types of leafy vegetable consumption	Frequency	Percentage
Ayoyo	27	13.5
Cabbage	13	6.5
Cocoyam leaves	146	73.0
Lettuce	14	7.0
Mode of consumption of cassava leaves		
Medicine	8	11.3
Soup	16	22.5
Stew	44	62.0
Tubani	1	1.4
Vegetable salad	2	2.8
Consumption of cassava leaves		
Yes		36.5
No		63.5
Nutritional awareness about cassava leaves		
Yes		63.5
No		36.5
Awareness of cassava leaves as leafy vegetable		
Yes		95
No		5

Source: Field survey, 2017

### **Perception about Cassava leaves being sold as a leafy vegetable**

The rate of consumption of a product depends on consumers' perception (Adamu et al., 2015; Rosenberger et al., 2012). The perception about a product is aligned heavily to consumers' attitude. Therefore, there is a link between consumers' attitude and perception. In view of this, a particular consumer willingness to pay for a product is influenced largely by his/her attitude and the choice of decision made (Adamu et al., 2015). Perception statements were presented to consumers about the selling of cassava leaves as a leafy vegetable in Ejisu-Juaben Municipality (Table 4).

The study found an overall perception index as 0.65, implying that the interviewed respondents agreed to the perception statements that cassava leaves should be sold as a leafy vegetable. This accedes to the report by Rosenberger et al. (2013) that product attributes play a significant contribution on consumption of a particular commodity. Also, similarly to Nimoh et al. (2018) who reported that respondents perceived cassava leaves as very useful and there is a need to be sold on the market. But the product attributes on assessment also provides a significant influence on whether respondents will consume cassava leaves as a leafy vegetable or not (Nimoh et al., 2018). These findings reflect that respondents' perception about the cassava leaves as a leafy vegetable being sold is positive, thus, perception indicates that consumers are

more willing to pay for cassava leaves as a leafy vegetable.

### **Willingness to pay for cassava leaves as a leafy vegetable**

Willingness to pay (WTP) for a product is a behavioral concept which shows the readiness at which a person expresses to buy a product. WTP is based on the principle that the maximum amount of money an individual is willing to pay for a commodity is an indicator of the value of that commodity (Dickson, 2013). The study employed the Contingent Valuation Methods (CVM) as results of hypothetical market treated as estimate of value of non-market good or service contingent upon the existence of the hypothetical market (Dickson, 2013). Majority of the interviewed respondents (38.5%), representing "Yes, Yes" response, were willing to pay for cassava leaves as a leafy vegetable (Table 5). Amazingly, close to 33% of the interviewed respondents were not willing to pay for cassava leaves. On average, GHS1.61 was the amount consumers were willing to pay for cassava leaves as a leafy vegetable which was below the initial bid of GHS2.00, the contingent or substitute average price of cocoyam leaves on the market.

### **Estimation of the factors affecting consumers' willingness to pay for cassava leaves as leafy vegetables in Ejisu-Juaben Municipality**

The study found a significant difference in the socioeconomic characteristics of the respondents and their perceptions of selling cassava leaves as a leafy



**Table 4.** Consumers' perception of selling cassava leaves as a leafy vegetable

Perception statement	Agree (1)	Neutral (0)	Disagree (-1)	Mean score
Cassava leaves is highly nutritious and should be sold to consumers.	143 (143)	13 (0)	44 (-44)	0.495
Utilization of cassava leaves can help reduce wastage of leaves.	151 (151)	39 (0)	10 (-10)	0.705
Marketing of cassava leaves an increase farmers' income.	177 (177)	12 (0)	11 (-11)	0.830
Selling of cassava leaves can serve as a source employment.	167 (167)	17 (0)	16 (-16)	0.755
Cassava is nutritious as other leafy vegetables.	120 (120)	49 (0)	31 (-31)	0.445
<b>Overall Perception Index</b>				0.646

Source: Field survey, 2017

vegetable. The Pseudo  $R^2$  was 0.2811 indicating that the explanations in the dependent variable was 28.1% and a F-value of 35.5 at a 1% significance level. Based on the empirical results from the Tobit model (Table 6), years of education was found to be significant at 1% on consumers' willingness to pay for cassava leaves as a leafy vegetable. This implies that among the respondents interviewed, more educated people would likely pay for cassava leaves as a leafy vegetable. Thus, an additional year of education a consumer is more likely to increase willingness to pay for cassava leaves as a leafy vegetable by 51.9%. The finding agrees with that of Mamat et al. (2013) which is partly geared to the increase in knowledge of the benefits of fruits and vegetables. There was positive relationship on education and WTP for dried cassava leaves or for different products (Dickson, 2013). Monthly income was found to have a negative influence on consumers' willingness to pay cassava

leaves as a leafy vegetable at 10% significance level. This means that a unit change in monthly income of consumers will decrease willingness to pay cassava leaves as a leafy vegetable by 0.22%. This implies that as consumers become better-off in terms of their earnings, their interest in purchasing and consumption of cassava leaves as a leafy vegetable may decrease. This accedes with Nimoh et al. (2018) who reported that high monthly income of consumers reduces willingness to consume for cassava leaves as a leafy vegetable. Furthermore, the study found that perception to sell cassava leaves as a leafy vegetable have a positive effect on consumers' willingness to pay for cassava leaves as a leafy vegetable at the 1% significance level. It implies that a unit change in perception to sell cassava leaves as a leafy vegetable would likely increase consumers willing to pay for the cassava leaves as a leafy vegetable by 120.7%.

**Table 5.** Responses about willingness to pay for cassava leaves as leafy vegetable among respondents

Response	Frequency (N=200)	Percentage (%)		
Yes, Yes	77	38.5		
Yes, No	17	8.5		
No, Yes	40	20.0		
No, No	66	33.0		
	<b>Mean</b>	<b>Std. Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
WTP (GHS)	1.61	1.42	0	5

Source: Field survey, 2017.

**Table 6.** Tobit regression estimates on factors affecting consumers' willingness to pay (WTP) for cassava leaves as a leafy vegetable

Actual WTP	Coefficient	Standard Error	t values	P> t
Years of education	0.5193***	0.0581	8.95	0.000
Occupation	0.5004	0.3447	1.45	0.148
Monthly income	-0.0022*	0.0012	-1.85	0.066
Perception to sell	1.2074***	0.3718	3.25	0.001
Perception on nutrition	-0.4656	0.3238	-1.44	0.152
Gender	-0.4037	0.3654	-1.10	0.271
Age	-0.0031	0.0123	-0.25	0.804
Household size	0.0551	0.0539	1.02	0.308
_cons	-3.968	0.5730	-6.93	0.000

Number of observations, 200; Pseudo R<sup>2</sup>, 0.2811; F (5, 195), 35.58; Probability >F, 0.000

\*\*\*, \*\*, \* denotes significant at 1%, 5% and 10%, respectively.

Source: Field survey, 2017.

## CONCLUSIONS AND SUGGESTION

Based on the findings, it can be concluded that majority of consumers in the Ejisu-Juaben Municipality have heard about the consumption of cassava leaves as a leafy vegetable which may influence their acceptance of the leafy vegetable. Most of the respondents were aware of the nutritional contents of cassava leaves and aware of cassava leaves as a leafy vegetable; this has the tendency to inform consumers' decision to accept and consume cassava leaves as a leafy vegetable. More than half of the respondents in the Ejisu-Juaben Municipality perceived and agreed to the selling of cassava leaves as a leafy vegetable in the market. Respondents had adequate knowledge of the nutritional status of cassava leaves with a positive perception index. Education

years, monthly income, and perception to sell cassava leaves as leafy vegetable were found significantly to affect consumers' willingness to pay for cassava leaves as leafy vegetable in the Ejisu-Juaben Municipality. The study recommends that there is a need for research, educational and health institutions to encourage the consumption of cassava leaves as a leafy vegetable by providing thorough information to make respondents aware of the nutritional benefits of cassava leaves. This may lead to an increased likelihood of respondents willing to pay for cassava leaves as leafy vegetable and consumption of the produce.

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