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Consumers' Willingness to Consume Cassava Leaves as a Leafy Vegetable in the Kumasi Metropolis, Ghana

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Abstract

This study employs the logit model to assess the determinants of consumers' willingness to consume cassava leaves as a leafy vegetable in the Kumasi Metropolis of Ghana. A multistage sampling technique was used to select 180 respondents for the study. The study found that majority (76%) of the respondents had no knowledge of the nutritional value of cassava leaves, though they had consumed the product before. The empirical results showed that socioeconomic characteristics of respondents such as age, sex, household size and monthly income, as well as their perceptions on the attributes and use of cassava leaves as food have significant influence on willingness to consume cassava leaves as a leafy vegetable. There is the need to provide information on the nutritional benefits of cassava leaves to facilitate decision-making on its utilisation/consumption. Programmes aimed at promoting the consumption of cassava leaves should consider the significant variables that have influence on the consumption of the product.

Keywords: Cassava leaves; Willingness to consume; Perception; Logit regression; Kumasi-Ghana

1 Introduction

Cassava is one of the most important staple food crops widely cultivated in the lowland humid tropics. It plays a major role in alleviating African food crises because of its efficient production for energy year round, availability, tolerance to extreme conditions and suitability to the farming and food systems in Africa (Scott, Rosegrant, & Ringler, 2000). The world's total cassava utilization has been projected to 275 million tons by 2020 (Westby, 2002).

Cassava is grown nearly in every African country located between latitude 30°C north and south of the equator (Okigbo, 1980). The crop is Africa's second most important food staple in terms of per capita calories consumed (FAO, 2005). Africa contributes about half of the world's production of cassava; Nigeria leads with 19% of global market share and Ghana is the third largest producer of cassava in Africa after Nigeria and the Democratic Republic of Congo (FAO, 2009). Cassava production in Ghana has grown steadily from 8,107,000Mt in 2000 to 13,504,000Mt in 2010, and it is estimated to exceed 15,000,000Mt in 2015.

Since its introduction to Africa, cassava has become one of the most important crops in Africa. It is an important source of dietary energy for over 600 million people in developing countries within the tropics and sub-tropics (Scott et al., 2000). It is currently grown as a subsistence crop, cash crop, for animal feed and as an industrial raw material for starch extraction or alcohol production. The young shoots (stems, leaves and petioles) of cassava are edible and widely used as food in Africa (Lancaster & Brooks, 1983). The tuber has a number of uses in Ghana such as pro-

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cessing into *gari*, dough, tapioca, cassava flour and starch. In addition, the fresh tuber may be boiled and eaten as "*ampesi*" or pounded into a paste (*fufu*) and eaten with soup. Cassava leaves are also consumed to varying degrees in the cassava growing regions of Africa and constitute a major component of the diet in some countries (Bokanga, 1994).

Cassava leaves, as indigenous leaves, are classified as part of leafy vegetables. Cassava leaves are good source of proteins, vitamins and minerals (Gomez & Noma, 1986). Cassava leaves are either served as part of a sauce or as cooked green vegetables, but their role in the diet is very different from that of the roots (Bokanga, 1994). The cassava leaf meal has been included in schools in basic food packs distributed to families among low income population (Motta, Fukuda, & Costa, 1994). Moreover, cassava leaves have been found to have high nutrient value which can effectively boost the nutrition for animal production when preserved as hay, thereby assisting in formulating and processing of simple adoptable and low cost feed resource strategy during dry season when there is scarcity of forage (Wanapat, Puramongkon, & Siphuak, 2000). However the utilisation of cassava leaves for human consumption is fairly low to other vegetables (Keller, 2004).

Ghana has the potential to develop a more attractive and independent economy by taking interests in the kind of crops cultivated and consumed, especially those vegetables produced for local consumption and export for foreign income. Vegetables are important sources of vitamins and minerals for human diet. Approximately 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption (World Health Organization, 2003). FAO/WHO report on diet nutrition and prevention of diseases recommends a minimum daily intake of 200g of vegetables or about 73kg/year/person. Unfortunately, priority has been based mostly on few types of vegetables such as spinach, amaranths, okra, nightshade eggplant and cowpea leaves (Weinberger, 2004), which are sometimes scarce and relatively expensive compared to cassava leaves. Many consumers underestimate the benefits of cassava leaves; they consider them as waste or animal feed. Also, the forgone benefits to farmers as income in periods of scarcity of conventional leafy vegetables such as "*Kontomire*" have contributed to their economic implications. The negative perception about cassava leaves can affect the consumption of the leaves. A positive perception of any commodity implies an encouraging approach to consumption of such commodity (Padberg, Riston, & Albisu, 1997). Furthermore, the constraints associated with the consumption of any product determine the rate of intake of such commodity. Assessing consumers' perception and their willingness to consume cassava leaves as a leafy vegetable will help provide information and opportunity for food processors, farmers and other stakeholders along the commodity chain to boost the food industry and the economy at large.

2 Materials and Methods

2.1 Conceptual framework and empirical model specification of the study

The willingness of an individual to consume or not to consume a product can be explained as a distinct set of variables, regarding the choice of model. For this study, the dichotomous dependent variable, willingness to consume or not to consume, was used. According to Greene (2008), linear methods are inappropriate for dichotomous choices since they can lead to heteroscedastic variances. This problem is typically remedied by using maximum likelihood estimation. When heteroscedasticity is observed in likelihood estimation, such models require more general estimation (Wooldridge, 2002). However, such models are not often used, since logit and probit models with flexible functional forms in the independent variables tend to work well.

It is generally assumed that consumers maximize their utility subject to a budget constraint, and will therefore choose the option among a bundle of goods that gives them the highest utility. In considering the consumption of cassava leaves, consumers therefore expect their utility for consumption of cassava leaves as a leafy vegetable (assuming a monotonic relationship

between utility and benefits) to be higher than the other alternative leafy vegetables. According to Greene (2003), random utility models address these types of individual choice situations. A common specification is the linear random utility model.

Suppose an individual consumer's utility after consuming the new leafy vegetable for a given vector of socioeconomic characteristics, perception and product attributes (Z) is denoted by U_{re}(Z) and the utility without willingness to consume by UN_{re}(Z). The willingness to consume cassava leaves as a leafy vegetable or not can be defined as a linear relationship.

$$U_{WTC} = Z\beta_{WTC} + \varepsilon_{WTC} \quad (1)$$
$$Y_{NWTC} = Z\beta_{NWTC} + \varepsilon_{NWTC} \quad (2)$$

In this case β_{WTC}, β_{NWTC} and ε_{WTC}, ε_{NWTC} are response coefficient and random consumption associated with willingness to consume and non-willingness to consume respectively. Assuming that the qualitative variable Y_{NWTC} indexes the consumption, then it will take a value of one if the consumer is willing to consume cassava leaves as leafy vegetable and zero if otherwise. The probability that a consumer is willing to consume cassava leaves as a leafy vegetable could be expressed as a function of Z as follows:

$$p(y = 1) = p(U_{WTC} > U_{NWTC}) \quad (3)$$
$$p(Z\beta_{WTC} + \varepsilon_{WTC} > Z\beta_{NWTC} + \varepsilon_{NWTC}) \quad (4)$$
$$p[Z(\beta_{WTC} - \beta_{NWTC}) > \varepsilon_{NWTC} - \varepsilon_{WTC}] \quad (5)$$
$$p(Z\beta > \varepsilon) = F(Z\beta) \quad (6)$$

Where P is a probability function, $\varepsilon = \varepsilon_{NWTC}$ - ε_{WTC} is a random consumption term, $\beta = \beta_{WTC}$ - β_{NWTC}, a vector of unknown parameters which can be interpreted as net influence of the vector of independent variables on willingness to consume cassava leaves as leafy vegetable, and F(Z β) is the cumulative distribution function for ε evaluated at Z β. The exact distribution of F depends on the distribution of random term ε. The model arises from assuming a normal distribution, and a logit model arises from assuming a logistic distribution. Under the standard assumptions about the error term, there is no *a-priori* reason to prefer probit to logit estimation (Greene, 2003). Accordingly, in most applications, it seems not to make much difference. Considering all these aspects, a logit model was developed to study the factors affecting willingness to consume cassava leaves as a leafy vegetable in the Kumasi Metropolis.

According to the logit model, the probability of an individual's willingness to consume cassava leaves as a leafy vegetable *-(WTC)* given socioeconomic characteristics, perception variables and product attributes *(Z)* is, *P(WTC(Z))*and can be specified as:

$$P[WTC(Z)] = \frac{e^{Z\beta+\varepsilon}}{1 + e^{Z\beta+\varepsilon}} \quad (7)$$

Where a < Z β < a

The probability of not willing to consume cassava leaves as leafy vegetable is therefore:

$$P[NWTC] = 1 - P[WTC(Z)] \quad (8)$$
$$= 1 - \frac{e^{Z\beta+\varepsilon}}{1 + e^{Z\beta+\varepsilon}} \quad (9)$$
$$= \frac{1}{1 + e^{Z\beta+\varepsilon}} \quad (10)$$

The relative odds of willing to consume versus not willing to consume are given by:

$$\frac{P(WTC(Z))}{P(NWTC(Z))} = \frac{e^{Z\beta+\varepsilon}1 + e^{Z\beta+\varepsilon}}{1 + e^{Z\beta+\varepsilon}} \quad (11)$$
$$= e^{Z\beta+\varepsilon} \quad (12)$$

By taking the logarithms of both sides,

$$In[\frac{P(WTC/Z)}{P(NWTC/Z)}] = Z\beta + \varepsilon \quad (13)$$

The maximum likelihood approach can be used to estimate the above equation. The factors influencing the willingness to consume cassava leaves as a leafy vegetable in the Kumasi metropolis can be specified empirically as indi-

cated in (12) as;

$$WTC_{ij} = \beta_o + \beta_1 Sex_{ij} + \beta_3 HD_{size_{ij}} + \beta_4 No.\_yrs\_in\_sch_{ij} + \beta_5 M\_inc_{ij} + \beta 6 Sweet_{ij} + \beta_7 Bitter_{ij} + \beta_8 P\_essentialmin_{ij} + \beta_9 Animal\_feed_{ij} + \beta_1 0 eaten\_as\_food_{ij} + \beta_1 1 good\_substitute + \beta_1 2 poisonous\_comp_{ij} + \beta_1 3 Affect\_HHealth_{ij} + \beta_1 4 Used\_in\_household_{ij} + \beta_1 5 Affects\_tubber\_form_{ij} + \beta_1 6 Sold\_on\_market_{ij} + \beta_1 7 Saves\_cost_{ij} + \beta_1 8 For\_poor\_people_{ij} + \beta_1 9 Aroma_{ij} \beta_{ij} + beta_2 0 Texture_{ij} + \beta_2 1 Gen\_appearance_{ij} \quad (14)$$

Where WTC denotes willingness to consume cassava leaves as a leafy vegetable (WTC=1, if consumer is willing to consume cassava leaves as a leafy vegetable, $NWTC$=0, if otherwise). Sex, denotes gender of the consumer (1=*male* and 0=*female*). *Age*, represents the age of the consumer (years). Hd_size, denotes household size (number of people in the household). $No.\_yrs\_in\_sch$, denotes the number of years spent in school. M_inc denotes consumer's monthly income (GHC). *Sweet* represents if cassava leaves are sweet to taste. *Bitter* represents if cassava leaves are bitter to taste. *P_essential min.* denotes if cassava leaves provide essential nutrients when eaten as leafy vegetable. *Animal feed* represents if cassava leaves should be used as animal feed. *Eaten as food* represents if cassava leaves should be eaten as human food (leafy vegetable). *Good substitute* represents if cassava leaves are good substitute to other leafy vegetables. *Poisonous comp.* denotes if cassava leaves contain poisonous components like cyanide. *Affect HHealth* denotes if cassava leaves could affect human health when consumed as leafy vegetable. *Used in household* represents if cassava leaves should be used in households. *Affects_tuber_form* denotes if cassava leaves affects tuber formation when plucked and consumed. *Sold on market* represents if cassava leaves are considered as useful good and therefore should be sold on the market. *Saves cost* represents if cassava leaves could save cost if consumed as leafy vegetable. *For poor people* represents if cassava leaves are mostly for poor people. *Aroma* represents if the aroma of cassava leaves makes it unsuitable to be consumed as a leafy vegetable. *Texture* represents if the texture (chewiness) of cassava leaves makes it unsuitable to be consumed as a leafy vegetable. *Gen_appearance* denotes if the general appearance of cassava leaves makes it unsuitable to be consumed as a leafy vegetable and β_1, β_2, β_3, ..., $\beta_2 1$ represent the coefficients of the variables. $\varepsilon_i$denotes error term capturing all factors unknown to the researcher.

2.2 Statement of hypotheses

Hypothesis 1: Socio-economic variables such as age, number of years of formal education, household size, and monthly income have influence on willingness to consume cassava leaves as leafy vegetable in the Kumasi Metropolis.
Hypothesis 2: Perception on the product's attributes such as aroma, texture and general appearance consumption of cassava leaves have influence on willingness to consume cassava leaves as a leafy vegetable in the Kumasi Metropolis.

2.3 Data Collection and Sampling method

A multistage sampling technique was employed for this study. This was used to ensure fair representation within the Metropolis. The stratified random sampling technique was used to select communities from the metropolis since they were clustered into low, middle and high income groups (Table 1). The simple random sampling technique was also used to select communities within the residential income class of communities. In all, a total of 180 respondents from 12 randomly selected communities out of the 78 in the Kumasi Metropolis were considered in the survey for this study; 4 communities from low income category, 4 communities from middle income category and 4 communities from high income category. The systematic random sampling technique was used to select fifteen respondents each from the sampled communities (Table 2). The face-to-face interview technique was employed using a structured questionnaire. This was to provide the opportunity to explain ques-

tions which were difficult to answer, to obtain the exact information needed for the study, and also to afford the interviewer the opportunity to educate the respondents. The study population was targeted at all consumers of leafy vegetables and assessed based on income groups of the respondents. One reason for using income groups as a basis is that consumption is a function of income (Edgmand, 1987).

3 Results and Discussions

3.1 Socio-economic characteristics of respondents in the Kumasi Metropolis

Majority of the respondents (60%) interviewed were females. The average respondents' age interviewed was 37 years (Table 3). The average household size of the respondents was 4 persons. The average number of years of education among the respondents was 13.9 years representing secondary education. The average respondents' monthly income was GHC1,191.22.

3.2 Consumers' awareness of the nutritional status of cassava leaves

Amongst the total number of respondents interviewed, 43 representing 23.9% had knowledge of the nutritional status of cassava leaves whereas 137 representing 76.1 percent did not have any knowledge of the nutritional status of the product as depicted in the Figure 1.

3.3 Utilization of cassava leaves by Respondents

About 92% of the respondents interviewed had consumed cassava leaves before as food (either as vegetable salad, stew or for soup) in the past, 5% as food and as medicine, and about 3% had also consumed cassava leaves as food, as medicine, used as animal feed and as farm material (Figure 2).

3.4 Consumers' perception on consumption of cassava leaves as a leafy vegetable

The perception of a product determines the rate of consumption of a particular commodity as indicated by Padberg et al. (1997) that consumers' attitude towards a product depend heavily on their perception about the product. There is therefore a link between attitude and perception. Consumers' willingness to consume a product is influenced largely by their attitudes and determines their choice of decision making (Alvensleben & Meier, 1989). Consumers' opinions were sought on the nutritional, health and economic concepts on consumption of cassava leaves as leafy vegetable in the Kumasi Metropolis as presented in Table 4.
The study found an overall perception index as 1.98, implying a neutral idea about cassava leaves as a leafy vegetable and thus, indicates that majority of respondents did not know about the nutritional, health and economic benefits of cassava leaves as a leafy vegetable in the Kumasi Metropolis. The product attributes on assessment also provides a significant influence on whether respondents will consume cassava leaves as a leafy vegetable or not. This affirms the statements by Ragaert, Verbeke, Devlieghere, and Debevere (2004) that product attributes play a significant contribution on consumption of a particular commodity.

$$TCP = \frac{Np + Hp + Ep + Ap}{4} \tag{15}$$

$$= \sum\left(\frac{1.67 + 2.26 + 1.78 + 2.22}{4}\right) \tag{16}$$

$$= 1.98 \tag{17}$$

Where, TCP is the total perception index, Np is Nutritional perception; HP is Health perception; Ep is Economis perception and Ap is Attribute perception.

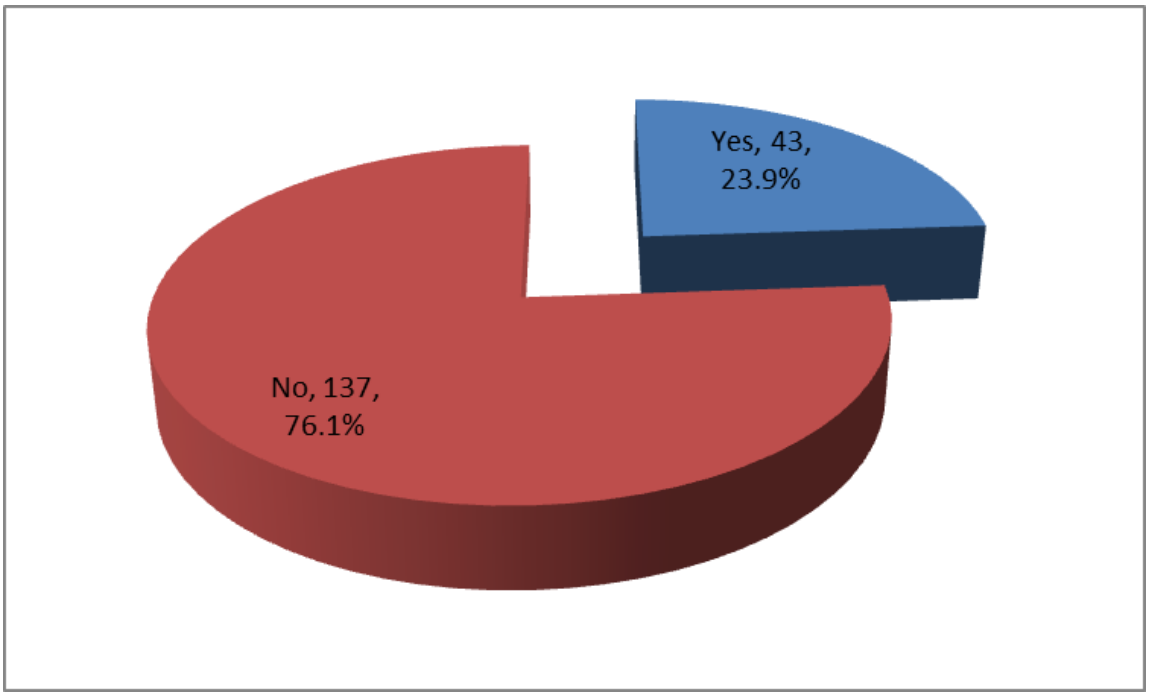

Figure 1: Consumers' awareness of the nutritional status of cassava leaves

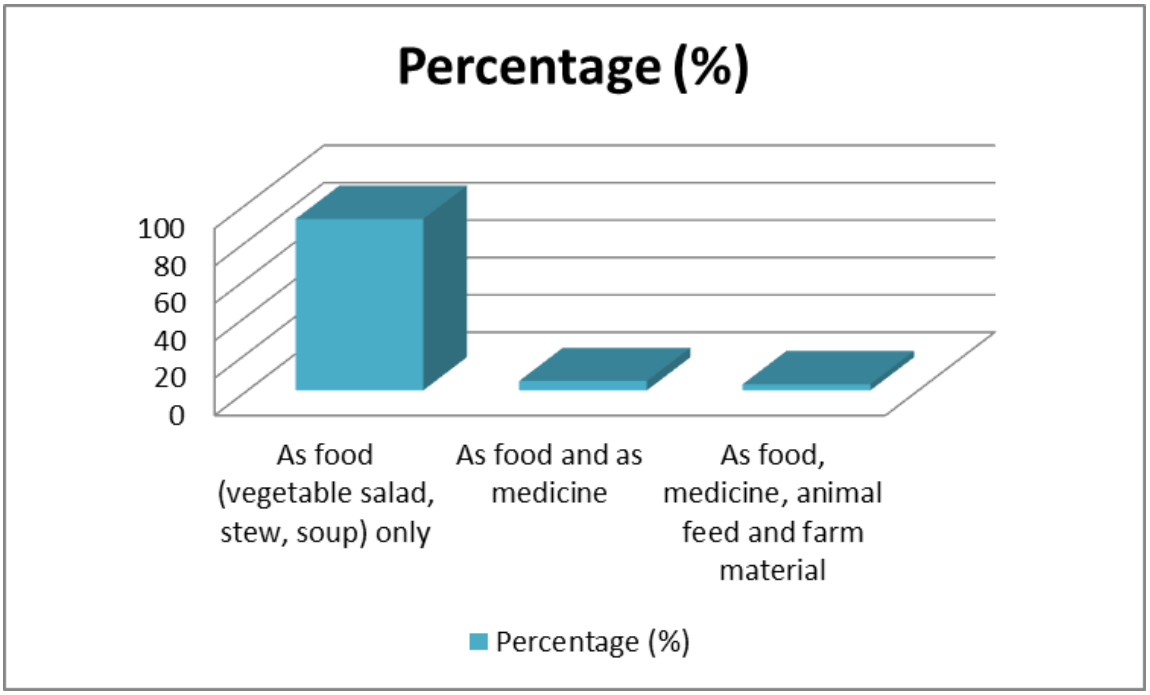

Figure 2: Utilization of cassava leaves by Respondents

Table 1: Residential Income Classes of Communities in the Kumasi Metropolis

High Income	Dadiesoaba, Asokwa, West Ayigya, Mbrom, Adiebeba, Adiembra, Ahodwo, Danyame, Odeneho Kwadaso, Aketego, Bomso, Bompe, Ridge, Nhyiaso, Extension, Parakuo Estate, Daban New Site, New Amakom Extension, Asokwa Residential Area
Middle Income	Asafo, Amakom, Airport, Bantama, Dichemso, Aprade, New Tafo, Asebi, Anyinam, Kuwait, Atonsu, New Atonsu, Gyenyase, New Agogo, Adoato, Kyirapatre Estate, Bohyen, Adumanu, Adumanu Extension, Asanti Newtown, Apiri, North Suntreso, Kotei, South Suntreso, Boadi West Patase, Ohwimase, Kwadaso Estate, Santase Odumase Extension, Patase, Kentinkrono
Low Income	Apatrapa, Dompoase, Aboabo, Moshie Zongo, Dichemso, Old Tafo, Ayigya Zongo, Dakwadwom, Sawaba, Yalwa, Daban, Kaase, Sokoban, Nsenee, Ahinsan, Anwomaso, Gyinyase, Adukrom, Asewase, Buobai, Nima, Pakuso, Abrepo, Sokoban, Amanfrom, Yenyawso, Buokrom, Ayeduase

Source: KMA, 2007

Table 2: Sampled communities within the Residential income class of communities

INCOME CATEGORY	RESIDENTIAL COMMUNITIES	NUMBER OF HOUSEHOLDS
HIGH INCOME	Bomso	15
	Ahodwo	15
	Ridge	15
	Asokwa residential area	15
MIDDLE INCOME	Asafo	15
	North Suntreso	15
	Boadi	15
	Amakom	15
LOW INCOME	Ayigya Zongo	15
	Aboabo	15
	Anwamaso	15
	Old Tafo	15

Source: Field survey, 2016

3.5 Estimation of factors affecting consumers' willingness to consume cassava leaves as a leafy vegetable in the Kumasi Metropolis

The study found a significant difference in the socioeconomic characteristics of the respondents and their perceptions with regards to the willingness to consume cassava leaves as leafy vegetable or not (Table 5). Based on the empirical results from the logit model (Table 6), age was found to be significant at 5% on consumers' willingness to consume cassava leaves as leafy vegetable. The direction of the variable was positive, meaning among the respondents interviewed those of older ages tend to consume cassava leaves as leafy vegetable. This can be explained that a unit change in the age of a consumer will increase willingness to consume cassava leaves by 0.39%. This is partly geared to the increase in knowledge of the benefits of fruits and vegetables (Elfhag, Tholin, & Rasmussen, 2008). In children and adolescents, consumption tends to decrease with age (Rasmussen et al., 2006). Sex of respondents was positive and significant at 10%. This finding agrees with Rasmussen et al. (2006). A unit change in male consumers will increase willingness to consume cassava leaves as leafy vegetable by 3.71%. Also respondents' monthly income was found to have a negative influence on willingness to consume cassava leaves as leafy vegetable at 10% significance level. This implies that, a unit change in monthly income of consumers in the Kumasi Metropolis will decrease willingness to consume cassava leaves as leafy vegetable by 6.2%.

The perception variable "cassava leaves are

Table 3: Socio-economic characteristics of respondents

Variable	**Category**		**Frequency (%)**	**Percentage**
Gender	Male		72	40
	Female		108	60
Marital status	Married		88	48.9
	Single		71	39.4
	Divorced/ Separated		21	11.7
Education level	Basic		41	22.8
	Secondary		58	32.2
	Tertiary		51	28.3
	Vocational		21	11.7
	Illiterate		9	5.0
Tribe	Akan		141	78.3
	Ga		8	4.4
	Ewe		10	5.6
	Northern		21	11.7
Continuous variables	**Minimum**	**Maximum**	**Mean**	**Std. deviation**
Age (years)	18	72	36.73	13.00
Household size (in persons)	1	9	4.36	1.55
Number of years in school	0	23	13.97	5.18
Monthly Income (GHC)	0.00	7000.00	1191.22	1203.20

Source: Field Survey, 2016

sweet" had a positive influence on consumption of cassava leaves and was significant at 1%. This result is consistent with the finding of Kamga, Kouame, Tchindjang, Chagomoka, and Drescher (2013). This means that, a unit change in the perception statement variable "cassava leaves are sweet" will increase willingness to consume cassava leaves as leafy vegetable by 10.55%. Also, the perception variable "Cassava leaves are bitter" was negative and was found to significantly affect consumption of cassava leaves at 1% level. This implies that, a unit change in the perception statement "Cassava leaves are bitter" will decrease willingness to consume cassava leaves as leafy vegetable by 12.2%. The perception variable "Cassava leaves should be used as animal feed" was negative and was found to significantly affect consumption of cassava leaves at 5% level. This indicates that, a unit change in the perception statement "Cassava leaves should be used as animal feed" will decrease willingness to consume cassava leaves as leafy vegetable by 4.58%. Moreover, the perception that "cassava leaves should be eaten as food" had a positive and a 1% significant influence on consumption of cassava as a leafy vegetable. A change in the unit of the perception variable "Cassava leaves should be eaten as food" will increase willingness to consume cassava leaves as leafy vegetable by 6.84%. "*Cassava leaves are good substitute*" was positive and significant at 5%. This connotes that a unit change in the perception variable "Cassava leaves are good substitute" will increase willingness to consume cassava leaves as leafy vegetable by 5.85%. The perception variable "*Cassava leaves are useful and therefore should be sold on the market*" was found to be positive and significant at 10%. This implies that a unit change in the perception variable "*Cassava leaves are useful and therefore should be sold on the market*" will increase willingness to consume cassava leaves as leafy vegetable by 2.66%. Also "*Aroma and General appearance*" were negative and have significant influence on consumption of cassava leaves at 1% and 5% respectively. This implies that a unit change in the cooked cassava leaves aroma will

Table 4: Consumers' perception on consumption of cassava leaves as a leafy vegetable

Nutritional perception statements on cassava leaves	**Agree (1)**	**Neutral (2)**	**Disagree (3)**	**Mean Score**
Cassava leaves are sweet	14	120	46	2.18
Cassava leaves are bitter	48	119	13	1.81
Cassava leaves provide some essential nutrients	57	123	0	1.68
Cassava leaves should be used as animal feed	156	1	23	1.26
Cassava leaves should be eaten as food	132	1	47	1.53
Cassava leaves are good substitute for other known leafy vegetables such as Spinach, lettuce	127	11	42	1.53
Nutritional Perception index				**1.67**
Health perception statement on cassava leaves	**Agree (1)**	**Neutral (2)**	**Disagree (3)**	**Mean Score**
Cassava leaves contains poisonous components like cyanide	52	64	64	2.07
Cassava leaves could affect human health when consumed	38	22	120	2.46
Health Perception index				**2.27**
Economic perception statements	**Agree (1)**	**Neutral (2)**	**Disagree (3)**	**Mean Score**
Cassava leaves should be used in households for cooking	130	2	48	1.54
Cassava leaves affect tuber formation if plucked and consumed	161	17	2	1.12
Cassava leaves are useful and therefore should be sold on the market	35	1	144	2.61
Cassava leaves save cost if consumed as leafy vegetable	126	19	35	1.49
Cassava leaves are mostly for poor people	43	66	71	2.16
Economic Perception index				**1.78**
Attribute statements on cassava leaves	**Agree (1)**	**Neutral (2)**	**Disagree (3)**	**Mean Score**
Aroma	6	116	58	2.29
Color (green)	0	57	123	2.68
Texture	42	113	25	1.91
General appearance	81	17	82	2.01
Attributes index				**2.22**

Source: Field Survey, 2016

decrease willingness to consume cassava leaves as leafy vegetable by 6.32% and 4.76%. This result is in line with Padberg et al. (1997), who stated that consumers' attitude towards a product depends heavily on their perception of the product. It was again found that, the product attribute "*Texture*" had positive influence on willingness to consume cassava leaves as leafy vegetable at 1% significance level. This indicates that a unit change in texture of cassava leaves will increase consumers' willingness to consume cassava leaves as leafy vegetable by 10.63%. This result is consistent with the finding of Kamga et al. (2013) that consumers' preferences of any particular commodity depend highly on the attributes of the product.

3.6 Consumers' constraints on utilization of cassava leaves as a leafy vegetable in the Kumasi Metropolis

Table 7 shows the constraints to consumption of cassava leaves in the study area. The study found "presence of other leafy vegetables" as the major limitation that hinders the respondents from consuming cassava leaves as leafy vegetable. Consumers in the Kumasi Metropolis who did not eat cassava leaves as a leafy vegetable attributed the "presence of other leafy vegetables" as the major constraint. This is in line with the statements of Weinberger (2004) that priority has been based mostly on few types of vegetables

Table 5: Descriptive statistics of respondents in the Kumasi Metropolis

Independent variable	NWTC	WTC	Mean difference	Significance
Sex	0.38	0.45	0.07	0.007***
Age	31.23	47.73	16.50	0.096*
Hd_size	3.98	5.13	1.15	0.110
No._yrs_in_sch	14.94	12.03	-2.91	0.000***
M_inc	1043.08	1487.50	444.42	0.002***
Sweet	0.01	0.22	0.21	0.000***
Bitter	0.03	0.73	0.70	0.000***
P_essential min.	0.27	0.42	0.15	0.001***
Animal feed	0.94	0.72	-0.23	0.000***
Eaten as food	0.63	0.95	0.33	0.000***
Good substitute	0.57	0.97	0.40	0.000***
Poisonous comp.	0.36	0.15	-0.21	0.000***
Affect HHealth	0.30	0.03	-2.27	0.000***
Used in household	0.61	0.95	0.34	0.000***
Affect tuber_form.	0.88	0.93	0.06	0.014**
Sold on market	0.15	0.28	0.13	0.000***
Saves cost	0.58	0.93	0.35	0.000***
For poor people	0.24	0.23	-0.01	0.805
Aroma	0.02	0.07	0.05	0.000***
Texture	0.02	0.67	0.65	0.000***
Gen_appearance	0.61	0.15	-0.46	0.000***

Source: Field Survey, 2016
***, **, * indicating significance at 1%, 5%, 10% respectively

such as spinach, amaranths, okra, nightshade eggplant and cowpea leaves which has caused some indigenous vegetables like cassava leaves to be extinct.

4 Conclusion

Based on the findings, it can be concluded that majority of consumers in the Kumasi Metropolis were not aware of the nutritional status of cassava leaves and this tended to inform their decision to accept and consume cassava leaves as a leafy vegetable. Respondents who were aware of the nutritional contents did not have a thorough knowledge of all the nutritional components and benefits. Most of the respondents in the Kumasi Metropolis agreed to consume cassava leaves as a leafy vegetable after being educated on its specific nutrients present. Therefore, awareness of the nutritional status informed consumers' willingness to consume cassava leaves as a leafy vegetable. Respondents did not have a positive perception on consumption of cassava leaves as a leafy vegetable. Due to inadequate knowledge of the nutritional status of cassava leaves, majority of the respondents did not agree or were neutral on the nutritional, health and economic benefits of cassava leaves.

Negative perception on consumption had influence consumers' willingness to consume cassava leaves as a leafy vegetable. Factors such as socio-demographic characteristics (age, sex, household, monthly income) and product attributes (aroma, texture and general appearance) were found to determine consumers' willingness to consume cassava leaves as leafy vegetable in the Kumasi Metropolis. Moreover, the presence of other leafy vegetables in the study area was identified as affecting the consumption of cassava leaves.

Based on key findings, the study recommends that research, educational and health institutions should promote the consumption of cassava

Table 6: Logit regression model on assessing consumers' willingness to consume cassava leaves as leafy vegetable in the Kumasi Metropolis

WTC	**Coefficient**	**Standard error**	**dy/dx**	**P-value**
Sex	2.2743*	1.3243	0.0371	0.0860
Age	0.2425**	0.1105	0.0039	0.0280
Household size	0.6782**	0.3268	0.0110	0.0380
Number of years in school	0.0673	0.0944	0.0010	0.4760
Monthly income	-0.0147*	0.0007	-0.0000	0.0620
Perception variables				
Cassava leaves are sweet	6.4674***	1.5455	0.1055	0.0000
Cassava leaves are bitter	-7.4814***	1.9811	-0.1220	0.0000
Cassava leaves provide some essential nutrients	-1.3464	1.1876	-0.0219	0.2570
Cassava leaves should be used as animal feed	-2.8124**	1.2005	-0.0458	0.0190
Cassava leaves should be eaten as food	-4.1952***	1.2848	-0.0684	0.0010
Cassava leaves has a good substitute	3.5895**	1.7513	0.0585	0.0400
Cassava leaves contains poisonous components	1.3895	1.4395	0.0226	0.3340
Cassava leaves could affect human health	0.8460	1.8167	0.0138	0.6410
Cassava leaves should be used in households for cooking	1.0881	1.3673	0.0177	0.4250
Cassava leaves affect tuber formation if plucked and consumed.	-0.3775	1.3637	-0.0061	0.7820
Cassava leaves are useful and therefore should be sold on the market	1.6329*	0.8852	0.0266	0.0650
Cassava leaves save cost if consumed as leafy vegetable	-2.4913	1.5899	-0.0406	0.1170
Cassava leaves are mostly for poor people	-2.3271	1.4643	-0.0379	0.1120
Aroma	-3.8735***	1.4041	-0.0632	0.0060
Texture	6.5161***	1.5851	0.1063	0.0000
General Appearance	-2.9215**	1.4071	-0.0476	0.0380
Obs., 180; Wald chi-square (21), 89.20; Prob. > chi-square, 0.0000; Pseudo R^2, 0.9088; Log pseudo likelihood, -10.44604				

***, **, * indicating significance at 1%, 5%, 10% respectively.
Source: Authors' calculations, 2016

Table 7: Consumers' constraints on utilization of cassava leaves as leafy vegetable in the Kumasi Metropolis

Constraints	Most serious (1)	More serious (2)	Moderate (3)	Slightly serious (4)	Least (5)	Mean score	Rank
Presence of other leafy vegetables	122	16	12	12	7	1.6154	$\mathbf{1}^{ST}$
Unaware if consumable	6	4	3	1	1	2.1333	$\mathbf{2}^{ND}$
Toxic components	9	7	3	5	2	2.3846	$\mathbf{3}^{RD}$
Product attributes	8	36	15	11	11	2.7654	$\mathbf{4}^{TH}$
Unaware of nutritional benefits	5	25	24	17	8	2.9747	$\mathbf{5}^{TH}$
No thorough education on consumption	7	24	31	26	13	3.1386	$\mathbf{6}^{TH}$
Time of cooking	5	7	13	11	6	3.1429	$\mathbf{7}^{TH}$
Not motivated	3	9	9	9	10	3.3571	$\mathbf{8}^{TH}$
Not preferred by household	2	10	10	13	13	3.5208	$\mathbf{9}^{TH}$
Unavailability at market	2	7	6	5	8	3.3571	$\mathbf{10}^{TH}$
Not consumed by parents	4	7	21	22	18	3.5972	$\mathbf{11}^{TH}$
Effect to tuber formation	4	5	11	10	15	3.6000	$\mathbf{12}^{TH}$
Stigmatization	2	10	10	12	24	3.7931	$\mathbf{13}^{TH}$
Dirty on sight	0	3	4	8	14	3.5972	$\mathbf{14}^{TH}$
Perceived as animal feed	0	1	2	5	7	4.2000	$\mathbf{15}^{TH}$
Pests infestation	0	1	4	9	16	4.3333	$\mathbf{16}^{TH}$

Source: Field survey, 2016

leaves as a leafy vegetable by providing thorough information which will make respondents aware of the nutritional benefits of cassava leaves. Educating consumers on the health benefits of cassava leaves would help re-orient their perception on consumption of cassava leaves as a leafy vegetable.

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