

Identifying Popular Indigenous Leafy Vegetables for Sustainable Interest in Vegetable Production in the Tamale Metropolis in the Northern Region of Ghana

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Abstract— One way of achieving a sustained interest in vegetable production in a catchment area is to identify the most popular vegetable with high demand. The present study determined the Popular Indigenous leafy vegetables in the Tamale Metropolis in the Northern region of Ghana. A structured questionnaire was used to access the requisite data. The items were divided into sections. Most of the items were close-ended questions with few open-ended ones to make room for more different opinions. The questionnaire covered the bio data of leafy vegetable marketers and consumers, buying and selling volumes of leafy vegetables, Leafy vegetable marketers and prospective leafy vegetable consumers were the target population. The population of 60 marketers of leafy vegetables and 274 consumers in the Tamale Metropolis were considered. Respondents (consumers) were chosen as they came to buy leafy vegetables at the market. The data obtained was subjected to one way analysis of variance (ANOVA), using Statistical Package for Social Sciences (SPSS Version 16.0). *Amaranthus dubius*, *Corchorus olitorius*, and *Hibiscus sabdariffa* were rated the most popular leafy vegetables.

Keywords— Vegetable Production, Northern Region of Ghana.

I. INTRODUCTION

Ghana has varying climatic conditions across the country which coupled with inadequate food distribution channels has led to existence of different food crops in the different regions. Leafy vegetables serve as the main source of nutrients, especially in poor-resource households in the country. This is the case of the residents of northern Ghana, which comprises the Northern, Upper East and Upper West regions. Residents of Northern Ghana, consume significant

quantities of greens gathered from their surroundings/farms (Amaglo and Nyarko, 2012).

Vegetables are the succulent edible plant parts that may be eaten as supplementary food or side dishes in raw state or in the cooked form and various preparations. They may be sweet, aromatic, bitter, hot and tasteless and sometimes require salting and considerable seasoning to render them more tasty and acceptable. Products of vegetables play an important role in the diet of West Africans. Some crops grown for one purpose may also be put to dual use, thus cowpea and cassava grown for their protein-rich seeds and carbohydrate-rich roots respectively, also have their leaves harvested for vegetables (Seidu *et al.*, 2012). Traditional leafy vegetables play a very important role in income generation and subsistence. They provide employment for peri-urban dwellers because of their generally short, labour intensive production systems, low levels of investment and high yield (Schippers, 2000).

Several attempts have been made by successive governments and other development partners to improve the productivity of vegetable farmers in an effort to reduce poverty in the region through small scale irrigation schemes, dug-outs and others. These interventions have contributed to the improvement in the production and supply of vegetables in the area. (Fuseini, 2018).

Vegetables are also a preferred cash crop because of their potential for lifting poor farmers out of poverty. It is reported that urban agriculture can meet large parts of the urban demand for certain kinds of food such as fresh vegetables, poultry, potatoes, milk, fish and eggs. The most commonly grown urban vegetables are the most perishable (leafy) ones such as *Amaranthus dubius*, *Corchorus olitorius*, and *Hibiscus sabdariffa*, which have to be

produced in market proximity. Sub-Saharan Africa regions are reported to have the world's lower intake of micronutrient-rich fruits and vegetables with the mean consumption being less than half the World Health Organization (2003) recommendations on daily intake of 400g per capita per day in most countries. Low consumption of fruits and vegetables is the main contribution to micronutrients deficiencies, especially in populations with a low intake of nutrient-dense animal sources and dietary products (Seidu *et al.*, 2012). It is an indisputable fact that leafy vegetables are vital sources of minerals and vitamins for human health and development. Climatic conditions such as high temperatures, low humidity short periods of rainfall in the northern part of the country does not favour the cultivation of crops with long maturation periods. The main objective of the study was to determine the commonly grown leafy vegetables in the Tamale Metropolis in the Northern region of Ghana.

A. Importance and benefits of Vegetables

Vegetables are very vital to human, both economically and nutritionally. Economically, they are relatively cheap to grow and act as a quick source of income to many rural women (Ijeomah *et al.*, 2012). Nutritionally, they are a good sources of vitamins, minerals and dietary fibre and water to aid digestion. Vegetables are rich in minerals such as potassium, sodium, calcium, iron, zinc and phosphorus. They also have high contents of thiamine, ascorbic acid, riboflavin and β -carotene. The water content is about 70% or more. They also contain many phyto-chemicals which are needed for health-promotion and disease prevention. Vegetables are consumed in very small quantities, and are used in almost every meal or used alone as salad or as a side dish with main meal (Ijeomah *et al.*, 2012).

Many authors have documented the importance of indigenous leafy vegetables of Africa as valuable sources of food, income and traditional medicine. Traditional African vegetables are extremely important for nutrition and farm income throughout Africa. They often supply most of the daily requirements of proteins, minerals and vitamins of poor rural people (Adebooye, 2005).

Quite a large number of African indigenous leafy vegetables have long been known and reported to have health protecting properties and uses. Several of these indigenous leafy vegetables continue to be used for prophylactic and therapeutic purposes by rural communities. This indigenous knowledge of the health promoting and protecting attributes of African indigenous Leafy Vegetables (ALVs) is clearly linked to their

nutritional and non-nutrient bioactive properties. ALVs have long been, and continue to be reported to significantly contribute to the dietary vitamin and mineral intakes of local populations (Smith, Francisca I. *et al.*, (2007).

Indigenous vegetables are important sources of vitamins, minerals and other nutrients for rural families since ancient times. These substances protect us from illness and ensure proper metabolism. Since we cannot synthesize vitamins and minerals, they must also be supplied in the food we eat. Vitamins are often destroyed or lost during food processing. Othersources of vitamins and minerals are green leafy vegetables such as spinach and *Kontomire* (cocoyam leaves); both are found in southern Ghana. A larger variety of wild and cultivated leafy vegetables such as bitter leaf, cassava leaves, baobab leaves and Guinea sorrel are found in Northern Ghana (Kwapata, 1991).

Vegetables are a good source of roughages, which by providing an indigestible matrix stimulates intestinal muscles and keep them in working order and also prevent constipation through their laxative effect. The fibre content of vegetables generally adds to bulk of the food which prevents us from frequent hunger (Norman, 1992). Vegetables play an important role in the diet of West Africans. Some crops grown for one purpose may also be put to dual use, thus cowpea and cassava grown for their protein-rich seeds and carbohydrate-rich respectively also have their leaves harvested for vegetables (Okigbo, 1983).

Vegetables are highly beneficial for maintaining health and preventing diseases. Dark green leafy vegetables provide high amounts of micro-minerals which play vital roles in nutrient metabolism and retard degenerative diseases (Darkwa and Darkwa, 2013). Vegetables are important dietary sources of nutrients, vitamins and fibre for humans' vital health and wellbeing. Well balanced diets rich in fruits and vegetables are especially valuable for their ability to prevent vitamin A and C deficiency (Sowley *et al.*, 2011). Leafy vegetables contain many typical plant nutrients, but since they are photosynthetic tissues, their Vitamin K levels in relation to those of other fruits and vegetables, as well as other types of foods, are particularly notable. Leafy vegetables are typically low in calories, low in fat, high in protein per calorie, high in dietary fibre, high in iron and calcium, and very high in vitamin C, carotenoids, lutein folate, magnesium as well as vitamin K (Schippers, 2000).

Some indigenous leafy vegetables such as okra, vegetable jute, impart a glutinous constituency to stew and soup and thus facilitate swallowing of food such as "Banku" "Fufu" and "Gari". It has been also discovered that vegetables are

rich source of vitamins K, A, and C as well as minerals such as calcium, iron, phosphorus, some appreciable amount of thiamine, Niacin and riboflavin, carbohydrate and crude proteins compared to exotic leafy vegetables (Schippers, 2000).

Green leafy vegetables are rich sources of carotene and vitamin B and C. Carotene often called pre-vitamin A is changed to vitamin A indigestion. Food rich in vitamin C play an important supportive role in preventing Iron deficiency. Also, leafy vegetables are high in calcium, iron, and phosphorus. Furthermore, leafy vegetables are high in water content and fibre. Because of their succulence, they aid digestion (Schippers, 2000). *Amaranthus dubius* for instance is consumed as cooked leafy vegetable. Its leaves is known to be good food with medicinal properties for young children, lactating mothers and for patients with fever, haemorrhage, anaemia, constipation or kidney complaints (Schippers, 2002). It is rich in vitamin C and it is used to support the treatment of patients suffering from HIV/AIDS (Babalola *et al.*, 2010).

Fibre is responsible for maintaining a healthy digestive tract and supporting a wide array of other bodily systems in less crucial ways as well. Eating green fruits and vegetables will help to ensure that you do not run into any problems with your digestive system. While each different green fruit and vegetable contains a slightly different mixture of vitamins, it is likely that any one that your choice will have a good source of at least one important nutrient of this type. Vitamin A and vitamin C are two of the most commonly occurring vitamins in these types of vegetables and fruits. Vitamin A helps your body to process a number of different nutrients, like calcium and potassium, while vitamin C is essential for the building up of your immune system and to prevent you from getting sick (WHO/FAO, 2003).

II. MATERIALS AND METHODS

Tamale Metropolis was the study area for this research work. Tamale Metropolis lies between latitudes 9°16' and 9°34' North and longitudes 0°36' and 0°57' West. The Metropolis occupies approximately 750 km² which is about 13% of the total land area of the Northern Region of Ghana (Sowley *et al.*, 2011). Tamale has a tropical wet and dry/savannah climate with a pronounced dry season in the low-sun months, no cold season, and wet season in the high-sun months. According to the Hold ridge life zones system of bioclimatic classification Tamale is situated in or near the tropical dry forest biome. The mean temperature is 27.9 degrees Celsius (82.3 degrees Fahrenheit). Average

monthly temperatures vary by 5.5 °C (9.9°F). The annual precipitation averages 1090 mm (42.9 inches) which is equivalent to 1090 litres/m² (26.74 gallons/ft²) or 90.8 mm (3.6 in) per month. On average there are 97 days per year with more than 0.1 mm (0.004 in) of rainfall. The driest weather is in December when an average of 3 mm (0.1 in) of rainfall occurs. The wettest weather is in September when an average of 231 mm (9.1 in) of rainfall occurs. On the average there are 2723 hours of sunshine per year. (Meteorological Service Department-Tamale, 2015). The study was conducted on some popular indigenous leafy vegetables in the Tamale Metropolis. A pilot survey was conducted to gather information on the popular indigenous leafy vegetables consumed in Tamale Metropolis. A structured questionnaire was used to access the requisite data. The items were divided into sections. Most of the items were close-ended questions with few open-ended ones to make room for more different opinions. The questionnaire covered the following broad areas; the bio data of leafy vegetable marketers and consumers, buying and selling volumes of leafy vegetables, and sources of the vegetables.

Leafy vegetable marketers and prospective leafy vegetable consumers were the target population. The population of 60 marketers of leafy vegetables and 274 consumers in the Tamale Metropolis were considered. Respondents (consumers) were chosen as they came to buy leafy vegetables at the market. The data obtained was subjected to one way analysis of variance (ANOVA), using Statistical Package for Social Sciences (SPSS Version 16.0).

III. RESULTS

BIO DATA OF RESPONDENTS

The age ranges of the marketers of leafy vegetables were 21-30, 31-40 and more than 41. Out of a total number of 60 vegetable marketers, 14 (23.3%) of them were within the age range of 21-31 years, 22 (36.7%) of the total were within the age range of 31-40 years, majority (40%) of the leafy vegetable marketers were in the age range of 41 years and above.

The level of education of leafy vegetable marketers were categorized into No formal education, Middle School Leaving Certificate (MSLC), Junior High School (JHS), Senior High School (SHS), and higher than SHS. Twenty five (41.7%) of the marketers had no formal education while ten (16.7%) were MSLC graduates. Junior High School (JHS) graduates were 15 (29.7%) of the total number. Seven (11.7%) of the total number of marketers

were Senior High School SHS graduates and the remaining two (3.3%) of marketers had education higher than SHS. Majority of the vegetable marketers had no formal education. Education higher than SHS category of marketers recorded the least.

Out of 274 answers, 65 (23.7%) were within the age range of 21-30 years, 121 (44.2%) of the total number of consumers were within the age range of 31- 40 years, while the remaining 88 (32.1%) were 41 years and above.

Table.1: Bio-data of respondents

		Marketers		Consumers	
		Frequency	%	Frequency	%
Gender	Male			135	49.3
	Female			139	50.7
Age	21-30	14	23.3	65	23.7
	31-40	22	36.7	121	44.2
	41+	24	40	88	32.1
Educational level	No formal	25	41.7	127	46.4
	MSLC	10	16.7	05	1.8
	JHS	15	29.7	52	19.0
	SHS	07	11.6	63	23.0
	Tertiary	02	3.3	27	9.9

Leafy vegetable marketers rated the vegetables as follows; 23 representing 38.3% of the total number of marketers rated *Corchorus olerarius* as the most popular leafy vegetable. Seventeen (28.3%) of the marketers rated *Hibiscus sabdariffa* as the most popular leafy vegetable. *Amaranthus dubius* was rated next most popular leafy vegetable to *Hibiscus sabdariffa* with 13 (21.7%) of the total number of marketers. Only 5.3% of the total number of marketers, rated cocoyam leaves, and 6.4% rated bitter leaf as the most popular leafy vegetable in the Tamale Metropolis.

From Table 4.2, out of the total number of sixty marketers, 14, (23.3%) were in the age range of 21-30 years; 22 marketers, representing 36.7% of the total number of the marketers were in the age range of 31-40 years. The remaining 24 marketers, representing 40%, were in the age range of 41 years and above. With this statistics, the youngsters (21-30 year range), six marketers, representing 42.9% of this group, sold *Corchorus olerarius* most, none sold cocoyam leaves and four marketers, representing 28.6% of the population sold *Hibiscus sabdariffa*. Others were three marketers, representing 21.4%, sold *Amaranthus dubius* and only one marketer, representing 7.1%, sold bitter leaf. On the other hand, in the 31-40 year group who were interviewed, seven marketers, representing 31.8%, sold

Corchorus olerarius; three marketers, representing 13.6%, sold cocoyam leaves, whilst seven representing 31.8%, sold *Hibiscus sabdariffa*. *Amaranthus dubius* was sold by five marketers representing 22.7% of the total number of this year group (31-40), while none of them sold bitter leaf. Finally, ten marketers, representing 41.7% of the total number were in the 41 years and above group sold *Corchorus olerarius*. Three marketers representing 12.5%, sold cocoyam leaves and five marketers, representing 20.8%, sold *Amaranthus dubius* and none of them sold bitter leaf. In this case *Corchorus olerarius* was rated the most popular leafy vegetable with a high percentage of 41 and above year group of marketers.

Corchorus olerarius was rated the most popular indigenous leafy vegetable with 107 (39.09%). This was followed by *Hibiscus sabdariffa* with 90 (32.84%) of the consumers rating it as the most popular leafy vegetable used at home. *Amaranthus dubius* was rated next by 51 (18.6%) of total number of consumers, as the most popular leafy vegetable used at home. 22 representing 8.02% rated bitter leaf as the most popular leafy vegetable used at home. The least rated leafy vegetable was cocoyam leaves where only four (1.45%) of the total number of consumers rated it as the most popular leafy vegetable used at home

Table.2: Popularity of leafy vegetable sold by age

Indigenous leafy vegetable	Description	Age			
		21-30	31-40	41+	Total
<i>Corchorus olitorius</i>	Count	6	7	10	23
	% within most popular leafy vegetable used at home	26.1%	30.4%	43.5%	100.0%
	% within age of marketers	42.9%	31.8%	41.7%	38.3%
Cocoyam leaves	Count	0	3	3	6
	% within most popular leafy vegetable used at home	0.0%	50.0%	50.0%	100.0%
	% within age of marketers	0.0%	13.6%	12.5%	10.0%
<i>Hibiscus sabdariffa</i>	Count	4	7	6	17
	% within most popular leafy vegetable used at home	23.5%	41.2%	35.3%	100.0%
	% within age of marketers	28.6%	31.8%	25.0%	28.3%
<i>Amaranthus dubius</i>	Count	3	5	5	13
	% within most popular leafy vegetable used at home	23.1%	38.5%	38.5%	100.0%
	% within age of marketers	21.4%	22.7%	20.8%	21.7%
Bitter Leaf	Count	1	0	0	1
	% within most popular leafy vegetable used at home	100.0%	0.0%	0.0%	100.0%
	% within age of marketers	7.1%	0.0%	0.0%	1.7%
Total	Count	14	22	24	60
	% within most popular leafy vegetable used at home	23.3%	36.7%	40.0%	100.0%
	% within age of marketers	100.0%	100.0%	100.0%	100.0%

From Table 4.3 total number of 107 consumers representing 39.1% of the total number of 274 chose *Corchorus olitorius* as the most popular leafy vegetable used at home. Out of this, 50.5% of them were males and 49.5% were females. Thereby, indicated 40.0% of the total male consumers rated *Corchorus olitorius* as the most popular leafy vegetable used at home and 38.1% of the total female consumers rated *Corchorus olitorius*. *Hibiscus sabdariffa* was rated the second most popular leafy vegetable used at home as 90 consumers, representing 32.8% of the consumers. Out of this population, 50.0% of them were males and 50.0% were females, thereby, indicating 49.0% of the total male

consumers rated *Hibiscus sabdariffa* as the most popular leafy vegetable used at home while 51.0% of the total female consumers rated *Corchorus olitorius* as most popular leafy vegetable used at home. Fifty one consumers, representing 18.6% of the total number of consumers, consisting of 18.5% males and 18.7% females indicated 49.0% of male consumers and 51.0% of female consumers respectively rated *Amaranthus dubius* as the most popular leafy vegetable used at home, placing it third on the list. Cocoyam leaves was rated the least with 1.5% and 8.0% by male and female consumers respectively of the total population of 4 consumers.

Table.3: Choice of popular leafy vegetable used by gender

Indigenous leafy vegetable	Description	Gender		
		Male	Female	Total
<i>Corchorus olitorius</i>	Count	54	53	107
	% within most popular leafy vegetable used at home	50.5%	49.5%	100.0%
	% within gender of consumers	40.0%	38.1%	39.1%
Cocoyam leaves	Count	2	2	4
	% within most popular leafy vegetable used at home	50.0%	50.0%	100.0%

	% within gender of consumers	1.5%	1.4%	1.5%
<i>Hibiscus sabdariffa</i>	Count	45	45	90
	% within most popular leafy vegetable used at home	50.0%	50.0%	100.0%
	% within gender of consumers	33.3%	32.4%	32.8%
<i>Amaranthus dubius</i>	Count	25	26	51
	% within most popular leafy vegetable used at home	49.0%	51.0%	100.0%
	% within gender of consumers	18.5%	18.7%	18.6%
Bitter Leaf	Count	9	13	22
	% within most popular leafy vegetable used at home	40.9%	59.1%	100.0%
	% within gender of consumers	6.7%	9.4%	8.0%
Total	Count	135	139	274
	% within most popular leafy vegetable used at home	49.3%	50.7%	100.0%
	% within gender of consumers	100.0%	100.0%	100.0%

Table 4.4 shows that, out of the total number of 274 consumers, 65 representing 23.7%, were in the age range of 21-30 years, 121, consumers, representing 44.2% of the total number of the consumers were in the age range of 31-40 years, and 88 consumers, representing 32.1%, were in the age range of 41 years and above. With this, 21 consumers, representing 32.3% of 21-30 year group, rated *Corchorus olitorius* was mostly used at home, none rated cocoyam leaves and 22 consumers, representing 33.8%, rated *Hibiscus sabdariffa*. Seventeen consumers, representing 26.2% of this group (21-30 years), rated *Amaranthus dubius* was mostly used leafy vegetable at home and only five people, representing 7.7%, rated bitter leaf. On the other hand, 31-40 year group who were interviewed, 55 consumers, representing 45.5%, rated

Corchorus olitorius; two consumers, representing 1.7%, rated cocoyam leaves as mostly used leafy vegetable at home, whilst 39 consumers (32.2%), rated *Hibiscus sabdariffa*. *Amaranthus dubius* was rated by 16 consumers, representing 13.2% of the total number of this year group (31-40) of consumers, while nine consumers, representing 7.4% of them rated bitter leaf. Finally, 31 consumers, representing 35.2% of the total number of the 41 years and above group of consumers, rated *Corchorus olitorius*. Only two consumers, representing 2.3%, rated cocoyam leaves and 29 (33%) consumers rated *Amaranthus dubius*. Finally, eight consumers, representing 9.1%, rated bitter leaf as mostly leafy vegetable used at home. It is clear that *Corchorus olitorius* was rated the highest with 39.1% with the concentration of 31-40 year range of 45.5%.

Table.4: Consumer rating of leafy vegetables used by age

Indigenous leafy vegetable	Description	Age			
		21-30	31-40	41+	Total
<i>Corchorus olitorius</i>	Count	21	55	31	107
	% within most popular leafy vegetable used at home	19.6%	51.4%	29.0%	100.0%
	% within age of consumers	32.3%	45.5%	35.2%	39.1%
Cocoyam leaves	Count	0	2	2	4
	% within most popular leafy vegetable used at home	0.0%	50.0%	50.0%	100.0%
	% within age of consumers	0.0%	1.7%	2.3%	1.5%
<i>Hibiscus sabdariffa</i>	Count	22	39	29	90
	% within most popular leafy vegetable used at home	24.4%	43.3%	32.2%	100.0%
	% within age of consumers	33.8%	32.2%	33.0%	32.8%
<i>Amaranthus dubius</i>	Count	17	16	18	51
	% within most popular leafy vegetable used at home	33.3%	31.4%	35.3%	100.0%

	% within age of consumers	26.2%	13.2%	20.5%	18.6%
Bitter Leaf	Count	5	9	8	22
	% within most popular leafy vegetable used at home	22.7%	40.9%	36.4%	100.0%
	% within age of consumers	7.7%	7.4%	9.1%	8.0%
Total	Count	65	121	88	274
	% within most popular leafy vegetable used at home	23.7%	44.2%	32.1%	100.0%
	% within age of consumers	100.0%	100.0%	100.0%	100.0%

IV. CONCLUSION

The survey conducted to identify the most popularly used indigenous leafy vegetables in the Tamale Metropolis, leafy vegetables were ranked in order of popularity by both leafy vegetable marketers and consumers. *Amaranthus dubius*, *Corchorus olitorius*, and *Hibiscus sabdariffa* were rated the most popular leafy vegetables, meanwhile *Corchorus olitorius* was rated the most popularly used indigenous leafy vegetable. Farmers of leafy vegetables should be encouraged to cultivate *Amaranthus dubius*, *Corchorus olitorius* and *Hibiscus sabdariffa*. This could help in the efforts to reduce unemployment situation in northern region of Ghana.

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