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Consumer Perceptions towards the Consumption and the Canning of African Leafy Vegetables in the Limpopo Province

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ABSTRACT The paper is based on a mixed research study which assessed the consumer perceptions towards consumption and canning of African Leafy Vegetables (ALVs). Findings showed that the consumption of ALVs was; stimulated by the perception that they were nutritious, easily accessible, chemical free and cost-effective; cultural significance and contribution to food security; but a declining interest towards ALVs consumption amongst younger generation. The issue of canning of ALVs intrigued the younger generation; the majority were concerned about preservatives; urban consumers perceived canning to offer valuable benefits such as convenience, trusted extended shelf-life and a variety of new flavours. An interface of traditional and modern technology could be beneficial to future consumers however, sensory evaluation is required to confirm consumer acceptability, willingness to utilize and to pay for canned ALVs.

INTRODUCTION

There are about 210 species of African Leafy Vegetables (ALVs) that form an integral part of South African households' daily nutritional diet (Dansi 2008). South Africa has been found to have more than 100 species of leafy vegetables, some of which are indigenous (Rose 1983; Jansen Van Rensburg 2007). African Leafy Vegetables like pigweed (*Amaranthus cruentus* L.), Chinese cabbage (*Brassica rapa* L. subsp. *Chinensis*), Black nightshade (*Solanum retroflexum* Dun.), cowpeas (*Vigna unguiculata* (L) Walp.), pumpkin leaves (*Cucurbit maxima* (Duchesne) and spider plant (*Cleome gynandra*) can flourish even in areas that have very low agricultural potential (Van der Heever 2002). As compared to other African countries ALVs in South Africa are underutilised. Micro-nutrient deficiencies are a growing problem due to limited or no dietary variation. About forty percent of South African families live in poverty and are exposed to malnutrition (UNICEF and the South African Human Rights Commission 2011). Increasing food prices, climate change and natural disasters tend to pose a serious threat to food security and aggravate the malnutrition situation.

In developing countries, the diets of the poor are largely cereal based and nutrient deprived with insufficient foods of animal origin, vegetable and fruits (Hotz and Gibson 2007). A survey by Faber et al. (2007) showed that in South Africa an estimated 11.1 million males and 12.5 million females over 15 years of age had a low intake of vegetables and fruit. The study recommended improved consumption of vegetables and fruits. This however is affected by issues of affordability, availability and seasonality and therefore reduces maximum intake (Love et al. 2001; Faber et al. 2013). There is currently high recognition of ALVs from government and research due to the introduction of the WHO (2009) strategy to increase consumption of fruits and vegetables to improve the well-being of the population. ALVs have gained commercial recognition over the past 15 years as a result of huge evolution in markets (Irungu et al. 2007). In Kenya, before 2000, ALVs were found only in the back streets and in limited open markets; however, they have now become a common occurrence in most supermarkets (Mwara 2013). Thirty percent of ALVs in Nairobi are locally produced and sold in the market (Dagmar and Hermann 2011). A similar pattern is being noted in

some sub-Saharan African (SSA) countries such as Zimbabwe. While the value of agricultural weeds as traditional vegetables was often ignored due to lack of information, there is noticeable recognition of ALVs as a cost effective agricultural-based food and nutrition security intervention for a large segment of the population in both rural and urban areas.

African Leafy Vegetables are a potential alternative to combat food and malnutrition challenges due to their high micronutrient content, their ability to grow naturally, cost effectiveness as they require less input and drought tolerance (Osei 2013). However, the major challenge is that ALVs are mainly seasonal as they are mostly abundant during summer affecting their availability throughout the year (Mepba et al. 2007). As stated by Makobo et al. (2010), ALVs are highly perishable food items, thus, special care should be taken during post-harvest, storage and further processing methods to extend shelf-life since there may be significant effects on the concentration of minerals, vitamins and other essential components present in the ALVs. Drying method has been an indigenous method of preventing post-harvest losses and extending shelf life of ALVs (Kiremire et al. 2010). While drying is a cost effective method of preserving ALVs, still used in most rural households, drying can result in poor quality products, loss of micronutrients such as vitamin A and C, loss of variable moisture content and microbial load (Prabhu and Barret 2009). A demand for aesthetic attributes and good quality products especially by urban consumers have clearly shown that products are not only judged by price but safety and nutritional quality. Furthermore, convenience influenced the utilisation and consumption of the product (Joubert 2010).

Canning method is an alternative ensuring that a product which was previously subject to seasonality is available all year round. Ready to eat meals saves preparation time and is considered to be safe. While the food industry is increasingly interested in new indigenous-based food products that could satisfy the needs of consumers, the use of canning addresses both non-sensory and sensory factors which affect consumer acceptance (Hong et al. 2011). Research shows that consumer's perceptions are of high importance as it affects the product acceptance and influences their consumption and utilisation (Joubert 2010; Bessiere and Tibere 2013). Consumer perceptions towards canning of ALVs as a preservation method have not yet been investigated.

METHODOLOGY

A mixed research method was used and included 120 questionnaires, 8 focus group discussions and key informant interviews based on the Rapid Rural Appraisal (RRA) approach and transact walks. According to Teddlie and Tashokkori (2009), a mixed research methodology is used to answer research questions which a single methodology cannot answer. It is intended to supplement information from one source with the other by addressing issues from different data sources, or triangulate to comprehensively provide answers that can be limited by a single approach. In this study, the various approaches provided information on individual's opinions, knowledge and perceptions towards the consumption of indigenous vegetables (Fowler 2011).

Description of the Study Area

This study was conducted in the Limpopo Province, South Africa, in Mopani district in Greater Tzaneen municipality. Two communities namely Mawa (rural) and Lenyenye (urban) participated in this study. The Limpopo province of South Africa is approximately 125,754 square kilometres in area. Almost all rainfall occurs in the summer months between October and April with an average rainfall in Tzaneen of 965mm per annum. The average temperature per annum in Tzaneen is 20.4°C. The main activity for this area is farming of fruits such as bananas, pineapples, litchis and pawpaw. Basic supplies of water, sanitation, electricity and roads are still lacking. The widespread unemployment and poverty in the area is evident (Census 2011). A total of 120 random purposive sample constituting a quota sample segmented as 30:30 rural older generation/rural younger generation and 30:30 urban older generation/urban younger generation. The younger generation in this study was composed of school children from 14 years 14 to 35 years and the older generation people older than 35 yrs.

Validity, Reliability and Trustworthiness of Methods

A rapid rural appraisal approach was done to familiarize the researcher with the area, hold

informal key informant interviews with the community members, and to observe the utilisation of ALVs in the targeted communities. The school principal was approached prior to request for permission for the learners to participate in the study. Furthermore, consent forms were given to the parents to sign allowing their children to participate in the study. The questionnaire was translated from English to isiPedi by two field workers who were proficient in both English and isiPedi (local language). Six field workers who spoke the local language were trained to assist the participants to administer the questionnaires. Focus group discussions were conducted by an expert in focus group facilitation, who was fluent in isiPedi.

Data Analysis

Using the IBM Statistical Package for Social Sciences (IBM SPSS), descriptive and frequencies were used to interpret the data. The qualitative data was analysed using content analysis to identify themes, patterns and concepts. The data collected through the focus group discussions (transcripts and tape recording) were transcribed immediately after data collection to identify themes, trends and concepts. Verbatim quotes were linked to the relevant themes and concepts to clarify the opinion of the participants.

RESULT AND DISCUSSION

Table 1 shows the socio-demographic profile of the respondents in the study communities in Limpopo Province. As opposed to the norm of women being mainly involved in ALVs production and planting, in this study both men and women were involved. Fifty-two percent of respondents were male and they were mainly involved in the collection of leafy vegetables. In addition, sixty-five percent of the rural participants had lower literacy levels as compared to urban areas. Most of the respondents in both areas were single (70.8%) and unemployed (65%).

In South Africa, many people are moving from rural to urban areas and this has led to great changes in socio-cultural and natural environment (Vorster et al. 2008). However findings from this study indicated that even the highly educated with better incomes residing in urban areas did not regard ALVs as food for the low income class. The need to promote consumption of ALVs need to consider the different settings, taking into account the rural and urban differences (Faber et al. 2013). In most parts of the developed world these vegetables are regarded as 'weeds' but in Africa and other developing countries, these plants form part of the daily diets of many rural households (Senyolo et al. 2014). The potential value for of these plants food security is also recognised by the Food

Table 1: Socio-demographics of the participants

		Study area		*Total*
		Mawa	*Lenyenye*	
Gender	Female	25 (20.8%)	33 (27.5%)	58 (48.3%)
	Male	30 (25.0%)	32 (26.7%)	62 (51.7%)
	Total	55 (45.8%)	65 (54.2%)	120 (100%)
Educational Level	No formal education	65.0%	0 (0%)	6 (5%)
	Primary	7 (5.8%)	1 (0.8)	8 (6.7%)
	Secondary	41 (34.2%)	37 (30.8%)	78 (65%)
	Tertiary	1 (0.8%)	27 (22.5%)	28 (23.3%)
	Total	55 (45.8%)	65 (54.2%)	120 (100%)
Marital Status	Single	38 (31.7%)	47 (39.2%)	85 (70.8%)
	Married	16 (13.3%)	14 (11.7%)	30 (25.0%)
	Divorced	0 (.0%)	3 (2.5%)	3 (2.5%)
	Widowed	0 (.0%)	1 (.8%)	1 (.8%)
	Separated	1 (.8%)	0 (0.0%)	1 (.8%)
	Total	55 (45.8%)	65 (54.2%)	120 (100%)
Employment	Employed full time	1 (0.8%)	25 (20.8%)	26 (21.7%)
	Employed part time	5 (4.2%)	4 (3.3%)	9 (7.5%)
	Unemployed	42 (35.0%)	36 (30.0%)	78 (65.0%)
	Pensioner	7 (5.8%)	0 (0.0%)	7 (5.8%)
	Total	55 (45.8%)	65 (54.2%)	120 (100%)

and Agriculture Organisation (FAO) together with Biodiversity International (WHO 2009). Also, even though socio-economic changes that have taken place in Africa have changed the eating habits in both rural and urban set ups, people in Africa still value ALVs (Orech et al. 2007).

Consumption of ALVs and Their Preparation

The ALVs were consumed almost on a daily basis with an average of twice per day mainly during lunch and supper. The focus group discussions showed that this particular consumption pattern was mainly common in rural areas as compared to urban areas.

The ALVs were mainly regarded as a complementary food to accompany any energy foods such as stiff porridge known as *'pap'*. African Leafy Vegetables are traditionally cooked and eaten as a complementary food item to accompany staple food of that particular region (Olvai et al. 2014). Table 2 shows the recipes used by consumers to prepare ALVs. The preparation of ALVs was similar in both rural and urban areas with tomatoes being the basic ingredient.

The focus group discussions revealed that tomatoes were a compulsory ingredient as the ALVs were not *'morogo'* without them. This was a generation-to-generation recipe, the justification for the tomatoes as the main ingredient was that it improved the sensory properties of the ALVs while other ingredients such as peanuts powder improved the ALVs nutritional value. It should be noted that the colour of ALVs is highly valued thus soda or ashes is added to retain a certain colour of green.

Consumer Preference towards ALVs

Table 3 shows the difference in consumer preference between ALVs and exotic leafy vegetables in both areas. The results shows that in both areas, most of the respondents prefer ALVs over exotic leafy vegetable. According to Voster et al. (2007) and Taleni et al. (2011) the weakness of preparation methods used when cooking ALVs could be a setback to their consumption especially because the children and youth consider taste to be an important factor in food. As noted in this study the younger generation's disinterest on the ALV consumption was due to lack of variety.

Although all the participants were consumers of ALVs but only 54.2 percent of them showed preference towards the consumption of ALVs with 11.7 percent who were undecided. A chi square test was performed to show that if there was difference in their preference on consumption for ALV. The result for chi square test shows that there was no significant difference ($p=0.145$) in preference between the two study areas. More so, the focus group discussions revealed that youth were the ones who least

Table 2: Recipes used by local people to prepare ALVs

ALV	*Ingredients*	*Method*
Dithaka	• Water • Tomatoes • Salt • Powdered peanuts (optional)	Wash vegetables and cutBoil water, pour vegetables in a saucepan, add saltSimmer and add tomatoes and simmer again.
Monawa	• Salt • Tomatoes • Oil	Wash vegetables, boil water and pour vegetables, stir once, add tomatoes and salt. Simmer then add oil or nuts.
Lekoshe	• Water • Bicarbonate of Soda • Salt • Tomato	Boil water, put salt, add soda or ashes, add vegetables then add tomatoes and simmer.

Table 3: African leafy vegetables preference

Study area	*Very bad*	*Bad*	*Average*	*Good*	*Very good*
Mawa	0.8%	0.8%	2.5%	12.5%	29.2%
Lenyenye	1.7%		9.2%	18.3%	25.0%
Total	2.5%	0.8%	11.7%	30.8%	54.2%

preferred the ALVs due to monotonous preparation and elders in both rural and urban areas preferred ALVs for their taste, nutritional value and medicinal purposes.

However, there was no significant difference between the ALV preferences compared to exotic vegetables as demonstrated in Table 4. In the rural area exotic vegetables were least preferred.

The Primary Purpose of ALVs in Households

Table 5 shows that the ALVs were perceived to be most valued food items within households. It mainly played a key role as a food security buffer, represented cultural heritage and are medicinal.

The focus group discussion revealed that the availability of ALVs was another main factor that influenced their consumption. As stated by the World Bank (2007), ALVs are known for their importance in providing food security to millions of Africans both in the rural and urban areas. Focus group discussion further revealed that ALVs were mostly valued for their nutritional benefit regardless of gender and or location. Even though many changes have occurred in South Africa in the last few decades, including urbanisation (Vorster et al. 2008). Many urban dwellers are mostly first generation who migrated from rural areas and therefore retain their preference for ALVs. This is an opportunity for endorsing the commercialisation of ALVs to promote the consumption of ALVs amongst both current and future generations.

ALVs are now contributing to the diet of the people for it still continues to be associated with health benefits. According to a study conducted in the United States in 2007, diabetes is considered the 7th leading cause of death, and participants have shown that ALVs can help in controlling blood glucose levels and reduce complications (Hoikyung et al. 2007). There are certain types of ALVs that are perceived to have more health benefits specifically to the elderly. In this study, a participant indicated that:

"ALVs are eaten by everyone in the household but Nku (Momordica charantia), English name Bittergourd is mostly preferred by old people because it is believed to reduce high blood pressure and helps control diabetes."

As shown in Table 6, ALVs were described food of high nutritional value, which grow on their own, are chemical free and cost effective.

ALVs have been found to be an affordable source of several micronutrients, however, their

Table 4: Preference for exotic vegetables in two study areas

Study area	*Very bad*	*Bad*	*Average*	*Good*	*Very good*
Mawa	0.8%	2.5%	5.0%	19.2%	18.3%
Lenyenye	0.0 %	2.5%	5.0%	25.8%	20.8%
Total	0.8%	5.0%	10.0%	45.0%	39.2%

Table 5: Respondent perceptions on the value of ALVs

Question	*Theme*	*Concepts*	*Quotes*
What Do You Regard as Traditional Vegetable?	*Food Security*	Available and accessible	*"You can find it at home"* *You do not have to plant them, they grow*
		Natural	*"on their own"* *"They are seasonal"*
		Use indigenous knowledge to prepare it	*"We cook it in our traditional way, it requires less ingredients"*
	Cultural and Sentimental Value	Generation heritage	*"It was eaten in the olden days"* *"They have been utilized for decades by Africans"*
	Medicinal	Healing properties	*"We use it for medicinal purposes"* *"We consume ALVs because they give our body nutrients"* *"We consume ALVs to reduce high blood pressure"* *"you do not age quickly and you do not gain weight if you consume ALVs"*

use is declining and their familiarity over the years could be lost if the younger generation is not being educated on the significance of these vegetables. These vegetables are considered to be inexpensive yet they are underutilised (Antia et al. 2006) and their contribution to the livelihood of rural poor is widely acknowledged (Kepe 2008). Descriptive analysis for the survey shows that in overall the respondents had a positive preference for ALVs. For instance 30.8 percent suggest that the preference for ALVs was good and 54.2 percent suggest it was very good. There was a significant difference ($p<0.05$) between the views of whether ALVs should be eaten by youth with members originating from rural areas and urban households. It was also discovered that there was no significant difference in the views of participants on whether these vegetables are more nutritious than the exotic counter parts. Among the consumers the popularity of these vegetables in the diet was a result of factors including their, taste, preference and ease of preparation (Vorster et al. 2007). A positive shift was noted as eighty-eight percent of respondents were confident that these vegetables are not backward foods or low class foods, contrary to studies conducted previously where these vegetables were regarded as "backward" foods (Weinberger 2004). It is evident from the findings that there is future for these vegetables if enough effort is put to promote their consumption.

Traditionally ALVs have been cooked using ingredients such as salt and water. Findings from this study indicates that the respondents were eager to have them prepared in different methods including addition of different flavours to make them more delicious. However, participants felt that the addition of spices to ALVs would not be appealing. A total of eighty-nine percent said that spices are not important in ALVs. In a study conducted by Faber et al. (2013), nearly all respondents used the same ingredients during the preparation of ALVs. Also in this study, it was discovered that since the same ingredients are used in preparation of ALVs, there is a lack of variety. Taste preferences of the youth have influenced their utilisation of ALVs; therefore the introduction of flavours in the preparation of ALVs has to be explored (Table 7).

Table 6: Respondent perceptions about ALVs

Statements	*Response*	*Mawa*	*Lenyenye*	*P = value*
ALVs are Food for Rural People	Yes	3.3%	7.5%	0.248
	No	42.5%	46.7%	
ALVs are Mainly for the Elderly	Yes	3.3%	2.5%	0.536
	No	42.5%	51.7%	
ALVs should not be Consumed by the Youth	Yes	0.8%	6.7%	0.030
	No	45.0%	47.5%	
ALVs are Food for Low Income Class	Yes	5.8%	3.3%	0.214
	No	40.0%	50.8%	
ALVs are Backwards	Yes	6.7%	5.0%	0.366
	No	39.2%	49.2%	
ALVs are More Nutritious than Exotic Vegetables	Yes	45.0%	42.5%	0.001
	No	.8%	11.7%	

Table 7: Consumer perceptions about the improved flavour of ALVs

		Study area			
Statements	*Response*	*Mawa*	*Lenyenye*	*Total*	*P = value*
I Would Enjoy if ALVs have a Variety of Flavours	Yes	33.3%	44.2%	77.5%	0.249
	No	12.5%	10.0%	22.5%	
ALVs would be More Exciting with the Taste of Tanginess	Yes	34.2%	35.8%	70.0%	0.318
	No	11.7%	18.3%	30.0%	
ALVs would be Very Interesting with Sweet and Sour Taste	Yes	27.5%	29.2%	56.7%	0.498
	No	18.3%	25.0%	43.3%	
ALVs would be Appealing with Bitter Sweet Taste	Yes	21.8%	19.3%	41.2%	0.210
	No	24.4%	34.5%	58.8%	
Spices are Important in Flavouring ALVs	Yes	6.7%	3.4%	10.1%	0.134
	No	39.5%	50.4%	89.9%	
Local Produced Food is Good	Yes	42.5%	50.8%	93.3%	0.807
	No	3.3%	3.3%	6.7%	
ALVs should be Chemical Free	Yes	28.3%	45.8%	74.2%	0.004
	No	17.5%	8.3%	25.8%	

Consumer Perceptions towards the Canning of ALVs

When participants were asked if they would still regard canned ALVs as traditional the participants revealed that they do not trust canning, they believe that the ALVs would lose their naturalness as preservatives and chemicals will be added: *"No, because the moment I think of canning I remember canned baked beans, they taste like they have sugar."* However there were conflicting views especially from the urban and rural younger generation. The rural older generation, completely did not support the idea of canning, because they said ALVs will no longer be traditional food whilst the younger generation was open to the idea though raised their concerns as: *"Yes, it would still be traditional morogo but the problem would be the added chemicals."*

As presented in Table 8, various factors were of concern, for example the trustworthiness of canning to maintain adequate levels of nutrients was also in question. The other concerns about canning the ALVs were about the change in sensory properties such as aroma, texture, and colour due to the canning process.

It was observed that canning to a certain extent was not well understood by the participants. The participants' valued concerns about the canning of ALVs and the perceived detrimental effect on human health due to the addition of preservatives was a fundamental concern. However, according to Maczulak (2012), food toxicities occurs when microbes growing in food secrete a toxin that causes illness when

Table 8: Consumer perceptions about canning of ALVs

Concept	*Themes*	*Urban youth*	*Rural youth*	*Urban adults*	*Rural adults*
Nutritional Value	Loss of nutrients	*"the canning might lead to loss of the nutr ients"*	-	*"canning can be good and bad, as long at the nutrition could be the same"*	*"our vegetables are highly nutritious especially the fresh ones, then when we dry we start to lose some nutrients, but we have a way of retaining the nutrients."*
Additives and Preservatives	Addition of chemicals will affect the taste & colour	*"we are used to drying so the canning is still not clear…" But we know that processed foods are usually unhealthy" "we think if they think about*	*"nutritional value will not be maintained"*		*"cooking before canning would change the taste because they might not use the ingredients that we use"*
Cost and Access	Expensive and affordability only to those who have money		*it would still be "traditional morogo but the problem will be added chemicals".*	*"although canning will ensure the availability of ALVs even if it is not in season, but it will be expensive"*	*"we get our morogo for free at home but canning would be costly"*
Appeal and Food Preparation Methods	Compromised taste and originality	*the traditional "morogo might not be traditional anymore…" "I would enjoy the variety of flavours"*	*"Good competition of canned foods" "I would love to get different flavours of morogo"*	*"we do not want chemicals in our foods"*	*"our food is the best, but if the canning will make our lives better, we could try it"*

eaten. Furthermore chemical preservatives are used to allow food to be stored without spoiling for several months or years. Chemicals that are safe for consumption are used as per the GRAS list such as ascorbic acid, benzoic acid, butylated hydroxynisole (BHA), butylated hydroxytoluene (BHT), methylparaben, propylparaben, propionic acid, sodium benzoate, sorbic acid and sulfure dioxide. Awareness and education should be considered if canning of ALVs is to be further explored.

CONCLUSION

In the global food industry there is growing interest around indigenous foods to provide alternative dietary options for consumers. African Leafy Vegetables are a valuable source of nutrients and in terms of food security these vegetables are likely to also address the nutritional status of households that are poor and food insecure. Respondents considered ALVs to be cheaper compared to exotic vegetables and consumption of ALVs was influenced by the belief that they were nutritious, easily accessible, chemical free and cost-effective. ALVs also had a sentimental value as they formed part of the African cultural heritage.

RECOMMENDATIONS

The study recommends that strategies to attract youth to utilize ALVs needs to be devised to improve their nutritional status and health including the use of integrated local recipes, the local production of ALVs, awareness creation and education about the canning process. These could improve the perception towards the canning of ALVs.

REFERENCES

Antia BS, Akpan EJ, Okon PA, Umoren IU 2006. Nutritive and anti-nutritive evaluation of sweet potatoes (*Ipomoea batatas*) leaves. *Pakistan Journal of Nutrition,* 5: 166-168.

Bessiere J, Tibere L 2013. Traditional food and tourism: French tourist experience and food heritage in rural spaces. *Journal of the Science of Food and Agriculture,* 93(14): 3420-3425.

Dansi A, Adjatin A, Adoukonou-Sagbadja H, Faladé V, Yedomonhan H, Odou D, Dossou B 2008. Traditional leafy vegetables and their use in the Benin Republic. *Genetic Resources and Crop Evolution,* 55: 1239-1256.

Faber M, Laubscher R, Laurie S 2013. Availability of, access to and consumption of fruits and vegetables in a peri urban area in KwaZulu Natal, South Africa. *Maternal and Child Nutrition,* 9: 409-424.

Faber M, Van Jaarsveld PJ, Laubscher R 2007. The contribution of dark-green leafy vegetables to total micronutrient intake of two-to five-year-old children in a rural setting. *Water Research Council,* 33: 3.

Hotz C, Gibson RS 2007. Traditional food-processing and preparation practices to enhance the bioavailability of micronutrients in plant-based diets. *The Journal of Nutrition,* 137: 1097-1100.

Irungu C, Mburu J, Maundu P, Grum M, Hoeschle-Zeledon I 2007. *Analysis of Markets for African Leafy Vegetables within Nairobi and its Environs and Implications for On-farm Conservation of Biodiversity.* Rome: Global Facilitation Unit for Underutilized Species (GFU).

Kepe T 2008. Social dynamics of the value of wild edible leaves *(Imifino)* in a South African rural area. *Ecology of Food and Nutrition,* 47: 531-558.

Kiremire BT, Musinguzi E, Kikafunda JK, Lukwago FB 2010. Effects of vegetable drying techniques on nutrient content: A case study of south-western Uganda. *African Journal of Food, Agriculture, Nutrition and Development,* 10: 5.

Love P, Maunder R, Green M, Ross F, Smale-Lovely J, Charlton K 2001. South African food based dietary guidelines. Testing of the preliminary guidelines among women in KwaZulu-Natal and the Western Cape. *South African Journal of Clinical Nutrition,* 14: 9-19.

Makobo ND, Shoko MD, Mtaita TA 2010. Nutrient content of Amaranth (*Amaranthus cruentus* L.) under different processing and preservation methods. *World Journal of Agricultural Sciences,* 6: 639-643.

Mepba HD, Eboh L, Banigo DEB 2007. Effects of processing treatments on the nutritive composition and consumer acceptance of some Nigerian edible leafy vegetables. *African Journal of Food Agriculture, Nutrition and Development,* 7: 1-18.

Orech FO, Christensen DL, Larsen T, Friis H, Aagaard-Hansen J, Estambale BA 2007. Mineral content of traditional leafy vegetables from western Kenya. *International Journal of Food Sciences and Nutrition,* 58: 595-602.

Osei M, Aidoo JR, Denkyira SK 2014. Consumers' perception of safety of leafy vegetables and its effect on their vegetable purchasing decisions in the Kumasi Metropolis of Ghana. *Journal of Agricultural Extension, Economics and Sociology,* 3: 1.

Prabhu S, Barrett DM 2009. Effects of storage condition and domestic cooking on the quality and nutrient content of African leafy vegetables (*Cassia tora* and *Corchorus tridens*). *Journal of the Science of Food and Agriculture,* 89: 1709-1721.

Senyolo GM, Wale E, Ortmann GF 2014. Consumers' willingness-to-pay for underutilized vegetable crops: The case of African leafy vegetables in South Africa. *Journal of Human Ecology,* 47: 219-227.

Shackleton SE, Shackleton CM, Netshiluvhi TR, Geach BS, Balance A, Fairbanks DHK 2002. Use patterns and value of savanna resources in three rural villages in South Africa. *Economic Botany,* 56: 130-146.

Teddlie C, Tashakkori A (Eds.) 2009. *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioural Sciences.* Thousand Oaks, CA: Sage Publications Inc.

UNICEF 2011. *South Africa's Children–A Review of Equity and Child Rights.* Pretoria: South African Human Rights Commission.

Voster IHJ, Jansen van Rensburg W, Van Zijl JJB, Venter SL 2007. The importance of traditional leafy vegetables in South Africa. *African Journal of Food, Agriculture, Nutrition and Development*, 7: 4.

Weinberger K 2006. Are indigenous vegetables underutilized crops? Some evidence from Eastern Africa and South East Asia. *Acta Hortic*, 752: 29-34.

World Health Organization 2009. *Global Prevalence of Vitamin A Deficiency in Populations at Risk 1995-2005: WHO Global Database on Vitamin A Deficiency.* WHO.