



Identification and Documentation of Neglected Underutilized Green Leafy Vegetables and Fruits in South East Geo-Political Zone of Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author NMN design the study, wrote the protocol and read the first draft of the manuscript. Author NNN managed literature searches, performed and managed the chemical analysis and performed the statistical analysis. Both authors read and approve the final manuscript.

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ABSTRACT

Background/Objective: Micronutrient malnutrition is a public health problem. Fruits and vegetables are good sources of micronutrient to fight hidden hunger and several chronic diseases like obesity, diabetes mellitus, hypertension, cancer and cardiovascular diseases. The study was designed to identify, characterize and document neglected underutilized fruits and vegetables in Southeast geopolitical zone of Nigeria.

Methodology: A multiple sampling technique was used. Focus group discussion (FGD) was used to elicit information on the underutilized fruits and vegetables, their availability and utilization in the study communities. Samples of 306 elderly women were used for the study. Volunteers from the FGD helped the researcher to uproot the food crops from the forest for further study. The plants uprooted were identified at Herbarium of the Department of Botany University of Nigeria Nsukka.

Results: The result showed that quite a number of fruits and vegetables abound in the study area.

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A total of forty-five (45) underutilized vegetables, fourteen (14) common vegetables, twenty-three (23) underutilized fruits and twenty-two (22) common fruits were identified and documented. Underutilized fruits and vegetables are used in different ways to cure so many diseases. **Conclusion:** Adequate consumption of these fruits and vegetables will help to fight micronutrient deficiency-related problems, chronic diseases and diversify diet thereby leading to food security.

Keywords: Identification; characterization; documentation; underutilized; vegetables and fruits.

1. INTRODUCTION

The term underutilized is referred to neglected, orphan or minor. Underutilized species are those species with under-exploited potential for contributing to food security, health (nutritional/medicinal), income generation, and environmental services [1]. Indigenous vegetables hardly compete with introduced vegetables of foreign origin not because of lower potentials but because of lag in research and development [2]. There is also growing ignorance among young people about the existence of these nutritionally rich food plants. The decline in the use of indigenous vegetables by many rural people has resulted in poor diets and increased incidence of nutritional deficiency disorders and diseases in many parts of the country. Utilization and conservation of indigenous vegetables are endangered. Unless something is done to conserve and repopularize the use of indigenous vegetables, they may be lost forever. United Nations Food and Agriculture Organization [3] has widely noted that most widespread and debilitating nutritional disorders, like birth defects, mental and physical retardation, weakened immune systems, blindness and even death has resulted from poor fruits and vegetables consumption habits [4]. The ideal strategy to fighting micronutrient deficiency is to improve the diet by including a large variety of food rich in micronutrients and to increase dietary absorption of these nutrients. According to Okigbo [5] while the crisis situation caused by lack of animal foods may require a broad and fundamental rethinking about policy and action, traditional food may be the short term remedy. Vegetables and fruits play a highly significant role in food security of the underprivileged in both urban and rural settings [6]. They are also valuable sources of energy and micronutrients in the diets [7]. Indigenous leafy vegetables represent inexpensive but high-quality nutritional sources, especially where malnutrition is widespread as in Nigeria and Southeastern Nigeria in particular [8].

Green leafy vegetables and fruits occupy an important place among the food crops as these

provide adequate amounts of many vitamins and minerals for humans. They are a rich source of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron and phosphorous. Indigenous and traditional leafy vegetables are abundant, but they still remain underexploited and under-utilized due to various constraints [9, 10,11,12,13]. Since low consumption of green leafy vegetables and fruits in the diet is one of the major factor, which leads to a deficiency of many nutrients, an attempt will be made to identify and document some underutilized green leafy vegetables and fruits from selected regions of South Eastern Nigeria that would enhance household and national food security. The ultimate goal of the research will be to enhance better food selection and consequently improve the nutritional status of both the rural and urban dwellers.

2. MATERIALS AND METHODS

2.1 Study Area/ Study Design

The study was carried out in South East Nigeria. The study design used was survey study.

2.2 Key Informant Interviews

Chiefs and Elders of the communities were the key informants. They provided information concerning the structure of the village.

2.3 Sampling Techniques

A multi-stage sampling technique was used. Two (2) Local Governments were randomly selected from each of the States. Two (2) communities were selected from each of the Local Government. Altogether 20 communities were randomly selected for the study. The age ranges of the subject were from 60 and above. They are the people knowledgeable about the topic of discussion.

2.4 Focus Group Discussion (FGD)

Focus group discussion guide was developed and validated for reliability. The guide was

prepared to obtain information on underutilized green leafy vegetables and fruits, knowledge of availability, consumption pattern and utilization in the selected communities in South East Nigeria. A total of Twenty (20) FGD was conducted in the course of the study. The number of subjects in a group was between 6-10, with a total of 302 respondents, comprising mostly of farmers and petty traders. In most places, primary schools were used for the meeting. The semi-circular seating arrangement was observed among participants as described by Escalada and Heong [14]. The discussion was captured in writing and the photographs of participants were also taken.



2.5 Identification of Samples

The plants harvested were identified at the Herbarium in the Department of Botany, University of Nigeria Nsukka, Nigeria. Some samples were randomly selected and used for further study.

3. RESULTS

Table 1 shows the food consumption pattern of the subjects. The study showed that only 11.40% of the subject consumed vegetables every day, 90.00% of the subjects never consumed fruits while 1.70% consumed fruits every day. All the subjects ate staple starch daily and 8.20% of the subject ate refined carbohydrate. Most of the subjects 55.97% preferred indigenous fruits and vegetables while 33.77% preferred exotic fruits and vegetables. It was also observed during the Focus Group Discussion (FGD) that vegetables were mainly used for soup/sauce, 10.60% of the subjects use vegetables as a complement to cereal and tubers, 0.66% use vegetables for a salad while 0.33% ate vegetables raw.

Table 2 shows the reason for underutilization of indigenous fruits and vegetables. It was observed that civilization, time, poverty and lack

of knowledge are the causes of underutilization of indigenous fruits and vegetables.

3.1 Food Documentation and Characterisation

Table 3 shows the list of common vegetables identified that are consumed in the study area with their common names, local names, botanical names and seasonality.

Table 4 shows the list of common fruits identified that are consumed in the study area with their common names, local names, botanical names and seasonality.

Table 5 shows the list of underutilized vegetables identified in the study area with their common names, local names, locality, botanical names and seasonality.

Table 5b shows the list of underutilized vegetables identified in the study area with their common names, local names, locality, botanical names and seasonality.

Table 6 shows the list of underutilized fruits identified in the study area with their common names, local names, locality, botanical names and seasonality.

Table 7a shows some indigenous vegetables and their health attributes. The Focus group discussion (FGD) showed that indigenous vegetables are used to cure some diseases including anaemia, convulsion, tuberculosis, pile, stomach ache, diarrhea, hypertension, chest pain, fertility enhancement in women, gastrointestinal disorder etc. They are used as laxative, blood purifier, fertility enhancement in woman and diuretic.

Table 7b shows some indigenous fruits and their health attributes. Indigenous fruits are used to cure some diseases including malaria, pile, stomach ache, diarrhoea, hypertension, chest pain, and sore throat.

4. DISCUSSION

The focus group discussion (FGD) showed that majority of the people preferred indigenous fruits and vegetables to exotic ones. Civilization, time for harvesting and preparation, lack of knowledge of the nutritional importance of the foods and rapid introduction of foreign foods by children and grand children from town pose a threat to the

consumption of indigenous foods. Majority of the underutilized fruits and vegetables are harvested in the forest which makes them unavailable and difficult to be accessed by the users. Previous workers have noted that the rate of consumption of fruits and vegetables is minimal [15]. Fruits and vegetables were not taken as the main dish rather vegetables were added in small quantity to a meal while fruits in some cases were not eaten for a period of two weeks. This was as a result of the fact that fruits and vegetables are not the main meal. Onimawo [16] observed poor fruits and vegetable consumption in southeastern part of Nigeria. The respondents depend on staple

foods like cassava, yam, garlic, rice for their daily meals.

Underutilized fruits and vegetables are used in different ways to cure so many diseases. They are used to cure diseases like anaemia, tuberculosis, convulsion, pile, stomach ache, diarrhoea and hypertension. The fruits and vegetables are used as a laxative, blood purifier, fertility enhancement in women and diuretic. The medicinal properties of the foods make the practice of traditional medicine at home easy and could boast the nutritional and health status of the users.

Table 1. Food consumption pattern of subjects

Subjects	Frequency (%)		
	Never	Once a week	Daily
Fruits	90.00	8.30	1.70
Vegetables	0.0	88.60	11.40
Starchy staples	0.0	25.60	74.40
Alcohol	53.40	39.80	6.80
Refine CHO and fatty foods	64.60	27.20	8.20
People's preference to indigenous and exotic fruits and vegetables			
Subject	Frequency (%)		
Exotic fruits and vegetables	102(33.77%)		
Indigenous fruits and vegetables	169 (55.97%)		
None	31 (10.26%)		
Total	302(100%)		
Mode of consumption of vegetables*			
Subject	Frequency(%)		
For making soup/stew	302(100)		
As complement to cereals and tubers	32(10)		
For salad	2(0.66)		
Eaten raw	1(0.33)		

*Multiple choice answer**

Table 2. Reason for underutilization of indigenous fruits and vegetables

Factor	Reason
Civilization	people tend to adjust to what those in the city are eating, that is emulating the eating habit of those in the city.
Time	Some indigenous vegetables require longer cooking time and the processing method are tedious. There is nobody to help out in the harvest of the foods due to quest for education. Many of the fruits are wild and harvesting is also a problem.
Poverty	People are ashamed to be associated with the foods, thinking it is associated with poverty and backwardness.
Knowledge	Lack of knowledge about the nutritional value of these foods and importance in Maintaining good health.

Table 3. List of common vegetables consumed in South East Geo-political zone of Nigeria with common names, local names, botanical names and seasonality

Common name	Igbo name	Scientific name	Seasonality	
			R	D
Green	<i>Inene</i>	<i>Amaranthus viridis</i>	√	—
African jointfir	<i>Okazi</i>	<i>Gnetum africanum</i>	√	—
Camwood	<i>Oha</i>	<i>Plerocarpus soyauxii</i>	—	√
Bitter leaf	<i>Onugbu</i>	<i>Vernonia amygdalina</i>	√	—
Gardenegg leaves	<i>Anara</i>	<i>Solanum macranthum</i>	√	—
Fever plant	<i>Nchanwu</i>	<i>Ocimum gratissimum</i>	√	—
Fluted pumpkin	<i>Ugu</i>	<i>Telferia occidentalis</i>	√	—
Black pepper	<i>Uziza</i>	<i>Piper guineense</i>	√	—
Pumpkin	<i>Anyu</i>	<i>Curcubita pepo</i>	√	—
Cocoyam leaves	<i>Akwukwo ede</i>	<i>Colocasia esculenta</i>	—	√
Cocoyam petiole	<i>Opi ede</i>	<i>Colocasia esculenta</i>	—	√
Ladys finger	<i>Okwulu</i>	<i>Abelmosichus esculenta</i>	√	√
African salad	<i>Utazi</i>	<i>Gongronema latifollis</i>	√	—
Lemon leaf	<i>Achalla oyibo</i>	<i>Cymbogon citrates</i>	√	—

R= Rainy Season D= Dry Season

Table 4. List of common fruits consumed in South East Geo-political zone of Nigeria with common name, local names, botanical names and seasonality

Common name	Igbo name	Scientific name	Seasonality	
			R	D
White rubber vine	<i>Utu</i>	<i>Landolfolia dulcis</i>	—	√
Pear	<i>Ube Igbo</i>	<i>Dacryodes edulis</i>	—	√
Avacado pear	<i>Ube Oyibo</i>	<i>Dacryodes edulis</i>	—	√
Incence tree	<i>Ube okpoko</i>	<i>Canarium chweinfurthii</i>	√	—
Guava	<i>Gova</i>	<i>Psidium guajava linn</i>	√	—
Monkey apple	<i>Udala nwaenwe</i>	<i>Pachystela brieripes</i>	—	√
White star apple	<i>Udala nkiti</i>	<i>Chrysophyllum albiduim</i>	—	√
Pawpaw	<i>Okwulu ezi</i>	<i>Carica papaya</i>	—	√
Mango	<i>Mangoro</i>	<i>Mangifera indica</i>	—	√
Soursop	—	<i>Anonas muricata</i>	—	√
Pineapple	<i>Akwuolu</i>	<i>Anonas cosmos</i>	—	√
Bush mango	<i>Ugiri</i>	<i>Irvingia gabonensis</i>	—	√
Orange	<i>Oroma</i>	<i>Citrus avrantium</i>	—	√
Lime	<i>Oroma nkirisi</i>	<i>Citrus avrantifolia</i>	—	√
Pumkin	<i>Anyu</i>	<i>Curcubita pepo</i>	√	—
Cashew	<i>Kashuu</i>	<i>Anacardiumoccidentalis</i>	—	√
Pepper fruits	<i>Nmimi</i>	<i>Dernettia tripetala</i>	√	—
Bitter Cola	<i>Akiilu</i>	<i>Garcinia kola</i>	√	—
Tomatoes	<i>Tomanto</i>	<i>Lycopersicum esculentum</i>	—	√
Coconut	<i>Aku oyibo</i>	<i>Cocos nucifera</i>	√	√
Garden egg fruit	<i>Mkpuru Anara</i>	<i>Solanum macrocarpum</i>	√	—
Kola	<i>Oji Ogodo</i>	<i>Cola spp</i>	√	—

R=Rainy season D= Dry season

Table 5a. List of underutilized indigenous vegetables identified with common name, local names, botanical names, locality and seasonality

Common name Vegetables	Igbo name	Scientific name	Locality	Season	
				R	D
Fig tree	<i>Ogbu ike</i>	<i>Ficus elsticoides</i>	Umunneochi	—	√
—	<i>Okwuruezikemba</i>	<i>Moraceaea spp</i>	Igbo Eiti	—	√
—	<i>Ogwuazu</i>	<i>Bombaceae spp</i>	Igbo Eiti	—	√
Black plum	<i>Uchakiri</i>	<i>Vitex doniana</i>	Ayameleu	—	√
—	<i>Uturukpa</i>	<i>Pterocarpus santalinoides</i>	Igbo Eiti	—	√
—	<i>Agbara</i>	<i>Mucuna purien</i>	Ayamelu	√	—
—	<i>Ayagaya</i>	<i>Amaranthus spp</i>	Igbo Eiti	√	—
—	<i>Ileleocha</i>	<i>Amaranthus spp</i>	Igbo Eze	√	—
—	<i>Itete/Agamaju</i>	<i>Vebana strict vent</i>	Igbo Eze	√	—
—	<i>Ugbamaja</i>	Yet to be identified.	Igbo Eze	√	—
Water leaf	<i>Ntioke</i>	<i>Portulace oleraceae</i>	Igbo Eiti	√	—
—	<i>Ujuju</i>	<i>Myrianthus arboreus</i>	Orlu	√	—
Hogweed	<i>Azuigwe</i>	<i>Boerhavia diffusa</i>	Igbo Eze	√	—
Chacrana	<i>Anyazu</i>	<i>Psychotria viridis</i>	Ayamelu	√	—
Jute	<i>Arira/Elegule</i>	<i>Corchorus olitorius</i>	Igbo Eze	√	—
Jute	<i>Kerenkere</i>	<i>Corchorus spp</i>	Ahiaazumbaise	√	—
—	<i>Akwokwo akpu</i>	<i>Ceiba pentandra</i>	Umunneochi	—	√
Awolowo leaf	<i>Kpugbum/Kingin</i>	<i>Chromaleana odorota</i>	Igbo Eze	√	—
—	<i>Okpookuko</i>	<i>Uvaria chamea</i>	Anambra East	√	—
—	<i>Ugurusu</i>	Yet to be identified	Igbo Eze	√	—
Potato leaves	<i>Akwukwo ji nnu</i>	<i>Ipomea batata</i>	Igbo Eiti	√	—
Huckleberry	<i>Ewa</i>	<i>Vaccinium Parvifolium</i>	Nkanu	√	—
Gooseberry	<i>Akpuru</i>	<i>Phyllanthus debilis</i>	Ivo	√	—
—	<i>Upororoko</i>	<i>Euphobiaceae spp</i>	Ivo	√	—
—	<i>Edeni</i>	<i>Verbaneceae spp</i>	Igbo Eze	√	—
Garden egg	<i>Ineneogwu</i>	<i>Solanum indicum</i>	Ikwo	√	—
Fig tree	<i>Ogbu</i>	<i>Ficus vogaliana</i>	Ahiaazumbaise	√	—
—	<i>Aku okoro</i>	<i>Ficus sur</i>	Orlu	√	—
—	<i>Okpo</i>	<i>Triplochiton scleroxylon</i>	Anambra East	√	—

R=Rainy season D= Dry season

Table 5b. List of underutilized indigenous vegetables identified with common name, local names, botanical names, locality and seasonality

Common name Vegetables	Igbo name	Scientific name	Locality	Season	
				R	D
—	<i>Ububa</i>	<i>Berlinia grandiflora</i>	Anambra East	√	—
—	<i>Okwe oyibo</i>	<i>Moringa olifera</i>	Igbo Eze	√	—
Akee/Ackee	<i>Uso</i>	<i>Blinghia unijugata</i>	Anambra East	√	—
—	<i>Erimmiri</i>	<i>Boerhavia diffusa</i>	Orlu	√	—
—	<i>Obogwu</i>	<i>Commelina nudiflora</i>	Anambra East	√	—
Shokoyokoto	<i>Erie mi onu</i>	<i>Celosia argentea</i>	Anambra East	√	—
—	<i>Atama</i>	<i>Heinsia crinite</i>	Ugwunagbo	√	—
—	<i>Agbolu-uku</i>	<i>Brillantaisi nitens</i>	Ugwunagbo	√	—
African tulip	<i>Ulumiri</i>	<i>Spathodea campanulata</i>	Anambra East	√	—
Goat weed	<i>Olulu-ogwai</i>	<i>Ageratum conyzoides</i>	Umunnechi	√	—
Awolowo weed	<i>kpugbum</i>	<i>Chromolaena odorata</i>	Igbo Eze	√	—
Bush marigold	<i>Anwiliwa-ani</i>	<i>Aspilia Africana</i>	Anambra East	√	—
—	<i>Obuako-enwe</i>	<i>Gssampelus mucanta</i>	Anambra East	√	—
—	<i>Agelieze</i>	<i>Merremia</i>	Ayamelu	√	—

R=Rainy season D= Dry season

Table 6. List of underutilized indigenous Fruits identified with local names, botanical names, locality and seasonality

Common name fruits	Igbo name	Scientific name	Locality	Seasonality	
				R	D
Hog plum	<i>Echikara</i>	<i>Spondian mombin</i>	Ayameleu	√	—
Black plum	<i>Mbembe</i>	<i>Vitex doniana</i>	Ayameleu	√	—
—	<i>Uvuru</i>	<i>Nauclea diderrichii</i>	Umunneochi	—	√
—	<i>Nkwukpo</i>	<i>Sterculia spp</i>	Igbo Etit	—	√
—	<i>Osisiike/Karagu</i>	<i>Myristicaceae spp</i>	Igbo Eze	—	√
Gooseberry	<i>Akpuru</i>	<i>Phyllanthus debilis</i>	Ivo	—	√
—	<i>Uvurunwamkpi</i>	<i>Artocarpus altilis</i>	Ugwunagbo	—	√
—	<i>Achicha</i>	<i>Cola pachycarpa</i>	Orlu	—	√
—	<i>Urumbia</i>	<i>Icacina trichatha oliv</i>	Igbo Eze	—	√
—	<i>Odure</i>	<i>Napoleana imperialist</i>	Igbo Eze	—	√
Kola (wild)	<i>Mkpuru amu Nwaebule</i>	<i>Hippocretae myrint</i>	Anambra East	—	√
—	<i>Ujuju</i>	<i>Myrianthus arboreus</i>	Igbo Eze	—	√
—	<i>Icheku/Unegu</i>	<i>Velvet tamarind</i>	Ahiazumbaise	—	√
—	<i>Aziza ohia/Okpaa</i>	<i>Olasivirdis spp</i>	Igbo Eze	—	√
Monk's pepper	<i>Ose ohia/Okwocha</i>	<i>Afromomium daniella</i>	Igbo Eze	—	√
—	<i>Oji eyi</i>	<i>Cola gigantean</i>	Igbo Etit	—	√
—	<i>Utu nkilisi</i>	<i>Ficus elasticoides</i>	Ikwo	—	√
Akee fruit /Akee	<i>Uso</i>	<i>Blinghia unijugata</i>	Igbo Eze	—	√
West African locust bean	<i>Nkpuru ugba</i>	<i>Parkia clappatoniana</i>	Umunneochi	—	√
White rubber vine	<i>Utu kperekpete</i>	<i>Landolfolia dulcis</i>	Ugwunagbo	—	√
—	<i>Aado</i>	<i>Gongronema spp</i>	Ayamelu	—	√
—	<i>Osenga</i>	<i>Olax viridis</i>	Ayamelu	—	√
Bush mango	<i>Ujuru</i>	<i>Irvingia gabonensis</i>	Ivo	—	√

R= Rainy season D= Dry season

Table 7a. Health attributes of some underutilized indigenous vegetables

Food	Local names	Health attribute
<i>Mucuna puriens</i>	Agbara	Cure anaemia.
<i>Corchorus olitorius</i>	Arira/Elegule	Treatment of convulsion acts as Laxative and blood purifier.
<i>Ficus elsticoides</i>	Ogbu ike	Cure whitlow
<i>Moraceaea spp</i>	Okwuruezikemba	Treatment of tuberculosis
<i>Bombaceae spp</i>	Ogwuazu	Acts of laxative
<i>Pterocarpus santalinoides</i>	Uturukpa	Treatment of stomach ache, gonorrhoea and fertility enhancement in women.
<i>Amaranthus spp</i>	Ayagaya	Fighting tapeworm and relief of respiratory disease
<i>Vebana strict vent</i>	Itete/Agamaju	Fertility enhancement in women
<i>Portulaca oleraceae</i>	Ntioke	Acts as diuretic and treatment of gastro-intestinal disorder
<i>Myrianthus arboreus</i>	Ujuju	Cure tuberculosis
<i>Ceiba pentandra</i>	Akwokwo akpu	Treatment of chest pain
<i>Boerhavia diffusa</i>	Azuigwe	The extract is used to stop bleeding and it also lowers blood Pressure, useful in treating anemia, heart diseases, asthma, tumors, abdominal pains, and in joint pains.
<i>Adonsonia digitata</i>		Treatment of diarrhea
Scent leaf extract	Nchanwu	Stop diarrhea, diabetes and bleeding.
<i>Vernonia amygdalina</i>	Onugbu	Cures worm, diabetes
<i>Gongronema latifollis</i>	Utazi leaf	Cures worm
<i>Telferia occidentali</i>	Ugu	Cures anemia

Table 7b. Health attributes of some underutilized indigenous fruits

Food	Local names	Health attribute
<i>Nauclea diderrichii</i>	Uvuru	Treatment of malaria
<i>Sterculia spp</i>	Nkwukpo	Treatment of diarrhoea
<i>Velvet tamarind</i>	Icheku/Unegu	Treatment of a sore throat
<i>Vitex doniana</i>	Mbembe	Treatment of the pile, stomach ache, diarrhoea, hypertension, Chest pain

5. CONCLUSION

Many underutilized fruits and vegetables were identified in the study area which could be consumed along with the common fruits and vegetable to help fight malnutrition (overnutrition and undernutrition). The study showed poor consumption of fruits and vegetables in South east zone of Nigeria. Less than 100 g of the vegetables were used in family soup /dish that will be consumed for one week.

Quiet a number of fruits and vegetables were identified in the study area. A total of forty-five (45) underutilized vegetables, fourteen (14) common vegetables, twenty-three (23) underutilized fruits and twenty-two (22) common fruits were identified and documented. The underutilized vegetables and fruits identified and documented would add to the pool of common

vegetables and fruits to help fight malnutrition in Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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