Prospects of Selected Forest Fruits and Vegetables in Enugu North Agricultural Zone of Enugu State, Nigeria

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The study examined prospects of selected forest fruits and vegetables in Enugu North Agricultural zone of Enugu State, Nigeria. Structured interview schedule and focus group discussion were used to collect data from a sample of one hundred and twenty (120) respondents. Data were analyzed using matrix rank ordering, percentage, mean scores and standard deviation. Results of the study identified about twenty forest fruits and vegetables that are of both economic and dietary importance to the respondents. The forest fruits and vegetables identified with their botanical and common names in order of importance include: *Prosopis africana* (okpeyi) (M = 2.96), *Irvingia gabonensiss/wombolus* (ogbono) (M = 2.79), *Treculia africana* (ukwa) (M = 2.76), *Parkia* spp (ugba) (M = 2.75). *Pterocarpus* spp (oha) (M = 2.55) and *Pergularia spp*. (utazi) (M = 2.55). Others include *Xylopia aethiopica* (uda) (M=2.50), *Piper nigrum* (uziza) (M = 2.40), *Gnetum africanum* (ukazi) (M = 2.38), *Chrysophylium africanum* (udara) (M = 2.34) *Garcinia kola* (akuilu) (M = 2.32), among others. These forest fruits and vegetables are very important to mankind considering the potentials economically, culturally nutritionally, medically and environmentally. Constraints to access and utilization were poor storage facilities (M=2.38), transportation problems (M=2.38), lack of modern processing technology (M=2.38), insect pests and diseases (M=2.36), deforestation and land degradation (M= 2.35), destruction of forests by fire resulting as a result of bush burning (M= 2.30), poor yield (M=2.19), deterioration/perishability (wastages) (M=2.18), among others. The study recommends that efforts are highly needed by government at the local level to involve local community leaders in enforcing laws to reduce deforestation and bush burning in order to avoid destruction of forest products and exploitation of the valuable forest resources. It highlights the involvement of government in providing adequate rural infrastructure in order to encourage establishment of rural agro-processing industries by investors to prevent losses emanating from spoilage of the products, ensure food security, and create employment opportunities thus reducing poverty and vulnerability among rural folks.

Keywords: Forests, Fruits, Vegetables, Benefits, Enugu State, Nigeria

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1. Introduction

Nigeria is endowed with abundant forest tree resources. Natural forests occupy a total of about 349,278km^2 or approximately 35% of Nigeria's total land area of 887,936km^2 (Isichei, 2005). It has an estimated land of about 68 million hectares of natural forest and range land covering 37 million hectares (Igbokwe and Eneje, 2001). Nigeria's forest is also rich in biodiversity, found in various vegetative types such as the coastal forest, mangrove forest, guinea, Sudan and Sahel savanna. There are over 4600 plant species, out of which 205 are endemic while about 496 species are threatened. The fruit trees found in the forests and wood lands provide numerous feeds, foods and other natural resources to mankind (Nweze, 2003). They also provide food and shelters for animals. Forests provide a variety of products and serve many functions such as provision of shades, wind breaks, fruits, ornamental flowers, and medicines. Local people, especially youths living in rural areas exploit forest for meeting requirement for timber, fuel wood, non-timber products such as herbal medicinal fruits, vegetables, gums, juices and for the production of mushrooms (*Auricularia auricular*) known as *Ero* in Igbo (Nweze, 2003).

Forest products particularly fruits are one of the major sources of foreign exchange earnings. Local people in developing countries especially Nigeria utilizes fruits in preparing various foods. The roots and herbs are used as medicine, the bark and leaves for dye products in textile industries, while the branches and trunks are used in construction industries (Spore, 2009).

Food and Agriculture Organization (2007) explained that extraction of indigenous plants and tropical fruit trees for phyto medicine and cosmetics have become popular in Nigeria and other West African countries. For instance, Gnetum africanum, citrus, banana, irvingia, dalium (icheku), dennettia tripatale (mmimi), black plum, African bread fruit,

etc, are the most important indigenous fruits and vegetables in Nigeria and often found growing in wild forests. These fruit crops are not only consumed on daily basis by rural and urban families but also represent sources of income for many rural households in the country who harvest them from the home gardens, forests and wood lands (Food and Agriculture Organization, 2005). Furthermore, they serve as sources of employment since many people are engaged in fruit gathering, harvesting, storage, processing, packaging and marketing of the produce.

Fruit trees provide an important source of food and income to rural households. In some areas fruit trees are commonly found growing along the field boarders, shelter belts, streams and path ways (Are, Igbokwe, Asadu and Bawa, 2010). In marginal environment of developing agricultural economies, many less-well known agricultural and non-timber forest species, are grown, managed or collected, thus contributing to the livelihood of the poor, the vulnerable and to agricultural biodiversity. Some of these species are underutilized plant species, and have the characteristics of being locally abundant in the developing countries but globally rare. Scientific information and knowledge about them are scanty and their current use is limited, relative to their economic potentials (Betti, 2002). Many fruit species such as pears, apples, cashew nuts and vegetables like *Gnetum africanum* (ukazi), *Dialium guinensis* (icheku) *Pterocarpus spp.* (oha), *Dennettia tripatale* (mmimi), *Brachystegia eurcoma* (achi), *Vitex doniana* (uchakiri), *Pergularia spp.* (utazi), *Piper nigrum* (uziza), *Landolphia nigeriansis* (utu), among others are sources of income for farm households. This helps foster conservation of agricultural biodiversity (Uguru, 1996). Betti (2002) reiterated that these fruits provide nutritional food value for healthy growth and development of man. They also supply vitamins and other essential minerals to man and animals.

The purchase of indigenous fruits and vegetables has increased drastically in the last few decades causing scarcity of these fruits and vegetables. Moreover, some have gone extinct due to uncontrolled logging and felling of trees accentuated by lack of restocking, due to loss of biological diversity (Spores, 2009). There is also high rate of rural-urban migration, high price of fruits and vegetables, hence rural families no longer harvest enough edible wild vegetables and fruits for household use.

Indigenous fruits and vegetables are increasingly of economic importance but erratic supplies and post harvest losses make it difficult to be accessed. In addition, processing and conservation of these fruits seem tasking too. The large number of fruit varieties with their various attributes and deficiencies affect quantity and quality of processed products. Despite the importance of fruits and vegetables its preservation by smallholders is limited.

There seems to be inadequate knowledge and awareness of the economic importance of fruits and vegetables in Enugu North agricultural zone of Enugu State, Nigeria. This raises the following pertinent questions. What are forest fruits and vegetables found in Enugu North agricultural zone of Enugu State? What are the benefits of the forest fruits and vegetables to households? And what are the constraints to access and utilization of forest fruits and vegetables among households?

Specifically the study was designed to:

1. identify forest fruits and vegetables in Enugu North agricultural zone;
2. ascertain perceived benefits of forest fruits and vegetables to households; and
3. ascertain constraints to access and utilization of forest fruits and vegetables among households.

2. Materials and Methods

The study was carried out in Enugu North agricultural zone of Enugu State, Nigeria. It is one of the agricultural zones in Enugu State. The agro-ecological zone is located between latitudes 6^o 31' and 7^o 6' North and longitude 6^o 54' and 7^o 54' North East of the Northern parts of Enugu State. The population of Enugu North agricultural zone is 1,190,908 persons made up of 678,015 males and 700,403 females (National Population Commission, 2006) with a land area of 3,404km^2 and about 11,000 households. The average population density is 233 persons/km^2 with over 70% of the population being farmers (Madu, 2006; Anyadike, 2009).

The primary occupation of the inhabitants is farming (Igbokwe and Eneje, 2001). Other minor occupations of the inhabitants include: petty trading, professional driving, craftsmanship, handicrafts, palm wine tapping, hunting and lumbering. They are also involved in harvesting forest fruits and vegetables such as locust bean, native pear, *(ube okpoko)*, walnuts *(ukpa)*, *Vitex doniana (uchakiri)*, African star apple *(udara)*, *Irvingia gabonensis/wombolu (ogbono)*, *Garcinia kola (akuilu)*, *Gnetum* africanum *(ukazi)*, etc. There are many cultivated economic tree and vegetables in the farmsteads and around home compound that are used as compliments to those from the natural forests.

The agricultural zone is made up of six (6) Local Government Areas (LGAs). These include: Uzo-uwani, Igbo-etiti, Nsukka, Igbo-eze South, Igbo-eze North, and Udenu LGAs. A total of sixty-six (66) town communities are contained in the zone (Ajayi and Eneje, 1998).

The population of the study comprised households involved in harvesting of forest fruits and vegetables. Enugu North agricultural zone is made up of eight (8) blocks comprising Uzo-uwani block I, Uzo-uwani block II, Nsukka block I, Nsukka block II, Igbo- etiti, Igbo-eze South, Igbo-eze North and Udenu (ENADP 1996). Five (5) blocks namely; Uzo-uwani 1, Nsukka 1, Igbo-etiti, Igbo-eze South, Udenu were purposively selected for the study. This was as a result of availability of abundant luxuriant forest trees and sustainable human activities such as lumbering, fruit gathering, hunting and farming in the area. Twenty- five (25) households were randomly selected for the study, giving a total of one hundred and twenty-five (125) respondents. Interview schedule and focus group discussion were used for data collection. Five (5) of the interview schedule used for the study were not filled properly and were dropped in the course of data analysis, leaving a total of one hundred and twenty (120) used for analysis. Matrix rank ordering, descriptive statistics such as percentage, mean scores and standard deviation were used for data analysis.

3. Results and Discussion

Socio-economic characteristics of the respondents

Entries in Table 1 indicate that majority (76.7%) of the respondents were females, while (23.3%) were males. This implies that females dominate in the business of forest fruits and vegetables particularly in the area of harvesting, processing, preservation and marketing than the males. This agrees with Ekong (2003) who noted that men are occupied with more tangible activities in forests such as lumbering in order to earn high income.

A greater proportion (47.5%) of the respondents were of the age bracket of 41-50 years while 34.7% were within the age bracket of 39 - 40 years. The mean age was 43 years. This implies that the respondents were in productive years hence greater involvement in search of forest fruits and vegetables. This agrees with the findings of Ani (2007) who found that majority of rural dwellers in Ebonyi State, Nigeria were young and contribute significantly to high production of agricultural food products.

Majority (81.5%) of the respondents were married, 13.4% and 5.0% were single and widowed, respectively. It shows that greater proportion of the respondents has husbands and wives who may be assisting in harvesting of forest trees and vegetables, respectively. Ezedimma (2001) reveals that married people have the responsibility of providing, harvesting, processing and marketing of food items for the household as well as sale of fresh forest fruits and processed agricultural products to earn income. The high percentage of those married is not surprising since early marriage is common in Enugu North agricultural zone of Enugu State, Nigeria.

Results in Table 1 also reveal that the respondents had a mean household size of 5 persons. This implies that the respondents have a fairly large household size. Members of households could serve as source of labour used for harvesting, processing and marketing of agricultural products, having to play various roles. The finding is in agreement with Ajani (2012) who observes that rural households in Nigeria are characterized by large family size with high dependency ratio.

Majority (98.2%) of the respondents were literate. Only 1.8% had no formal education. The mean number of years of formal education was 9 years. This implies that greater percentage of the respondents had formal education and should be knowledgeable about the potentials of consuming fruits and vegetables to add value to household food dietary menu. Hence it provides sources of vitamins, minerals, and other essential nutrients to man and livestock.

Entries in Table 1 also reveal that 55.8% of the population had rural background while 44.2% had urban childhood back ground. This implies that majority of the respondents were brought up in rural areas and could have adequate knowledge of indigenous forest fruits and vegetables. Engaging in the business of forest fruits and vegetables could serve as source of employment and generation of income for economic empowerment.

A greater percentage (52.6%) had farming as a major occupation, 32.4% engaged in petty trading, while 11.3% were civil servants, among others. About 55.0% of the respondents were involved in part-time farming, while 33.7% had petty trading as a minor occupation, among others. It shows that farming is the dominant occupation in the area though they also engage in petty trading and other occupations in order to acquire additional income to meet up with family responsibilities. The finding is supported by Ajani (2012) who reported that people living in rural areas diversify income sources in order to empower themselves economically to meet family responsibilities.

Benefits of forest fruits and vegetables to households

The major economic importance of forest fruits and vegetables indicated by the respondents in order of priority include *Irvingia wombolus/gabonensis* (ogbono) (M= 2.87), *Prosopis Africana* (okpeyi) (M = 2.79), *Pentaclethra*

macrophyllum (ukpaka) (M = 2.78), *Treculia* africana (ukwa) (M = 2.75), *Pterocarpus* spp. (oha) (M = 2.48), *Pergularia spp.* (utazi) (M =2.46), among others (Table 2). It shows that the forest trees and vegetables are of vital economic importance and should be given adequate attention in terms of exploiting its potentials for optimum benefits. They have high food values when taken in different forms and mixtures, providing great source of nutrients for body nourishments. According to Are, Igbokwe, Asadu and Bawa (2010), indigenous fruit tree crops continue to be the major source of medicine, dyes, fibre, timber, nuts, seeds, snails and bush animals which generates income for economic empowerment.

The respondents also indicated dietary importance of forest trees and vegetables to include: *Prosopis africana* (okpeyi) (M = 2.96), *Irvingia gabonensis/wombolus* (ogbono) (M = 2.79), *Treculia* africana (ukwa) (M = 2.76), *Parkia* spp (ugba) (M = 2.75). *Pterocarpus* spp (oha) (M = 2.55) and *pergularia spp.* (utazi) (M = 2.55). Others include *Xylopia aethiopica* (uda) (M=2.50), *Piper nigrum* (uziza) (M = 2.40), *Gnetum spp.* (okazi) (M = 2.38), *Chrysophylium africanum* (udara) (M = 2.34) *Garcinia kola* (akuilu) (M = 2.32), among others. This implies that fruits and vegetables are vital dietary ingredients in diets of most households and can be used in curing various sicknesses and aliments. Ene-Obong (2006) observed that they contain a lot of proteins, vitamins and minerals; providing large quantities of nutrients which can be found in thiamine, calcium, iron, magnesium, phosphorus, potassium, sodium, etc. Igbokwe and Eneje (2001) reiterated that utazi has the properties of healing aliments such as diabetes, stomach problems (aches), convulsion and epilepsy. The author further noted that utazi is used in preparing different kinds of foods at home and restaurants. For instance, utazi is a regular component of such dishes as *abacha*, *nkwobi*, *ngwo-ngwo*, pepper soup which are delicacies. Fruits and vegetables contribute enormously to make food more palatable and digestible, supplying essential ingredients for healthy body development.

Estimated annual income from forest fruits and vegetables

Data Table 3 indicates annual income from selected forest fruits and vegetables in the study area. The table shows that 33.3% of respondents earned income within the range of less than ₦10,000 while 33.3% of them earn ₦10,001 to ₦20,000 per annum. About 16.70% of the respondents earn ₦20,001 to ₦30,000 per annum on fruits and vegetables for household utilization while 13.33% earn between ₦30,001 and ₦40,000 per annum. Only 3.33% of the respondents earn ₦40,001 and above per annum. It implies that the respondents make higher incomes from sale of forest fruits and vegetables. The findings agree with a study carried out by Okwu and Morah (2004) in Enugu State, Nigeria that estimated revenue per tree of *Irvingia gabonensis/wombolus* (ogbono) and *Chrysophylium africanum* (udara) was up to ₦7,500 and ₦3,600, respectively per harvesting season.

Table 1. Percentage distribution of the respondents according to their socio-economic characteristics (n = 120)

Variables	Percentage	Mean Score (M)
Sex		
Male	23.3	
Female	76.7	
Age (years)		
≤ 30	6.5	
31-40	34.7	43
41-50	47.5	
51-60	11.6	
61 and above	1.3	
Marital status		
Single	13.4	
Married	81.5	
Widowed	5.0	
Household size		
≤ 3	7.3	
4-6	83.6	5
7-9	9.1	
Educational level (years)		
No formal Education	1.8	
Primary school	56.6	9
Secondary school	21.2	
Tertiary education	20.4	
Childhood background		
Rural	55.8	
Urban	42.2	
Major occupation		
Farming	52.6	
Civil Service	11.3	
Student	3.5	
Petty trading	32.4	
Teaching	4.0	
Minor occupation		
Farming	54.6	
Petty trading	33.7	
Student	8.2	
Teaching	7.2	

Table 2. Mean score of economic and dietary importance of forest fruits and vegetables (n = 120)

Plant specie		Economic importance			Dietary importance		
Botanical names	Igbo names	Mean score	Standard deviation	Rank	Mean score	Standard deviation	Rank
Chrysophylium africanum	Udara	2.19	0.574	13th	2.34	0.561	10th
Garcinia kola	Akuilu	2.47	0.560	6th	2.32	0.690	11th
Pterocarpus santalinoides	Nturukpa	2.10	0.651	15th	1.16	0.653	19th
Dennettia tripatale	Mmimi	2.08	0.686	16th	1.94	0.625	17th
Treculia africana	Ukwa	2.75	0.491	4th	2.74	0.522	4th
Pentaclethra macrophyllum	Ukpaka	2.78	0475	3rd	2.75	0.505	3rd
Piper nigrum	Uziza	2.35	0.594	9th	2.40	0.648	7th
Detarium microcarpium	Oho	1.97	0.661	18th	1.08	0.659	20th
Dialium guinensi	Icheku	1.96	0.615	19th	2.07	0.634	16th
Pterocarpus spp	Oha	2.48	0.598	5th	2.55	0.568	6th
Juglans regia	Ukpa	2.27	0.616	11th	2.29	0.611	12th
pergularia spp.	Utazi	2.43	0.563	7th	2.56	0.569	5th
Xylopia aethiopica	Uda	2.37	0.598	8th	2.39	0.637	8th
Parkia clappertoniana	Ugba	2.18	0.573	14th	2.18	0.637	13th
Vitex doniana	Uchakiri	2.01	0.585	18th	2.11	0.635	15th
Dacroydes edulis	Ube- okpoko	2.22	0.708	12th	2.14	0.636	14th
Gnetum africanum.	ukazi	2.30	0.584	10th	2.38	0.586	9th
Irvingia gabonensis/ wombolus	Ogbono	2.87	0.361	1st	2.79	0.431	2nd
Landolphia owarienoides	Utu	1.82	0.682	20th	1.98	0.620	18th
Prosopis africana	Okpeyi	2.80	0.585	2nd	2.96	0.192	1st

Table 3. Estimated annual income from forest fruits and vegetables (n = 120)

Expenditure in Naira (₦)	Frequency	Percentage
< 10,000	40	33.33
10,001 – 20,000	40	33.33
20,001 – 30,000	20	16.70
30,001 – 40,000	16	13.33
40,001 and above	4	3.33

Perceived benefits of forest fruits and vegetables

The major perceived benefits of forest fruits and vegetables were provision of edible food to man (M=3.69), increases family income (M=3.51), improves standard of living of ruralites (M=3.47), improves human nutrition (M=3.43), provision of medicinal value (M=3.32), payment of children's school fees (M=3.23), source of employment (M=3.18), among others. This implies that forest fruits and vegetables are very beneficial to mankind considering the potentials economically, culturally nutritionally, medically and environmentally. Forest fruits and vegetables are important sources of protein, vitamins and minerals to man and animals. Vermeir and Verbeke (2006) reported that forest fruits and vegetables are targeted at increasing income, alleviating poverty problems, reducing vulnerability and increasing quality of life. They concluded that plant species are gold mines for the resource poor since majority of fruits and vegetables harvested from forests, woodlands, and home gardens are with minimal expenses, less efforts, low capital investments to procure external inputs for a sustainable livelihood.

Constraints to access and utilization of forest fruits and vegetables among households

The major constraints to access and utilization of forest fruits and vegetables include Poor storage facilities (M=2.38), transportation problems (M=2.38), lack of modern processing technology (M=2.38), insect pests and diseases (M=2.36), deforestation and land degradation (M= 2.35), destruction of forests by fire resulting as a result of

bush burning (M= 2.30), poor yield (M=2.19), deterioration/perishability (wastages) (M=2.18), among others (Table 5). The standard deviation was below 1, showing the uniformity as regards the responses of the respondents on constraints to access and utilization of forest fruits and vegetables. It therefore shows that the respondents were highly constrained by infrastructural related problems. Efforts are highly needed in ensuring that adequate physical infrastructure such as storage facilities, modern processing technology, good roads, etc are put in place in order to minimize loss/wastage and ensure optimum productivity and higher returns. The findings of the study are in agreement with WHO (2004) who reported that losses in forest fruits and vegetables occur as a result of lack of transportation, bad roads, lack of storage facilities and refrigeration. Besides, lack of access to forest and woodland due to fear of dangerous animals, sanctions, religious beliefs and cultural attributes cause a lot of obstacles to the utilization and non-availability of these agricultural products**.**

Table 4. Respondents perceived benefits of forest fruits and vegetables

Benefits	Mean score	Rank
Provision of edible food to man	3.69	1st
Increases family income	3.51	2nd
Improves standard of living of ruralites	3.47	3rd
Improves human nutrition	3.43	4th
Provision of medicinal value	3.32	5th
Payment of children's school fees	3.23	6th
Source of employment	3.18	7th
Provides cash for medical bills	3.09	8th
Empowerment of youths, women and vulnerable groups	3.08	9th
Provides shades and serves as wind breaks	3.06	10th
Provides fuel wood for cooking	3.04	11th
Promotes the ecosystem and micro/macro climate	3.03	12th
Improves the environment and biodiversity	2.98	13th
Provides wood for construction of roads and erecting farm structures	2.93	14th
Money for house rents and electric bills	2.92	15th
Purchase of household needs such as generator, water tanks, television set, radio, lanterns, etc.	2.90	16th
Value addition – used as raw materials for producing juice, canned food and beverages	2.84	17th
Promotes tourist attraction	2.76	18th
Provides fodder for livestock feeding	2.71	19th
Purchase of motor cars/motorcycles	2.68	20th

Table 5. Mean score of constraints to access and utilization of forest fruits and vegetables

Constraints	Mean scores	Standard deviation
Cultural problems	1.65	0.720
Scarcity of the products	2.11	0.727
High market price	2.08	0.764
Low crop value	1.89	0.782
Extinction of crop species	2.03	0.746
Poor market network	2.17	0.765
Religious beliefs	1.58	0.730
Inadequate provision of extension services	1.99	0.781
Deterioration/perishability (wastages)	2.18	0.729
Over dependence an export goods	2.02	0.694
Poor harvesting techniques	2.10	0.735
Insect pests and diseases	2.36	0.719
Poor yield	2.19	0.702
Transportation problems	2.38	0.727
Fear of forests and wild animals	1.97	0.799
Deforestation and land degradation	2.35	0.707
Destruction by wildfire resulting from bush burning	2.30	0.716
Poor storage facilities	2.38	0.727
Lack of modern processing technology	2.38	0.727

4. Conclusion and Recommendations

Forest fruits and vegetables which can be found in the study area were Irvingia wombolus/gabonensis (ogbono), Prosopis Africana (okpeyi), Pentaclethra macrophyllum (ukpaka), Treculia africana (ukwa), Pterocarpus spp. (oha), Pergularia spp. (utazi), among others. These products are of immense economic and dietary importance to mankind. They are also vital sources of cash income to households, generating revenue to government as export agricultural produce to foreign countries. Access and utilization of forest fruits and vegetables were highly constrained by infrastructures such as poor storage facilities, lack of modern processing technology, transportation problems, among others.

It is paramount for the government at the local level to involve local community leaders in enforcing laws to reduce deforestation and bush burning in order to avoid destruction of forest products and exploitation of the valuable forest resources. Efforts are highly needed by the government in providing adequate rural infrastructure in order to encourage establishment of rural agro-processing industries by investors to prevent losses emanating from spoilage of the products, ensure food security, and create employment opportunities thus reducing poverty and vulnerability among rural folks.

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