



Plants and Plant Products in Local Markets Within Benin City and Environs

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Abstract

The vulnerability of agriculture systems in Africa to climate change is directly and indirectly affecting the availability and diversity of plants and plant products available in local markets. In this chapter, markets in Benin City and environs were assessed to document the availability of plants and plant products. Markets were grouped into urban, suburban, and rural with each group having four markets. Majority of the plant and plant product vendors were women and 88 plant species belonging to 42 families were found. Their scientific and common names were documented as well as the parts of the plant and associated products available in the markets. Most of the plant and plant products found in local

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markets belong to major plant families. Urban markets had the highest diversity of plants and plant products. Three categories of plants and plant products were documented. Around 67% of the plants and plant products were categorized as whole plant/plant parts, 28% as processed plant parts, while 5% as reprocessed plant/plant parts. It was revealed that 86% of these plants are used as foods, 11% are for medicinal purposes, while 3% is used for other purposes. About 35% of plants and plant products across the markets were fruits, which is an indication that city and environs are a rich source of fruits. The local knowledge and practices associated with the plants and plant products can contribute towards formulating a strategic response for climate change impacts on agriculture, gender, poverty, food security, and plant diversity.

Keywords

Climate change · Ethnobotany · Plant diversity · Plant products · Food security · Market survey · Indigenous plants species · Economic plants · Agriculture vulnerability · Sustainable development

Introduction

The utilitarian nature of humans is driving the massive extinction of biodiversity, climate change, and ecological vulnerability. However, a greater understanding of plant-human interactions can contribute to sustainable development, addressing climate change and biodiversity loss, food security, and poverty reduction. All plants are considered important and can potentially serve to fulfill one or more of our basic needs – food, shelter, and clothing as well as environmental integrity. Plant product refers to goods and services derivable from plants and may include whole plant or plant part (used as ingredients and condiments). Proper local and scientific identification of plant materials is necessary to determine and predict the role of a plant and this will require a general knowledge of botany, sociology, and anthropology. Plant is essential for our continued survival on earth as they directly or indirectly provide food for survival, medicine, fibers, chemical products, and other commodities as well as to protect and maintain the environment against erosion, used to cure disease and relieve from suffering. Many industries are dependent on plants for their raw materials. Some of the most outstanding materials of modern civilization are obtained from plants, such as wood, tanning materials and dyestuffs, oils, resins, gums, varnishes, beverages, etc. Plants provide raw material for industrialization and are basis of the green revolution and a pillar for food security. The esthetic value of plants has no small influence on man's overall life satisfaction, as evidenced by the host of garden enthusiasts and flower lovers. Plants are also the basis of a vegan lifestyle.

In the economy of nature, the production and distribution of plant products have a profound influence on the environmental, economic, and social life of a nation with both domestic and international influence. The maintenance of an adequate supply of

food and plant-based industrial raw materials is essential to the existence, as well as the prosperity, of any nation (Burkill 1985). Additionally, plants also have important roles in the tribal, social and cultural life of man (Osawaru and Dania-Ogbe 2010; Osawaru and Ogwu 2014a). Local markets are an integral part of life and cultural practice of the people especially in developing countries as a social, economic, and ecological institution. Plant products available in the market can be used as an indicator for biodiversity richness, climate changes effects, and agricultural vulnerabilities. This is more important in Africa, which according to Ogwu (2019) the environment and agriculture systems are most vulnerable climate change. Markets in rural parts of Africa are often scheduled at considerable day interval, whereas in urban and semi-urban centers, it is mostly open every day or night. Sellers have their stalls or place while hawkers also patrol the market with their various plants and plant products. Markets are rich sources of information on plants and plant products as well as an easily accessible and cost-effective place for plant-based fieldwork and germplasm collection. Markets can provide qualitative and quantitative data concerning cultural, social, and economic aspects of a plant's usage (Bye and Linares 1983; Martin 1992; Cunningham 2001). Moreover, markets are recognized as a vital botanical record of the history of useful plants in a region (Whitaker and Cutler 1966). They are places of intensive interaction between people and plants.

Local traders (mostly women) are very knowledgeable about the uses of plants and their seasonal availability. This knowledge is vital in the global response to global climate change and massive loss of biodiversity in this sixth extinction era. In Nigeria and West Africa, market vendors are known to deal in certain types of plants and plant product and are found clustered together, which imposes a sort of market influence such as fixed prices for their commodities. However, traders have certain concession such as monopoly to regular customer and slight price variations. Moreover, the survey of marketplaces provides information about food and nutritional value of plant and products as well as their ethnobotany (Nguyen 2005). Findings from such studies have been used to draw interesting conclusions and hypothesize about human-environmental-plant interactions and relationships. Climate change, migration, and economic forces can influence the availability of certain plant and plant products in the market. Obiri and Addai (2007) surveyed economic plants in Kumasi central market and documented a total of 150 plant species from 55 families most of them had multiple uses – 57% and 20% used for medicinal and food purposes, respectively. Idu et al. (2010) documented the medicinal plants sold in markets in Abeokuta, Nigeria, revealed 60 medicinal plant species used for traditional health management. The ethnobotanical survey of Yaradua and El-Ghani (2015) reported 54 plants belonging to 33 families from Katsina metropolis markets. The objective of this chapter is to identify and document the plants and plant products sold in local markets in Benin City and environs.

This chapter will compare the diversity of the plants and plant products available in local markets in urban, peri-urban, and rural centers in Benin City, Southern Nigeria. Thereafter, this chapter will categorize the plants and plant products based on the level of processing it was subjected to as well as their taxonomic families. The results will seek to promote local markets as a reservoir of plant germplasm and

contribute towards understanding of how climate change vulnerability is affecting agriculture system in Edo state, diversity of plant and plant-based food materials available in local markets that can potentially contribute to addressing food security, poverty, and sustainable development. It will also highlight the plant parts and plant products sold in the markets.

Plants and Plant Products in Local Markets: The Case of Benin City and Environs

There are numerous open markets in Benin City (latitude $06^{\circ} 19'00''$ E to $6^{\circ} 21'00''$ E and longitude $5^{\circ} 34'00''$ E to $5^{\circ} 44'00''$ E; average elevation of 77.8 m above sea level; 2006 est. pop. 1,147,188 with an annual growth rate of 2.9%), which is one of the oldest cities in Nigeria and the capital of Edo State, Southern Nigeria. It is within the tropical rainforest zone of Nigeria with an estimated area of 550 km². Geologically the city has a sedimentary formation of the Miocene-Pleistocene age. Benin has an undulating topography with a vegetation type characterized by lowland rainforest and an annual average rainfall of 800 mm. A 35-year study by Floyd et al. (2016) revealed massive climate fluctuations especially in average rainfall, temperature, humidity and suggested that it is impacting plant production and environmental changes due to soil erosion. The fluctuation is attributed to high anthropogenic activities in Benin City (Efe and Eyefia 2014). With increased warming, flooding, and urbanization, agriculture and food production are threatened in Benin City (Atedhor et al. 2011).

Benin is the center of Nigeria's rubber industry, but processing palm nuts for oil is also an important traditional industry. Benin has numerous local markets strewn across the city to cater to the needs of its inhabitants as well as to serve as a sales outlet for the numerous farm produce cultivated in the rural areas of the state as well as in urban home gardens. The nodal nature of Benin makes it an ideal place for various commercial activities as these farm produce can be easily transported to cities like Lagos, Abuja, and Port Harcourt. Benin City is endowed with a wide diversity of plants and plant products. The sales of plants and plant products play a key role in the sustenance of livelihoods of people providing income, employment, food, and medicines among others in Benin City and environs. Some of the local markets in Benin City and environs are God's Market (Ekiosa), Oba Market (Ekioba), New Benin Market, Santana Market, Uselu Market (Ediaken Market), Oliha Market, Ugbogiobo Market, Evbuotubu Market, Oregbeni Market (Ikpoba Hill Market), Ekiador Market, Iguobazuwa Market, Ehor Market, and Usen Market.

The sampling frame considered markets within Benin City and environs, which were delimited into three categories according to the status defined by Osawaru and Odin (2012) – urban, peri-urban, and rural. A reconnaissance visit was undertaken to all the local markets in Benin City and environs. Twelve markets were randomly selected for sampling. They consist of four urban, four peri-urban, and four rural markets (Table 1).

Table 1 Sampling sites for the survey of plants and plant products in Benin City and environs

Market	Category	Local government area
New Benin	Urban	Oredo
Uselu	Urban	Egor
Oba	Urban	Oredo
Oregbene	Urban	Ikpoba-Okha
Evbuotubu	Peri-urban	Egor
Ugbogiobo	Peri-urban	Ovia North East
Ugbiohioko	Peri urban	Egor
Iguobazuwa	Peri-urban	Ovia South West
Ehor	Rural	Uhunnwode
Usen	Rural	Ovia North East
Ekiadolor	Rural	Ovia North East
Ugbogui	Rural	Ovia South West

In each market, ten traders of mixed age and sex were randomly selected and plants and plant products in their stalls were assessed. Each market was visited three times. First, to map out the randomly selected informant, secondly, to administer the questionnaire and inventory the plants and plant products, and finally, to seek clarity for some questions outlined in the questionnaire. Responses via the questionnaires were retrieved from the questionnaires, translated and scored by typing into Microsoft Excel, and analyzed quantitatively. Plants and plant products were categorized according to Osawaru and Odin (2012) i.e.,

1. 1^o of plants and plant products-whole plant/plant part
2. 2^o of plant and plant product-processed plant part
3. 3^o of plant and plant product-reprocessed plant/plant part

Majority of the traders encountered in the markets were women. This confirms the findings of De Caluwe (2011) and Agea et al. (2011) that trading in plant and plant products are dominated by women. In a different study, Osawaru and Ogwu (2014b) also established that women contribute significantly to holding plant germplasm. These findings underscore the importance of women in the fight to address the effects of climate change especially food security and sustainable agriculture. Moreover, the sales of plants and plant products in the different markets were practiced by different tribes and ethnic groups in all the markets surveyed.

A total of 88 plants and plants product was found in all the local markets assessed (Table 2). The botanical and common names, forms, diversity, and categories of the plant and plant products sold in local markets within Benin City and environs are presented in Table 2. These 88 plants and plant product are distributed into 42 families. Presence of plant and plant products varies in the different markets. For instance, *Adansonia digitata*, *Brassica oleracea*, *Cucumis sativus*, *Cucurbita pepo*, *Cyperus esculetus*, *Dialium guineense*, *Ricinus communis*, *Pennisetum glaucum*, *Pentaclathra macrophylla*, *Myristica fragans*, and *Phoenix dactylifera*

Table 2 Diversity of plants and plant products in 12 local markets within Benin City and environs

Botanical name	Family	Common name	Form/product type	Local name (Bini)	Urban market	
					New Benin	Uselu
<i>Abelmoshus esculentus</i> L.	Malvaceae	Okra		Ikhiav-bo	+	+
<i>Adensonia digitata</i> L.	Malvaceae	Baobab			+	+
<i>Allium cepa</i> L.	Liliaceae	Onion		Alubara	+	+
<i>Allium sativum</i> L.	Liliaceae	Garlic			+	+
<i>Amaranthus caudatus</i> L.	Amaranthaceae	Spinach		Ebaafor	+	+
<i>Anacardium occidentale</i> L.	Anacardiaceae	Cashew			+	—
<i>Ananas comosus</i> L.	Bromeliaceae	Pineapple		Edinebo	+	+
<i>Annona muricata</i> L.	Annonaceae	Soursop			+	+
<i>Arachis hypogaea</i> L.	Fabaceae	Groundnut		Isaerewe	+	+
<i>Azadirachta indica</i> L.	Meliaceae	Neem			—	+
<i>Bombax buonopozense</i> L.	Malvaceae				—	—
<i>Brassica oleracea</i> L.	Brassicaceae	Cabbage			+	+
<i>Calotropis procera</i> Auton.	Apocynaceae				+	+
<i>Capsicum annum</i> L.	Solanaceae	Pepper		Ehien	+	+
<i>Capsicum frutescens</i> L.	Solanaceae	Pepper		Ikpovb-ukho	+	+
<i>Carica papaya</i> L.	Caricaceae	Pawpaw		Uhoro	+	+
<i>Celosia argentea</i> L.	Amaranthaceae	Celosia			+	+
<i>Citrus aurantifolia</i> L.	Rutaceae	Lime		Alimonegiere	+	+
<i>Citrus limon</i> L.	Rutaceae	Lemon			+	+
<i>Citrus sinensis</i> Osbeck	Rutaceae	Orange		Alimebo	+	+
<i>Cochorus olitorius</i> L.	Tiliaceae	Jute			+	+
<i>Cocos nucifera</i> L.	Palmae	Coconut		Ivin	+	+
<i>Cola acuminata</i> Engl.	Sterculiaceae	Kolanuts		Gbanja	+	+
<i>Cola nitida</i> Schum.	Sterculiaceae	Kolanut		Evbedo	+	+
<i>Colocasia esculenta</i> Schott	Araceae	Cocoyam		Akaha	+	+
<i>Crescentia cujele</i> L.	Curcubitaceae	Calabash		Uko	+	+
<i>Cucumeropsis mannii</i> Naudin	Cucurbitaceae	Melon		Ogi	+	+
<i>Cucumis sativus</i> L.	Cucurbitaceae	Cucumber			+	+
<i>Cucurbita pepo</i> L.	Cucurbitaceae				+	+
<i>Cucurma longa</i> L.	Zingiberaceae				+	+
<i>Cymbopogon citrates</i> L.	Poaceae	Lemmon grass		Ebiti	+	+
<i>Cyperus esculentus</i> L.	Cyperaceae	Tiger nut			+	+
<i>Dacryodes edulis</i> Lam	Burderaceae	African pear		Oruvbu	—	—
<i>Daucus carota</i> L.	Apiaceae	Carrot			+	+
<i>Dennettia tripetala</i> Bak. F.	Annonaceae	Pepper fruit		Ako	+	+
<i>Dialium guineense</i> Willd	Fabaceae	Velvet tamarind			+	+
<i>Dioscorea alata</i> Lour	Dioscoreaceae	Water yam		Igierua	+	+
<i>Dioscorea cayenensis</i> Lam.	Dioscoreaceae	Aerial yam		Ikpen	+	+

Table 2 (continued)

Botanical name	Family	Common name	Form/product type	Local name (Bini)	Urban market	
					New Benin	Uselu
<i>Dioscorea rotundata</i> Poir	Dioscoreaceae	Yam	Yam chips and yam flour	Emowe	+	+
<i>Elaeis guineensis</i> Jacq	Palmae	Oil palm	Oil	Udin	+	+
<i>Garcina cola</i> Heckel	Guittiferae	Bitter cola		Edun	+	+
<i>Glycine max</i> L.	Fabaceae	Soy bean		Owerie-otan	+	+
<i>Gnetum africanum</i> Welw.	Gnetaceae				+	+
<i>Gossypium hirsutum</i> L.	Malvaceae	Cotton		Oruhu	+	+
<i>Hibiscus cannabinus</i> L.	Malvaceae				+	+
<i>Hibiscus sabdarifa</i> L.	Malvaceae	Roselle		Zobo	+	+
<i>Ipomea batata</i> L.	Convolvulaceae	Sweet potato		Iyinebo	+	+
<i>Irvingia gabonensis</i> Baill	Irvingiaceae	Bush mango		Ogwi	+	+
<i>Lycopersicum esculentum</i> L.	Solanaceae	Tomato	Tomato paste	Etomat-osi	+	+
<i>Mangifera indica</i> L.	Anacardiaceae	Mango		Emango	+	+
<i>Manihot esculatua</i> Crantz	Eupobiaceae	Cassava	Garri, fufu, bobozi and cassava flour	Igari	+	+
<i>Murraya koenigii</i> L.	Rutaceae	Curry		Curry leaf	+	+
<i>Musa paradisiaca</i> L.	Musaceae	Banana			+	+
<i>Musa sapientum</i> Linn	Musaceae	Plantain	Chips and plantain flour	Oghede	+	+
<i>Myristica fragrans</i> Houtt.	Myristicaceae	Nutmeg			+	+
<i>Ocimum gratissimum</i> Linn	Lasiotae	Scent leaf		Ebihiri	+	+
<i>Oryza sativa</i> L.	Poaceae	Rice		Izee	+	+
<i>Parkia clappertoniana</i> Key	Fabaceae	Locust bean		Evbarie	+	+
<i>Pennisetum glaucum</i> (L.) R. Br.	Poaceae	Millet	Kunu		+	+
<i>Pentaclethra macrophylla</i> L.	Fabaceae	African oil bean			+	+
<i>Persea americana</i> Miller	Lauraceae	Avocado Pear			+	+
<i>Phaseolus vulgaris</i> L.	Fabaceae	Beans	Beans cake, beans flour	Ere	+	+
<i>Phoenix dactylifera</i> L.	Palmae	Date palm			+	+
<i>Piper guineense</i> Schumach	Piperaceae	African pepper		Oziza	+	+
<i>Psidium guajava</i> L.	Myrtaceae	Guava			—	—
<i>Rauwolfia vomitoria</i> Afzel.	Apocynaceae	Rauwolfia		Akata	—	+
<i>Ricinus communis</i> L.	Euphorbiaceae	Castor oil			+	+
<i>Saccharum officinarum</i> L.	Solanaceae	Sugar cane	Sugar	Ukhure	+	+
<i>Sesamum orientale</i> L.	Pedaliaceae				+	+
<i>Solanum melogena</i> L.	Convolvulaceae	Garden-egg		Ekhue	+	+
<i>Solanum tuberosum</i> L.	Poaceae	Irish potato			+	+
<i>Sorghum bicolor</i> L.	Poaceae	Guinea corn	Kunu		+	+
<i>Spondias mombin</i> L.	Meliaceae	Hug phem		Okhikhan	—	+

Table 2 (continued)

Botanical name	Family	Common name	Form/product type	Local name (Bini)	Urban market	
					New Benin	Urelu
<i>Talfairia occidentalis</i> Hook	Cucurbitaceae	Pumpkin		Uvbeg-hen	+	+
<i>Talinum triangulare</i> Jacq	Portulacaceae	Water leaf		Ebodo-don	+	+
<i>Tamarindus indica</i> L.	Fabeaceae				+	+
<i>Tetrochidium didymostemon</i> (Baill.) Pax & K. Hoffm	Euphorbiaceae				–	–
<i>Thaumatococcus danielli</i> Benth.	Marantaceae			Ebe-eba	+	+
<i>Theobroma cacao</i> L.	Sterculiaceae	Cocoa		Koko	+	–
<i>Thymus vulgaris</i> L.	Lamiaceae	Thyme			+	+
<i>Treculia Africana</i> Decne.	Moraceae	African breadfruit			+	+
<i>Trilepisium madagascariensis</i> DC	Apocynaceae				+	+
<i>Triticum aestivum</i> L.	Poaceae	Bread (processed wheat)			+	+
<i>Vernonia amygdalina</i> Delile	Asteraceae	Bitter leaf		Oriwo	+	+
<i>Vigna unguiculata</i> L.	Fabaceae	Cow pea		Ere	+	+
<i>Vitellaria paradoxa</i> Gaertn	Sapotaceae	Shea butter			+	+
<i>Xylopia aethiopica</i> (Dunal) A. Rich	Lauraceae			Unie	–	–
<i>Zea mays</i> L.	Poaceae	Maize	Corn flour	Okha	+	+
<i>Zingiber officinale</i> Roscoe	Zingibeaceae	Ginger			+	+

+ = Present; – = Absent

were more common in urban markets than in rural markets. On the other hand, *Tetrochidium didymostemon*, *Xylophia aethiopica*, *Anacardium occidentale*, *Bombax buonopozense*, and *Dacryodes edulis* were found mostly in rural markets. However, this trend might not translate directly into plant diversity in urban and rural centers but their utilization patterns. In Benin City, peri-urban markets mostly act as a transition zone for rural and urban markets. Previous investigations of rural markets in Nigeria by Johnson and Johnson (1976) recorded 58 species of plants sold in Nigeria, Keratela and Hussain (1990) reported 21 species, Gill et al. (1993) recorded 93 plants, Idu et al. (2010) reported 103 and Osawaru and Odin (2012) reported 117. The difference in the number of plants recorded from the different study might be related to the season when the study was undertaken as well as the agricultural yield of the previous seasons and change in attitude, taste, where vendors source their plants, prevailing economic and environmental conditions. Mekasha and Tirfe (2019) highlighted that the marketing of agricultural produce requires planned production, grading of products, transportation to markets, distribution, pricing, and advertisement. Most of the plant species found in the markets are exotic. This supports the report of Muhanji et al. (2011) and Ogwu et al. (2016, 2017) which opined that the colonial era introduced and promoted the production and sale of plants exotic to Africa. Overall, the plants and plant products distribution across the market ranged from 58 to 83 in all the markets assessed (Fig. 1). There are more plants and plant products in urban markets compared to peri-urban and rural markets. This might be due to the higher food demands of the growing urban population, urbanization policies, greater economic power, and migration (Romanik 2008; Ogwu 2019). If the current urbanization trend is left unchecked, it might increase the vulnerability of African cities to climate change as well as challenges associated with food security. Another reason for the high distribution of plant species in urban markets might be the large size of these markets and the age-long attitude of rural dwellers to bring their farm produce to city centers for sale. The least diversity was in Usen Market while Uselu Market had the highest species composition. Overall, the urban markets had higher species composition. Next to the urban markets were peri-urban markets in plant and plant product abundance.

Plant products found in the different markets were assessed based on the level of processing that has been done to the plants. The classification of plant processing included first, second, and third-degree of plant and plant products (Fig. 2). The first degree of plant and plant products refers to the whole plant or plant part, while the second degree of plant and plant products and third degree of plant and plant products are processed and reprocessed plant or plant parts, respectively. It was also observed that most plant products were only processed once before been presented for sale in the markets (Fig. 2).

Plants and plant products in the local markets can be grouped into cereals (e.g., maize, rice, guinea corn, millet etc.), legumes (e.g., beans, groundnut, soybean etc.), stem tubers (e.g., yam and Irish potato), root tubers (e.g., cassava, carrot and sweet potato), fruits (e.g., pawpaw, orange, pineapple, mango, banana, pear, etc.), vegetables (e.g., waterleaf, bitter leaf, *Amaranthus* sp., *Celosia* sp., pumpkin leaf etc.), nuts (e.g., coconut), oil (e.g., palm fruit), spices (e.g., pepper, onion, ginger, garlic etc.).

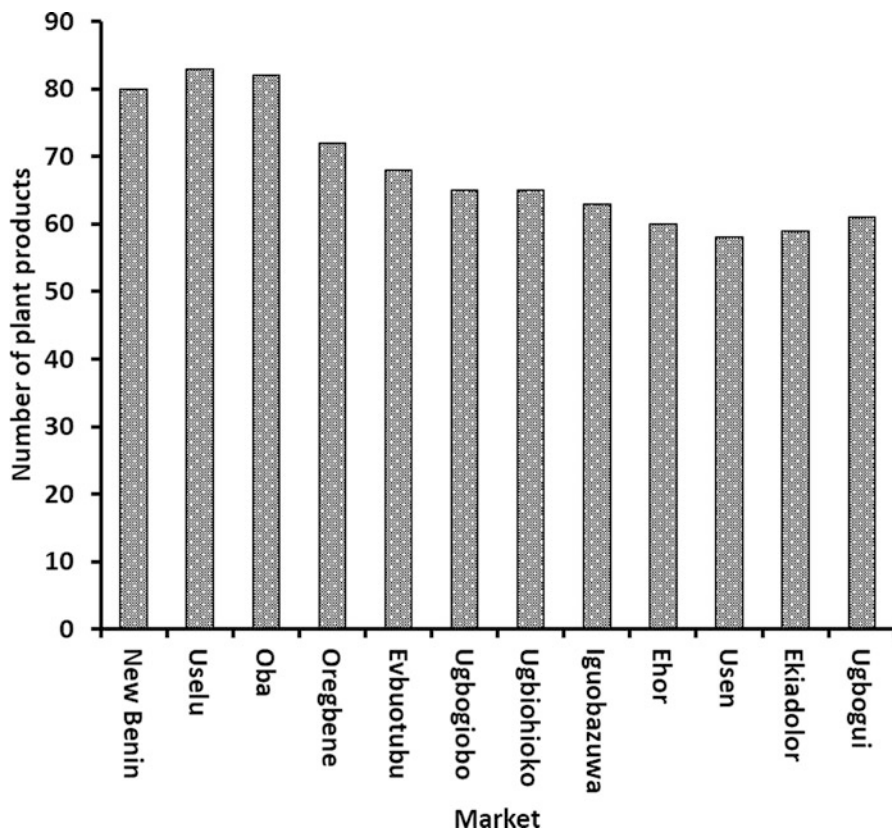
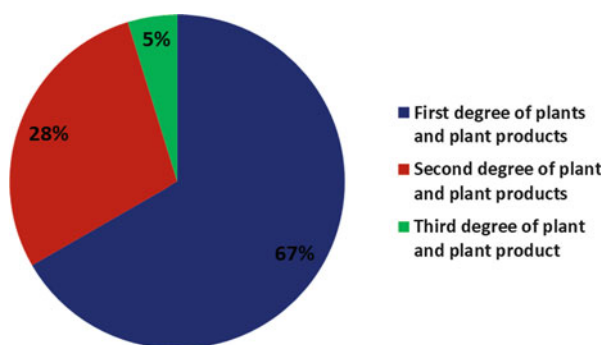


Fig. 1 Number of plants and plant products in local markets in Benin City and environs

Fig. 2 Category of plants based on forms in which they are available in the market



The dominance of first degree processed plant products could be attributed to the near lack of government support for the agriculture sector of Nigeria. It also suggests Nigerians might prefer plant products that have undergone little to no processing. It

was observed that the availability of plants and their products rely on seasonal variations. The plants and plant products were seen in different forms in the markets depending on the season. Markets are made up 90–99% of plants and plant products. Some of these products may have been to the 3rd degree of processing, for example, Rain boot, etc. However, not all part of the plant may be essential. These forms are fruits, leaves, rhizomes, bulbs, corms, stem tuber, root tuber and also in processed forms such as fufu, gari, and cassava flour from cassava; oil, broom, and basket from oil palm; tomato paste from tomato, etc. These different forms are the status in which these plants and plant products are best sold and preserved. This is in line with the report of Idu et al. (2005).

The utilization pattern of the plants and plant products is presented in Table 3. Major categories included cereals, legumes, roots and tubers, fruits, fats and oils, sugar crops, fiber crops, spice and condiments, beverages, medicinal, and others. It was observed that 86% of the plants and plant products are used for foods, 10% are used for medicinal purpose while 3% is used for other purposes. However, the highest percentage was noticed in fruits, which are 35%.

The habit of plants found in local markets in Benin City and environs range from grasses, herbs, shrubs, and trees to vines. Overall, the composition was 39%, 20%, 17%, 15%, and 9% for trees, shrubs, grasses, herbs, and vines, respectively (Fig. 3). This is an indication that for plants and plant products gotten from tree crops, buyers, and vendors will have to wait for months or years before parts that are available to be harvested for sale or consumption.

The plant species recorded in the study are mainly used as a source of food, cash or medicine. Others supply diversity, essential nutrients, vitamins, or minerals in diets that would otherwise consist primarily of carbohydrates (Johns 2004; Johns and Sthapit 2004). Our investigation revealed that most of the plants and plant products are mainly for foods while a few are for medicinal and other uses. Often, they reflect cultural values and as a pool of health and nutritional information for the public and health practitioners (Johns and Eyzaguirre 2002). The availability of diverse plant and plant products in the market relies on local agriculture system, seasonal variations, local knowledge and practices, as well as plant germplasm. Produce are mainly sourced locally from home gardens and distant farms. Therefore, the vulnerability of agriculture systems in Benin City to climate change might not be affecting the production of the plants reported in this chapter in the short term. However, the interplay of diverse external factors and climate change is likely to affect the availability of plant and plant products currently found in open markets in the long term. It is recommended that the roles of women, soil health, and plant diversity be assessed in order to formulate a policy to mitigate and adapt to climate change impact on agriculture and food security in Benin City and other parts of Nigeria and Africa.

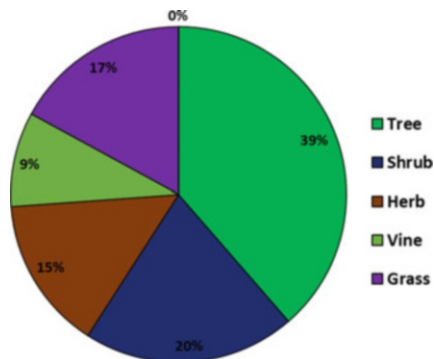
Moreover, considering that Muhanji et al. (2011) reported that there might be 45,000 plant species in Africa, the amount of plant and plant products recorded in open markets in Benin City only represent a small portion of that diversity. About 86% of the plants and plant products found in the markets in Benin City and environs are used for foods, 11% are for medicinal purpose, while 3% are used for others

Table 3 Utilization pattern of plants and plant products in local markets within Benin City and environs

Botanical name	Common name	Cereal	Legumes	Root and tubers	Vegetables	Fruits and nuts	Fats and oil	Sugar crop	Fiber crop	Condiments and spices	Beverage and stimulant	Corn and rhizome	Medicinal	Other
<i>Abelmoshus esculentus</i>	Okra				•	•								
<i>Adenersonia digitata</i>	Baobab					•								
<i>Allium cepa</i>	Onion										•			
<i>Allium sativum</i>	Garlic										•		•	
<i>Amaranthus caudatus</i>	Spinach				•									
<i>Anacardium occidentale</i>	Cashew					•								
<i>Ananas comosus</i>	Pineapple					•								
<i>Annona muricata</i>	Sour sop					•								
<i>Arachis hypogaea</i>	Groundnut		•											
<i>Azadirachta indica</i>	Dogoyaro													
<i>Bombax buonopozense</i>						•							•	
<i>Brassica oleracea</i>	Cabbage				•									
<i>Calotropis procera</i>	Pepper					•								•
<i>Capsicum annum</i>	Pepper					•				•				
<i>Capsicum frutescens</i>	Pepper					•								
<i>Carica papaya</i>	Pawpaw					•								
<i>Celosia argentea</i>	Celosia				•									
<i>Citrus aurantifolia</i>	Lime					•							•	
<i>Citrus limon</i>	Lemon					•							•	
<i>Citrus sinensis</i>	Orange					•								

(continued)

Fig. 3 The habit of plants and plant products in local markets within Benin City and environs



purpose. Of the 86% used for food purpose, fruits and vegetable had the highest percentage of usage, which are 35% and 9% for fruits and vegetables, respectively. This is an indication that the markets in Benin City and environs have rich and diverse pool of fruits and vegetables, which are of great nutritional value. This is in line with the study of Odhav et al. (2007) and Ogwu et al. (2016) wherein they pointed out that indigenous vegetables and fruits represent inexpensive but high quality nutrition sources for the poor segment of the population. Since many indigenous food plants grow wild, they are accessible, they can be collected freely and are thus available to everyone, including the poor (Kabuye et al. 1999). Fruits and vegetables are of great nutritional value. They are important sources of vitamins and minerals that are essential for human health and well-being. Their consumption ensures the intake of various essential vitamins and mineral elements thus avoiding the problem of malnutrition (Yamaguchi 1983). There is a wide variety of indigenous vegetables and fruits found in Africa, which are chief sources of nutrients, vitamins, antioxidants, minerals, and proteins (Odhav et al. 2007; Ogwu et al. 2016; Ogwu 2020). Some of the indigenous vegetables and fruits are mainly used for medicinal purposes (Eifediyi et al. 2008).

Names and naming are important determinant factors in local society and contributing to promoting sustainable plant utilization and conservation (Penny 2001; Ogwu and Osawaru 2014; Ogwu et al. 2014). Plants are more easily recognized by their local names in every part of the world. These local names play a vital role in ethnobotanical study of a specific tribe or region (Singh 2008). The local names of crop plants, especially in Bini language, are reported among tribes surveyed. Documentation of local names is highly valued by Rogers (1963), Rogers and Applan (1973), Allem (2000), Bressan et al. (2005), Sawadogo et al. (2005), and Osawaru and Dania-Ogbe (2010). Local names are used to promote and trade plant and plant products in all the local markets assessed with little to no reference to their scientific nomenclature. Although local names are not directly recommended for scientific discussions because they lack uniformity and consistency (Singh 2008), yet they may certainly be considered as a useful tool for obtaining useful information on plants. Local names provide means of reference by local people in a particular

area. Also, in some cases, the plants are well known with their local name than the common names. This is the case of “ebolebo” and “dogoyaro” for Indian almond and neem, respectively.

In conclusion, plants provide valuable functions as foods, raw materials, socio-economic development, as well as sustainable environmental development and indicator of climate change impacts. They have been used as a means of livelihood sustenance and preservation of indigenous knowledge through their utilization pattern for centuries. This chapter established that local markets are a data bank for economic plant species. The diversity of these plants and plant products in the various local market assessed suggest that despite ongoing climate change, some level of plant production and plant-human interaction is ongoing. This chapter also revealed that urban markets have a higher number of plants and plant products compared to peri-urban and rural markets. This is a reflection that lesser populated markets are less diverse in terms of plants and plant products in the market. Additionally, majority of the plants and plant products are utilized as food with fruits being the predominant part that is used as food. Overall, the vendors/sellers are predominantly women and their interaction with plants in the market makes them an important group in the fight against climate change, food insecurity, and biodiversity crisis.

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