# LIFE-FORM DISTRIBUTION AND STOCK DENSITY OF PLANTS OF FOOD AND PHARMACEUTICAL IN A COMMUNITY-PROTECTED RAINFOREST IN AKWA IBOM STATE, NIGERIA

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**ABSTRACT**
Sustainable management of the remaining tracts of Nigerian rainforest for production of multiple forest goods cannot be realized with paucity of quantitative and qualitative ecological data and information on the constituent plant species. Thus, a community-owned lowland rainforest in Akwa Ibom State, Nigeria was assessed for plants producing edible and pharmaceutical products using the combination of systematic and simple random sampling techniques. The identified plant species were classified into life-forms. The stock density of individual species was determined on per/ha basis, and data obtained were also analysed employing descriptive statistic of pie-chart.The results indicated that thirty-nine (39) plant species were encountered. With respect to population density, *Nephytytis constrita* had the highest population density of 323 per/ha, while *Melastomastrus capitatum* had the least of 4 per/ha under herb life-form; *Microdermis puberula* had the highest of 33 per/ha, while the least of 2 per/ha was recorded by *Araliopsis soyanuxii* under herb; in the climber life-form, *Icacina trichanta* had the highest of 35 per/ha and *Abrus precatorius* had the least of 1 per/ha; *Canarium schwinfurthii* has the highest 42 per/ha, while the least of 2 per/ha a piece was recorded for *Brachystegia nigerica*, *Colamillenii* and *Dacryodes edulis*under the tree life-form. The distribution of the encountered plant species among the life-forms indicated that 31% was herb, 28% tree, 26% shrub and 15% climber. Sustainable management of the forest for production of multiple forest goods is strongly proffered to engender the conservation of the forest's biodiversity.

**Key Words:** Rainforest, plants, food, medicine, sustainable forest management.

## INTRODUCTION

The importance of tropical rainforest biome in the well-being of human cannot be over-stressed. The tropical rainforest is acornucopia of basic needs of man for food, medicine, shelter energy and healthy environment. The world tropical rainforest is the most biological diverse ecosystem on earth, that is, the richest in term of diversity of plant and animal species (Turner, 2001; Gillespies *et al*., 2004; ITTO, 2011).The Nigerian rainforest is an integral part of the world tropical rainforest. The rainforest covers 95,372 $km^2$ of the Nigerian landmass of 983,213$km^2$ (Akindele, 2012 and Akpan-Ebe, 2015).

A tract of rainforest is often erroneously exclusively valued for the population of density of desirable timber trees present therein, while much more valuable non-timber plant resources were ignored. Consequently, vast areas of rainforest considered poor in desirable timber tree species, but richly stocked with diversity of valuable non-timber plant resources have been converted to farmlands, plantation agriculture and far less valuable monoculture forests of mostly fast-growing exotic tree species. The non-timber products from many of the rainforest plants include items of food, medicine, livestock fodder and raw materials for cottage industries. Until recently little or no recognition was given to the non-timber forest products (NTFPs) in the scheme of forest management. Incomes generated from most NTFPs do not get entered into the national economic ledger to calculate the actual total contribution of forestry sub-sector to the gross domestic product [GDP] (Lorbach *et al*., 2000, Ella and Domingo, 2014). The Nigerian rainforest is stocked with diversity of plants that are sources of edible and medicinal products in the forms of fruits, seeds, nuts, leaves, twigs, barks, floral and roots. It has been observed that the edible plant materials from the rainforest ecosystem are mostly available at the seasons of the year when the cultivated crops are not yet mature or off seasons (Oni and Gbadamosi, 1998 and Udo, 2016). The edible forest products constitute important and cheap sources of vitamins, minerals, protein, carbohydrate, fat and oil of the diets of the largely rural people. A considerable number of plant species of the rainforest have been identified to contain therapeutic ingredients. The people have for ages been depending on these plant materials for their healthcare needs. Natural forests, particularly tropical rainforest, provide the only medicine available to the largest proportion of the world population of which 90-95% is in the developing world, and the high concentration of different chemicals in some plants serve as raw materials for the production of modern drugs (FAO, 1985; Panayotou and Ashton, 1992; ITTO, 2011). It has been estimated that some 9,000 species of medicinal plants are thus threatened (Burford et al., 2000; Maazou and Wema, 2011). The Nigerian rainforest has been widely destroyed and now generally occurred in scattered patches (Akpan-Ebe, 2015 and Olajide, 2018). Sustainable management of the remaining tracts of rainforest for production of multiple forest goods will be an illusion without sufficient quantitative ecological data on constituent plant species, especially, those producing socio-economically valuable non-timber forest products. Thus, this paper is a report of an assessment of plant species of food and pharmaceutical products in a community-protected lowland rainforest. It is hoped that the information obtained would help sustainable management of the forest and similar other tracts of rainforest for the production of multiple forest goods.

## Materials and methods

### Study Area

The study was carried out in Abam Itak Forest, Ikono Local Government Area of Akwa Ibom State, Nigeria. The forest is a disturbed lowland tropical rainforest that covers an area of 29.6ha. The area lies between latitudes 5°00' and 5°23'N, and longitude 7°40' and 7°56'E. The mean annual rainfall of the area is 2400mm, while the mean minimum and maximum temperatures are 25°C and 30°C respectively. The mean relative humidity of the area is 83%. The soil type of the area is predominantly silt-loam. The forest had been subjected to timber and other wood resource exploitations in the recent past.

### Data Collection

Four 200m belt transects were laid randomly, at 5m away from the major access route, into the forest. Fifty 5m x 5m quadrats were laid alternately at randomly selected points along each belt transect to assess and enumerate permanent undergrowth species. In the case of trees, four 50m x 50m sample plots were laid alternately at randomly selected points along each belt transect. Accordingly, the undergrowth species producing food and pharmaceutical products were identified and enumerated in all the quadrats, while the trees in the 50m x 50m sample plots. The identification of the plants and their food and medicinal products were made on the field with the aid of two forest taxonomists and four resident natives of the community whose ages ranged between 55 and 63 years.

### Data Analysis

The enumerated plant species were classified into four life-forms or habits of herb, shrub, climber and tree. The population density per/ha of each species in each of the life-forms was determined from its population in the total area of all the quadrats enumerated, which was 0.5ha, while the population of each tree species was determined from the total area of the enumerated sample plots (4ha). The data were further subjected to descriptive statistic of pie-chart.

## RESULTS

Thirty-nine (39) plant species producing various food and pharmaceutical products were encountered. The distribution of the species across the life-forms or habits is as follows: shrubs: 10; herbs: 12; climbers: 6 and trees: 11. Under shrub category, the highest population density of 33 per/ha was recorded by *Microdermis puberula*, while *Araliopsis soyauxii* had the least of 2 per/ha (Table 1). *Nephytytis constrita* had the highest population of 323 per/ha, while *Melastomastrus capitatum* had the least of 4 per/ha under herb life-form (Table 1). Under the climber life-form, *Icacina trichanta* had the highest population density of 35 per/ha, while *Abrus precatorius* had the least of 1 per/ha, and in the category of trees, *Canarium schwinfurthii* had the highest of 42 per/ha, while the least of 2 per/ha apiece was recorded for *Brachystegia nigerica*, *Cola millenii* and *Dacryodes edulis* (Table 1).

**Table 1: Population density of plant species producing food and pharmaceutical products in Abam Itak Forest, AkwaIbom State, Nigeria.**

| | **Shrub** | **Population density (per/ha)** |
|---|---|---|
| 1. | *Aralopsis soyauxii* | 2 |
| 2. | *Genestis ferruginea* | 22 |
| 3. | *Lasienthra africanum* | 21 |
| 4. | *Maesobotrya dusenii* | 7 |
| 5. | *Mallotus oppositifolius* | 3 |
| 6. | *Microdermis puberula* | 33 |
| 7. | *Rauvolffia vomitoria* | 6 |
| 8. | *Rothmania hispida* | 29 |
| 9. | *Sorindeia mildbrieadii* | 16 |
| 10. | *Uvaria chamae* | 19 |
| | **Herb** | |
| 1. | *Acanthus montanus* | 33 |
| 2. | *Afromomum melegueta* | 44 |
| 3. | *Afromomum sceptrum* | 16 |
| 4. | *Anchomanes difformis* | 56 |
| 5. | *Costus afer* | 15 |
| 6. | *Laportea aestuans* | 31 |
| 7. | *Marantochloa cuspidate* | 30 |
| 8. | *Melastomastrus capitatum* | 4 |
| 9. | *Nephytytis constrita* | 323 |
| 10. | *Palisota hirsota* | 162 |
| 11. | *Physalis angulata* | 241 |
| 12. | *Piper umbrellacum* | 84 |
| | **Climber** | |

| | **Shrub** | **Population density (per/ha)** |
|---|---|---|
| 1. | *Abrus precatorus* | 1 |
| 2. | *Gnetunm africanum* | 15 |
| 3. | *Gongronema latifolium* | 8 |
| 4. | *Icacina trichanta* | 24 |
| 5. | *Lonchocarpus cyanescens* | 3 |
| 6. | *Smilax anceps* | 11 |
| | **Tree** | |
| 1. | *Brachystegia eurycoma* | 3 |
| 2. | *Brachystegia nigerica* | 2 |
| 3. | *Canarium schwinfurthii* | 42 |
| 4. | *Cola millenii* | 2 |
| 5. | *Coula edulis* | 27 |
| 6. | *Dacryodes edulis* | 2 |
| 7. | *Irvingia gabonensis* | 3 |
| 8. | *Pentaclethra macrophylla* | 22 |
| 9. | *Petersia africanum* | 14 |
| 10. | *Pycnanthus angolensis* | 3 |
| 11. | *Xylopia aethipica* | 3 |

The life-form distribution of the plant species showed that 31% was herb, 28% tree, 26% shrub and 15% climber (Fig. 1). The food and pharmaceutical products from these plants vary from fruits, seeds, nuts, barks, leaves, tubers and root (Table 2).

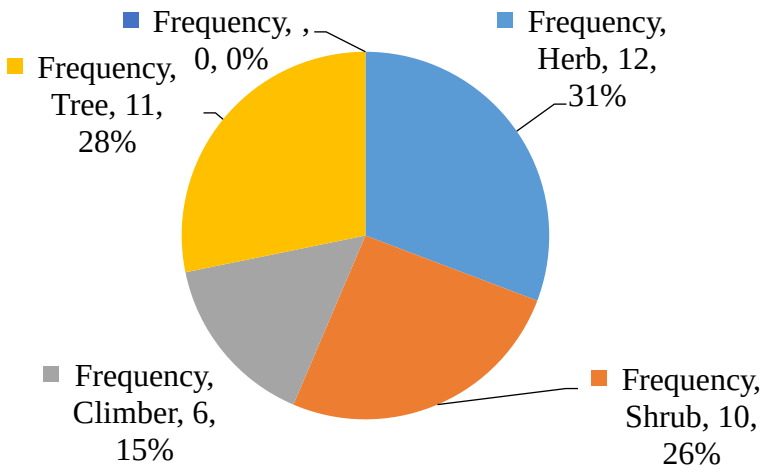


Fig. 1: Distribution of the identified plant species of food and pharmaceutical products into life-form.

**Table 2: Food and pharmaceutical products of the plant species**

| | **Shrub** | **Food and pharmaceutical product** |
|---|---|---|
| 1. | *Aralopsis soyauxii* | Livestock fodder |
| 2. | *Gnestis ferruginea* | Edible fruit |
| 3. | *Lasienthra africanum* | Edible and medicinal leaves |
| 4. | *Maesobotrya dusenii* | Edible and medicinal leaves |
| 5. | *Mallotus oppositifolius* | Livestock fodder |
| 6. | *Microdermis puberula* | Edible leaves and livestock fodder |
| 7. | *Rauvolfia vomitoria* | Livestock fodder |
| 8. | *Rothmania hispida* | Medicinal leaves |

| | | |
|---|---|---|
| 9. | *Sorindeia mildbrieadii* | Edible seeds |
| 10. | *Uvaria chamae* | Edible fruit |
| | **Herb** | |
| 1. | *Acanthus montanus* | Medicinal leaves |
| 2. | *Afromomum melegueta* | Medicinal leaves |
| 3. | *Afromomum sceptrum* | Edible fruit and pulp, medicinal rhosome |
| 4. | *Anchomanes difformus* | Medicinal leaves |
| 5. | *Costus afer* | Medicinal rhizome |
| 6. | *Laportea aestuans* | Medicinal leaves and root |
| 7. | *Marantochloa cuspidate* | Livestock fodder |
| 8. | *Melastomastrus capitatum* | Edible fruit and medicinal leaves |
| 9. | *Nephytytis constrita* | Medicinal leaves |
| 10. | *Palisota hirsota* | Medicinal leaves and livestock fodder |
| 11. | *Physalis angulate* | Medicinal leaves |
| 12. | *Piper umbrellacum* | Medicinal leaves |
| | **Climber** | |
| 1. | *Abrus precatorus* | Medicinal leaves and seeds |
| 2. | *Gnetum africanum* | Edible and medicinal leaves |
| 3. | *Gongronema latifolium* | Edible and medicinal leaves |
| 4. | *Icacina trichanta* | Edible fruit |
| 5. | *Lonchocarpus cynanescans* | Medicinal leaves |
| 6. | *Smilac anceps* | Medicinal leaves |
| | **Tree** | |
| 1. | *Brachystegia eurycoma* | Edible seed (soup condiment) |
| 2. | *Brachstegia nigsica* | Edible seed |
| 3. | *Canarium schwinfurthii* | Edible fruit |
| 4. | *Cola millenii* | Medical bark and root |
| 5. | *Coula edulis* | Edible nuts |
| 6. | *Dacryode edulis* | Edible fruit |
| 7. | *Irvingia gabonensis* | Edible fruit and nuts |
| 8. | *Pentadethra macrophylla* | Edible seeds |
| 9. | *Petersia africanum* | Medicinal leaves |
| 10. | *Pycnanthus angolensis* | Medicinal leaves and bark |
| 11. | *Xylopia aethiopica* | Spicy and medicinal fruit |

**DISCUSSION**

The occurrence and stocks density of a plant species in a rainforest ecosystem is a function of availability of its seeds and other propagules (propagation forms), coupledwith the presence of favourable micro-climates for germination and growth. Moreover, the abundance or rarity of a plant species that produces socio-economic product(s) is contingent on the intensity and pattern of its exploitation and general management of the forest. A plant species is deemed abundant in a tropical rainforest ecosystem if its population density is ≥10per/ha (Parthasaeathy and Karthikeyan, 1997, Nath *et al*., 2005).Therefore, the high population densities of most herb species indicate that, the study forest is a disturbed rainforest with the micro-climate at the forest floor favourable for their prolific regeneration and growth.This favourable micro-climate is primarily facilitated by canopy gaps occasioned by excessive tree felling, which increase the insolation on the forest floor that induces germination and rapid growth of the undergrowth species particularly herbs. This observation of the higher population densities of most herb species of ethno-botany or socio-economic importance compare to other life-forms had been reported by previous studies on disturbed tropical rainforests (Nath *et al*., 2005; Olajide and Udofia, 2008; Olajide and Udo, 2014; Olajide *et al*., 2019).

The relatively fewer population of most tree species may be ascribed to their over-exploitation for stakes, poles, firewood and timber. Similar observations of very low population densities of timber tree species producing socio-economically valuable non-timber forest products in some rainforest reserves had earlier been reported (Olajide *et al*., 2010; Olajide and Etigale, 2017). Moreover, the collection of most of the trees' seeds for food and medicine might result in gross scarcity of seeds to sustain natural regeneration in the forest.

**CONCLUSION**

Following the presence and high stock densities of many plant species of food and pharmaceutical in the study rainforest, it therefore, presupposes that sustainable multiple-value management should be applied to the forest to engender sustainable production of diverse forest goods. Indiscriminate felling of trees should be prohibited in the forest to forestall the loss of trees of

food and pharmaceutical products. Some of the plant species, particularly trees, should be incorporated to or domesticated in farms to reduce pressures on the forest for extraction of their products.

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