

ASSESSMENT OF PLANTS PRODUCING ECONOMICALLY VALUED NON-TIMBER PRODUCTS IN UKPOM COMMUNITY FOREST, AKWA IBOM STATE, NIGERIA

Enefiok S. Udo¹, Opeyemi Olajide¹ and Eyo A. Udoh²

ABSTRACT

Five 20m x 20m sample plots were laid in alternate positions at randomly selected points along each of the three 200m transects earlier laid for a previous study in Ukpom Community Forest, Ikono Local Government Area of Akwa Ibom State, Nigeria. Plant species producing economically valuable non-timber forest products were enumerated in all the sample plots. Species diversity and dominance concentration indices of the different life-forms were determined using Shannon-Wiener diversity and Simpson's dominance concentration functions, respectively. Forty six plant species comprising 16 tree species, 17 shrub species, 8 herb species and 5 climber species were encountered. Apart from *Baphia nitida*, *Pentaclethra macrophylla* and *Brachystegia eurycoma* with populations of 6, 4 and 3/ha respectively, all other tree species had one frequency each/ha. In the shrub category, *Lasianthera africana* had the highest population of 255/ha and *Alchornea cordifolia*, the least of one/ha. *Palisota hirsuta* had the highest population of 136/ha in the herb life-form, and *Urena lobata* the least of one/ha. Among the climbers, *Ancistrophyllum secundiflorum* had the highest population of 51/ha, and *Plukenetia conophora*, the least of one/ha. Diversity indices of 4.73, 4.98, 2.31 and 14.3, and dominance concentration indices of 0.000063, 0.150, 0.018 and 0.004 were respectively obtained for trees, shrubs, herbs and climbers. Thus, the forest has been severely degraded. Enrichment planting, using native rainforest tree species of multiple value could help restore and sustain its natural ecological integrity.

Key Words: Akwa Ibom, Density, Diversity, Nigeria, Non-Timber Products, Plants, Rainforest, Regeneration, Sustainable Management, Ukpom Community.

INTRODUCTION

A forest is a natural resource of multiple values. However, the value of a tract of forest is often estimated from the population density or standing volume of timber tree species present, while valuable non-timber resources are ignored. This is absolutely improper. The predominant forest type in Nigeria is rainforest. Other forest formations are swamp forest and mangrove forest. The Nigerian rainforest is an integral part of the world tropical rainforest, which has been identified as the most biologically diverse terrestrial ecosystem on earth (Richards, 1996; Turner, 2001). The rainforest occupies only 9.7% (95,372 km²) of the country's landmass of 983,213 km² (Onyekwelu *et al.*, 2005). Furthermore, only 19,986km² of the tropical rainforest (21.0% of the rainforest ecosystem and 2.0% of the country's landmass) has been constituted into forest reserves (Onyekwelu *et al.*, 2005). Not until recently, the Nigerian rainforest has been managed exclusively over the years for timber production. Consequently, a considerable area of the rainforest, poor in timber tree species but heavily stocked with a diversity of valuable non-timber resources, has been replaced with monoculture forests of mostly fast-growing exotic species like *Gmelina arborea* and *Tectona grandis*, as well as farmland and pasture.

¹ Department of Forestry and Wildlife, University of Uyo, Uyo, Nigeria

² College of Agriculture, Obio Akpa, Akwa Ibom State, Nigeria

Among the multifarious valuable non-timber resources of the rainforest are edible and medicinal fruits, seeds, leafy vegetables, twigs, nuts and industrial products like rattan, gum, tannin, latex and dyes. In contrast to timber exploitation, harvesting and collection of non-timber products cause negligible perturbation of the ecosystem (Ford Foundation, 1998; Olajide, 2003). Thus, non-timber products can be harvested in perpetuity without hacking down the forest.

This study was carried out in a community forest to assess the diversity and distribution of plant species that produce economically valuable non-timber products to provide a basis for formulating strategies for multiple value management of the forest and other similar forest tracts.

METHODOLOGY

Study Area: The study was carried out in Ukpom Community Forest, Ikono Local Government Area of Akwa Ibom State, Nigeria. The forest covers an area of about 9.4 hectares. It is a typical lowland rainforest, though it has suffered human disturbance particularly through timber exploitation. The area lies between latitudes 5°45' and 6°15' N of the Equator, and longitudes 7°35' and 8°15' E of the Greenwich Meridian. The average annual rainfall of the area is 2,500mm. The mean minimum and maximum temperatures are 25°C and 30°C respectively. The average relative humidity is about 85% at 7.00Hr. The soil in the area is sandy-loam.

Data Collection: Ten metres away from the access route into the forest, three 200m transects, each separated by a distance of 100m, were laid in the forest. Along each transect, five 20m x 20m sample plots were laid in alternate positions at randomly selected points. Thus, fifteen 20m x 20m sample plots, which totaled 6000 m² (0.6ha), were laid. All the sample plots were enumerated for plant species producing valuable non-timber products. The data collection was undertaken between October 2005 and February 2006.

Data Processing and Analysis: The enumerated plant species were classified into four life-forms, namely: trees, shrubs, herbs and climbers. The number of each plant species was extrapolated to per hectare basis. The population data on each life-form were subjected to diversity index analysis using Shannon-Wiener Diversity Function, expressed as equation 1.

$$H = - \sum_{i=1}^S \left(\frac{n_i}{N} \right) \left(\dots\dots\dots \right) \quad 1$$

Where,

- H = Shannon – Wiener diversity index
- n_i = density of the species i
- N = total density of all species in the forest
- S = number of plant species

Dominance concentration index of each life-form was calculated using Simpson's Dominance Concentration function expressed as Equation 2.

$$C = - \sum_{i=1}^s \left(\frac{n_i}{N} \right)^2 \dots\dots\dots 2$$

Where,

C = Simpson's Dominance Concentration

S = number of species

n_i = density of species i

N = total density of all species

RESULTS

There was a total of 46 plant species in the forest. The distributions were 16 species of trees, 17 shrub species, 8 herb species and 5 climber species (Table 1).

Table 1. Plant Species Producing Valuable Non-Timber Forest Products in Ukpom Community Forest, Ikono Local Government Area, Nigeria

| S. No. | Plant Species | Population/ha |
|---------------|------------------------------------|---------------|
| TREES | | |
| 1. | <i>Anthocleista djalonensis</i> | 1 |
| 2 | <i>Baphia nitida</i> | 6 |
| 3 | <i>Brachystegia ecurycoma</i> | 3 |
| 4 | <i>Canarium schweinfurthii</i> | 1 |
| 5 | <i>Ceiba pentandra</i> | 1 |
| 6 | <i>Cola argentea</i> | 1 |
| 7 | <i>Coula edulis</i> | 1 |
| 8 | <i>Distemonanthus benthamianus</i> | 1 |
| 9 | <i>Elaeis guineensis</i> | 1 |
| 10 | <i>Garcinia mannii</i> | 1 |
| 11 | <i>Macaranga barteri</i> | 1 |
| 12 | <i>Musanga cecropioides</i> | 1 |
| 13 | <i>Pachypodanthium staudtii</i> | 1 |
| 14 | <i>Pentaclethra macrophylla</i> | 4 |
| 15 | <i>Pterocarpus midbraedii</i> | 1 |
| 16 | <i>Spondias mombin</i> | 1 |
| SHRUBS | | |
| 1 | <i>Alchornea cordifolia</i> | 1 |
| 2 | <i>Bambusa vulgaris</i> | 29 |
| 3 | <i>Bandeiraea simplicifolia</i> | 6 |
| 4 | <i>Carpolobia lutea</i> | 8 |
| 5 | <i>Cola milieni</i> | 11 |
| 6 | <i>Dactyladenia barteri</i> | 4 |
| 7 | <i>Glyphaea brevis</i> | 15 |

| | | |
|-----------------|--------------------------------------|------|
| 8 | <i>Harungana madagascariensis</i> | 8 |
| 9 | <i>Hippocratea africana</i> | 2 |
| 10 | <i>Lasianthera africana</i> | 255 |
| 11 | <i>Lonchocarpus griffonianus</i> | 2 |
| 12 | <i>Maesobotrya barteri</i> | 4 |
| 13 | <i>Mallotus oppositifolius</i> | 2 |
| 14 | <i>Microdesmis puberula</i> | 33 |
| 15 | <i>Perperomia pellucida</i> | 2 |
| 16 | <i>Randia acuminata</i> | 330 |
| 17 | <i>Sphenocentrum jollyanum</i> | 5 |
| HERBS | | |
| 1 | <i>Acanthus montanus</i> | 25 |
| 2 | <i>Aframomum accepatrum</i> | 31 |
| 3 | <i>Culcasia scandens</i> | 7 |
| 4 | <i>Gongronema latifolium</i> | 3 |
| 5 | <i>Laportea aestuans</i> | 16 |
| 6 | <i>Monantochloa cuspidate</i> | 4 |
| 7 | <i>Palisota hirsuta</i> | 136 |
| 8 | <i>Urena lobata</i> | 1 |
| CLIMBERS | | |
| 1 | <i>Ancistrophyllum secundiflorum</i> | 51 |
| 2 | <i>Calamus deerratus</i> | 47 |
| 3 | <i>Gnetum africanum</i> | 10 |
| 4 | <i>Piper guineense</i> | 2 |
| 5 | <i>Plukenetia concophora</i> | 1 |
| | Total | 1077 |

Aside from *Baphia nitida*, *Pentaclethra macrophylla* and *Brachystegia eurycoma* with populations of 6, 4 and 3/ha respectively, all other tree species had one frequency each/ha (Table 1). In the shrub category, *Alchornea cordifolia* had the least population of one/ha, while *Lasianthera africana* had the highest of 255/ha. In the herb life-form, *Palisota hirsuta* had the highest population of 136/ha, while *Urena lobata* had the least of one/ha. *Ancistrophyllum secundiflorum* had the highest population of 51/ha in the climber category, while *Plukenetia conophora* had the least of one/ha. The plant species produce items ranging from edible seeds and fruits, medicinal leaves and barks, industrial raw materials and fodder (Appendix 1).

Diversity indices of 4.73, 4.98, 2.31 and 1.43, and dominance concentration of 0.000063, 0.150, 0.018 and 0.004 were calculated for trees, shrubs, herbs and climbers respectively (Table 2).

Table 2. Diversity indices and dominance of concentration of plant species producing economically non-timber products in Ukpom Community Forest.

| Plant Life-Form | Diversity Indices | ominance Concentration |
|-----------------|-------------------|------------------------|
| Trees | 4.73 | 0.000063 |
| Shrubs | 4.98 | 0.150 |
| Herbs | 2.31 | 0.018 |
| Climber | 1.43 | 0.004 |

DISCUSSION AND CONCLUSION

The existence of a plant species in a rainforest is a function of the availability of its seeds or progagules and favourable microclimate for germination and growth. Also, the abundance or rarity of a plant species, especially if it has an economic value, is a function of the intensity and pattern of its exploitation and that which the forest is generally subject to. Thus, the fewer population of individual tree species producing valuable non-timber products observed in this study can be ascribed to over-exploitation of the trees for timber. This might have caused gross inadequacy of seeds for regeneration, as a lot of the mother trees must have been felled. Parthasarathy and Karthikeyan (1997) similarly reported poor population density of timber trees producing economically valuable non-timber products in a tropical evergreen forest under exploitation in Western Ghats, India. The wide canopy-gaps of the forest arising from timber exploitation created a favourable microclimate, which included adequate sunlight, for different species of shrubs and herbs, some of which were economically valuable, to thrive. Nath *et al* (2005) reported higher population of undergrowth species as compared with tree species in a disturbed tropical rainforest in Northeast India.

Judging from the Shannon-Wiener diversity index which ranges from 1.5 to 3.5 (Kent and Coker, 1992), the diversity indices reported in this study indicate that the forest is highly diverse with respect to trees and shrubs producing economically valued non-timber forest products. Dominance concentration indicates the cover space in a forest. Thus, the extremely low dominance concentration index of 0.000063 calculated for trees in Ukpom Community forest indicates the severe degradation of the forest occasioned by timber exploitation and rapid taking over of the tree spaces by shrubs and herbs.

In order to ensure conservation and sustainable management of the forest for multiple value, the community should bar timber exploitation in the forest. Moreover, with the assistance of the Akwa Ibom State Government Forestry Directorate, the forest should be subjected to enrichment planting using native rainforest tree species, particularly those that have multiple value so that the natural ecological integrity of the forest can be sustained.

REFERENCES

- Ford Foundation, 1998. Forestry for Sustainable Rural Development: A review of Ford Foundation-supported Community Forestry Programs in Asia. 58p
- Kent, M. and P. Coker, 1992. Vegetation description and Analysis: A practical approach. Belhaven Press, London. 363 pp
- Nath, P. C., Arunachalam, A., Khan, M. L., Arunachalam, K. and A. R. Barhuiya, 2005. Vegetation analysis and tree population structure of tropical wet evergreen forests in and around Namdapha National Park, Northeast India. *Biodiversity and Conservation* 14: 2109 – 2136.
- Olajide, O., 2003. Steps towards sustainable natural forest management for non-timber forest products in Nigeria. In: *Akindede, S. O. and L. Popoola (eds) Community Forestry and Stake holder's Participation in Sustainable Development*. Forestry Association of Nigeria pp.303 – 308.
- Onyekwelu, J. C., Adekunle, V. A. J. and S. A. Adeduntan, 2005. Does Tropical Rainforest Ecosystem possess the ability to recover from severe degradation? In: *Popoola, L., Mfon, P. and P. I. Oni (eds) Sustainable Forest Management in Nigeria: Lessons and Prospects*. Forestry Association of Nigeria pp 145 – 163.
- Parthasarathy, N. and R. Karthikeyan, 1997. Biodiversity and Population density of woody species in a tropical evergreen forest in Courtallum reserve forest, Western Ghats, India. *Tropical Ecology* 38: 297 – 306.
- Richards, P. W., 1996. *The Tropical Rainforest: An Ecological Study* 2nd Edition. Cambridge University Press, Cambridge 450pp.
- Turner, I. M., 2001. *The Ecology of Trees in the Tropical Rainforest*. Cambridge University Press, Cambridge, U. K. 298 pp.

Appendix 1: Uses of Non-Timber Products in Ukpom Community Forest Local Government Area, Akwa Ibom State, Nigeria

| S. No | Plant Species | Uses |
|-------|------------------------------------|---|
| 1 | <i>Anthocleista djalonensis</i> | Leaves used as fodder; bark and roots as medicine |
| 2 | <i>Baphia nitida</i> | Chewing sticks; leaves as fodder; root for medicine. |
| 3 | <i>Brachystegia eurycoma</i> | Edible seeds; leaves as fodder. |
| 4 | <i>Canarium schweinfurthii</i> | Edible fruits; nuts for rattles; leaves, bark and root for medicine. |
| 5 | <i>Ceiba pentandra</i> | Leaves as fodder; silk cotton for pillows and mattresses, bark and root for medicine. |
| 6 | <i>Cola argentia</i> | Edible fruits; leaves as fodder |
| 7 | <i>Coula edulis</i> | Edible seeds; leaves for fodder. |
| 8 | <i>Distemonanthus benthamianus</i> | Root and bark for medicine. |
| 9 | <i>Elaeis guineensis</i> | Edible fruits and seeds; fodder, oil; brooms and baskets; palm wine; fronds for tradition/cultural purposes; palm kernel cake |
| 10 | <i>Garcinia mannii</i> | Chewing sticks; seeds as snacks and for medicinal purposes |
| 11 | <i>Macaranga barteri</i> | Fodder; poles for building, decking and staking |
| 12 | <i>Musanga cecropioides</i> | Root, barks and leaves for medicinal purposes; wood for making local xylophone, canoes, boxes, battens, crates, drums. |
| 13 | <i>Pachypondium staudtii</i> | Medicinal. |
| 14 | <i>Pentaclethra macrophylla</i> | Edible seeds, oil, medicinal, cultural and religious purposes; wood for production of charcoal and mortars. |
| 15 | <i>Pterocarpus mildbraedii</i> | Edible leafy vegetable; ornamental and traditional purposes |
| 16 | <i>Spondias mombin</i> | Edible fruits and seeds; fodder; fence sticks; medical |
| 17 | <i>Alchornea cordifolia</i> | Fodder; medicinal. |
| 18 | <i>Bambusa vulgaris</i> | Medicinal; fodder; yam stakes; poles for building; erosion control; baskets and chairs |
| 19 | <i>Bandeiraea simplicifolia</i> | Leafy vegetable, fodder; children's whistle. |
| 20 | <i>Carpolobia lutea</i> | Edible fruits, medicinal, sweeping materials, canes, |
| 21 | <i>Cola milieni</i> | Edible fruits; medicinal |
| 22 | <i>Dactyladenia barteri</i> | Fodder; yam stakes; poles for building and decking, |
| 23 | <i>Glyhaea brevis</i> | Ornamental; chewing stick; medicinal |
| 24 | <i>Harungana madagascariensis</i> | Leaves as fodder; bark medicinal |
| 25 | <i>Hippocratea africana</i> | Edible fruits; leaves as fodder. |
| 26 | <i>Lasianthera africana</i> | Edible leafy vegetable; chewing sticks; fence sticks; medicinal leaves. |
| 27 | <i>Lonchocarpus griffonianus</i> | Boundary plant; amenity plant; medicinal. |
| 28 | <i>Maesobotrya barteri</i> | Edible fruits; chewing sticks; medicinal. |

| S. No | Plant Species | Uses |
|-------|--------------------------------------|--|
| 29 | <i>Mallotus oppositifolius</i> | Ritual and cultural displays; chewing sticks; medicinal. |
| 30 | <i>Mirodesmis puberula</i> | Edible fruits; fodder |
| 31 | <i>Perperomia pellicuda</i> | Edible leafy vegetable; chewing sticks; fodder; medicinal. |
| 32 | <i>Randia acuminata</i> | Chewing sticks; fodder; medicinal. |
| 33 | <i>Sphenocentrum jollyanum</i> | Medicinal. |
| 34 | <i>Acanthus montanus</i> | Ornamental; medicinal |
| 35 | <i>Afromomum acceptrum</i> | Edible fruits; fodder; medicinal |
| 36 | <i>Culcasia sacandens</i> | Medicinal |
| 37 | <i>Gongronema latifolium</i> | Edible leafy vegetable; medicinal |
| 38 | <i>Lapota aestuans</i> | Edible leaves and shoots; medicinal. |
| 39 | <i>Monantochloa cuspidate</i> | Wrapping leaves |
| 40 | <i>Palisota hirsuta</i> | Fodder; medicinal |
| 41 | <i>Urena lobata</i> | Making of ropes; medicinal |
| 42 | <i>Ancistrophyllum secundiflorum</i> | Medicinal; basket making, cane tables, chairs and shelves |
| 43 | <i>Calamus deerratus</i> | For making cane baskets, tables, chairs and shelves |
| 44 | <i>Gnetum africana</i> | Edible leafy vegetable; medicinal |
| 45 | <i>Piper guineense</i> | Edible leafy vegetable and fruits (spices) |
| 46 | <i>Plukenetia conophera</i> | Edible seeds; medicinal. |