

## **IMPACT OF INDISCRIMINATE LANDUSES ON SPECIES ABUNDANCE: CASE STUDY OF SILK COTTON TREE *CEIBA PETENDRA* COLONY AT SOUTHERN SUBURB OF ZARIA CITY – NIGERIA.**

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**ABSTRACT:** *The case of silk cotton tree (Ceiba petendra ) that has colonized an area of more than 1,000 hectares at the southern suburb of Zaria city for almost 5 centuries' is the subject of the study. It aims at documenting how indiscriminate human activities led to the gradual depletion of the vegetal cover. Landuse characterization, botanical and ecological parameters were focused and an alarming negative results were evident in such indices as species density, species 'regeneration, surface cover, soil erosion and fertility status. This negative development is assiduously affecting not only the tree colony but also soil quality, crop yield and the water table of the entire city. Consequently, a re-reservation and the re-plantation of the colony was proposed as a panacea to the ever increasing deterioration of the fragile ecosystem.*

**KEYWORDS:** Land use, Silk-Cotton, Species, Zaria, Ecology, Flora

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### **INTRODUCTION**

Urban setting all over the world, provides a good example of how 'man by carrying out his normal day-to-day activities in an attempt to live comfortable in his environment can comprehensively alter the ecological system through the destruction of vegetation cover, erection of buildings, encroachment of buffer zones, squatter urban fringes and master plan deviation (Cottoamm 1959). Urbanization affects vegetation in terms of reduction in species density, species abundance and species evenness of especially native and endemic species (Le Houerou 1980), reported severe instances of vegetal destruction due to Suburb landuses and abuses in England and Wales. The effect of un-control urban growth of Mexico city on the indigenous vegetation of the city was a topic of researchers like (Pollard 1971) and Amano (1994). The researchers indicated severe loss of biodiversity, ecological imbalance, land degradation and problems of flooding. These and may findings necessitated a comprehensive vegetation/landuse provision for urban environment. The Ebenezer Howard (1963) Garden city concept and its similar "Green concepts" for urban development were meant for ecosystem preservation through planting of various trees and shrubs in urban formations.

In Africa however, especially south of the Sahara the "Green concept" of urban development is not given the deserved attention. Instead of planting vegetation around cities, the existing ones as reported by Coauton (1988) and Lykke (1998)" are under severe attack. A case in history is the silk cotton tree colony in the Zaria southern suburb that is persistently being depleted by several activities. As the destruction is going unabated the effect is glaringly manifesting at least in the

last two decades. Unfortunately no attempt is being made to even study the phenomena more less to stop it. This dearth of negligence on the tree colony has prompted the present research. The main objective of this research is to investigate the cause of the tree felling of *Cieba pentendra* around Zaria city. This was done through careful study of its floristic characteristics and ecological integrity with the view to highlighting the gradual ecosystem depletion taking place.

### **The Study Area**

Zaria city is located at 11°N and 7°38' E in Kaduna State on the central high plains of Hausaland in northern part of Nigeria (Udo 1978). The major soil type in the area is the tropical ferginous; while along the wide gentle sloping valley bottom lands are the dark vertisol (Fadama soils). Zaria falls within the northern guinea savanna vegetation. The climax vegetation of the area was thought to be tropical deciduous, however, because nearly all the vegetation of the area had been degraded due to intense urban agriculture, fuel wood harvesting and urbanization processes, tree climax vegetation is absent except in the remnant silk-cotton tree colony around the southern suburb.

Notwithstanding, there are few scattered tree stands, interspersed with tall grasses about 1-15m and 2-5m respectively (Jackson, 1970). Common trees found include locust bean (*Parkia bigcbose*), tamarind (*Tamarindus indica*), Isobelina (*Isobelina doka*), Shea butter (*Butteres permium parkia*) and the silk cotton (*Ceiba pentendra*) which is the single dominant species that has colorized the southern suburb. The grass types include *Andropogonaea Spp* such as *Hypherrhenia Spp*, *Androging Spp*. Others are *sizachnium semiberbe* and *monocynbium seresiiforme* (Jackson, 1970). Zaria experiences tropical continental climate (Aw), according to Trewatho's modification of Koppen's climate classification. Aw climate is characterized by a wet and dry season in a year. The wet season lasts for six months, May to October. and is dominated by convectional heavy falls with high intensities of up to 120min/hr. The mean annual rainfall peaks up in July/August.

### **Antecedent of Zaria and Colonization of Silk Cotton Tree (Ceiba petendra)**

The settlement of Zaria was established in 1520 by Bakwa Turunku. It was named after one of his daughters Zaria. The other daughter Amina was compensated by giving her political powers of the Zazzau Kingdom; she was responsible for waging wars to expand the kingdom and sourcing slaves for the Arab slave merchants. (Smith, 1972).

The impact of Amina in the two spheres were very remarkable as she expanded the Zazzau kingdom far and wide; up to Maradi and Lokoja to the north and south respectably. She also generated great fortunes for the kingdom in terms of spoils of war and slaves conquered. The later made Birnin Zaria a haven for Arab slave trade. The slaves were exchanged in bata for Iron wares (war and agricultural implements), mattresses and horse saddles, as well as other royal wares; the southern part of the Zaria settlement was ear-marked as slave depots before being moved to the market in the walled city. According to Gems (1968) there were over 50 slave depots around the southern edge of Zaria settlement in 1780; being maintained by individual slave Merchant/Agents.

Silk cotton tree was first brought to the area from Indo-Arabian sub-continent by the slave merchants who exchanged its products (mattresses and horse saddles) for slave. The tree's seed was through the trade dispersed into the area and eventually germinated and grown as a through such trade. Its uses in the area helped in the initial propagation, planting and protection when sooner, the people of Zaria realized several uses of the tree products for animal forage, medicinal uses and several other utility uses. This made the Tree species a "Hotcake" for the natives (Dan Shariff, 1973)

In 1912, the then Emir of Zazzau Mallam Aliyu Dan Sidi proclaimed the region (present southern suburb of Zaria) which the Ceiba tree had colorized as a green reserve. (Norlin, 1968). Restrictions were imposed for especially the construction of new settlements (except the already existing ones). Tree felling, and bush burning were all prohibited in the reserve, etc. while hunting and crop farming were allowed. Even at the time the reservation was proclaimed, the species abundant/acre had fallen from 117 stands in 19<sup>th</sup> century to 62 stands/acre.

The conversion in 1973 of parts (72 hectares) of the Green reserve for low cost Housing Estate, as well as the subsequent encroachments (42 hectares) for establishing a UPE college in 1976, construction of a police barrack in 1980 within the given reserve (40 hectares), also a large chunk of the reserve (27 hectares) was used for citting a hospital in 1985 and another encroachment (27 hectares) for an additional college in 1989 had unofficially de-reserved the area and opened up the colony for exploitation and abuse by various human activities; which this paper seeks to study and proffer solutions.

In order to assess the damage done to the silk Cotton Tree colony of the southern Zaria suburb, the following parameters were selected in the study:

- i. Species abundance per hectare: which according to Belsky (1994) is the best way of assessing tree colony integrity?
- ii) Rate of regeneration per hectare; which as an indicator for biomass sustainability per given area (Tivy: 1968)
- iii) Landuse characteristics; which serves as a pointer to sustainable or exploitative human activity in an ecosystem according to Maydell (1995).
- iv) Species characteristics; through botanical investigation.

A total of 1217 hectres was covered by the study. This is about 70% 'of the Colony reserved and is about the area with remnants of the tree species. For study purposes, the area was subdivided into four equal parts of 304.25 hectares and a landuse analysis of each part was undertaken. Using ERAM (1994) methodology. The physical inventory of the species biological and ecological characteristics was carried out using Dansereu method (1972), in which a diagonal transect was also laid across the length of the study area using ranging poles and survey chains. Then, alternatively spaced quadrants of 100 metre square were delineated for study at either side of the transect (alternatively) at 30 and 120 metres interval, then the botanical and ecological characteristic of the Tree colony were inventoried.

## RESULTS

Land use characterization and encroachment result in the four subdivided portion of the study area is presented on table 1.0 averagely about 50 percent of the uses the land resources is put into is outside the stipulated use by the authority. While the northern part of the study area is affected, more by institutional and residential encroachment the southern part of the area is most affected by firewood harvest, over grazing and utility encroachment.

**Table 1. Land use Characterization of the Study Area.**

S/N	Landuse	Enrichment in Section A	Section B	Section C	Section D	Total Enrichment
1.	Institutional	12 km	2k km <sup>2</sup>	19 km <sup>2</sup>	8km <sup>2</sup>	60km <sup>2</sup>
2.	Residential	4 km <sup>2</sup>	7k km <sup>2</sup>	6 km <sup>2</sup>	3km <sup>2</sup>	20km <sup>2</sup>
3.	Utility uses	3ha	7ha	16ha	8ha	34km <sup>2</sup>
4.	Commercial Uses	4ha	5ha	9ha	2ha	20ha
5.	Firewood harvest	6ha	8ha	3ha	7ha	24ha
6.	Forage/grazing	5ha	7ha	4ha	10ha	26ha

**Source:** Author's Field work, February 2006 .

The biological status of the species in terms of species density, regeneration and appearance were presented on table 2. All the result shown on the table is far below the normal sustainability recommended figures. Similarly, the ecological parameters of surface cover, erosion and soil fertility were in the negative.

**Table 2.0 Botanical and Ecological characterization of silk cotton tree in the study Area**

S/N	Parameter	Section A	Section B	Section C	Section D	Standard
1.	Density	17/ha	10/ha	12/ha	24/ha	75/ha
2.	Regeneration	3/ha	2/ha	3/ha	7/ha	16/ha
3.	Appearance	Severely pruned	Severely pruned	Moderately pruned	Severely pruned	Full canopy
4.	Surface-cover	3 metres	4 metres	2 metres	6 metres	10 metres
5.	Erosion index	Severe	Severe	Severe	Moderate	Decimal
6.	Soil utility	Poor	Poor	Good	Good	Excellent

**Source:** Author's Field work, February, 2006

## DISCUSSION

Landuse, botanical and ecological characterization focused on different, aspect of vegetation was done. By combining the three methods it is possible to derive a detailed and reliable picture of the changes' that occurred in the silk-cotton tree colony of Zaria southern suburb during the last 5 decades; because there is a large Concordance between information derived from different methods.

The study documented changes in the direction of a reduced and impoverished silk-cotton tree vegetal cover which more specifically can be summarized under the following:

6.1 A general decline of silk cotton species from 78 stands/ha in 1910 to 16 stands ha in 2006

6.2 Lack of younger trees to replace existing stands, on average/ha against 16/ha

6.3 A rarefaction or disappearance of the tree species in areas under extensive human utilization of especially institutional and residential by an encroachment rate of up to 62%. The general decline of the species abundance in this study corresponds to results from earlier investigations of tree colonies being affected by indiscriminate landuse elsewhere. For instance Pearce (1988) established this point in the study of Baobab (*Adansonia digitata*) tree colony in old Tsafe settlement. Except that Sarkin (1994) found a recovery of valley stands during the *last* decades, which contrast from the present study. An increasing decline of species abundance in *Commiphore Africana* colony in Cameroon was also reported by Stiles (1995) on the basis of earlier vegetation investigation from the southern region. This coincides with the general tendency in the present study.

Several implications on the rapid decline of the vegetal resources of the Zaria Ceiba tree colony by the indiscriminate landuse can be enumerated to include; dependence on the plant for firewood, medicine, roofing materials, forage and selling its products like the cotton and seeds. The continuous degradation of the colony has therefore direct impact on the livelihood of the Zaria city and the ecological sustainability of the environment.

The over dependence on the tree species for livestock fodder year round as the main source of food especially in the dry season when grass and herb production ceases, had great implication for species density and regeneration, this point is buttressed by the appearance of over 90% of the existing stands which are severely pruned.

Ecologically, the soil fertility and stability are greatly at risk as pointed on table 2.0 in which erosion index of three-quarter of the study area is severe, in the same vein the soil fertility status in terms of available Nitrogen, potassium and phosphorus are fool' in half of the study area especially in section A and B of the area. These adversities are not unconnected with the role of the tree species in sustaining and ameliorating the soil and grass component of the savannah system. Generally a higher fertility and stability of soil is achieved around areas under canopies than in the surrounding due to increased shade for surface cover against splash erosion, rainstorm wash away, and agents of leaching. Similarly, the regeneration of trees is stimulated under canopies Le Hourou (1989) observed decline in the canopy layer elsewhere therefore makes it

difficult for new stands of the species to establish it and grow.

## **CONCLUSION**

This study documented that silk cotton tree colony of Zaria has become impoverished during the last five decades and that most stands are currently being threatened by urban growth and indiscriminate landuses. This has generated unbearable impairment on the soil system and may affect crop' yields and water table in Zaria city. The observed tree colony modification that had lead to a decline in some of free and most desirable resources must be checked through re-reservation and re-plantation of the south and eastern part of the colony relics. The study has buttressed the assertion made by the other scientists that a continuous depletion of the floral species in the northern part of Nigeria, is part of the causes responsible for the extent of decertification currently disturbing the region.

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