International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

# Human Induced Change Characteristics of Selected Vegetation Variables in Parts of Kogi East, Nigeria

**Ocholi, I. U.[1], Idoko, O.[1, 2], Ogidiolu, A.[1]**

[1]Department of Geography and Environmental Studies, Kogi State University, Anyigba.
[2]School of Tourism, Hospitality, and Environmental Management (STHEM), Universiti Utara Malaysia. Sintok.

Corresponding Author's Email and Phone number: charlidoko[at]yahoo.com, +60167673597

**Abstract:** ***This study examines the spatial effects of deforestation on selected vegetation variables in Kogi East in the last twenty years. It focused specifically on the assessment of the implications of the destructive interference of vegetation characteristics, structure and composition by human activities. In a bid to fulfill the goal of this study, twenty one vegetation sample each were collected from across the three dissimilar axis (i.e. Ankpa / Omala / Olamaboro; Idah / Ibaji / Igalamela-Odoru and Dekina, Ofu and Anyigba) in Kogi East; and classified using a 1000meters square line transect in the triangular axis. The study relied essentially on the results of a field investigation. It was found that in many parts of the study area substantial hectares of the forest landscape have been logged and rendered less productive. Over a 100,000 hectares of vegetation cover was lost annually, most of which were deliberately removed to make way for agriculture, mineral exploitation, urbanization and expansion of settlements among others. Reforestation efforts replenished only 25,000 hectares. Detail analysis of the vegetation revealed that the vegetation in the area have suffered significant damage / changes in terms of its structure, density and characteristics. It was also found that the prolonged adverse human influence on the forest landscape has contributed significantly to loss of forest resources, degradation of flora, fauna, and soil. This have disrupted the overall ecosystem functions in the study area. The study thus suggested a sustainable Landuse management practices in the study in order to address the ugly trend.***

**Keywords:** Anthropogenic influence, change in vegetation structure, degradation, line transect, assessment.

## 1. Introduction

The importance of Vegetation to the physical environment cannot be overemphasized. Essentially, studies have also shown that plants also serves as source of food, raw materials, employment and medicine to human beings (Idoko and Ocholi, 2007). Also corroborating, Odugbemi (2006) stressed that the use of plants as a source of food and medicine is as old as human existence, noting that it's also found in the contemporary society irrespective of their level of development and sophistication.

However, excessive exploitation of these vegetal / forest resources by man is further driving the pace of degradation / destruction of vegetation in many parts of the developing countries, especially in the Nigeria. For instance, a study which was conducted by the FAO / UNEP (2006) described this spate of deforestation as an injury to the nation's soil and economy. Also corroborating, the National Bureau of Statistics (NBS) in 2007 reported that between 2000 and 2005, Nigeria witnessed the highest rate of deforestation in the world having lost substantial areas of its primary forests. It was further stated that about 600,000 hectares of vegetation cover is lost annually, most of which is deliberately removed to make way for agriculture, shifting cultivation, firewood collection, excessive logging, mineral exploitation, development of infrastructure and expansion of settlements (FAO, 2006; Adedayo et al 2008 and Opeke, 2005).

It is unfortunate to note that the rate of degradation of this bio-resource in Nigeria portends danger for sustainable development of the country. Economic activities like poor agricultural practices, population growth, high level of illiteracy, paucity of policies have been identified as key factors responsible for the increasing rate of deforestation in Nigeria (Idoko and Ocholi, 2007; and Onoja, Idoko and Adah, 2008).

Existing studies focusing on the impacts of human activities on biodiversity degradation, by extension, implications of excessive forest exploitations in the country dwelt more on the issue at the national levels (Idoko and Ocholi, 2007; Onoja et al, 2008). Similarly, Onoja and Idoko's (2012) study rather concentrated more on the econometric analysis of factors influencing fuel wood demand in rural and peri-urban farm households of Kogi State. However, there exists knowledge gap regarding specific study aimed at finding the structure, composition, extent and magnitude of vegetation change in Kogi East in particular. In order words, there are no studies suggesting the extent and magnitude at which the vegetation is fast changing in terms of its structure and composition in eastern part of Kogi state. Hence, the focus of this current study.

Therefore, this study sets to answer the following questions: what is the spatial pattern of human induced vegetation change in parts of Kogi East; and what measures can be put in place to mitigation / address the negative effects of these changes in the study area.

The findings of this study will help to proffer suggestions that could addressing this environmental problem in Kogi East and beyond.

## 2. The Study Area

### Location

Kogi East is located between latitudes 06° 05' - 08° 00' N; and longitude 06° 07' — 07° 05' E (Ukwedeh, 2003), as

shown in figure 1. The study area is situated in the north central part of Nigeria. The area shares boundary with the Federal Capital Territory in the north, Benue state in the East, Enugu state in the south and with its neighbors, the Central and Western senatorial districts in the West.

In terms of its political administration, the study area which is situated in the eastern flank of Kogi State covers a total of nine Local Government Areas (LGAs). These include Ankpa, Dekina, Ibaji, Idah, Igalamela / Odolu and ofu. Others are Olamaboro, Bassa and Omala LGAs

Kogi East is drained by two major rivers, namely river Niger and river Benue. While the western flank of the study area is bounded by the river Niger, the northern part of Kogi east is bounded by the river Benue. Other moderate sized rivers and streams like Imaboro, Okura, Inachalo, Ofu, Ubele, and Omala also dots the landscape.

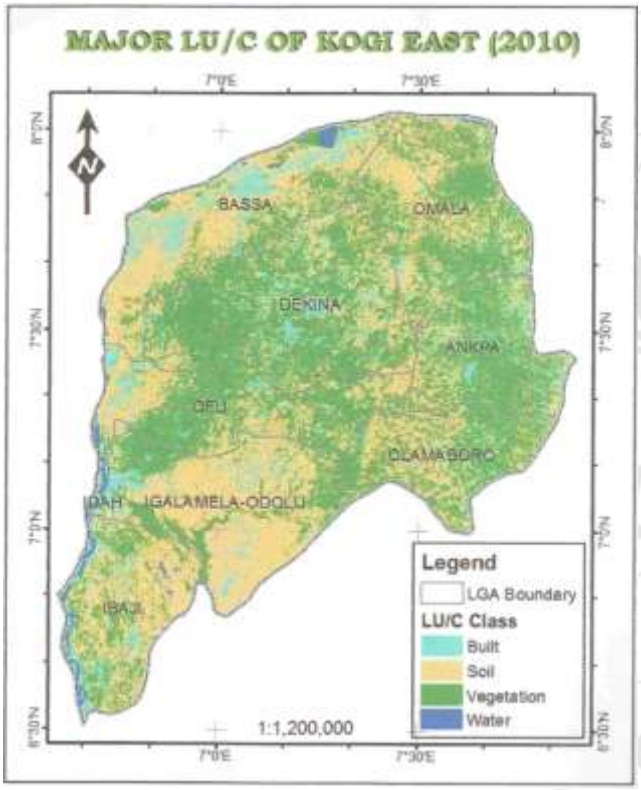


**Figure 1:** Land use / Land cover of Kogi East
**Source:** NARSDA, ABUJA. (2010)

The region lies within the warm humid climatic zone of Nigeria with distinctive wet-dry seasons. The climate of the area is thus affected by two main air masses: the tropical maritime, mT and the tropical continental, cT. Rainfall is heavy within the rainy months with an average of about 1500 – 2000mm annually, (Ocholi, 2007). Kogi East has a mean annual temperature of 24.5$^{o}$C.

The dominant vegetation communities remain the tropical savanna woodland of secondary types and mixtures of scattered tropical trees and grassland formations. Vegetation distribution in this area follows a pattern that is similar to that of rainfall distribution, Ekwedeh (2003).

There are numerous socio-economic, cultural, political and judicial activities going on in the region. These have engaged a significant number of the people to an extent that the population remains an active one all the year round.

The population of the region is unevenly distributed; some areas are densely populated, particularly the built up areas while others are moderately or thickly populated. Based on the projected 2006 Population Census figure, the total population of Kogi East is estimated at 1,659,269.0 persons, NBS, (2007).

## 3. Materials and Methods

In line with the stated objectives, plant species were observed for their forms, composition, dominance and density in the designated axis of the study area as shown in figure 2 study area. Because of the intricate position of vegetation among the environmental resources, its examination has remained a critical segment of this work. In the course of the study, samples of the plants species in area were collected, listed and analyzed (see tables 1-4 for details).

### Vegetation sampling Plots

Linear Transects were cut and used in each of the sampling plots of the study area. A 1000m$^2$ axis in each of the three geographical locations were sampled for species density, composition and dominance Density is one out of the prominent parameters of vegetation considered for analysis in this work. It is the number of individuals (plants) of a given species per unit area, (Ogidiolu, 2003). It is an absolute term that can be adopted in the determination of plant abundance, in spite of the tedious nature of the use of the model. He however considered it as the easiest parameter to measure on the field. On the whole, a total of 3000m$^2$ Transect was used. 1000m$^2$ Transects each was assessed in the three triangular zones, of: Idah-Ibaji-Igalamela-Odolu axis; Ankpa-Omala-Olamaboro axis; and Dekina-Ofu-Anyigba axis. The selection of the sample areas was based on the three major but old divisions of Igala Kingdom (Idah, Ankpa and Dekina) for the sake of equitable spatial coverage. The inventory of plants / vegetation species in the study area was profoundly based on the principle of taxonomy or Systematic Botany, very much related to plant geography. This branch of science deals with the description and identification of plants, and their classification into various natural groups according to the similarities and differences between their morphological characteristics (Duta, 2009). This taxonomic description of the plants in the study area enabled us to determine the effects of human influence on the composition and density of vegetation / plants within the period of assessment. The choice of these areas and the model in use were based on the ease of accessibility of the sample areas and the ability of the model to drive information from a representative fraction of a large data set. Likewise, the choice of the model was purely based on selective / stratified sampling procedure. With this method too, the most convenient random distances were measured and demarcated to provide an opportunity to locate

random points and take inventory of vegetation types in order to determine their density while imaginary lines were drawn perpendicular to the base line.

## 4. Results and Analysis

The result of the vegetation study has been presented as follows.

**Characteristics, Types and structures of vegetation of Kogi East**

The result of the field study show that the vegetation of the study area comprises of mixed plant types and includes trees, shrubs, herbs, and grasses. A checklist of names was used to demonstrate the distribution in the study area. This was meant to identify the common vegetation types in the area in order to ascertain their composition, density and dominance. The density has to do with the numbering of individual plant species of the study area in tabular form. This was done with a view to appraising the need for conservation of the plant species in the phase of growing forest loss. There are in deed variations in the type, structure and composition of vegetation in the study area, particularly along streams and river sides and in the more urbanized areas where there is significant human impact. In a comprehensive study however, it was found that the variation appears to be influenced by the combined factors of habitat and climatic changes caused by human activities. An observation on the field shows that the present vegetation cover of the area is mainly a secondary type, generally referred to as derived savanna. The characteristics of this type of vegetation were found and are explained by the fact that the inhabitants have used the forest lands for many of their socio-economic activities in order to secure food, shelter and comfort, a confirmation of the earlier assertion that the variation appears to be influenced by the combined factors of habitat and climatic changes that are caused by human activities. The prominent activities include farming, firewood harvesting, development of new settlements and lumbering. The change in the structure and characteristics of the vegetation of Kogi state was affirmed by Ocholi (2015) in his landuse study of parts of kogi east. He found that the forest ecosystem in the area has witnessed significant changes in its structure and composition in the last 21 years. He further stressed that higher percentage of the forest resources in the eastern part of Kogi has been degraded. These changes became pronounced and have caused alterations in the structure of vegetation and the consequent structural and compositional changes from which used to be called heavy / thick forest to savanna woodland, scrubland and grassland formations.

The distribution of these vegetation samples are contained in tables 1-4. Susan (1997) defined Savanna woodland as an ecological zone that is made up of mixtures of trees, shrubs and grasses. Most of the trees in the area are scattered and have short to moderate heights due to persistent lumbering. This type of vegetation can also be called derived forest or secondary forest. The P.T.F. (1997) thus classifies the height of such vegetation at ~ 1.2m tall and above. This type of vegetation is a product of centuries of forest depletion through bush clearing, bush burning and overgrazing. Kogi State Ministry of Budget and Planning (KGSMBP) (2004), sees bush burning and overgrazing as recurrent anthropogenic activities that are responsible for large scale deforestation in Kogi state.

The effects of these activities on the forest create room for the scorching effects of insolation on the top soil. In consequence, the soil temperature rose significantly (22.8 – $27^0$C) for soil and (30 – $36^0$C) for ambient temperatures. Consequently, many of the plant species, particularly the trees have fallen victims of this menace.

It was further revealed that the dominance and density of the vegetation intimately relate with the varying climatic and anthropogenic features of the study area.

The tree of the study area has the biggest girth measurements of 1 to 2 meters (on the average). However, the girth measurement of the smallest size among the woody shrubs on other hand is less that 1 metre. Furthermore, these trees are few in number and are also predominantly short (height). The highest tree density came from the sample plots covering the galleries, forest reserves / plantations particularly, the Line Transects that enclosed the Ankpa, Omala and Olamaboro (AOO) axis. The AOO Transects also touched Okura stream in Ogodu-Inye-Ojeh axis. On the other hand, the lowest (tree) density was noticed in the savanna areas due to reduced number and girth of wooded species and increase distance among the stands. Invariably, there are more numbers of the trees in the galleries and reserve forests than in open savanna woodlands. This shows that human activities, particularly farming, have been proved to be more pronounced in the open lands than the galleries and reserves.

The samples of plant species in the three triangular zones are contained in tables 1-3.

**Table 1:** Density of Vegetation Samples (Ankpa / Omala / Olamaboro axis)

| Family | Specie / Sc. Name | Common / English Name | Sample No. (Per Δ 1000ft) | % of total species | Average Girth(m) |
|---|---|---|---|---|---|
| Moraceae | Milicia excelsa, Treculia africana, Musanga cepropioidies | Iroko | 6 | 0.41 | 2.5 |
| Melioceae | Khaya ivoernsis | Mahogamy | 2 | 0.07 | 1.5 |
| Palmae | Elaeis gueneensis v dura | Palm tree | 1350 | 91.5 | 0.8 |
| Verbenaceae | Vitex doniana, Vitex rivularis | Black plum | 1 | 0.07 | 1.7 |
| | Hibiscus esculentus | Okro tree | Nil | - | 1 |
| | Parkia biglobosa | Locus Bean Tree | 4 | 0.27 | 2 |
| Sterculiaceae | Triplochiton scleroxylon | Obeche | 4 | 0.27 | 2.1 |
| | , Ceiba pentandra | Red silk cotton tree | 2 | 0.14 | 2.6 |
| | Erythrophleum ivorenses | Red water tree | 2 | 0.14 | 1.3 |
| | Daniellia oliveri | African Balsam | Nill | 2.98 | 2.5 |
| | Azadiracta indica | Neem | 44 | 0.20 | 2.1 |
| | Cocos nucifera | Coconut | Nil | - | - |
| | Malus syvestris | Apple | Nil | - | - |
| | Burkia africana | Burkia | 3 | 0.41 | 2 |
| | Gmelina arboreal | Gmelina | 6 | 0.41 | 2.7 |
| | Tectorna grandis | Teak | 6 | 0.41 | .8 |
| | Mangifera indica | Mangoes | 22 | 1.5 | 2 |
| | Eucalyptus sp. | Eucalyptus tree | Nil | - | - |
| | Anarcadium occidentale | Cashew | 24 | 1.63 | 1.4 |
| | Cola acuminate / nitida | Kolanut | Nil | - | - |
| | Others; (Grasses,herbs, Lianas, etc) | Bush | Variable | Variable | - |
| | | **Total** | **1475** | **100** | **29.0** |

Source: Field work, 2010.

**Table 2:** Density of Vegetation Samples (Idah / Ibaji / Igalamela-Odolu axis)

| Family | Specie / Sc. Name | Common / English Name | Sample Number / 1000ft) | % of total species | Average Girth (m) |
|---|---|---|---|---|---|
| Moraceae | Milicia excelsa, Treculia africana, Musanga cepropioidies | Iroko | 23 | 9.2 | 3.1 |
| Melioceae | Khaya ivoernsis | Mahogamy | 20 | 4 | 2.7 |
| Palmae | Elaeis gueneensis v dura | Palm tree | 122 | 48.8 | 1.0 |
| Verbenaceae | Vitex doniana, Vitex rivularis | Black plum | 3 | 1.2 | 2.1 |
| | Hibiscus esculentus | Okro | Nil | - | - |
| | Parkia biglobosa | Locus Bean Tree | 6 | 2.3 | 1.8 |
| Sterculiaceae | Triplochiton scleroxylon | Obeche | 21 | 8.0 | 3.2 |
| | Ceiba pentandra | Red silk cotton tree | 8 | 3.0 | 2.2 |
| | Erythrophleum ivorenses | Red water tree | 5 | 2 | 1.4 |
| | Daniellia oliveri | African Balsam | 1 | 0.4 | 2.8 |
| | Azadiracta indica | Neem | 21 | 8.0 | 2.8 |
| | Cocos nucifera | Coconut | 2 | 1 | 1.0 |
| | Malus syvestris | Apple | 1 | 0.4 | 2.0 |
| | Burkia Africana | Burkia | 4 | 2 | 1.6 |
| | Gmelina arboreal | Gmelina | 2 | 1 | 3.0 |
| | Tectorna grandis | Teak | 10 | 4 | 1.8 |
| | Mangifera indica | Mangoes | 2 | 1 | 2.5 |
| | Eucalyptus sp. | Eucalyptus tree | 6 | 2.3 | 1.1 |
| | Anarcadium occidentale | Cashew | 1 | 0.4 | 1.7 |
| | Cola acuminata / nitida | Kolanut | 2 | 1 | 1.0 |
| | Others; (Grasses herbs,, Lianas, etc) | Bush | Varianle | Variable | - |
| | | | **250** | **100** | **29.9** |

Source: Field work, 2010.

**Table 3:** Density of Vegetation Samples (Dekina / Ofu / Anyigba axis)

| Family | SPECIE Scientific Name | Common / English Name | Sample No. (Per 1,000ft) | % of total species | Average Girth(m) |
|---|---|---|---|---|---|
| Moraceae | Milicia excelsa, Treculia africana, Musanga cepropioidies | Iroko | 10 | 1 | 3.0 |
| Melioceae | Khaya ivoernsis | Mahogamy | 6 | 0.3 | 2.8 |
| Palmae | Elaeis gueneensis v dura | Palm tree | 1802 | 90 | 1.6 |
| Verbenaceae | Vitex doniana, Vitex rivularis | Black plum | 3 | 0.1 | 1.3 |
| | Hibiscus esculentus | Okro | 2 | 0.1 | 1.4 |
| | Parkia biglobosa | Locus Bean Tree | 3 | 0.1 | 1.8 |
| Sterculiaceae | Triplochiton scleroxylon | Obeche | 6 | 0.3 | 2.9 |
| | , Ceiba pentandra | Red silk cotton tree | 2 | 0.1 | 2.0 |
| | Erythrophleum ivorenses | Red water tree | 3 | 0.1 | 1.4 |
| | Daniellia oliveri | African Balsam | 4 | 0.2 | 2.0 |
| | Azadiracta indica | Neem | 91 | 4.5 | 2.6 |
| | Cocos nucifera | Coconut | Nil | - | - |
| | Malus syvestris | Apple | 2 | 0.1 | 1.8 |
| | Burkia africana | Burkia | 2 | 0.1 | 1.5 |
| | Gmelina arboreal | Gmelina | 12 | 0.6 | 2.2 |
| | Tectorna grandis | Teak | 9 | 0.5 | 1.1 |
| | Mangifera indica | Mangoes | 8 | 0.4 | 2.3 |
| | Eucalyptus sp. | Eucalyptus tree | 1 | 0.05 | 1.2 |
| | Anarcadium occidentale | Cashew | 36 | 1.8 | 2.6 |
| | Cola acuminate / nitida | Kolanut | 2 | 0.1 | 1.1 |
| | Others; (Grasses,herbs, Lianas, etc) | Bush | Variable | Variable | - |
| | | | **2004** | **100** | **36.6** |

Source: Field work, 2010.

## 5. Data Interpretation

Twenty one (21) vegetation samples were analyzed in the three separate line transects of Idah-Ibaji-Igalamela / Odolu; Anpka-Omala-Olamaboro, and Dekina-Ofu-Anyigba axis respectively. These vegetation samples comprises of hardwood, semi hard and soft wood types. While species like Milicia excelsa, Khaya ivorensis, Triplochiton scleroxylon belongs to the hard wood types; Damiellia oliveri, Eucalyptus species, Azadiracta indica, Malus sylvestries, Tectorna grandis, Burkea africana and Gmelina arboreal belong to the semi-hard wood types. However, Mangifera indica, Erythrophloem ivorenses, and Afzelia and Vitex domiana are categorised as soft or white woods. The study also found that the common plantation / perennial farm crops in these sample areas include Elais guineensis v-dura, cocos nucifera, Magnifera indica, Anarcadium occidentale, and Cola nitida.

Specifically, the study found Elaeis guineenses v-dura to be the most dominant specie among all the (three line) transects that were collected from the three axis. Hence, it represents 91.5% in Ankpa / Omala / Olamaboro axis, 48.8% in Idah / Ibaji / Igalamela odolu axis, and 90% in Dekina / Ofu / Anyigba axis. When summed up, the total girth of Elaies guineenses v-dura is 3.4m at 1.7m total average. It appears the Elaeis sp. is dominant in the area because of the numerous values attached to it; among which are nutritional, economic, socio-cultural and agricultural importance. The prominence of this crop is an indication that the sampled areas were predominantly agricultural areas. This further support the perception that the activities of the residents of the study area could be directly or indirectly responsible for the increasing rate of deforestation / logging in those areas too. The Elaeis guineenses v-dura species in the three line transects have average girth of 0.8m; 1.0m and 1.6m respectively.

It is very clear from table 1 that, next to Elaeis guineenses v-dura species in Ankpa / Omala / Olamaboro axis is Anarcadium occidentale and Mangifera indica recording 24 and 22 at 1.63% and 1.5% respectively. These plants are traditionally fruit crops which are popular for their great economic value. Specifically, the study reveals that the total number of plant species that was found in the Ankpa / Omala / Olamaboro axis is 1,475. It was discovered that the intensity of farming activities and other socio-economic activities like rural infrastructural development and expansion of settlement were responsible for the upsurge in secondary forest and loss of plant species in the area.

In Idah / Ibaji / Igalamela-odolu axis, Elaeis guineesis V-dura remains the most common plant species out of the 21 in the zone. Elaeis sp.represents 48.8% (122) of the total number. It has an average girth of 1.0. The three next most common plants species are Milicia excelsa, Triplochiton scleroxylon and Tectorna grandis recording 23, 21 and 10 representing 9.2%, 8.0% and 4.0% respectively. The highest girth measurement of 3.2 was recorded by Triplochyton scleroxylon in this zone while Cola nitida, Cocos nucifera and Elaeis guineensis recorded the lowest girths of 1.0, 1.0 and 1.0 respectively. These plants have been found to be edible plants and are of immense economic value. They have equally been grown by succession; hence they are the dominant plant species fairly farmed in the area. The total sum of the girths is 29.9, about 0.9 higher than the girths of plants in Ankpa / Omala / Olamaboro axis but 6.5 lower than those in Dekina / Ofu / Anyigba axis. Analytically, a higher density invariably means less human influence in the affected area.

In this analysis therefore, studies it was found that human activities are more pronounced in Idah / Ibaji / Odolu and Dekina / Ofu / Anyigba axis than that of Ankpa / Omala / Olamaboro axis because of the higher density in the later. The girth of the plant species ranges betwee n 0.8-2.7m in Ankpa / Omala / Olamaboro axis, 1.0-3.2 in Idah / Ibaji / Igalamela odolu axis and 1.1-3.0m in Dekina / Ofu / Anyigba axis.

The data contained in table 4 summarizes the vegetation characteristics of the study area.

**Table 4:** Summary data on vegetation density and composition

| Line Transects | Total Sample Species | Percentage of Total | Commonest Plant Species | Total Average Girth (m) | Percentage of Total |
|---|---|---|---|---|---|
| A,O,O, axis | 1475 | 39.6 | Elaeis guineensis v-dura | 29.0 | 30.4 |
| D,O,A, axis | 2004 | 53.7 | ” | 36.6 | 38.3 |
| I,I,I, axis | 250 | 6.70 | ” | 29.9 | 31.3 |
| Total | 3729 | 100 | ” | 95.5 | 100 |

Source: Field work, 2012.
Note: A, O, O, = Ankpa / Omala / Olamaboro axis
D, O, A, = Dekina / Ofu / Anyigba axis
I, I, I, = Idah / Ibaji / Igalamela-odolu axis

In table 4, the sample plots covering the three line transects of: AOO, DOA and III axis have been summarized in other to compress the distribution. In AOO axis, there are a total of 1,475 plant samples representing 39.6% of the total samples. The commonest plant / crop in this zone is Elaeis guineensis with a total average girth of 29.0m at 30.4%. While the DOA ranked first as the axis with the highest density of plants, the AOO ranked second as the axis with the next higher density of plants. In DOA axis, there are a total of 2,004 representing 53.7% of the plant species, having Elaeis guineensis as the commonest plant / crop. This axis recorded the highest number of plant species as well as the highest girth of 36.6m at 38.3%. It can be translated to mean that the agricultural input by the people on the forest land is lower in this axis than those in the other axis hence the higher density of crops. In III axis, there are a total of 250 representing 6.70% of the total species. Elaeis guineensis remains the commonest plant in the zone with an average girth of 29.9m at 31.3% of the total. The zone has the lowest density of vegetation among the three transects.

The result of this assessment shows that the III axis, with the lowest number of plant species demonstrated the highest effects of deforestation. In other words, the effects of human activities are more pronounced in these sampled plots considering the low density of vegetation cover. It can thus be concluded that the rate of vegetation loss in the study area vary significantly with the traditional agricultural practices of the people It is indicated that there is progressive development of plantation agriculture in the sampled areas, testifying a corresponding increase in vegetation change. Presumably, this change is expected to continue as human activities and population increase continue to mount pressures on the vegetation resources in the area. Hence, the call for relevant government agencies, ministries and stakeholders to collaborate in order to halt this growing negative trends in the area (for details on ways of addressing this problems, see the recommendations).

## 6. Conclusions

The results of the study are the products of the interaction of a significant number of forces. In most parts of the study area, deforestation has been a recurrent event and its effects on edaphic components have become pronounced over the last 21 years.

A total number of 250 population of the different plant forms were assessed in this zone. It also shows that this zone seems to have more productive potentials for forest trees and vegetation. In Dekina / Ofu / Anyigba axis, there are a total of 2,004 plants that were sampled. Out of this number, Elaeis guineensis recorded the highest number of 1,802 representing 90% and it is the dominant plant specie in the zone. This also shows that the zone is an agricultural one, since the most dominant plants are agricultural crops. It has a girth measurement of 1.6. The remaining 10% of the figure was shared by the other twenty plant species. Azardiracta indica and Anarcadium occidentale are the two next most common plants in the zone with records of 91 and 36 at 4.5% and 1.8% respectively. These plants too are agricultural / planted crops. The total average girth of all sample species is 36.6. Nearly over 60% of the sample species are economic crops and these are indicative of active farming activities. The results of this analysis thus shows that these regions are indeed agrarian, leaving just about 40% of its land uncultivated. It means that deforestation has degraded about 60% of original / primary forest land of the sampled area

The effects on the structure, composition and density of vegetation were significant as many plants / tree species of high potentials have disappeared, leaving relics of scrublands and degraded floral species. The degraded flora has been investigated to be products of persistent human activities in the area. Of significant influence are farming, settlement expansion, local industrialization, fuel wood extraction, plantation agriculture, and infrastructure development. Elaeis gueneenses v dura was found to be the most cropped plant in the sampled areas. Species abundance were however not stable due to climatic changes(erosion and flooding) that ravaged parts of the study area With increase intensity of the effects of

deforestation, the people generally are fearful on the declining quantity and quality of what their forests could offer to achieve sustainable development. At the present rate of loss of natural forests, it is believed that the people can hardly meet the estimated target in the near future even under the best natural forest management system.

It is imperative for the people to focus more on forest management policy that is tailored towards establishing more forest plantations as well as developing the existing ones. By so doing, cases of soil erosion in the area will be drastically controlled. In order to fully realize this goal, loggers should also be encouraged to plant more trees in order to serves as replacement to those timbers that will be harvested.

In conclusion, the analysis of vegetation of the sample plots revealed that farming activities is the most influential anthropogenic factor which has contributed to forest loss in the study area; particularly, economic crops such as Elaies guineensis, Anarcadium Occidentale, Mangifera indica and Hibiscus esculentus are largely cultivated in the area. Incidentally, this development has culminated in the loss of the original forest landscape, to as much as 19.4km$^2$ of the total land area of Kogi East.

## 7. Recommendations

In line with the objectives of this study, the following recommendations have been made with a bid to reducing human influence on vegetation in the study area.

Kogi state government, corporate institutions, affected communities and individuals should be made to adopt sustainable timber harvesting and reduction of deforestation in order to realize the enormous economic potentials forests provides.

A sustained programme of Agroforestry and plantations development should be established to create steady supply of forest resources to meet the people's need. The opening up of new plantations to cushion these effects resulting from deforestation is highly recommended. Regular thinning and silvicultural practices should also be carried out by the staff of forest unit to ensure continuous and healthy growth of the plantations.

Government, Industrialists and individuals should be encouraged to invest in or promote rural industrialization to take some people off agriculture and ease the pressure on forest.

In order to restore degraded lands that have occurred as a result of deforestation in the study area, efforts should be made by all stakeholders to bring them back into more productive use through tree planting and protection of existing vegetation from fire, grazing and land clearing.

Adequate data on the state of the forest in Kogi East should be provided to address the main issues relating to forest misuse. This is consistent with Abubakar et al (2017), who also recommended that geographic information system (GIS) could help to efficiently monitor and collect accurate geographic data regarding the impacts of anthropogenic activities.

Log control units / check points and Task Forces should be adequately installed at strategic areas to check forest exploitations.

Finally, the rural dwellers, especially those residing around this vegetation resources should be restricted to fetch only naturally dried wood as against the current trend where live trees are being cut down for the same purpose.

## References

[1] Abubakar, E.O., Idoko, O. and Ocholi, O.S. (2017): Efficient Tour Planning for Tourist Sites Visitation in Lokoja, Nigeria: A Multi-Scenario Analysis Using GIS. Journal of Geographic Information System, 9, 59-81. https: / / doi.org / 10.4236 / jgis.2017.91005
[2] Adedayo, A. G; Sale, F.A. and Kekeh, O. (2008): Household Wood Energy Utilization Patterns and its Impact on Deforestation in Akoko South West LGA, Ondo State, Nigeria; Forests and Forests Products Journal Vol. 1. pp 51-57.
[3] ANON, (2011): The New Encyclopedia Britannica; Encyclopedia Britannica Inc; U.S.A.; Vol. 16, pp 599-620.
[4] Anyigba Agricultural Development Project 'AADP' (2010): Surveys Production (Topographical Map), Cartographic Unit of Engineering Surveys Reproduction Ltd; Surrey, England.
[5] Asthana, D.K. and Asthana, M. (2005): Environment: Problems and Solutions; S. Chand and Co. Ltd, Ran Nagar, Naw Delhi.
[6] Duta, A.C. (2009): Botany for Degree Students; Sixth Edition, Oxford University Press.
[7] Idoko, O. and Ocholi, I. U. (2007). A Review of the Impacts of Human Activities on the Biodiversity Degradation in Nigeria. Confluence Journal of Environmental Studies, Vol. 2, No. 1, pp. 63-70.
[8] Jimme, M.A; Kagu, A. and Yahya, S.A. (2010): Environmental Resources Management in Borno State, Nigeria: Religious Perspectives; Journal of Environmental Issues and Agriculture in Developing Countries; Vol.2, No.1, pp 1-6.
[9] Kogi State Ministry of Budget and Planning "KGSMBP" (2004): Kogi State Economic Empowerment and Development Strategy, "KOSEEDS"; ACTEEF Ventures, Lokoja, Kogi State.
[10] National Bureau of Statistics (2007): Social Statistics In; N.B.S-Abuja, Nigeria.
[11] Obi, C.O; Nnabude, P.C. and Onuoha, E. (2005): Effects of Kitchen Wastes Composts and Tillage on Soil Chemical Properties; Nigerian Journal of Agriculture, Vol. 3, pp. 69-70.
[12] Ocholi I.U; (2007): "Environmental Impact of Deforestation in Dekina LGA of Kogi State" Unpublished M Sc. Degree Project, Department of Geography, University of Nigeria, Nsukka.
[13] Ocholi, I.U. (2010): Socio-economic significance of Forests to the people of Dekina LGA, Kogi State; PG Seminar paper 1, Department of Geography and Planning, Kogi state University, Anyigba.

[14] Ocholi.I.U.(2015):Analysis of Effects of Deforestation on Edaphic Components of the Environment in Parts of Kogi East, Nigeria; Unpublished Ph.D Thesis, Department of Geography and Environmental Studies, Kogi State University, Ayigba.
[15] Ogidiolu, A. (2003): "Field Methods in Vegetation Studies"; in Jimoh, H.I; Techniques in Environmental Studies, Nathadax Publishers, Ilorin, Nigeria.
[16] Opeke, I.K. (2005): Tropical Commodity Tree Crops; Spectrum Books Limited, Ibadan-Nigeria.
[17] Petroleum Trust Fund (PTF) (1997): Draft Report on the Environmental Impact Assessment of the Proposed Dredging of the Lower Niger Waterway; Vol. 1.
[18] Susan. (1997): Oxford Dictionary of Geography; Oxford University Press, Oxford, New York.
[19] Onoja, A. O. and Idoko, O. (2012): Econometric Analysis of Factors Influencing Fuel Wood Demand in Rural and Peri-Urban Farm Households of Kogi State. Consilience: The Journal of Sustainable Development Vol. 8, Issue 1, Pp. 115-127.
[20] Onoja, A. O., Idoko, O. and Adah, C.O (2008): Policy implications of the effects of deforestation on Nigerian economy. Production Agriculture and Technology; Vol. 4, No. 2, pp. 114-120 ISSN: 0794-5213www.patnsukjournal.com / currentissue
[21] Ukwedeh, J.N. (2003): History of Igala Kingdom; Ahmadu Bello University Press Ltd; Zaria- Nigeria