The Impact of Deforestation on the Land Use System in Zaria

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Abstract

Deforestation results from the removal of trees without sufficient replacement. This will lead to a decline in natural habitat and biodiversity and quality of life. This paper examines the impact of deforestation on land use system in Zaria from 1987 to 2005. LANDSAT TM 1987, SPOT XS 1994, and LANDSAT ETM 2005 were used for the study. ArcGIS9.2 was used as a platform to analyze the changes that occurred as a result of effect of deforestation on land use system in the study area. This study revealed that out of the 1.704 per cent forest area in 1987, only about 0.041 per cent of the forest was left on ground in 2005. The result also reveals that the current rate of forest depletion stands at 0.05 per cent per annum. In view of the above changes, it is therefore recommended that the federal, state and local governments' efforts to curb the menace of deforestation should be extended to, and intensified in, the rural areas. This will not only create awareness, but also discourage indiscriminate cutting of trees in the area. In addition, everybody living in Zaria and, of course, the whole country should make it a point of duty to plant at least a tree every year. If every Nigerian is patriotic enough to do this, the situation in Zaria and Nigeria as a whole would improve.

Keywords: Deforestation, Land Use, LANDSAT TM, LANDSAT ETM, SPOT XS, and Zaria

1.0 Introduction

Deforestation results from removal of trees without sufficient replacement. When too many trees are cut or destroyed, a very important element is taken from nature, making it difficult for the forest ecosystem to maintain a balance in its natural cycle (Encyclopedia, 2008). The imbalance of natural forest cycle threatens all living organisms (including man) that depend on the forest for food, shelter and protection.

Nigeria was once covered by extensive vegetation varying from humid tropical forests in the south to savannah grasslands in the north. A great percentage of this vegetation has been removed in the course of various human activities leading Nigeria to having the world's highest deforestation rate of primary forests

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(Johannesburg Summit, 2002, FAO, 2008). A number of factors is said to be associated with the rate of deforestation in Nigeria. For instance, poverty has led to an almost total dependence of the rural and urban population in Nigeria on the forest for livelihood and economic survival, to meet domestic and industrial demands (Enabor, 1986 and Johannesburg Summit, 2002). Though accurate consumption figure is not available, an estimate has been made that put an average value of 20 million tonnes per day on wood consumption in this country (Asere and Aliyu, 1992). This is an outstanding figure which, if allowed to continue, could wipe out rich forest living behind bare lands.

Forest management in Nigeria today is mostly limited to government programmes. All the forest reserves, which form the bulk of the nation's productive forest, are under the management of the state or local governments. The forests outside forest reserves (free areas), where most of the wood products in the market comes from, are not put under any form of systematic management (Johannesburg Summit, 2002).

The most threatening issues of prime concern in the world today are changes that affect the environment (Zailani, 2008). The impact of deforestation is quite enormous as it affects the forest ecosystem where trees, water, soil, plants and animals are all dependent on one another. When trees are cut, this natural balance is upset and the important functions that trees perform such as holding the soil in place, protecting groundwater and providing food and shelter for plants and animals are hampered. Over-cutting of forest and the disruption of the forest ecosystem are causing erosion of soil, drop in water tables, loss of biodiversity as plant and animal species become extinct, loss of soil fertility and silting up of many water bodies. When this continues for a long period of time or over a large area, there can be total environmental collapse.

1.1 Statement of the Problem

The increase in demand for farmland and expansion of villages and towns due to increasing population have led to the exploitation of trees and other forms of vegetative cover. Rapid growth in terms of economic activities and farming accounts for deforestation and land use changes in Zaria and its environs. This paper therefore seeks to assess the impact of deforestation on the land use system in Zaria between 1987 and 2005 which has influenced so many changes in land use pattern. Proper assessment of deforestation and its impact on the land use system will serve as planning and developmental strategies. Keeping adequate and available record of the nature of deforestation of Zaria and its environs will help a great deal in harmonizing effective strategies and thus maintaining a meaningful sustainable development.

The aim of this paper is to assess the impact of deforestation on the land use system in Zaria metropolis between 1987 and 2005. Detailed result and analysis are presented herein.

1.1.1 The Study Area

Zaria is located on the central plains of the Hausa highland standing at a height of about 670m above sea level. Zaria is the second largest city in Kaduna State. It is

located between latitude 10°5' and 11°6' north of the equator, and longitude 7°4' to 8°5' east of the Greenwich meridian. It is drained by three major rivers, namely: the Kubanni, the Galma and Saye rivers all of which converge on River Kaduna (Mortimore, 1970).

1.1.2 Socio-Economic Background of the Study Area

The occupational structure of the Zaria resident has changed over the years due to the process of urbanization. Originally, the economic activities of the people were dominated by primary production, which mainly involved the direct exploitation of the resources from nature for immediate use. These include activities such as fishing, farming, hunting and mining of iron ore for the production of tools, etc.

As growth continues in the town, an associated development took place and transportation from primary to secondary forms of occupation followed. These include developments in the fields of cloth-weaving, blacksmithing, etc. These gave rise to a demand for more labourers, thus leading to the emergence of tertiary forms of occupation such as banking, employment in the civil service, the medical service, etc.

1.1.3 Climate and Vegetation

The climate characteristics exhibited by Zaria is that of tropical continental climate which is approximately described as a tropical savannah climate, with distinct wet and dry seasons. The daily maximum temperature rises gradually from January (33°C) and attains its highest peak in April (40.6°C). It drops rapidly to its lowest in August (26.6°C) and then rises again to a second peak in October (38.2°C) (Mortimore, 1970).

The climatic climax vegetation of Zaria was a forest savannah: However, due to man's influence such as clearance for cultivation, building and construction, and other forms of intensive land uses, the whole area has been stripped of its natural vegetation. Through the clearance of vegetation for cultivation, firewood, overgrazing, as well as introduction of non-natural plant species, the natural vegetation of Zaria has drastically changed to guinea savannah.

1.1.4 Land Use System

The economic characteristics of land use are partly determined by its physical and socio-cultural settings. Various types of land use exist in Zaria. However, a 5-category classification is identified based on the Anderson classification (Anderson et al., 1976). These are:

(i) *Agricultural Land Use:* There are two main dominant types of agricultural land use in Zaria. These are the upland field land and Fadama. The upland field usually depends on rainfall while the Fadama is found along drainage basins.

(ii) *Built-up Area:* This is another type of land use in Zaria that is growing very fast due to the teeming population of the area. Built-up areas include residential areas, commercial areas, industrial areas and institutional areas. Numerous urban and rural residential units can be seen in place like Zaria city, Sabon Gari, Samaru, etc.

There exist several educational institutions in Zaria. These include: Ahmadu Bello University (ABU), Federal College of Education (FCE), Nigerian College of Aviation Technology (NCAT), Nigerian Institute of Transport Technology (NITT). Other landmark establishment are: the Army Depot at PZ area, and the Army Engineering Barracks at Basawa.

(iii) Forest Land: Forest lands are areas that have a tree-grown area density, stocked with trees capable of producing timber or other wood products, and which exert an influence on the climate or water regime. Zaria is an area that has been stripped of its vegetation due to man's activities leading to the transformation of the area from savannah to guinea savannah.

(iv) Water Body: Water, as defined by the United States Bureau of Census, includes all areas within the land mass that persistently are water-covered (Anderson et al, 1976). In Zaria metropolis, the water bodies considered here include dams, streams and canals.

(v) Degraded Area: This is another area considered in addition to the classification based on Anderson. These are areas that have been worn away by erosion due to man's activities in the study area. Most areas affected require so much money to be spent before they could be useful again.

2.0 Methodology

Satellite images at different epochs were acquired in digital format. A careful study of the images was carried out to identify the various land use systems in the study area based on Anderson, et al, (1976). The data derived from the satellite images were used for the analysis to determine the trend and rate of deforestation in the study area. Based on the statistical values derived, a statement was made of the future situation of deforestation and its impact on the land use system in the study area.

2.1 Source of Data

The data used for this research work were obtained from the Federal Department of Agriculture and Land Resources (FDALR), Mando, Kaduna State. The satellite images of Zaria for the three epochs (1987, 1994 and 2005) were acquired in digital form. The data were selected based on data availability. The images selected include:

(i) LANDSAT TM (1987): This is the National American Space Agency (NASA) Satellite that was launched in 1982. It is equipped with a three- channel Return Beam Vidicon (RBV) set in panchromatic mode and designed specifically for earth resource survey. In addition, it has the Multispectral Scanner (MSS) instrument and carries a sensor with an improved spectral and spatial resolution known as the Thematic Mapper ™ (Salami, 2007). It has a resolution of 30m.

(ii) The SPOT XS (1994): This satellite was developed by French Center Nationale de Spatiate (NES). It was launched into orbit in 1986 and has a resolution of 15m. It is also equipped with multi-spectral linear sensor which can operate in three spectral bands.