

Full Length Research Paper

An outline of land cover changes in Nigeria, 1975 - 2005

Umuna W.K

Department of Geography, Ahmadu Bello University, Zaria, Nigeria. E-mail: umuna_kenneth@yahoo.com.

Accepted 27 February, 2014

The pattern of land cover changes between 1975 and 2005 strongly indicated loss of prime arable lands which is in turn leading to the opening up of new virgin land towards the south. In the northern and the middle parts of the country, the cereal productive Sudan Savannah ecology is transiting to pure Sahel and the influence of the Sahara is increasing southwards. In the same vein, the root and the tuber productive ecology of the Guinea Savannah is giving way to Sudan Savannah grassland. The predominant Fulani herdsman of the lower Sahel and Sudan Savannah ecologies is moving south to the Guinea Savannah and Forest belt of the South to find greener pasture for his herds. This is not acceptable to the root and tuber farmers of the Guinea Savannah that is already farming close to the margin of cultivation. He has the fears that Fulani herds will destroy his farm-lands. The natural result is clash over right to the lands. This paper therefore looks at the land cover changes in Nigeria between 1975 and 2005 with a view to explaining this scenario.

Key words: Land cover, land use, pattern, afforestation, degradation.

INTRODUCTION

Natural and human induced global environmental change belongs to the class of risk with high probability of occurrence and damage potential but in such a remote future, for the time being no, one is willing to perceive the threat. Although the probability of occurrence and the damage potential are well known and clear, there is always a time lag between trigger and consequence which create a fallacious impression of security (German Advisory Council on Global Change, 1998). Most disasters (including flood, droughts, desertification, land degradation, subsidence, etc) are not random events without underlying causes; they are sudden manifestations of slow but continuous degradation processes (UNEP/GRID-Arendal 2005). Environmental – change processes lead to changes in the biophysical life supports system including land surface (vegetation), water resources, soil and atmosphere which constitute the elements that support the long term sustainability of life on earth. It also affects the social and economic structure and framework, and by implication survival, of people. These changes are driven by combination of both natural and anthropogenic causes. The world's vegetation can be described as the renewable green gold (Odeyemi, 1998) on which the long term sustainability of life on earth rests. It is the single source of

primary biological production that sustains the human population and animal species.

The objectives of the World Conservation Strategy (WCS) which include: maintenance of essential ecological processes and life support systems, preservation of genetic diversity and sustainable development of species and the ecosystems revolve around the land and vegetation. Land cover change has been described as the most significant regional anthropogenic disturbance to the environment (Roberts et al., 1998). In essence both land use and land cover changes are products of pre-existing interacting natural and anthropogenic processes by human activities (the use to which land is being put). Land use and cover change and land degradation are therefore driven by the same sets of proximate and underlying factors elements. Land use and cover change is therefore central to environmental processes, environmental change and environmental management through its influence on biodiversity, water budget, radiation budget, trace gas emissions, carbon cycling, livelihoods (Verburg et al., 2002), and a wide range of socio-economic and ecological processes (Desanker et al., 1997), which on the aggregate affects global environmental change and the biosphere. A cause – effect relationship

uses and covers change and land degradation. Land cover changes sometimes result from interaction of demographics, social and economic processes. These factors have been summarized by Eyre (1990) and Population Reference Bureau (PRB, 2001) to be the 4Ps: People, Poverty, Plunder, and Policy.

The PRB reports that: forests now cover about 27% of the world's land areas, compared to roughly 50%, some 10,000 years ago. In Europe and South America, forests extend over roughly half the land areas, compared to less than one – fourth in Africa, Asia and Oceania. Of the forested land that remains today, 55% is found in less developed countries. During the 1990s, human activities resulted in the gross deforestation of an area roughly the size of Colombia and Ecuador combined (146 m.ha). During that same time period 52 million hectares were regained due to reforestation efforts and natural regrowth. Rates of net deforestation were highest in South America and Africa, while high rate of gross deforestation in Asia were offset by expanding forest plantations. In general, the 1990s saw forest cover expand in temperate less developed countries, decline in tropical less developed countries and remain relatively stable in more developed countries (PRB,2001).

Land degradation is both a part and consequence of environmental changes on land leading to loss of valuable land resources. Loss of productive agricultural lands in some parts of the world where livelihood is contingent upon subsistence farming pushes human existence to the merging of cultivation. This sets in motion the survival of the fittest principle. The Natural result is the struggle for, and clashes on, land.

Aim and Objective

The aim of this paper therefore is to present an overview of land cover changes in Nigeria between 1975 and 2005. The specific objective is:

To investigate some key land use-land cover changes and examine their contributions to the emerging patterns of agricultural land use and pressure on land.

METHODOLOGY

Data and data sources

The thrust of this work is to portray land cover changes between 1975 and 2005 over Nigeria and to show to what extent this was directly related to the survival of the people in the use of agricultural land and the pressure it brought on the land. Therefore, the data utilized for this research was digital land use data for 1975 and 2005 sourced from the archive of Geography Department, Ahmadu Bello University, Zaria. The digital data were generated from GIS analysis of Landsat™ of 1975 and SPOT (XS) of 2005 by the Department of Geography, Ahmadu Bello, University, Zaria.

Procedure

Seven land use and land cover classes (out of 35 classes) that indi-

cate significant ecological changes in Nigeria generally and the Guinea, Sudan, Sahel Zone (G S S Z) in particular were selected and their areas in 1975 compared with 2005 from the digital static land use and cover data of Nigeria.

RESULTS

The Nigerian environment, just like in any other parts of the tropical world land cover changes, results mostly from combination of natural and anthropogenic influences. The main natural force is rainfall changes. The reduction in rainfall reduces the natural regeneration rate of land resources. This also presents a chain of causal reaction that makes people exploit more previously undisturbed land. In Nigeria, the rate of human regeneration of natural resources through re-forestation is very low hence, there is the tendency to abandon a piece of land once it is no longer productive or cannot produce enough to support grazing animals.

Seven land cover classes (of the 35 classes) that can serve as index for measuring abandonment of former lands to new productive areas were selected. These land use- land cover classes include disturbed forest, extensive small holder rain fed agriculture (including grazing), flood plain agriculture, forest plantation, rain fed arable crop plantation, sand dunes /aeolian deposits and undisturbed forest. The statistics of static land use and cover data of Nigeria for both 1975 and 2005 (Table 1) were generated and compared.

The results of static land cover changes for the 30 year period indicated that disturbed forest increased by 32.8%, extensive small holder rain fed agriculture by 12.9%, and flood plain agriculture by 123%. Forest plantation increased by 58% and rain fed arable crop plantation by 3000%. The strong increase in acreage of disturbed forest, extensive small holder agric and rain fed arable crop plantation suggests intensification in down- south movement of grazing zone. The strong increase in flood plain agriculture strongly suggested intensification of cultivation within the Fadamas when other surrounding lands are already close to the climatic margin (limit) of cultivation.

Forest plantation increased by 58% which is due to some limited arid protection afforestation and shelter breaks projects embarked upon especially in the Sudan and Sahel zones by some state governments in collaboration with UNEP and some other international organizations. The very strong increase (425%) in the extent area of sand dunes/Aeolian deposits and the over 50% decrease in area of undisturbed forest gave strong pointers to the land resources loss.

DISCUSSION

The increasing down- south march of the Sahara desert through the Sahelian zone of Nigeria is leading to the opening up of more natural forests for cultivation and grazing in the guinea savannah and rainforest zones. The

Table 1. Changes in some land use-land cover in Nigeria between 1975 and 2005.

		Area(km ²)1975	Area(km ²) 2005	Change1975-2005	%change
1	Agricultural Tree Crop plantation	824.15	1656.88	832.73	101.0
2	Alluvial	523.61	282.38	-241.23	-46.1
3	Discontinuous grassland dominated by grasses and bare surfaces.	7614.72	12517.23	4902.51	64.4
4	Disturbed Forest	14677.70	19491.29	4813.59	32.8
5	Dominantly grasses with discontinuous shrubs and scattered trees	13053.77	12487.62	-566.15	-4.3
6	Dominantly shrubs and dense grasses with a minor tree component	118529.55	85020.98	-33508.57	-28.3
7	Dominantly tress/woodlands/shrubs with a subdominant grass component	154933.40	83281.15	-71652.25	-46.2
8	Extensive small holder rainfed agriculture.	170837.55	192892.33	22054.77	12.9
9	Extensive Small Holder Rainfed Agriculture with Denuded Areas	447.88	10118.47	5700.58	129.0
10	Floodplain Agriculture	9671.81	21576.03	11904.21	123.1
11	Forest Plantation	1000.85	1581.24	580.39	58.0
12	Forested Freshwater Swamp	18564.71	16696.51	-1868.20	-10.1
13	Graminoid/sedge Fresh Water Marsh	5882.74	1136.51	-4746.22	-80.7
14	Grass Land	1196.74	8146.74	6950.00	580.7
15	Gullies	125.35	19070.48	18945.13	15113.2
16	Intensive row crops	3292275.97	373481.34	44253.37	13.4
17	Irrigation Project	148.85	1008.86	860.01	577.8
18	Livestock Project	51.02	139.65	88.63	173.7
19	Major Urban	1102.58	1362.37	259.79	23.6
20	Mangrove Forest	10157.12	10067.31	-89.81	-0.9
21	Minor Urban	958.69	4022.98	3064.29	319.6
22	Montane Forest	7900.02	8053.76	153.74	1.9
23	Montane Grassland	2502.27	3898.15	1395.88	55.8
24	Natural Water bodies / Ocean	6766.53	15588.36	8821.83	130.4
25	Rainfed Arable Crop Plantation	15.92	521.38	505.46	3175
26	Reservoir	1331.41	2901.16	1569.75	117.9
27	Riparian Forest	7506.46	5330.46	-2176.01	-29.0
28	Rock Outcrop	1445.15	2647.96	1202.81	83.2
29	Salt marsh /Tidal Flat	18.84	596.92	578.08	3068.37
30	Sand dunes/ Aeolian	1032.77	5428.30	4395.53	425.6
31	Shrub/Sedge Graminoid freshwater Marsh/Swamp	17749.63	10251.68	-7497.95	-42.24
32	Teak/Gmelina plantation	624.44	1156.43	531.99	85.19
33	Undisturbed Forest	28022.42	13477.90	-14544.52	-51.90
34	Canal		30.76	3076	
35	Mining Areas		61.15	61.15	Mining Areas

Source: Department of Geography, ABU, Zaria.

Sudan and Sahel Savannah represent the region of extensive grazing with vegetable and cereal cultivation localized around the Fadamas. The Guinea savannah zone is the food basket of the nation. It is the region where both intensive and extensive root and tuber crops, cereals and other arable crops are cultivated. This region

represents the net exporter of food items such as yam, cassava, potatoes, guinea corn and millet to other regions of Nigeria. The south-southern part of Nigeria scenario is a little different but plays out the same. By nature, 50% of the lands in the Niger Delta are not workable due to the edaphic and physiographic limitations imposed by

drainage. Secondly, all the land in the south including the 50% agriculturally productive lands have been parceled to multinational oil corporations as Oil Mining Leases (OML) and/or Oil Prospecting Leases (OPL) by the government. By implication, the real owners-the natives are only farming on the lands for a moment. Oil exploration activities on productive lands coupled with wide spread depletion of resources from both natural and anthropogenic factors drive the people to the margin of survival. Hence, the recourse to communal clash and arms struggle with oil companies and government

The rainforest belt represents the only region where grassing of commercial tree crops especially cocoa and oil palm is done. The region also supports the growth of some root and tuber crops at subsistence level. However, decrease in rainfall with increase in surface temperature over the years is now resulting in the loss of arable land in the guinea savannah zone and the rainforest belt.

The pattern (rate and direction) of land use and cover changes gave strong evidence to loss of productive arable lands and opening up of new virgin forested lands especially in the guinea savannah and other forested areas. As a result, there has been serious decline in cash crop production in Nigeria from the 1980's to the present. The groundnut pyramid of the Northern sudano-sahelian zone has disappeared. Cocoa production in the rainforest belt has been on steady decline since 1980s as most original cocoa plantations are now fallow lands.

Programmes that have objectives of making more arable lands available through restoration of already degraded and impoverished lands should be encouraged. Stemming the downward of the Sahara through certification of afforestation projects is important towards reducing the rate of evapo-transpiration in the Sudan and Sahel zones. International organization should also assist Nigerian government in providing alternative solution to the long and short range trans-humance agriculture of the cattle Fulani's which is one of the reasons responsible for land degradation in Nigeria, through the development of intensive small area grazing

where these can ensure quick re-growth and regeneration of grasses to ensure continuous feed for animals. There is also the need to intensify research on fodder systems in Nigeria to sustain animals on hay and stage rather than the current long range search for greener pastures.

REFERENCES

- Desanker PV, Frost PGH, Justice CO and Scholes RJ (1997). The Miombo Network Frameworks for a terrestrial transect study of land use and land cover change in the Miombo systems of Central Africa. IGBP Report 41
- Eyre LA. (1990). Tropical Forest as Seen from Space, Space and Forest Management in special current Event Session of International Astronautical Federation, 41st IAF Congress, Dresden, Germany.
- German Advisory Council on Global Change (1998). World in Transition: Strategies for Managing Global Environment Risk. Annual Report 1998.
- Odeyemi SO (1998). Plant – The Renewable Green Gold, Inaugural Lecture Series, University of Lagos Press.
- Population Reference Bureau (2001). Healthy people Need Healthy Forests – Population and Deforestation, PRB, October 2001.
- Roberts DA, Bastitsa GT, Pereira SLG, Walter EK, Nelson BW (1998). Change Identification using Multitemporal Spectral Mixture Analysis – Application in Eastern Amazonian, in Lunetta, R.S and Elvidge, C.D, (eds) Remote Sensing and Change Detection Environmental Monitoring Methods and Applications. Sleeping Bear Press Inc. Michigan.
- UNEP-GRID-Arendal (2005) Environmental Times No.3 GRID_Arendal, Logum Park, Service Box 706, Arendal.
- Verburg PH, Veldkamp WSA, Espaldon RLV, Mastura SSA (2002). Modeling the Spatial Dynamics of Regional land use: The CLUE-S Model. Environ. Manage. 3 (3): 301–405, Springer – Verlag New York Inc.