

## LAND USE/LANDCOVER CHANGE DETECTION IN BOBI GRAZING RESERVE, NIGERIA

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### ABSTRACT

*This study investigated the changes in landuse/landcover of the Bobi Grazing Reserve of Niger State from its inception to 1993. Landsat MSS of 1970, landsat TM of 1987 and SPOT (XS) of 1993 were used as the major sources of data. Topographic map of 1964 and livestock census of 1989/1998 were used as secondary sources of data. This was aided by ground truthing. During ground truthing, GPS coordinates of points of interest were obtained. The research was based on computer interpretation of the imageries using ERDAS, ARC / INFO and ARC / VIEW software. Results from the study has revealed that all other human activities have continued to increase within the reserve thereby reducing drastically the area earmarked for grazing purposes specifically there have been increase in farming activities, increase in human settlements around the reserve resulting in an increase in human population, increase in animal population because of changes in climate which has accelerated the spread of desert from the northern part of the country.*

**KEYWORDS:** *Bobo, Landsat, Landcover, Topography, Landcover*

### INTRODUCTION

Grazing reserves established in almost all parts of the northern part of this country are large parcels of land set aside by various states and local governments in the federation for the sustenance of livestock farming in the country. They are set aside for the grazing of animals and production of small quantities of agricultural crops for the sustenance of the pastoralists and their animals (Adeniyi et al 1999). Because of the vast areas of land involved for this purposes the grazing land (otherwise known as rangeland) supports different vegetation types including shrubs, grasslands, woodlands (Hall, 2001).

The relief of a grazing reserve area may vary by only a few centimeters per kilometer in plain area to hundreds of meters per kilometer in mountainous regions. These physical factors together with their varied position within the land masses create extreme diversity in precipitation and temperature regimes and magnify the complexity of resource use and management (Amuyunzu et al, 1999). We often judge grazing reserves as abused or over-grazed without considering that conditions change overtime. Climate is a major determining factor of the various changes that take place within a grazing reserve.

At the core of the present day climate problem is the fact that during the past 100 years mankind has been emitting increasing quantities of carbon dioxide, methane and other greenhouse gases, thus strengthening the greenhouse effect. This, along with feedbacks within the climate system, can lead to a global temperature significantly warmer than at present conditions, and consequently to a regionally very different sort of climate. The increase in the global mean near-surface temperature is largely

due to anthropogenic changes in the composition of the atmosphere (Lozan et al, 2000)

With growing population pressures, the need for responsible management of our natural resources base is increasingly of concern. Fortunately, recent development in environmental information technologies offers a range of exciting new products and procedures to assist this management process.

Remote sensing application provide accurate and timely information about the plants and environment associated with all rangelands (grazing reserves) about the animals that use these lands, and about the impact, which the animals and man have on the vegetation and soil resources (Lillesand et al, 1979).

Going by the frequent conflict between the pastoralists and the farmers in various parts of the country, the Federal Government through the National Livestock Projects Division (A World Bank sponsored project) under the Federal Department of Livestock and Pest Control Services in the Federal Ministry of Agriculture and Rural Development in 1985, began to assist various state governments in the establishment of grazing reserves and providing all necessary inputs to them after gazetting by the various state governments. This was with the intent of settling the pastoralists within the reserves. It is the in light of the above context that the Bobi grazing reserve was established formally within Niger State Before this time, it was a forest reserve are (NLPD, 1988).

The population of animals within the reserve at its inceptions as compared to what it is now has changed dramatically and the number of such animals in agriculture is expected to double within the next decade.

The human population within the reserve is also expected to increase drastically with the increase in livestock population. This is especially so because the future changes in climate will probably accelerate the spread of desert because they will include no increase or even a decrease in precipitation as the temperature increases in many arid zones.

Within the past few years of the establishment of this reserve notable activities have taken place resulting in some form of changes whether positive or negative, which have not helped in the relationship between the pastoralists and the arable farmers. Of concern to the pastoralists are where they could get fodders for the animals, good drinking water and area that are ridden of harmful pests etc.

#### LOCATION

The study area was formally known as Funa-Funa Grazing Reserve in Niger State under the First Livestock Development Project (FLDP) which was one of the six identified by the World Bank for development, now known as Bobi Grazing

Reserve. It is located approximately 50km South East of Kontagora and off the newly completed Kaduna-Lagos highway. It is within Mashegu L.G.A. It covers an area of about 31,398.68 hectares between latitude 10°00' to 10° 10'N and longitude 5° 46' to 6° 00'E. It is located on sheet 141 of the Nigerian Topographic Maps series of 1963. The grazing reserve was gazetted in December 1987 by the Niger State Government.

The reserve is drained by a network of several rivers and their tributaries including the rivers Beiri, Zamguga, Agogo in the West and Asimdira Ashina, Gaba and Dabangara in the East.

#### METHODS

The LANDSAT images were geo-referenced by the geographic coordinates collected during the ground truthing with GPS to enable easy analysis. In the course of digitization, layers were created, and each layer represents either a particular use or characteristics of the landscape.

#### RESULTS AND DISCUSSION

The following land use categories were identified and mapped out:

Table 1 shows the available land/use categories as in 1970

- a) Cultivated area
- b) Grazing area
- c) Reservoirs
- d) Settlements
- e) Major road
- f) Minor road
- g) Streams/rivers

**Table 1: Land Use/Land cover of Bobi Grazing Reserve in 1970.**

S/No.	Land use / land cover	Area of coverage in hectare	Percentage
1	Cultivated area	2,480.56	7.8
2	Grazing area	28,916.070	92.1
3	Settlements	2.046	0.1
4	Reservoirs	0	0
<b>Total</b>		<b>31,398.676</b>	<b>100.0</b>

Source: (Author's analysis 2010 )

From table, it can be observed that the grazing area covered 28,916. 70ha (92.1 %) of the total land surface area 31,398.68ha and is uniformly distributed over the entire study area. Cultivated area covering 2,480.56ha (7.8%) of the total area is next to grazing area and found mostly close to settlement areas around the boundary of the reserve Settlements, which were very scanty,

occupied only 0.1 % of the total area of the reserve (2.04ha).

It can be observed that in 1970, there were no reservoirs and hence zero area coverage and zero percentage. Seventeen years later, some changes had occurred in the area as shown on Table 2

**Table 2: Land use/ Land cover of Bobi Grazing Reserve in 1987.**

S/No.	Land use / land cover	Area of coverage in hectare	Percentage
1	Cultivated area	3,285.68	10.5
2	Grazing area	28,083.645	89.4
3	Settlements	29,360	0.1
4	Reservoirs	0	0
<b>Total</b>		<b>31,398.685</b>	<b>100.0</b>

Source: (Author's analysis, 2010)

As shown in the table, grazing area covered only 89.4% (28,083.645Ha) of the total area in 1987 while cultivated area covered 10.5% indicating a reduction of 2.7% in grazing area and an increase of 2.7% in cultivated area

Settlements covered an area of 0.1 % (29.360Ha) of the total land area. It can also be observed that dams occupied zero percentage (zero hectare) of the total land area. By 1993 more changes had occurred as illustrated in Table 3.

**Table 3: Land use/Land cover situation in 1993**

S/No.	Land use / land cover	Area of coverage in hectare	Percentage
1	Cultivated area	12,470,353	39.7
2	Grazing area	18,862.68	60.1
3	Settlements	37.008	0.1
4	Reservoirs	28,635	0.1
<b>Total</b>		<b>31,398.676</b>	<b>100.0</b>

Source( Author's analysis, 2010)

Table 3 shows that in 1993 grazing area covered only 60.1 % (18,862.68ha) of the total land area of the reserve concentrating mainly in the central area, while the cultivated area covered 39,7% (12,470,353 ha).

Also, settlements covered an area of 0.12% (37,008ha) of the total land area while

reservoirs occupied an area of 0.1 % (28,635ha) scattered within the entire reserve. This is a reduction of over 30% from the initial situation for the grazing reserve. Comparing the 1970 and 1987 scenario, Table 4 emerges.

**Table 4: Land use change between 1970 and 1987**

S/N	L/use, L. cover change	Area coverage (HA) 1987	Area coverage (HA) 1970	Percentage coverage 1987	Percentage coverage 1970	Percentage change	Change in HA	Dec/inc change
1	Cultivated area	3,285.68	2,480.56	10.5	7.9	+32.58	805.12	Positive change
2	Grazing area	28,083.646	28,916.07	89.4	92.1	-2.88	832.4	Negative change
3	Settlements	29.36	2.05	0.09	0.07	+1332.20	27.3	Positive change
4	Dams	0	0	0	0	0	0	0

Source: (Author's analysis,2010)

The cultivated area is the most highly affected. The area covered increased from 4 71.02Ha in 1970 to 3,276.13ha in 1987 showing that farming has increased by 05.11 ha or 32.58% ha .Grazing area on the other hand had decreased from 28,916.07ha in 1970 to 8,083.65Ha in

1987, indicating a decrease of 832.4ha or 2.88%. Settlements increased from 2.05Ha in 1970 to 2936Ha in 1987 indicating an increment of 27.3Ha or 1332.20%. There was no evidence of reservoirs between 1970 and 1987.

**Table 5: Land use change between 1987 an 1993**

S/N	L/use, L / cover change	Area coverage (HA) 1987	Area coverage (HA) 1970	Percentage coverage 1987	Percentage coverage 1970	Percentage change	Change in HA	Dec/inc change
1	Cultivated area	12,470.353	3,285.68	39.7	10.5	9,184.67	+279.54	Positive change
2	Grazing area	18,862.68	28,083.65	60.1	89.4	9,220.97	-32.83	Negative change
3	Settlements	37.008	29.36	0.12	0.1	7.65	+26.05	Positive change
4	Reservoirs	28.635	0	0.1	0	28.64		Positive
<b>Total</b>		<b>31,398.68</b>	<b>31,398.69</b>	<b>100%</b>	<b>100%</b>	<b>18,441.93</b>		

Source: (Author's analysis 2010).

Also, the cultivated area is the most highly affected with an increase from 3,285.68Ha in 1987 to 12,470.353Ha in 1993 showing that farming has increased by 9184.67 or 279.54%.

Grazing area had continued to decrease from 28,083.65Ha in 1987 to 18,862.68Ha in

1993 which is 9220.97Ha or 32.83%. Settlements also increased marginally from 29.36.Ha in 1987 to 37.008Ha in 1993 or 26.05% positive change. Reservoirs had surfaced by 1993 occupying an area of 28,635ha.

**Table 6: Cattle, Goats and Sheep numbers in Mariga Local Government Area (1989)**

	CATTLE	SHEEP	GOAT
Number	154,519	152,746	304,041
No./Sq.km	9.4	93	18.4

Source: (Authors' analysis, 2010)

Mashegu Local Government Area was part of the old Mariga Local Government Area in which Bobi grazing reserve is situated. The area of the reserve is 31,398.68ha = 3139868sq.km .Going

- i) Cattle = 2,952
- ii) Sheep = 2,920
- iii) Goats = 5,778

Total = 11,650

As at 1989, an estimated number of the above livestock population was 11,650. In 1998, a regular user survey carried out by National Livestock Projects, Kaduna in the reserve during

- i) Cattle = 13,348
- ii) Sheep = 2,272
- iii) Goats = 2,556

Total = 18,176 as at 1998

It can be seen that the number of animals within the grazing reserve increased significantly which has negative impact on the land use / land cover.

### CONCLUSION

From the analysis of land use and land cover situation between 1970 to 1983 and that of 1983 to 1993, the bobi grazing reserve had shown a significant increase in cultivated area due to

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by the number of cattle, sheep and goat per square kilometer from the table, the following total numbers of livestock in the reserve are obtained.

dry season show that there were 142 families with an average family size of 9 while average herd size documented for each family is Cattle - 94. Sheep - 16 and Goat - 18. For the 142 families, the following numbers were obtained:

increased interest in the reserve as a result of provision of social amenities like access roads within the reserve, dams and schools. Settlements around the reserve had increased resulting in land degradation within the reserve as these had led to the clearing of large expanse of vegetal cover. The grazing area had decreased while the population of the animals had continued to rise- exerting pressure on the already depleted vegetal cover.

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