

# Assessment of the impact of deforestation in Yankari Game Reserve, Nigeria: a review of issues and challenges

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## Abstract

**Objectives:** To assess the impact of deforestation in Yankari Game Reserve, Nigeria. It will also review some issues and challenges facing the game reserve.

**Methods/Statistical analysis:** The methodology adopted for the study consists of field trips for an onsite visit and data collection, evaluation of the existing literatures and interviewing of some identified stake holders.

**Findings:** Encroachment of the reserve was observed and woodlands are being converted to non-forest land. The Game Reserve is the Nigerian richest wildlife sanctuary that contains many wild animals. The control and management of deforestation in the area is minimal. Absence of modern technology such as remote sensing and GIS can provide accurate documentation of the location, extent and rate of the deforestation. Besides, these technologies will be cost-effective in estimating forest change as well as the movement of these wild animals. It was also identified that corruption, abuse of office, low morale and inadequate training among the factors affecting the non-performance of the Game Reserve.

**Application/Improvements:** The forest laws in the state owned should be reviewed to incorporate the local communities for effective performance. Any poacher arrested should get punishment. The salary and allowances of the staff should be paid regularly.

**Keywords:** Assessment, Impacts, Deforestation, Game reserve, Issues, Challenges.

## 1. Introduction

The Nigerian's rate of deforestation of 3.5% has been adjudged as the highest in the world [1, 2]. A lot of factors are responsible for this unhealthy development. The often listed factors in the literature are population growth and poverty [3]. Nigeria has a population of about 160 million people [4] and the highest concentration of the population is in the Northern part of the country. Yankari Game Reserve is located in Bauchi State which is the seventh most populated state in the country which is also situated in the Northern part of the country with a population of about 5 million people. The alarm is more on the situation as it affects National parks and Game Reserves. Yankari Game Reserve is a large wildlife park holding about 'the only remnants of wildlife left in Nigeria' and is home to several natural warm water springs, as well as a wide variety of flora and fauna. These features among others made it a unique place for tourists and holidaymakers to watch wildlife in its natural habitat [5, 6].

However the original savanna woodland and forest area of Yankari have of recent been replaced by open grassland and farms on some parts of the reserved area resulting into a serious land change. This is largely due to human activities principally deforestation, poaching, construction and the climate change effects. Consequently, a large number of plant and animal species that once populated the area and their habitats are in danger of extinction.

Deforestation, arising from haphazard cutting or over-harvesting of trees to clear the land for agriculture, construction, ranching or any other human activities has been a major concern worldwide. It has been shown in [3] that in African countries rates of deforestation continue to worsen as forest are tightly linked to the livelihoods of poor rural African households.

There are several factors mitigating this deforestation. As an established protected area, deforestation within the

Yankari Game Reserve, however, represents a distinctive challenge, considering its formal status where the government is directly involved in its maintenance and provision of a legal protection. Therefore, it is important that an assessment of the impact of deforestation need to be carried out for effective planning and management of forestland the Game Reserve and other decisions making process.

This paper reviews some of the issues and challenges as a prelude to the full assessment of establishing a relationship model between population growth and deforestation in Yankari Game Reserve, Bauchi, Nigeria.

The methodology of the study consists of field trips for an onsite visit and data collection, evaluation of existing literatures and interviewing of some identified stakeholders.

The result would provide the needed framework for understanding and determination of the appropriate tools to be employed in an elaborate assessment of the impacts of deforestation in the area.

### 1.1. Deforestation

Deforestation refers to the indiscriminate cutting or over-harvesting of trees for timber or pulp, or to clear the land for agriculture, ranching, construction, or other human activities[7,8]. The problem of deforestation has been documented widely in many parts of the world. Therefore, most of the studies and literatures have attempted to analyze the extent and causes of the problem but, controversy had arisen world-wide over the data presented. This was as a result of the disparities in the definition of the term deforestation which means different things to different people. Between 2000 and 2010, some 13 million hectares of forest were converted to other uses, such as agriculture, or lost through natural causes, such as forest, recreation and pasture down from 16 million hectares per year during 1990s, according to assessment which surveyed 233 countries and areas[1]. Brazil and Indonesia being the highest loss of forest in the world, Latin America lost 40% of their forest, Africa is still more than half of the forest remain. In many countries the rate of deforestation is accelerating. For example, most forested areas of Bangladesh, India the Philippines, Srilanka and parts of Brazil's rainforest could be gone by the end of the century[9]. Between 2000 and 2005 the earth lost more than a million square kilometers of forest land. Surprisingly, the country with the top percentage of forest lost was none other than the United States[1]. The rate of deforestation varies from region to region around the world. In 2009, two third of the world forest loss occurred in ten top countries; Brazil, Indonesia, Russia, Mexico, Papua New Guinea, Peru, USA, Bolivia, Sudan, Nigeria[10]. Malaysia lost 8.6% of forest cover from 1990-2010[1] or around 1,920,000 hectares. Its rapid rate of development has put it far ahead of several of its neighbors' such as Indonesia and Papua New Guinea. Africa is suffering from deforestation at twice the world rate, according to United Nation Environment Programme[11]. The main factor contributing to the continent's high rates of deforestation is the dependence of 90% of its population on wood as fuel for heating and cooking. Two hundred years ago, forest covered an estimated 80% of the land in Europe; today they cover only 40%, excluding Russian Federation. In African countries, over the centuries forests and wildlife in many parts of the continent were protected through rituals and sacked activities. Most of this attitude is gradually abandoned during the period of European colonization, but many small, sacked forests have survived in West Africa and are still used for various rituals. Therefore, deforestation is a major global issue, especially due to its impact on the environmental services that forests deliver, associated biodiversity depletion and contribution to climate change[3].

Deforestation processes have complex causes and a multitude of effects. Causes of deforestation can generally be differentiated as proximate and underlying drivers[12]. The proximate causes are direct activities such as logging or agricultural practices, while underlying causes or drivers can be political, economic, institutional and cultural factors[13].

These causes of deforestation are known to vary from location to location, but certain patterns tend to be consistent across all forest areas. Among the many consequences of deforestation the following are mostly reported in the literature:

As an established protected area, deforestation within the Yankari Game reserve, however, represents a distinctive challenge, considering its formal status where government is directly involved in its maintenance and provision of a legal protection. Therefore, processes responsible for deforestation in Yankari are different from those being witnessed on other forestland that lacks such formalized government property rights status.

In Yankari Game Reserve a typical cycle of forest destruction ensues mainly due to the construction of infrastructures that includes roads and buildings and also the effects of climate changes. It is an accepted fact that land clearance for whatever intends results in the destructions of trees and the inducement of changes in the existing

Biodiversity and habitat fragmentation. Notwithstanding the fact that the boundaries of the reserve were well delineated and respected by local farmers, logging and over grazing within its boundaries by cattle herds and other livestock seems to be additional noticeable factors contributing to land cover changes in the study area.

(a) National parks: These large areas that protect important ecosystems, natural or cultural features. They are being managed by the Federal Government of Nigeria. Examples; Gashaka-Gumti, Kamugu, Old Oyo, Chad Basin, Kainji Lake, Cross River, and Okomu.

(b) Game Reserves: These are protected areas where animals considered to be game can live. Reserves are free from poachers and human encroachment. They may be state owned or privately owned, and may be open to tourist or restricted. Examples, Yankari, Lame-Bura, Sumu, BorguKashimbila, Zugerma, Ohosu etc.

(c) Forest Reserve: These are areas of lands usually reserved for animals grazing. These forests are usually managed by Local Government Authorities. Examples, Afiriver, Akure, Akureofosu, Oluwa, SambisaOkeluse etc.

## 2.0 The study area

Yankari Game Reserve of Bauchi in Nigeria lies between latitudes 09° 30' N - 10° 00' N and Longitudes 10° 10' E - 10° 50' E South-East of Bauchi, Bauchi State in Nigeria. It was established by the Government of the former Northern Nigeria in the year 1956 and till date, it is one of the major tourist attraction portals in Nigeria. The study area which is in the north eastern region of Nigeria could be seen in Figure 1.

Figure 1. The study area



The area is located in the southern part of the Sahel Savannah grassland on the Kerri geologic formation of Tertiary age. This formation is composed of sandstone, silt stones, kaolinites and grits. Underneath this lies the Gombe formation, of Cretaceous age, composed of sandstones, silt stones, and ironstones.

The valleys of the Gaji, Yashi and Yuli Rivers that traverse the area are filled with Alluvium of more recent age. It has a well-developed patch of woodland. It is also a region of rolling hills, mostly between 200m and 400m. Keriyo Hill is the highest point at 640m[14] reported and the Game Reserve is an important refuge for over 500 species of mammals that includes African Bush Elephant, Olive Baboon, Pastas Monkey, Tantalus monkey, Lion etc. There are also over 350 species of birds that comprise of 130 resident, 50 pale Arctic migrant and the rest are intra-African migrant that move locally within and around Nigeria.

There are about 110 furnished chalets of varying size and class and a restaurant. The annual average number of tourist visiting the Reserve is about 20,000 persons making it the most popular tourism potential in West Africa. Figure 2 is the Google Earth satellite imagery of the study area.

Figure 2. Satellite imagery of the study area (courtesy: Google Earth)



The rainy season begins mostly in May and lasts up to September or early October. The annual rainfall of the area is between 900mm and 1,000mm. Temperature ranges between 18° C and 35° C. The hottest period falls in March and April, when temperatures can rise above 40° C in the day time. During the dry season, night temperatures may fall as low as 12°C especially during the winter period (November- February) of which wind blows from the Sahara desert and this often brings dusty skies. During the dry season, the larger wildlife in the reserve depends on the Gaji River and its tributaries for survival. It is the only major watershed and cuts the reserve in two. The river estimated area is about 40 km<sup>2</sup>. The River Valley is used by elephants in the dry season.

### 2.1. Issues and challenges

Highlighted below are, some of the major issues and challenges facing Yankari Game reserve arising from the study so far conducted by this effort.

#### a. Population growth:

There is large population growth around the Game Reserve. Between 1955 to 1985 there are only 92 villages surrounding the Game Reserve [7]. But at present we have over 367 villages. It is surrounded by three districts namely: Duguri, 117 villages; Gwana, 185 villages and Pali, 65 villages [15]. These villages were located within 1-5km range from the reserve boundary. The increase in population at the edge of the reserve has an implication for call in demand for food, shelter and other livelihood. Therefore, with low off-farm employment opportunities in the area, the population will exert more pressure on the resources of the reserve. As observed by [16], population increase near wildlife-rich area increases demand for more land for livelihood maintenance.

Clearing of land is done on a large scale due to large number of immigrants around the reserve. These phenomena triggered the onward migration of wild animals that are endemic to the Game Reserve as well as death of other species that were ecologically niche to a particular habitat around the reserve perimeter. Also, land clearance through bush burning causes animals to be extinct. A number of people living in both rural and urban areas depends on forest resources for their daily needs. In the rural areas, forest is considered as a means of survival where people cut trees for fire wood and construction, commercial logging and subsistence farming. As a result of this, conflict usually arises between the local authorities and the poor community because of the protected land [17].

#### b. Fuel wood extraction

The non-availability of energy option such as kerosene and cooking gas has made people in the area to resort to fuel wood by cutting trees for their daily cooking. The fuel wood is done by both commercial fuel merchants, who use trucks to evacuate large quantity of woods to the capital city of Bauchi and other neighboring urban centers and populated settlements.

The cutting of the fuel wood is in *en mass*, therefore there is a tendency of cutting a good species of tree. Since their major concern is to collect the fuel wood in a large quantity, they cannot cut in random. Discouraging this practice is a great challenge as they have no other source of income though, the cutting is illegal as government has ceased to issue permit for that kind of practice [18, 19]. In a survey conducted in western Tanzania revealed that the internally displaced people used an average of 2.8kg of fuel wood per person per day, whereas local host communities used just 1.7kg per person per day. The reason for such difference was due to the facts that internally displaced people were found to rarely put out fires between meals due to lack of matches and use mostly dry food substances which took longer time to cook than fresh food.

#### c. Hunting and other human activities:

There is always going to be conflict between these people and the Game rangers as more trees and animals will be lost. This can even resort to a loss of life if care is not taken. Through the understanding of the implication of low income in communities neighboring protected areas prompted World Bank to introduce the Local Empowerment and Environmental Management Project (LEEMP). The project aims at reducing the dependency of local people on the resources of protected areas. People in the rural areas of low income countries depend on the natural resources with their availability as well as its accessibility in supporting their livelihoods [20]. Unfortunately, the wrong implementation of the programme due to poor supervision, selfishness has succeeded in Yankari Game Reserve. It

was manipulated through favoring some communities more than others. This usually happened especially when there is an influential politician or government functionary from a particular area.

Many scholars have argued that poaching is not a significant activity that local people engage in for the purpose of driving leisure, but it is associated with socio-economic uplift. There is a need to involve the local communities in driving the economic benefits from such tourist areas (Game reserves) operating in their areas. Such benefits can be income generation, infrastructural development or preservation of their local heritage[21].

**d. Monitoring and surveillance:**

There is a complete absence of established effective monitoring system for the environment as well as for the animals. They go free within and outside the reserve. There is a need to increase the security patrol to keep off poachers who depend on the fauna and flora in the reserve for their livelihood[22].

As the area covered by Game Reserve is 2244square kilometers, and it is not fenced, it is too big for rangers to patrol at a time. The rangers are very few in number. Also there is no political will from the Government side in protecting the area. There is a complete absent of modern instruments and techniques for effective identification, quantification, knowledge of rate and trends of deforestation which will help in better planning and management. Even if instruments are available, man power to operate them are major the constraints. Only three-tracker units are currently in use. Fund collected from visitors is poorly managed.

**e. Law enforcement:**

The existing laws are outdated with time, both economically and socially. These laws were established since 1956 when the Game reserve was established and therefore become obsolete.

The challenge here is on how to increase the amount of levy or penalty enforced on a culprit. Also to update the laws through some legislative processes as a Bill is needed. According to World Rainforest Movement[23], corruption of government officials is the root cause of deforestation. Therefore, the success of enforcement of laws depends much on the surrounding communities[24]. The area is surrounded with a human- land use type and densely populated consisting of subsistence communities.

**f. Poor forest management:**

Because of poor funding, insufficient operational logistics and poor policy implementation, the management of the Game Reserve have been neglected and underfunded since 2006 when Bauchi state Government took the responsibility. This has resulted in to a conflict between elephants and local communities living near the boundaries of the reserve resulting in crop damages. This conflict reduces the level of community support for the reserve and encourages local community support for elephant poachers. There was also a mismanagement of the reserve from 2002 to 2006 because of the transitional period between the Federal Government of Nigeria and the Bauchi state Government as well as the inter-Ministerial professional management within the state itself. The state Government is agitating to return the management of the park to its former status (Game Reserve) while the Federal on the other hand is unwilling to relinquish the park to the state, which delayed for some time up to 4 years. Therefore, this argument and delay have subjected the animals to a severe poaching, while the protecting staff (Game guards) and other supporting staff were subjected to hardship through nonpayment of their salaries and allowances. It was also unfortunate, that the reserve was established through enforcement and compulsory ejection of local settlers[25]. These local communities who were distant away from their natural resources, traditional roles, skills, social standings, and means of livelihood mostly jeopardize the success of conservation in the reserve. In[26]shows that deforestation rates in communally managed pine-oak forests in Guerrero in Mexico were roughly the same as these in the protected areas, lending further weight to the belief that community forestry can aid in forest conservation.

**g. Insecurity:**

In addition to the lack of sufficient patrol vehicles, shortage of fuel and inadequate functional firearms, the frequent attacks on rangers by poachers and cattle herders exist. There was no appropriate surveillance, the existing protecting equipment were all grounded. New ones are not forthcoming, and only one Toyota Hilux remains as the means of patrolling the whole area of 2,244 square kilometers. The reserve becomes porous and poachers can easily escape after committing offence, and this has reduced the morale of the rangers, and does not serve effective

deterrent. The conservation and protection of the reserve is deliberately undermined by corruption and mismanagement. Although, despite the security challenges during the transition period, a total number of 431 people were arrested between 2004 and 2008 as a result of illegal poaching activities[15].

Also, poor educational level coupled with low economic status, as well as imposition of restriction for sustainable development in the selected localities compounded the problem of conflicts between the game reserve authorities and the local population[27]. The indigenous population has a long history of association with the area in terms of their health, cultural and economic needs for agriculture and economic hardship[28]. The increased pressure on Yankari Game Reserve from the adjoining villages of the reserve for demand for fuel wood and quest for arable land had been reported[23].

#### **h. Statutory and customary arrangement:**

During raining season the forest areas are the abodes for pastoralist especially the cattle herders who are predominantly the Fulani clan. Forest laws were enacted and some selected areas were delineated and designated as forest reservation areas. There seems to be connivance between the management of the Game Reserve and some local communities to extend their farmlands along the reserve area. This has led to the clearing of more forest and deforestation sets in. The forest laws that were enacted and made the forest area state owned still exist, but most local communities were unaware. As such customary ownership under chiefs still continues.

### **3. Discussion**

It was observed that forest laws were enacted, and some selected areas were delineated and designated as Forest reserve areas. These laws made the forest areas state owned but most local communities were unaware. When these laws were to be enacted they have not been properly educated on its impact and implication. The customary ownership under the local chiefs is still continuing. The statutory laws are meant to protect and control illegal activities in the designated areas by the state. However, in areas where the traditional customary institution exerted greater influence, the enforcement of the laws is weakening. The boundary of the reserve is well respected by the local farmers even though there is an encroachment. The increase in human population around the Game Reserve has impacted negatively on the game reserve e.g. between 1955-1985 there are about 92 villages were surrounding the game reserve, but at present we have about 367 villages. The protection of the endangered species and habitats has not been a top priority for the Government. Therefore, communities have reduced their level of participation in the support of the game reserve thereby supporting elephant poachers from outside the region. Also poachers are allowed to escape from custody or released after a very small fine which in turn makes them to return for the hunting. Conservation and protection of the reserve is deliberately undermined by corruption and mismanagement. Also the management of the Game reserve is yet to incorporate the use of modern instruments and techniques for effective, identification, quantification and knowledge of the rate and trend of deforestation.

### **4. Conclusion**

There is an encroachment on the part of the reserve while at same time woodlands are being converted into non-forest lands. The game reserve have suffered in the past and is continuing to be suffering as demand on forest resources is a threat to its future existence. Yankari Game Reserve is Nigeria's richest wildlife sanctuary that contains the largest surviving number of different type of wild animals in the country. Due to a number of possible factors such as lack of fund, and unmotivated personnel as well as lack of stiffer penalties for the culprits, the control and management of deforestation phenomenon in Yankari Game Reserve is currently minimal. There is also a need for Government and Government departments to be effective, efficient and accountable.

It has been recognized that the use of GIS and remote sensing techniques to enhanced data availability are necessary to provide more accurate documentations of the extent and rate of spread of deforestation. These Technologies would also provide cost-effective estimates of forest change and movement of the wild animals. It was also been established, that the main factors affecting the non-performance of the Game Reserve includes, abuse of office, corruption, weak institutional capacity for forest law enforcement and governance, associated with

inadequate staff, low morale and poor equipment for forest guards and inadequate training and knowledge of forest legislation. Therefore, any attempt to control and manage deforestation must be prepared to invest on the understanding of the causal factors.

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