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## **CAUSES AND LEVEL OF ENVIRONMENTAL DEGRADATION IN PLATEAU STATE, NIGERIA**

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### **ABSTRACT**

Studies have shown that much existing (as much as half as well as potentially productive agricultural land in developing countries is being lost through the processes of land degradation and abandonment. This study analysed the causes and level of environmental degradation in Plateau State. Using multi-stage sampling technique, 265 farming households were randomly sampled from 9 communities spread across three Local Government Areas from the three agro ecological zones in the State. Primary data generated from farming household heads through well structured questionnaires were mainly used for this study. The data collected included the farmer's perception of the level of degradation and environmental utilization as it pertains to the use of land and forestry resources. The data were analysed using descriptive statistics and Likert scale. Out of the several causes of environmental degradation, not planting of trees because of non-ownership of farm lands was ranked as the first (41%). Felling of farm trees for fuel and other domestic uses (29%) was ranked second. The result of the Likert scale shows that most of the mean scores ranged between 3.03 – 3.89 which implied that most of the farmers experienced moderate degradation on their farms. Measures applied by arable crop farmers to mitigate environmental degradation in the study area include tilling their farm lands against the gradient to serve as a control terrace to washing of the topsoil (69%) among others. Effort should therefore be made to curtail further expansion of the already form gullies. This will no doubt safeguard the environment and inadvertently enhance the livelihoods of the farming communities in the state.

**Keywords:** Causes, Level, Environmental, Degradation, Plateau

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### **Introduction**

The development of the agricultural sector in the face of rapid population growth has involved progressively more intensive use of land resources for cropping and grazing and with this, greater control and pressure on local habitats, leading to environmental change (Gretton and Salma, 1997). The development of the agricultural sector (along with other sectors of the economy) has therefore involved adaptation to a changing environment.

Environmental degradation has a negative connotation that implies the loss of

something of value within the environmental economic system (Gretton and Salma, 1997). The loss value may be related to the productivity of land for agriculture, the environment as home to naturally occurring species of flora and fauna or to the environment as a place for other human activities (such as mining and secondary industries, human habitation and waste assimilation).

A lot of literature has been developed by many scholars on the concept and issues of environmental degradation. Environmental degradation is a process by which the resource base (air, water, soil/land) become



depleted, thereby reducing their originality and quality. This affects the general health of the biological environment. Air, water, and soil/land are the major resources which are vulnerable to depletion or being degraded through overuse and unfriendly human activities. Dangyil (2009) points out that every move by man against nature for his benefit, welfare or for the generation unborn amounts to a degradation of the environment.

There are numbers of ways in which environmental degradation occurs. The process can be entirely natural in origin, or it can be accelerated by human activities. The emphasis of this paper is more on human related degradation. For instance, indiscriminate or unplanned felling of trees without planting of new ones, release of untreated industrial wastes, and mining of minerals resources, oil spill, and many more in areas like Enugu, Jos Plateau and Niger Delta regions have left those areas devastated and polluted. Bellamy in Arongol and Dachomo (2007) noted that in Nigeria, "trees are being cut down thirty times as fast as they are being replaced". Degradation of resource base generally translates into decrease in production, income and availability of food. As the world's vegetative shrubs, cover trees and grassland are cleared, it's already fragile soil loses the capacity to nourish crops and retain moisture (Arongol and Dachmo, 2007). Declining soil fertility leads to lower crop yields, resulting into hunger, famine and ultimately aggravates poverty (IFAD, 1992).

Land degradation can be extreme, severe, moderate or light. The definitions of these categories of land degradation as given by Oldeman *et al.* (1990) and the World Resources Institute (WRI) (1992) are: Extreme degradation is degradation that occurs on poor soils and restoration is

impossible. Severe degradation on the other hand is degradation involving severe nutrient depletion and deeper, more frequent gullies and hollows, extensive restoration is required involving physical structures, drainage works, terraces, mechanised deep ploughing and reseeding, while moderate degradation is degradation that involves loss of topsoil from water and wind erosion, nutrient decline, some salinization and soil compaction, all of which contribute to loss of potential productivity; restoration is essential to reverse productivity declines and requires both soil conservation practices and major structural interventions, such as drainage for water logging or salinity, contour ridging, bands and the likes. Finally, light degradation is degradation on good soils showing signs of degradation – some top soil loss, nutrient decline and increased salinity that can be restored through standard conservation practices, such as crop rotation, minimum tillage and other on farm practices.

The Soil References and Information Centre in Wageningen, Netherlands recently published more conservative estimates of the extent and severity of land degradation in Africa. Its data indicates that about 321 million hectares (14.4% of the total vegetated land surface) are moderately, severely or extremely degraded and an additional 174 million hectares (7.8% of the vegetated area) are lightly degraded (Oldeman *et al.*, 1990). This study therefore identified the causes and establishes the level of environmental degradation in Plateau state, Nigeria.

## Methodology

### The Study Area

The study was carried out in Plateau State, located in central Nigeria. The State derives its name from the geographical landscape that predominates in this part of the country.



The state lies between latitudes 8° N and 10°N, and longitude 7°E and 11°E of the prime meridian (GTZ, 2010). The altitude ranges from around 1,200 meters (about 4000 feet) to a peak of 1,829 metres above sea level in the Shere Hills range near Jos. The state has a land mass covering nearly 30,913 km<sup>2</sup> (11,935.6 sq mi) and ranked as the 12<sup>th</sup> in land mass out of the 36 states in Nigeria. The state has a population of 3,206,531 based on the 2006 census (NBS, 2009). The projected population by 2011 stands at 3,681,299 people going by a population growth rate of 2.8% per annum.

Though situated in the tropical zone, a higher altitude means that Plateau State has a near temperate climate with an average temperature of between 18 and 22°C. Harmattan winds cause the coldest weather between December and February. The warmest temperatures of 30°C usually occur in the dry season months of March and April. The mean annual rainfall varies from 131.75 cm (52 in) in the southern part to 146 cm (57 in) on the Plateau. The highest rainfall is recorded during the wet season months of July and August. The average lower temperature recorded in Plateau State has led to a reduced incidence of some tropical diseases such as malaria. The Plateau makes it the source of many rivers in northern Nigeria including the Kaduna, Gongola, Hadejia and Yobe rivers (GTZ, 2010).

The state comprises 3 agro ecological zones and 17 administrative Local Government Areas, viz: The northern senatorial zone consisting of Bassa, Barkin Ladi, Jos East, Jos North, Jos South and Riyom Local Governments. Bokkos, Kanke, Mangu, Kanam and Pankshin Local Government Areas make up the central senatorial zone. The local governments of Langtang North, Langtang South, Mikang, Qua'an Pan,

Shendam and Wase make up the southern senatorial zone.

### **Sampling Procedure**

A multi stage sampling was used to select respondents for the study. One local government area was purposively selected from each of the three agro ecological zones of the state. The purposive sampling ensures that the researcher does not end up with a sample concentrated in one ecological and or senatorial zone. Qua'an Pan was selected from the southern zone while Bokkos was selected from the central zone. Bassa from the northern zone brought the total number of the local governments to three (3). These LGAs have been shown to be engaged in intensive crop cultivation (PADP, 2000). From each of these LGAs, three communities were randomly selected, making a total of nine communities. The farming communities are; from Qua'an Pan – Namu, Kwalla and Kwande; from Bokkos – Bokkos, Manguna and Mushere while from Bassa – Jengere, Jebu-Bassa and Kwall were selected. The sampling frame was made up of a list of farming households obtained from PADP found in the communities. The simple random sampling method was used to draw at least 10% from the list to constitute the sample size. The total number of the sample size was 265. These were selected by the use of the table of random numbers.

### **Data Collection**

For the purpose of this study, only primary data were used. The data were collected using structured questionnaires. The questions were structured to elicit answers on the objectives of the study. The data collected include the farmer's perception of the level of degradation and environmental utilization as it pertains to the use of land and forestry resources.

### **Analytical Techniques**



The tools used for data analysis to achieve the objectives of the study include Descriptive statistics and Likert scale. A Likert scale measures the intensity or degree of agreement by the respondents to a statement that describes a situation, phenomenon, item or a treatment. The respondents were given a range of five (5) categories depicting the level of environmental degradation in the study area. They were expected to make their choices based on the causes and level of environmental degradation. The observed categorisation of degradation as extreme, severe, moderate or light as reported by Oldeman *et. al.* (1990) and WRI (1992) were used. The likert scale is expressed as:

$$X_w = \frac{5(N_1) + 4(N_2) + 3(N_3) + 2(N_4) + 1(N_5)}{F} \quad (1)$$

F

Where;

$X_w$  = Weighted average  
 $N_1 + N_5$  = Rating scale  
 F = Frequency of respondents  
 =265

The mean score of respondents was set at 3.00 that is

$$X = \frac{5 + 4 + 3 + 2 + 1}{5} = 3 \quad (2)$$

A chi square ( $X^2$ ) statistic is used to investigate whether distributions of categorical variables differ from one another. The  $X^2$  was used in this study to test for significant difference between farmers that reported the existence of degradation on their farms and those that reported otherwise.

$$X^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} \quad (3)$$

## Results and Discussion

### Causes and Level of Environmental Degradation

The result in Table 1 shows the causes of environmental degradation as ranked by the respondents. Out of the several causes of environmental degradation, the problems associated with the ownership structure of farm lands was ranked as the first. This agrees with *apriori* expectation that in most parts of sub Saharan Africa, the living hold the land in trust for the unborn generation. Thus, permanent crops are hardly planted on such farms. The arguments have been that where farmers do not own farmlands in perpetuity but rather possess only leasehold, they will be unwilling to incur short term costs (for example, expenditure on erosion control) for the sake of benefits realized after the terminal date of that leasehold (Southgate, 1988). Similarly, the risk of future dispossession makes them disregard the benefits of land conservation realized only after the passage of several years.

Felling of farm trees for fuel and other domestic uses was ranked second. This is because the hitherto nearby forests has receded to far distances, such that the respondents had to resort to the indiscriminate felling of any available tree to meet their needs. This agrees with the findings by Maiangwa *et al.* (2007) who reported that fuelwood is the dominant form of cooking energy for all rural farmers in Nigeria. Mailumo *et. al.* (2011) also reported that the clearing and burning of vegetation accounted for 28% of the causes of environmental degradation in Kebbi State, Nigeria. Lack of allowing farms to fallow and overgrazing by animals as causes of environmental degradation tied at the 3<sup>rd</sup> position. Lal and Okigbo (1990) reported that now adays, at best, fallow periods last between 1 to 2 years – a period much shorter than the 5 to 7 years required to restore soil fertility. IAR (1996, 1998) reported that the unavailability of designated grazing lands makes the animals



to graze uncontrollably, leading to overgrazing. The likely consequences of these are the loss of soil to wind and water erosion, destruction of soil as a result of trampling by livestock and degradation of arable lands. Mailumo *et. al.* (2011) reported that overgrazing by animals accounted for 25% of the degradation in Kebbi State, Nigeria.

The result of the Likert scale is also presented in Table 1. With Likert scale data, the best measure to use is the mode, or the most frequent. Therefore the implication of the result is that most of the farmers

experienced moderate degradation on their farms. The mean score of most of the farmers was slightly above 3.00 which is an indication of moderate degradation. This agrees with findings by International Fund for Agricultural Development (1992), who recently published more conservative estimates of the extent and severity of land degradation in Africa. Its data indicates that about 321 million hectares (14.4% of the total vegetated land surface) are moderately, severely or extremely degraded. The chi-square result was found to be 7.173 and was statistically significant ( $P < 0.01$ ).

**Table 1: Causes and Level of Environmental Degradation**

Causes of Degradation	ED (5)	SD (4)	MD (3)	LD (2)	ND (1)	Raw score	Mean score	Rank
• Ownership structure of farmlands	109	57	68	23	08	1031	3.89	1 <sup>st</sup>
• Felling of farm and forests trees	51	68	101	60	35	985	3.72	2 <sup>nd</sup>
• Lack of allowing farms to fallow	65	88	70	16	26	945	3.57	3 <sup>rd</sup>
• Overgrazing by animals	52	99	74	21	19	939	3.54	4 <sup>th</sup>
• Burning of crop residues on farm	56	88	59	52	10	923	3.48	5 <sup>th</sup>
• Over usage of agro chemicals on farm lands	68	62	84	20	31	911	3.44	6 <sup>th</sup>
• Non existence of collective organisations dedicated to envtvl conservation	76	60	56	45	28	906	3.42	7 <sup>th</sup>
• Non application of org manures	03	99	116	47	00	853	3.22	8 <sup>th</sup>
• Continuous tillage of farmlands	67	48	52	42	56	823	3.11	9 <sup>th</sup>
• Over usage of chemical fertilizers	25	67	80	77	16	803	3.03	10 <sup>th</sup>
• Lack of information on natural resource Conservation	32	51	63	71	48	743	2.80	11 <sup>th</sup>

ED=Extreme degradation; SD=Severe degradation; MD=Moderate degradation; LD=Light degradation and ND=No degradation

### Mitigation Measures to Environmental Degradation

Measures applied by arable crop farmers to mitigate environmental degradation in the study area were identified and described (Table 2). The result shows that majority (69%) of the farmers deliberately tilled their farm lands against the gradient to serve as a control terrace to washing of the topsoil. This was followed by the creation of wide furrows and planting of cover crops with 45 and 35% respectively in 2<sup>nd</sup> and 3<sup>rd</sup> positions. This is in tandem to Mailumo

*et.al.* (2011) who reported that the creation of water channel was significant as a mitigation measure to environmental degradation in Kebbi State, Nigeria. Other measures employed by the farmers included fallowing of farm lands with 34%, planting of grass for border demarcation with 19% and the practice of zero tillage with 12%. The respondents also plant trees (9%) and practice mixed cropping (6%) to mitigate the effects of environmental degradation. Mailumo *et. al.* (2011) also reported that planting of trees was a significant measure



in the mitigation of environmental degradation in Kebbi State, Nigeria.

The valuable role of trees in controlling water runoff and the positive interaction of trees such as acacias with crops and animals are reasons why much more emphasis needs to be given to them for environmental protection (Mohammed, 2010). Deforestation will have major adverse impacts on rainfall availability, capacity of the soil to hold water, local climate, and

habitat for animal species and bio-diversity. Basically, farmers migrate to forested lands for both crop and animal production. Crops grown on these lands give good yields and the vegetative plants provide pasture for their live stocks. The circle of use, degrade and migrate to new areas continues unabated. All these will collectively affect the livelihood and socio-economic aspect of the society.

**Table 2: Ranking of the Mitigation Measures to Environmental Degradation**

Mitigation Measures	Frequency*	Percentage	Rank
Tilling the farm against the gradient	182	69	1st
Creation of wide furrows	118	45	2nd
Planting of cover crops	92	35	3rd
Allowing farm lands to fallow	91	34	4th
Planting of grass for border demarcation	50	19	5th
Zero tillage	33	12	6th
Planting of trees	24	9	7th
Mixed cropping	16	6	8th

\*multiple responses allowed

### Conclusion and Recommendations

The study found that the land resource in the study area has been moderately degraded over the years. The study further found that the interplay of factors such as uncertainty in the ownership of farm lands, felling of farm trees for fuel and other domestic uses, over cultivation of farm lands without allowing them to fallow and over grazing by animals are some of factors responsible for the degradation in the area. This has severely impaired the regenerative capacity of the soil with the consequent reduction in crop yield, loss of forest resources and biodiversity. To forestall further degradation of the soils in the study area, it is recommended that:

Farming households should be empowered to own farms. Also they should be encouraged to use alternative sources of fuel

to discourage them from felling of trees. The good old culture of allowing farmlands to fallow should be encouraged amongst others.

To discourage the indiscriminate felling of trees by farmers to meet their daily energy needs, technologies that utilized the ample solar and wind energies are suggested or technologies that convert local waste materials to energy should be developed

Finally, it is recommended that environmental aid be introduced to abate environmental degradation. Environmental aid will to a large extent be significant in accelerating economic growth. The aid should be targeted at preserving the environment or facilitating environmental-friendly infrastructural development that will directly benefit the poor people. This



should be backed by a strong environmental policy with the political will to enforce it.

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