ENVIRONMENTAL DEGRADATION AND MITIGATION RESPONSE BY FARMERS IN DANKO/WASAGU LGA OF KEBBI STATE NIGERIA

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Abstract

The paper assessed farmer's mitigating practices to land degradation in Danko/Wasagu Local Government Area (LGA) of Kebbi State. Four (4) districts were randomly selected out of eight (8) districts that made up the LGA. They included Kainya, Ribah, Waji, and Wasagu. Random sampling technique was employed to select 20 farmers from each of the four (4) districts giving a sample size of 80 farmers. Data were collected using structured questionnaire and analyzed using descriptive statistics and logit regression model. Result showed that 43% of the respondents experienced slightly severe degradation on their farmlands while 13% witnessed severe degradation. However, the study found that clearing and burning of shrubs on farms and planting of sole cereals were the major causes of land degradation (28%); and grazing by animals (25%). The logit regression model shows that water channels, level of education, planting of trees, mulching and land tenure arrangement had positive coefficients. Conversely, coefficients of farm size, family size and cover crops had inverse influence as practices to the mitigation of land degradation. The marginal effects of the independent variables on the dependent variable revealed that on the average, a 1 percent increase in the creation of water channels for example, leads to a 0.77 percent increase in the probability of applying land degradation measures in the study area, holding all else constant. To preserve the farm lands, the identified causes of land degradation should be remedied.

Keywords: Mitigating, Land Degradation, Danko/Wasagu

Introduction

Some definitions of land degradation that appeared in literature include the following: It is a reduction in the land's actual or potential uses/a diminution or complete loss of the productive potential of the soil for current and or future use (Blaike and Brookfield, 1987); and it is the decline in the biological productivity or usefulness of land resources in their predominant intended use… stemming from human activity and encompasses soil degradation and changes in the traditional landscape and vegetation due to human interference (Gretton and Salma,1997)

Nigeria has been shown to posses one of the worst environmental records in the world. Deforestation is a serious problem in the country which has consequently resulted in the country having one of the highest rates of forest loss (3.3 percent) in the world (Butler, 2005a). Since 1990, the country has loss some 6.1 million hectares or 35.7 percent of its forest covers (Butler, 2005b). Nigeria's most bio-diverse old-growth forests are disappearing at a faster rate.

Between 1990 and 2000, the country lost a staggering 79 percent of these forests and since 2000, Nigeria has been losing an average of 11 percent of its primary forests per year doubling the rate of the 1990s. These figures give Nigeria the distinction of having the highest deforestation rate of natural forest on the planet (Butler, 2005a).

It is estimated that Nigeria is currently losing about 351,000 hectares of its landmass to desert conditions annually, and such conditions are estimated to be advancing southwards at the rate of about 0.6km per year. Desertification, which is affecting mostly the entire northern states, is considered as the most pressing environmental problem and accounts for about 73 percent out of the estimated total cost of about $5.110 billion per annum the country is losing arising from environmental degradation (Anonymous, 1999).

The visible sign of this phenomenon is the gradual shift in vegetation from grasses, bushes and recessional trees, to grass and bushes and in the final stages, expansive areas of desert-like sand. It has been estimated that between 50 percent and 75 percents of Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe and Zamfara States are being affected by desertification. In addition, seven adjacent states to the south are reported to have about 10 to 15 percents of their land area threatened by processes of desertification (Anonymous, 1999).

This study therefore intends to look at the mitigation measures employed by farmers within the study area so as to curb the adverse effects of land degradation.

Methodology

The Study Area:

The study was carried out in Danko/Wasagu Local Government Area of Kebbi State. The study area has a population of about 420,588 (D/W L.G.A, 2007) which covers a geographical area of about 4,508km^2. The study area lies along latitude 11^{o}23' North and longitude 5^{o}29' East. The month of March has been found to be the hottest month of the year with mean maximum and mean minimum temperature of 46.5^{O}C and 35.7^{O}C respectively and the mean relative humidity is highest in August (68.8%) and lowest in February (15.5%) (KSADP, 1999). Annual rainfall is approximately 58.33mm while monthly hour of sunshine is highest in April and lowest in August-September (KSD, 1995). The soil types are sandy, clay and loamy (Dark). Majority of the people are farmers who mostly practiced mixed farming and to some extent dry season cultivation in low land (*Fadama*) with irrigation (KSADP, 1999).

Sampling Technique:

The study area is made up of eight (8) districts, (Bena, Danko, Kainya, Kebbo, Ribah, Waje, Wari and Wasagu). Out of this, four (4) districts were randomly selected for this study. Twenty

(20) respondents were randomly selected from each of these four (4) districts and interviewed with the structured questionnaire, thus giving a sample size of eighty (80) respondents. The data were collected between February and March 2009.

Data Collection and Analysis:

Primary data was used for the study. The questionnaire sought information on the severity of environmental degradation noticed in the area and measures deliberately put in place to mitigate the impact of environmental degradation by farmers. The data were analyzed using descriptive statistics and logit regression model.

The Logit Model:

Following Pindyck and Rubinfeld (1981), the logit model is written as:

$In (P_i / (1 – P_j) = Z_i = B_0 + B_iX_i + e$ ……………….……………………………….(1)

The logit model was based on the cumulative logistic probability function. The dependent variable Zi is the logarithm of odds that a particular choice will be made. It is an index reflecting the combined effects of Xi factors that promote or prevent land degradation. The importance of each factors is influenced by the coefficient of probabilities within a (1, 0) range interval to the problem of predicting odds of events occurring within the range of a real line. The final test for goodness of fit is the correct classification of farmer's responses on the application of mitigation measures to land degradation. This study defines dependent variable as farmers' positive or negative response on the application of mitigation measures to land degradation. The logistic model is estimated using the maximum likelihood estimator (MLE) as describe by Kimenta, (1986).

The estimated model is specified as follows:

$Li = In (P/ (1-P) = Bo + B_1X_1 + … B_8X_8 + e$ ……..……………………………. (2)

Where,
Li = Logit or log of odds ratio
Pi = Degradation index (1 practice Mitigating Practices, 0 = otherwise)
X_1= Farm size (ha)
X_2 = Water channels measured as dummy variable (1= creating of water channels, 0 = otherwise)
X_3 = Educational level (yrs)
X_4 = Planting trees measured (number of trees planted)
X_5 = Family size (number of dependents)
X_6 = Mulching measured as dummy (1 = practice mulching, 0 = otherwise)
X_7 = Land tenure arrangement measured as dummy (1 = personal land, 0 = otherwise)
X_8 = Cover- crops measured as (seeds planted in kg)

In order to know the probability of practicing mitigation measures by the farmers, the predicted probability was calculated as suggested by Agada, *et al.*, (1997) and Abebaw *et al.*, (2001). According to them, the two groups can be compared using predicted probability created through the logit regression. The difference is the estimate of gain due to the application of that particular measure. If the estimated coefficient of a particular variable is positive, it means that higher value of that variable result in a higher probability of practicing land degradation mitigation measures.

Result and Discussion

Table 1 indicates that 67% of the respondents were farming on their personal land. Farmers that inherited their farms constituted 14% of the respondents. Farmers that purchased their farms and those that farm on borrowed farms represented 9% respectively. Since most of the respondents (67%) farm on their personal land; it was easy for them to accept medium term or long term measures to prevent their farms from being degraded.

Farmers were required to give the perceptual extent of degradation on their farms. The required responses were severe, moderately severe, slightly severe and not severe. Table 2 shows that 43% of the total respondents experienced slightly severe level of degradation, 20% of the respondents experienced moderately severe level of degradation in the study area. While 13% experienced severe degradation on their farms. This necessitates the employment of mitigating practices so as to reclaim already degraded land and to save semi-degraded and un-degraded farms.

Table 3 shows the causes of environmental degradation in the study area. About 28% of the respondents were clearing and burning agricultural residues on their farm land. Also 28% of the respondents were planting only cereal crops on their farm land. Some 25% of the respondents were allowing animals to graze on their farm land throughout while 19% of the respondents packed stalks after harvesting.

Result of the logit regression model presented in Table 4 shows that the coefficients of water channels, level of education, planting of trees, mulching and land tenure arrangement were positive These suggests that an increase in these variables gives a higher probability of application of mitigation measures to land degradation. Conversely, coefficients of farm size, family size and cover crops had inverse influence as practices to mitigate land degradation, the reason for this could not be immediately deduced. The marginal effects of the independent variables on the dependent variable revealed that on the average, a 1 percent increase in the creation of water channels for example, leads to a 0.77 percent increase in the probability of applying land degradation measures in the study area, holding all else constant. Same goes for the marginal effects of level of education, planting of trees and land tenure arrangement.

Conclusion and Recommendations

The study analyzed the mitigation measures applied by farmers to mitigate the rampaging effects of land degradation. The result indicated that 67% of the farmers owned the farmlands on which they grow their crops and 43% reported that the degradation on their farmlands was slightly severe. Many factors were found to influence the application of mitigation measures to land degradation by the farmers. The logit regression result shows that the coefficients of water channels, level of education, planting of trees, mulching and land tenure arrangement were positive These suggests that an increase in these variables gives a higher probability of applying land degradation measures. Conversely, the coefficients of farm size, family size and cover crops had inverse influence as practices to mitigate land degradat2 € the reason for this could not be immediately deduced. By inspecting the marginal effects of the independent variables on the dependent variable, it can be seen that on the average, a 1 percent increase in the creation of water channels for example, leads to a 0.77 percent increase in the probability of applying measures to curb land degradation in the study area, holding all else constant. Same goes for the marginal effects of level of education, planting of trees, mulching and land tenure arrangement. Finally, the respondents reported the practices of planting sole cereals, packing and or burning of stalks after harvest and grazing by animals as the major causes of land degradation in the area.

To ensure a sustainable use of land resource in the study area, farmers should be encouraged to continue creating water channels parallel to the gradient of their farms, sought for knowledge, plant more trees on and around their farms and owned their farms. They should also be encouraged to maintain manageable farm sizes, taught ways and times to plant cover crops and how best to mulched their farms through advocacy.

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Table 1: Distribution of respondents based on mode of land acquisition.

Mode of Land Acquisition	Frequency	Percentage
Inheritance	11	14
Purchase	07	09
Lease	01	01
Borrowed	07	09
Personal	53	67
Total	**79**	**100**

Source: Author's field survey, 2009

Table 2: Distribution of respondents based on the level of degradation experienced

Level of Degradation	Frequency	Percentage
Severe	10	13
Moderately severe	16	20
Slightly severe	34	43
Not severe	19	24
Total	**79**	**100**

Source: Author's field survey, 2009

Table 3: Distribution of respondents based on causes of degradation

Causes of Degradation	Frequency	Percentage
Clearing and burning	22	28
Planting sole cereals	22	28
Grazing by animals	20	25
Packing of stalks after harvest	15	19
Total	79	100

Source: Author's field survey, 2009

Table 4: Result of logit regression analysis showing variables that mitigate environmental degradation

Variable	Estimated coeff.	T-ratio	Marginal Effect
Farm size (X_1)	-0.293	-0.754^{ns}	-0.729
Water channel (X_2)	0.289	2.460^{**}	0.774
Education level (X_3)	0.482	3.013^{***}	0.509
Planting trees (X_4)	0.756	2.477^{**}	0.188
Family size (X_5)	-0.215	-1.860^{*}	-0.535
Mulching (X_6)	0.620	0.724^{ns}	0.154
Land tenure arrangement (X_7)	0.222	2.483^{**}	0.399
Cover crop (X_8)	-0.673	-0.897^{ns}	-0.729
Constant	-0.538	-0.370^{ns}	-0.167

Source: Author's field survey, 2009

*, **, ***, ns = significant @ 0.01, 0.05, 0.10 and not significant respectively.