JOURNAL OF AGRICULTURAL ECONOMICS, EXTENSION & SCIENCE ISSN (Print) 2545-5179, ISSN (Online) 2714-5018
Official Journal of the College of Agricultural Economics, Extension & Science JAEES Vol. 7 No. 2 2021, Pages 147 - 163
www.jaees.org

EFFECTS OF LAND USE AND DEGRADATION ON FOOD SECURITY IN SOUTH-SOUTH NIGERIA

***Edoja, P.E., Aye, G.C., Abu, O. and Ater, P.I.**
Department of Agricultural Economics, Joseph Sarwan Tarka University, Makurdi,
P.M.B. 2373 Makurdi, Nigeria.
*Correspondence e-Mail: edojaprosper@gmail.com

Abstract

The study investigated the effects of land use and degradation on food security in south-south Nigeria. Multi-stage random sampling technique was used to select 360 respondents (120 each from Edo, Delta and Rivers States of south-south, Nigeria). Structured questionnaire was used to collect data from the selected arable farmers. Relevant descriptive and inferential statistics such as frequency, percentages, mean and binary logit model were used to analyse the data. The results on land degradation showed that on average the respondents perceived land degradation in South-South Nigeria to be high with their mean score (MS) of 2.45. Specifically, Fire disaster (MS = 2.83), Urbanization (MS = 2.77), soil nutrient loss (MS = 2.66), land poisoning (2.61), deforestation (3.10), heavy rainfall (MS = 2.92), soil turned sandy (MS = 2.94), excessively hot soil (MS = 2.83), soot (MS = 2.55) were considered important land degradation factors. The result showed that about 47.5 percent of respondents in the study area perceived land degradation to be with very high intensity, 5.0 percent were under high intensity while 47.5 percent of the respondents perceived it as having low intensity. Results further showed that 35.12percent of the farmers in the study area were food secure, while 20.40 percent were mildly food insecure, 17.73 percent were moderately food insecure and 26.76 percent were severely food insecure. Overall about 64.88 percent were food insecure. On the effects of land use and degradation on food security in south-south, Nigeria, the Logit results showed that the use of herbicides (-0.19), irrigation (-0.22), grazing on farmland (0.16), use of improved variety (0.16), farm size (0.22), erosion (-0.12) and heavy rainfall (-0.13) have significant effects on food security in the region. In conclusion, this study has demonstrated that land use and degradation have a critical effect on food security in the region and therefore the attention of all the stakeholders in environmental economics, Ministry of Agriculture, Non-

governmental organizations and relevant agencies is required to effect a definite end to the possible food security problems in the region.

Introduction

The perceived limits to producing food for a growing global population have been a source of debate and preoccupations for ages (ESA, 2012).Land use and land degradation are central in the discussion of agricultural productivity and food insecurity. Food is no doubt, the most basic of all human survival needs. Land degradation has become a critical issue worldwide, especially in the developing countries, which has lead to great concerns about food security. To better the livelihoods of human beings and to maintain sustainable development of human society, healthy land ecosystems are fundamentally pivotal elements. However, the key services of good quality land and their true values have been usually taken for granted and underestimated, leading to serious land degradation, which not only deteriorates the ecosystem services but also hinders regional sustainable development. Land degradation means a significant reduction of the productive capacity of land. It is an interactive process involving various casual factors, among which climate changes, land use/cover changes, and human dominated land management play a significant role (Bajocco *et al.*, 2012; Barbier, 1997; Sivakumar and Ndiang'ui, 2007 and Symeonakis *et al.*, 2007)

Land use consist the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods (Wikipedia, 2021). It is the total of arrangements, activities, and inputs that people undertake in a certain land type (FAO, 1997a; FAO/UNEP, 1999). Land-use intensity is the extent to which land is used. It is an indication of the amount and degree of development in an area, and a reflection of the effects generated by that development.

Land degradation takes a number of forms, including depletion of soil nutrients, salinization, agrochemical pollution, soil erosion, vegetative degradation as a result of overgrazing, and the cutting of forest for farmland. All of these types of degradation cause a decline in the productive capacity of the land reducing potential yields. Farmers may need to use more inputs such as fertilizer or manure in order to maintain yields, or they may temporarily or permanently abandon some plots. Degradation may also induce farmers to

convert land to lower-value uses. For example, farmers may plant cassava, which demands few nutrients, instead of maize, or convert cropland to grazing land. Many scholars have obsessed that farmland degradation can also have important negative effects on the farm, including deposition of eroded soil in streams or behind dams, contamination of drinking water by agrochemicals and loss of habitat.

Globally, one third of the earth's land surface is degraded, affecting more than 2.6 billion people in more than 100 countries (Global Environment Facility, 2018). Land degradation is a process in which the value of the biophysical environment is affected by the combination of human-induced processes acting upon the land (Conacher and Conacher, 1995). It is viewed as any change or disturbance to the land perceived to be deleterious or undesirable (Johnson, 1997). Natural hazards are excluded as a cause; however human activities can indirectly affect phenomenon such as floods and bush fires. When land is degraded it cannot support all the processes that depend on it. Some irrigated lands, for example, have become heavily damaged from salt. Every year, this salinization causes the loss of some 1.5 million ha of arable land and an estimated US$11 billion in production (Global Environment Facility, 2018).

Degraded soils are a major constraint to agricultural production and food security in the south-south, Nigeria. Crude petroleum and farming activities damage the fertility of the soil, and destroy wildlife and the breeding ground for marine fishes because of the toxicity of oil and gas. Degradation such as erosion, flooding, saline water intrusion, destruction of vegetation, toxicity, subsidence, badlands, oil spillage and oil pollution are prevalent in the area (Idowu and Mayowa, 2012).Consequently, the indigenous people are impoverished, with attendant increase in environmental abuse occasioned by their struggle for survival.

Agriculture is the major sustainer of most developing economy in the world. Nigeria as a developing economy is an agro-driven economy. Agriculture has been a major contributor to Nigeria's economy for several years in providing food, shelter, employment and clothing for the people, raw materials for the agro-allied industries and earning foreign exchange for the economy. However, despite its robustness in providing food for the people there is still the problem of food security as most of the people are food insecure as agricultural operations which is carried out on land over the years have left our lands degraded. Being the main foundation for agricultural production and sustainable rural livelihoods, land is at the core of the challenges of triggering off a revolution for improved food, land and environmental security.

Since ecosystems are so connected, land degradation can have cascading effects across the entire biosphere. Loss of biomass, through vegetation clearance and soil erosion, produces greenhouse gases that contribute to global warming and climate change. So also is the loss of arable land to crude oil pollution and oil exploration, which has led to the abandonment of arable lands in most of the southern part of Nigeria in particular the Niger Delta region. Land degradation is central in the discussion of agricultural productivity and food insecurity. Water erosion, wind erosion, soil fertility loss, water logging, salinization, lowering of the water table, deforestation, forest degradation, rangeland degradation and soil pollution have been identified as the different types of land degradation (Idowu and Mayowa, 2012).

High population pressure, greater dependency on agricultural land i.e. less availability of cultivable land (urbanization), oil exploration and transportation as well industrialization are the anthropogenic factors of land degradation in most developing countries, Nigeria inclusive. How to feed the world's growing population and satisfy the demand for nutrition and bio-energy is one of the hot issues currently facing land managers, agricultural resource and environmental economists, and the Nigerian government (Avijit, 2018, Tsue,2015; Grassini *et al*., 2013; Idowu and Mayowa,2012;Godfray *et al.,* 2010).Land degradation will remain an important global issue for the 21st century because of its adverse effect on agronomic productivity, the environment, and its effect on food security and the quality of life (Akinnagbe and Umukoro, 2011).UNDP's Niger Delta Human Development Report (2006) revealed that the Niger Delta has an enormously rich natural endowment in the form of land, water, forests, and fauna. However, these assets have been subjected to extreme degradation due to oil prospecting.The current study contributes in this area of research by assessing the effects of land use and degradation on food security in south-south Nigeria. The objectives of the study were to estimate the food security status of farm households in the region and to analyse the effects of land use and degradation on food security in south-south, Nigeria.

Methodology

The study was carried out in South-south, Nigeria. South-South Nigeria is one of the geopolitical zones of Nigeria, consisting of the following states: Akwa Ibom, Cross River,

Bayelsa, Rivers, Delta and Edo. The area lies between longitude 40 15' E – 9 0 30' E and latitude 30 35' N – 7 0 00' N. The area is rich in crude oil, majority of the people living there are farmers and fishermen. The population of the study was thearable crop farmers in South-south Nigeria. Multi-stage random sampling technique was used to select the respondents for the study. In the first stage, a random selection of three States from south-south Nigeria which comprised Rivers, Delta and Edo States was made. In the second stage, two agricultural zones were randomly sampled from each State making six agricultural zones. In the third stage, two local government areas were randomly selected from each agricultural zone, giving a total of twelve local government areas. In the fourth stage, three farming communities were randomly selected from each local government area making a total of thirty-six farming communities. In the fifth stage, ten arable crop farmers were randomly selected from each farming community, giving a sample size of 360 arable crop farmers (i.e.120 respondents from each state).

Data for this study were collected mainly from primary sources. The primary data were collected from the arable crop farmers in the south-south region of Nigeria using a well structured and pre-tested questionnaire.The data collected for this study were analyzed using descriptive statistics and binary logistic regression model.

Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale (HFIAS) is one of the four experience-based food insecurity scales included in Data4Diets, which also contains the Household Hunger Scale (HHS), the Latin American and Caribbean Food Security Scale (ELCSA), and the Food Insecurity Experience Scale (FIES). The HFIAS was developed between 2001 and 2006 by the USAID-funded Food and Nutrition Technical Assistance II project (FANTA) in collaboration with Tufts and Cornell Universities, among other partners. The HFIAS has since provided the foundation for the development of the HHS, another household-level experience-based scale, which resulted from cross-country validation of the HFIAS (Ballard et al., 2011).

Like other experience-based indicators, the HFIAS is constructed from a short questionnaire that captures households' behavioral and psychological manifestations of insecure food access, such as having to reduce the number of meals consumed or cut back on the quality of the food due to a lack of resources. Responses to the questionnaire enable

the household to be pinpointed on a spectrum that indicates the degree of severity of insecure food access.

The HFIAS module covers a recall period of 30 days, and consists of two types of questions: nine "occurrence" and nine "frequency-of-occurrence" questions. The respondent is first asked if a given condition was experienced (yes or no) and, if it was, then with what frequency (rarely, sometimes, or often). The resulting responses can be transformed into either a continuous or categorical indicator of food security. When calculating the HFIAS as a continuous indicator, each of the nine questions is scored 0-3, with 3 being the highest frequency of occurrence, and the score for each is added together. The total HFIAS can range from 0 to 27, indicating the degree of insecure food access. As a categorical variable, households are categorized as food secured, mildly food insecure, moderately food insecure, or severely food insecure. Households that respond affirmative to the more severe behaviors (or experience them more frequently) are classified as more severely food insecure.

HFIAS category variable is calculated for each household by assigning a code for the food insecurity (access) category in which it falls. The data analyst should have coded frequency-of occurrence as 0 for all cases where the answer to the corresponding occurrence question was “no” (i.e., if Q1=0 then Q1a=0, if Q2=0 then Q2a =0, etc.) prior to assigning the food insecurity (access) category codes. The four food security categories should be created sequentially, in the same order as shown in Table 2, to ensure that households are classified according to their most severe response.

Table 1: HFIAS Categorisation

HFIAS Categorisation	Calculate the Household Food Insecurity Access category for each household. 1 = Food Secure, 2=Mildly Food insecure Access, 3=Moderately Food insecure Access, 4=Severely Food insecure Access. For the purpose of analyzing objective 5, category 1 is food secure and categories 2 - 4 are collapsed as food insecure. HFIA category = 1 if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0] HFIA category = 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0] HFIA category = 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0] HFIA category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]

Binary Logistic Model

Although the HFIAS food security index is categorized into four, for the purpose of achieving the objective. category 2 to 4 were collapsed into one and termed food insecure while category 1 is food secure. This enabled the use of a binary logit model to analyze the effects of land use and degradation on food security. The model is specified as:

$$P = \frac{1}{1+e^{-zi}} \quad (1)$$

Where

$$Z_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \cdots \beta_{16} X_{16i} + e \quad (2)$$

P_i = Probability of household i being food secure is 1, 0 otherwise

Z_i = Vector of explanatory variables

X_{1i} = Use of herbicides (l/ha)

X_{2i} = Irrigation (Yes=1, otherwise-0)

X_{1i} = Grazing on Farmland (Yes=1, otherwise-0)

X_{3i} = Use of improve variety (Yes=1, otherwise-0)

X_{4i} = Fertilizer application (kg/ha)

X_{5i} = Oil exploration (4 and 3 =1, otherwise = 0)
X_{6i} = Erosion (4 and 3 =1, otherwise = 0)
X_{7i} = Deforestation (4 and 3 =1, otherwise = 0)
X_{8i} = Heavy rainfall (4 and 3 =1, otherwise = 0)
X_{9i} = Age (Number of Years of existence of Household head)
X_{10i} = Sex (Male=1, Female=0)
X_{11i} = Marital status (Married =1, otherwise = 0)
X_{12i} = Farming Experience (Years)
X_{13i} = Household size (Number of person feeding from the same pot in the same house)
X_{14i} = Education (Years)
X_{15i} = Income of household *i* (Total income from Farm and non-farm activities in Naira)
X_{16i} = Farm Size (hectares)
β_1-β_{16} = estimated parameters
e_i = error term

Results and Discussion

Evaluation of the intensity of land degradation from farmers' perspective in the region

To determine the intensity of land degradation in the study area, the level of intensity of land problems as perceived by the farmers were examined and presented in Table 4. The following indicators of land degradation were perceived as very high intensity by farmers in South-South Nigeria with mean score of 2.55 and above (i.e. MS ≥ 2.55) namely:

Fire Disaster**:** This had a mean value of 2.83 has been found to have deleterious effects on land leading to its degradation in the region. Fire outbreak resulting from oil spillage, wild fires and other anthropogenic sources have had terrific effects on farming activities in the region leading to land abandonment, destruction of soil micro-organisms, and causing/leading to soil erosion. This goes a long way to show that when there is fire on erodable soils and slopes it can lead to accelerated erosion. This aligns with Akinnagbe and Umukoro (2011) who asserts that occurrence of frequent forest fires has been a major cause of degradation of forestland in many parts of Nigeria. They also opined that, apart

from destruction of vegetation, high intensity forest fires alter the physical-chemical and biological attributes of the surface soil and leave the land prone to erosion and lowering of soil quality

Urbanization: urbanization was also found to be of high intensity on land degradation with a mean value of 2.77. This could be referred to the increased population of man and the need to provide shelter for the populace. Thus, the infringement into natural habitats met for cropping for industrial and residential structures development. This in turn brings about a reduction in the volume of available land for agricultural purposes due to land fragmentation, infrastructural development and arable land conversion to residential uses. More so, construction work like building of new roads and other infrastructures also cause land degradation. The building of new roads and other infrastructure in the region as a result of oil exploration activities could affect the structure of the soil, hence could lead to soil erosion and water logging, thereby causing land degradation and making it unfit for agricultural purpose. This aligns with Akinnagbe and Umukoro, (2011) who found that urbanisation and industrialisation are exerting pressure on the environment and on the natural resources of the country.

Soil nutrient loss: the result further shows that soil nutrient loss is one of the major areas through which pressure is being mounted on arable land in the region. This is particularly so owing to the mean score of 2.66. The bare nature of cultivated lands in the region due to falling of trees and poor farming practices could be alluded to reasons for which soil nutrients loss and its attendant soil physical degradation occasioned by soil nutrient loss through runoff and sediment, which are major drivers for diminishing of soil fertility. This aligns with McHugh *et al.,* (2007) who asserts that poor land cover increases soil erosion through physical and mechanical impact of rainfall and aggregate destruction. This, subsequently, leads to soil surface sealing and decreased infiltration with increased runoff and soil nutrient loss.

Land poisoning: Again land poisoning with the mean value of 2.61 is also among variables responsible for farmers mounting pressures on limited land available for their usage. This could be seen from the excessive use of pesticide, indiscriminate disposal of industrial waste from petrochemical companies as well as abusive use of agro allied chemicals. In addition, also, is the fact that petrochemicals exploration contributes to land degradation in the area. The speculation for, exploration and exploitation of crude oil in Nigeria has created the problem of oil pollution and degradation of farm lands. All these

activities of mankind have combined to diminish the earth's resources, degrade the environment and cause loss of biodiversity. Thus, confirming the works of Akinnagbe and Umukoro, (2014) and Etuonovbe (2009), who found that leaking pipelines, running through villages, farms, creeks and rivers in the Delta, are a major source of pollution, sickness and economic ruin for the people and that farmlands polluted by petrochemicals are rarely rehabilitated, thus, destroying livelihoods.

Deforestation: Deforestation which is indiscriminate falling of trees is also another factor responsible for high land degradation intensity in the region with a mean value of 3.10. This is particularly so due to men quest for timbers, fuel wood, urbanization and industrialization with no commensurate improvement in resource utilization patterns. Thus the pressure on arable land in the region. This aligns with Akinagbe and Umukoro (2014) who assert that people exert tremendous pressure on the forests, particularly close to settlements for firewood, roofing and household furniture and these have resulted in depletion of forests and degradation of forestland in the Ethiope East Local Government Area of Delta State.

Heavy rainfall: Heavy rainfall and its attendant effects were found to have a mean value of 2.92. Heavy rainfall which is found to be associated with the rain forest region has brought about the washing away of top soil and deepening of erosion in most farmlands in the region. It is greatly responsible for a good number of degraded lands in the region and it is still exposing many rill and golly erosion, thus reducing the farming activities in the region and worsening the agricultural productivity challenges in the region. This aligns with Akinnagbe and Umukoro (2014) who found that heavy rain could lead to soil erosion and water logging, thereby causing land degradation and making it unfit for agricultural purpose.

Soil turned sandy: With a mean value of 2.94, soil turned sandy was found to be another variable for very high land degradation. This is expressed in soil becoming sandy and thus being unable to retain water, manure, fertilizer and other soil minerals administered to it. This may in turn affect crop productivity thus leading to undue pressure being mounted on the soil to force out increased productivity thus leading to worsened state of land degradation.

Excessive hot soil: Again this was found to be of very high degradation intensity with a mean value of 2.83. Excessive hot soil affects agriculture by increasing the soil pH as a result of organic acid denaturation which increases at high temperature. It leads to loss

of soil water from the soil, cracks in the soil and separation of soil particles which in turn leads to wilting of the crops, exposure to wind erosion and destruction of micro-organism which was hitherto meant to naturally aerate the soil for crop growth and this could subsequently lead to reduction in the farm yield.

Soot: This is also found to be of very high intensity on land degradation at mean value of 2.55. This is particularly so, since particulate from flared gas are found to drop on the leaves of crops, homes, farms and fish ponds. Thus, polluting and poisoning the atmosphere for valued agricultural practices. In most cases, this has resulted to poisonous gas inhalation and poor health of farmers. Hence, reduction in farming activities in farming locations like Ubeji, Omadino, Egbekodo, Ndokwa and other areas of the region.

Arable farmers on the average perceived land degradation to be of high intensity (2.45). Table 5 shows the frequency distribution of land degradation intensity. The result showed that about 47.5percentof respondents in the study area perceived land degradation to be with very high intensity, 5percent were perceived it to be high intensity while 47.5 percent of the respondents perceived it to be low intensity.

Table 2: Mean Scores of Intensity of Land Degradation as Perceived by Farmers

Land Problem	Mean	Standard Deviation
Gas Flaring	2.19***	1.499
Acid Rain	2.44***	1.409
Fire Disaster	2.83*	1.234
Oil Exploration	2.08***	0.945
Oil Transportation	1.61***	0.688
Urbanisation	2.77*	1.165
Soil Nutrient Loss	2.66*	0.869
Land Poisoning	2.61*	1.057
Erosion	1.89***	1.044
Flooding	2.51**	0.808
Sand Dredging	2.12***	0.972
Deforestation	3.10*	0.848
Heavy Rainfall	2.92*	0.888
Soil Turned Sandy	2.94*	0.803
Excessively Hot Soil	2.83*	0.757
Stone Query	1.62***	0.868
Cattle Grazing	2.10***	1.166
Water Logging	1.70***	0.825
Soot	2.55*	1.215
Mean intensity	2.45**	0.503

Note:*= very high intensity (i.e. MS>2.55); **= high intensity (i.e. 2.45 = MS = 2.54)
*** =low intensity (i.e. MS< 2.45)

Source: **Computed from field survey data, 2019**

Food security status of respondents

The result of food security status of arable farmers in the study area is presented in table 1. From the result, 35.12% of the farmers in the study area were food secure, while 20.40% of the respondents in the study area mildly food insecure, 17.73% of the farmers were moderately food insecure and 26.76% were severely food insecure. If the food security status is categorized into two as food secure and food insecure (mildly food insecure, moderately food insecure and severely food insecure), the analysis showed that 64.88% of the farmers are food insecure while 35.12% are food secure. This implies that most of the respondents do not have access to adequate amount of nutritious, safe and culturally appropriate food. This result agrees with that of Usheng, Edoja and Aye (2020), in Makurdi, North Central Nigeria.

Table 3: Food Security Status of Farm Households

Variable	Frequency	Percentage
Food Secure	105	35.12
Mildly Food Insecure	61	20.40
Moderately Food Insecure	53	17.73
Severely Food Insecure	80	26.76

Source: Field survey 2019

Influence of land degradation on Food Security of Arable Farmers in South-south Nigeria

The binary logit model was used in estimating the effects of land use and degradation on food security in the region (Table 2). The log likelihood function was -179.39427 and probability greater chi2 was 0.0502 which indicated a good fit of the model and it also that the variables were jointly significant at 5percent.Therefore, the null hypothesis that land use and degradation do not have significant effect on food security in the area was rejected. The results showed that use of herbicides, irrigation, grazing on farm land, use of improved variety, farm size, erosion and heavy rainfall had significant effects on food security.

Use of herbicides: This variable has negative (-0.19) effect on food security status of the farming households in the study area and is significant at 5percent. This implies that a

unit increase in the level of herbicides used in weed control on the land will reduce the probability of food security status of the farmers in the region. This could be adduced to the abusive and excessive use of herbicides by farmers in the region which could bring about land poisoning and environmental pollution in the region. This will in turn increase the farmers operational cost at ensuring that the land is suitable enough for agricultural use thus reducing cash deployed to feeding the family adequately.

Irrigation: This variable has positive effect (0.22) on food security of the farming households in the region. The variable has the expected sign and is significant at 5 percent. This indicates that the higher the level of irrigation practiced by households, the greater the probability of the land being more productive. This could be expected because, increased in irrigation all things being equal means increase in food productivity which will in turn bring about enhanced food security in the region. The value of the marginal effect implies that if irrigation increases by 0.22, the probability of the household being food secure will increased by 0.22, holding all other things constant. This result is consistent with Ushang *et al*., (2020) who revealed that irrigation has significant and positive effect on productivity and food security at 1percent level.

Grazing on Farmland: This variable was found to be of positive influence on food security status of households and met the a priori expectation. This could be expected since grazing animals help in pulverizing the soil and also in manureing of the soil through their excretal deposits on the land. The result of the study implies that household that have animals grazing on their land had greater probability of being food secure compared to those who did not have grazing animals on their land, all things being equal. The value of the marginal effects (0.16) indicates that when a household farm land is grazed on; the probability of that household to being food secure will be increased by 0.16. This is in consonance with Tesfaye (2018) who indicated that grazing on farmland is least considered as a land degradation factor in Ethiopia.

Use of Improved Variety: This variable was found to have positive influence on food security status of households and met the a priori expectations too. The value of the marginal effect of 0.16 in the result implies that farm household that cultivated improved variety on their land had greater probability of being food secure compared to those who did not cultivate such on their land. The values of the marginal effect indicate that when a farm household cultivates improved variety, the probability of that household being food secure will be increased by 0.07.

Farm Size: The size of farm had positive marginal effect of (0.22) and significantly influenced food security in the region at 10percentsignificant level. This implied that larger farm sizes increases the probability of food security of farmers in the region. If farmers have access to large farm size, it could influence commercial agriculture, which could bring more income to empower the farmer to procure food that is sufficient enough and healthy for their family consumption.

Erosion: This variable was found to be significant at 5 percent and had a negative marginal effect of -0.12 on food security in the study area. . This implies that land erosion as one of the land degradation variables will decrease the probability of food security of the farm household by -0.12 for every unit change in the rate of erosion. This is particularly so since land erosion diminishes soil fertility, which can negatively affect crop yields thereby bringing about the worsening of the food security status of farmers in the region. It also sends soil-laden water downstream, which can create heavy layers of sediment that prevent streams and rivers from flowing smoothly and can eventually lead to flooding. The moment soil erosion occurs; it is most probable to happen again. This finding is in agreement with Jones *et al.*(1997), Pimental *et al.* (2006) and who noted that soil erosion reduces the general productivity of terrestrial ecosystems and also supported by Mbagwu (2003) who asserted that, about 85percent of the causes of land degradation worldwide are due to soil erosion by wind and water.

Heavy Rainfall: The results in table 9 further showed that heavy rainfall was significant at 5 percent and had negative marginal effect of -0.13 on food security of the farming households. A clear indication that a unit increase in heavy rainfall will reduce the probability of food insecurity in the region. Rainfall is the most important climatic factor in determining areas at risk of land degradation and potential desertification. Rainfall plays a vital role in the development and distribution of plant life, but the variability and extremes of rainfall can lead to soil erosion and land degradation. If un-checked for a period of time, this land degradation can lead to desertification. Heavy rainfall was found to be one of the causes of land degradation in the study area. Water logging is caused by restricted infiltration of water into the soil. This lowers land productivity through rise in ground water close to the soil surface. When crop productivity is reduced food insecurity is inevitable.

Table 4: Effects of Land Use and Degradation on Food Security in South-South, Nigeria

Variables	Marginal Effect	Z	P>|z|
Constant		-0.70	0.48
Use of herbicides	-0.19	-2.05	0.04**
Irrigation	-0.22	-2.25	0.02**
Grazing on Farmland	0.16	2.06	0.04**
Use of improved variety	0.16	1.78	0.07**
Fertilizer application	0.10	1.29	0.20
Oil exploration	-0.06	-1.03	0.30
Erosion	-0.12	-1.88	0.06**
Deforestation	0.10	1.31	0.19
Heavy rainfall	-0.13	-1.96	0.05**
Age	0.002	0.68	0.49
Sex	-0.01	-0.28	0.78
Marital status	0.05	0.85	0.39
Farming Experience	0.003	0.82	0.41
Household size	-0.01	-1.13	0.25
Education	0.00	0.36	0.71
Income	-2.25	-0.36	0.71
Farm Size	0.22	1.64	0.10*
Number of obs = 299			
LR chi2 (17) = 27.57			
Prob > chi2 = 0.0502			
Log likelihood = -179.39427			

**, * = significant at 5percent and 10percent levels respectively
Source: Computed from field survey data, 2019

Conclusion and Recommendations

This study concludes that land use and degradation impacted substantially food security in the region. Promotion of land sustainability and reduction in the vulnerability of farm households to land degradation in the study area in addition to quality land use and management practices were found to be key instruments for achieving food security in the study area. Specifically, The results showed that use of herbicides, irrigation, erosion and heavy rainfall had significant negative marginal effects on food security whereas grazing on farm land, use of improved variety, farm size had positive marginal effects on food security in the region.This therefore implies that, poor land use practices among arable farmers is a disincentive to conservation of resources. Overall, this study has demonstrated that land use and degradation have a critical effect on food security in the region and therefore the attention of all the stakeholders in environmental economics, Ministry of

Agriculture, Non-governmental organizations and relevant agencies is required to effect a definite end to the possible food security problems in the region.

References:

Akinnagbe, O.L. and Umukoro, E. (2011). Farmers' Perception of the Effects of Land Degradation on Agricultural Activities in Ethiope East Local Government Area of Delta State, Nigeria. *Agriculturae Conspectus Scientificus*· April 2011. Pg 135-141.

Avijit M. (2018). Land Degradation Processes and Status of Purulia district. *Journal of the Indian National Cartographic Association* vol.36(1)

Ballard, T., Coates, J., Swindale, A. and Deitchler, M.(2011). Household Hunger Scale: Indicator definition and measurement guide. FANTA III.

Bajocco, S., de Angelis, A., Perini, L., Ferrara, A., and Salvati, L.,(2012).“The impact of land use/land cover changes on land degradation dynamics: a Mediterranean case study,” *Environmental Management*, vol. 49, no. 5, pp. 980–989.

Barbier, E. B.(1997) “The economic determinants of land degradation in developing countries,” *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 352, no. 1356, pp. 891–899.

Conacher, A., Conacher, J. (1995). Rural Land Degradation in Australia. South Melbourne, Victoria: Oxford University Press Australia. p. 2. ISBN 0-19-553436-0.

ESA, (2012).Annual Report

Etuonovbe, A.K (2008). Sustaining coastal Management / Adaptation of climatic change and sea level rise in the Niger Delta. Paper presented at Integrating Generations FIG Working Week 2008 Stockholm, Sweden 14-19 June 2008. Available at http://www.fig.net/pub/fig2008/papers/ts03f/ts03f_06_etuonovbe_2753.pdf.

Godfray,H.C.J.,Beddington,J.R.,Crute,I.R.,Haddad,L.,Lawrence,D.,Muir,J.F.,Pretty, .,Robinson,S.,Thomas,S.M.,Toulmin,C.,2010.Food security: the challenge of feeding 9 billion people. Science 327(5967),812–818.

Grassini, P. *et al.* Distinguishing between yield advances and yield plateaus in historical crop production trends. *Nat. Commun.* 4:2918 doi: 10.1038/ncomms3918 (2013).

Idowu I. A. and Mayowa J. F.(2012). The Human Perception of Land Degradation in a Section of Niger Delta, Nigeria.Marine Sciencep-ISSN: 2163-2421 e-ISSN: 2163-243X2012; 2(5): 94-100doi: 10.5923/j.ms.20120205.08

Johnson, D.L., S.H. Ambrose, T.J. Bassett, M.L. Bowen, D.E. Crummey, J.S. Isaacson, D.N. Johnson, P. Lamb, M. Saul, and A.E. Winter-Nelson. 1997. Meanings of environmental terms. Journal of Environmental Quality 26: 581-589.

Mbagwu, J. S.C.(2003). Aggregate Stability and Soil Degradation in the Tropics. Lecture given at the College on Soil Physics, Trieste, 3-21 March 2003, pp.1-7.

McHugh O, Steenhuis T, Abebe B, Fernandes E. Performance of in situ rainwater conservation tillage techniques on dry spell mitigation and erosion control in the drought-prone North Wello zone of the Ethiopian highlands. *Soil tillage Res*. 2007;97(1):19–36.

Pimentel, D.; Petrova, T.; Riley, M.; Jacquet, J.; Ng, V.; Honigman, J.; Valero, E. (2006). Conservation of Biological Diversity in Agricultural, Forestry, and Marine Systems. In Focus on Ecology Research; Burk, A.R., Ed.; Nova Science Publishers: New York, NY, USA; pp. 151–173.

Senjobi, B. A. and Ogunkunle, O. A. (2010). Effect of Land Use on Soil Degradation and Soil Productivity Decline on Alfisols and Ultisols in Ogun State in South Western, Nigeria. *Agriculturae Conspectus Scientificus* | Vol. 75 (2010) No. 1 (9-19)

Sivakumar, M. V. and Ndiang'ui, N.,(2007) *Climate and Land Degradation*, Springer.Symeonakis, E., Calvo-Cases, A., and Arnau-Rosalen, E. (2007) "Land use change and land degradation in southeastern Mediterranean Spain," *Environmental Management*, vol. 40, no. 1, pp. 80–94.

Tsue, P.T. (2015). Effects of Arable Land Tenure and Utilisation on Environmental Degradation Among Small-Scale Farmers In North-Central Nigeria. Unpublished Dissertation presented to the Department of Agricultural Economics, University of Nigeria, Nsukka in partial fulfilment of the requirements for the award of Doctor of philosophy (Ph.D) in Agricultural Economics of the University of Nigeria, Nsukka.

Uchendu, V.C. (1980). State, land and society in Nigeria: A critical assessment of land use decree (1978). *Journal of African Studies, 6*(2), 71.

Ushang, D.O., Edoja, P. E. and Aye, G. C.(2020). The effect of Irrigation on Crop Productivity and Food Security in Makurdi, Nigeria. University of Nigeria Nsuka, Agricultural Economics Conference, 2020.