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EFFECTS OF LAND USE AND DEGRADATION ON AGRICULTURAL PRODUCTIVITY IN SOUTH-SOUTH, NIGERIA

Prosper E. Edoja[1], Goodness C. Aye[1], Orefi Abu[1] and P. I. Ater[1]
Department of Agricultural Economics, Federal University of Agriculture, 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 agricultural productivity and food security among farm households 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. The data collected was analysed using the ordinary least squared multiple regression model. The F-statistics (12.417) is significant at 1 percent indicating that overall, land use and degradation has significant effect on agricultural productivity thus the null hypothesis which stated otherwise is rejected. The R^2 indicated that 84.2 percent of variation in agricultural productivity is explained by land use and degradation variables. The ordinary least square regression results showed that land degradation intensity (-7.093), Fallow rotation (-26.911), and use of improve variety (-6.989), grazing on farmland (-3.985), fertilizer application (-4.816), use of organic manure (-17.350), land conflicts (-7.254) and terrace farming (-16.170-) had negative and significant effects on agricultural productivity.

Key words: effects, land use, degradation, agricultural productivity, south-south, Nigeria

Introduction:

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.

Diverse opinions abound on what constitutes agricultural land use. Growing crops, clearing land, planting trees, draining a wetland - these and many other activities falls into the broad category of land use, or how people use land. However, chief among the various definitions is that given by **[1]** –which refers to agricultural land use as the activities of man on land which are directly related to the growing of crops on fields. It is conceptualized as the activities carried out on lands which aid the growth of crops. Some of the different land-use categories are: rain fed agriculture, irrigated agriculture, permanent crops, permanent pastures or rangeland and fallow. Generally, agricultural land use involves both the manner in which the biophysical attributes of the land are manipulated and the intent underlying that manipulation for agricultural purposes. An important feature of agricultural land use is regional variations, in particular, in intensity of use. Agricultural land use in Nigeria may take one of the following forms: market gardening, commercial food crop farming, plantation agriculture (e.g. rubber, cocoa, palm products, forest products), subsistence agriculture, forest clearing and forest culture, fishing (and part time farming), hunting zones, poultry farming, livestock and pastoral activity, collection and gathering.

Land degradation in most developing countries is becoming a major constraint to future growth and development [2][3]. About 40-75% of the world's agricultural land's productivity is reduced due to land degradation [4]. Land degradation (soil salinity, acidity, erosion) is the decline in quality of land from the mismatch between land quality and land use [5][6] . It can also be explained by complexity of forest, pastures, woodland and consider the loss or reduction of biological or economic productivity [7]. There is about30percent of forest, 10percent of grassland, and 20percent of cultivated

land across the world that suffers from land degradation related problems and 1.5 billion people are affected by it.

Since ecosystems are so connected, land degradation can have cascading effects across the entire biosphere. Land degradation is erosion, salinization and compaction of soil and can reduce the soil's capacity to regulate water. 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.

As a result of rapid population growth and urbanization in most developing nations, the need for food security has attracted much attention. Although the area of cropland has expanded greatly to significantly increase grain production in the past 50 years, contributing to an approximately 12 percent increase in grain production [8] (Foley et al., 2005), the continuing population growth means this improvement has been unable to guarantee future food security [9]. [10] showed that by 2030, an additional 81 x 10^6 to 147 x 10^6ha of cropland will be needed globally compared to the 2000 baseline, and by 2050, global food needs are expected to rise by 70e110 percent to feed an estimated population of about 11 _ 109 billion people [11] (. Nonetheless, cultivation of this additional land may be undesirable due to its adverse impacts on biodiversity conservation, greenhouse gas emissions, and regional climate and hydrology, and this use would also incur high costs to provide the necessary infrastructure[11] Malnutrition has resulted in death of many of its citizens. African Food Security Briefs (AFSB) estimated that approximately one out of every three persons in the sub-Saharan Africa is undernourished [12].

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 [13]. Decline in chemical, physical and biological properties of soil, biodiversity loss, reduction of availability of portable water, surface water as a lessened volumes, aquifers decline due to lack of recharge, reduced yields, famine, water and food insecurity, population pressure on available land and mass migration are prevalent in the south-south region. Achieving a sustainable economic development in Nigeria and Africa at large will continue to be a mirage without well-nourished and healthy people. The ever increasing gap in the degradation of agricultural land as a result of more erratic rainfall resulting in drought, flooding, rise in sea levels and eroding coastlines alongside poor use of environmentally friendly and socio-economically robust technologies among resource-poor rural households have exacerbated the already fragile natural environments making it more difficult to produce sufficient food to meet the SDG's objective of food security for the ever increasing population [14]. This is further worsened by the competing economic uses of agricultural land have resulted in reduced land to man ratio, reduced fallow periods and the intensification of land-use[15]. This has led to changes in agricultural productivity and food security with increasing land fragmentation and rapid soil degradation resulting in reduced farm yields and income/ expenditure levels, as well as unsustainable use of the productive capacity of the environmental resource base.

The fact that agricultural growth is necessary for food security and agricultural sector contribution to economic growth coupled with the vagaries of land use and degradation, informs our focus on investigating the effect of land use and degradation on agricultural productivity in south-south, Nigeria and to unravel the possible monumental effects of this land use and degradation on agricultural productivity in the aforesaid region that prompted the researchers to asking What the effects of land use and degradation on the agricultural productivity of farm households in the region are. The answer to the question is the objective of this study. In particular, a study of effects of land use and degradation on agricultural productivity is useful to policy makers in formulating policies that will increase the productivity of farmers thus evading the negative effects. Furthermore, while there are several studies on the effects of land use and degradation on the agro productivity, as shown in the literature review section, there is a dearth of regional analysis of this.

The rest of the paper is organized as follows: Literature review is presented in section 2. Data are presented in section 3 while section 4 discusses the empirical model. Results are presented in section 5 while section 6 concludes.

LITERATURE REVIEW

This section examines past and related research studies on effects of land use and degradation on agricultural productivity in south-south, Nigeria with particular interest on data used, the methodology adopted and nature of the effects.

[16] Established that Land degradation is a major development challenge in Central Asia, with negative implications on rural livelihoods and food security using the benefit transfer approach using the Economics of Ecosystems and Biodiversity (TEEB) database [17] based on the values of ecosystem services of the biomes. Using the Environmental Sustainability Index (ESI) and Principal Component Analysis of [18]

[19] using practical framework that integrates geographic information systems (GIS), soil quality assessment and landscape metrics analysis to track and analyze arable land transformations and landscape changes in response to rampant urbanization within the Ningbo region show that arable land loss and degradation have continued, despite the development of a comprehensive legal framework for arable land protection.

[20] using frequency, percentage and mean statistic for 60 farmers in Ethiope East Local Government Area of Delta State, established that 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. If the present diminishing availability of productive land resources continues unabatedly and uncheck mated, then the survival of African population will be seriously threatened as noted by [21]

[22] working with a 112 respondents based on a proportionate sampling technique of 50 percent of the selected villages and using Frequency, percentage and mean score for their study in Anambra State, enumerated the need to include land management and conservation practices into agricultural extension programme (ADP) so that their clientele(farmers) can be equipped and involved practically in conservation/management of land for improved agricultural output and better future.

[23] using time-series data (1962–2017) collected from the Food and Agriculture Organization and World Development Indicators and based on Ng-Perron and the Lee-Strazicich methods for exploring the unit root property of the breaks, Chow test for structural breaks and Gregory and Hanssen's approach for the long-run relationship established that land degradation and climate change have a negative relationship with agriculture production in Somalia. Land degradation leads to the decline in agricultural production as the loss of one hectare of land due the depletion causes agriculture production of Somalia to fall by about five percent.

[24] Collecting samples from ten (10) farmland with the usage of Soil auger for the collection soil samples for laboratory analysis between the depths of 0-15cm (top soil) and 15-30cm subsurface layer established that the greater the soil loss and runoff rates the smaller the cumulative yield. Farmland

All these studies concluded that land use and degradation has deleterious effects of agricultural productivity. However, none has been able to determine the effects of land use and degradation on agricultural productivity in the region, hence the focus of this study.

The Study Area

The study was carried out in South-south, Nigeria as shown in Figure 3. 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 National Population Census [25] put the population of the South-South States at 21,014,655 [26] .South-South Nigeria provides the economic mainstream of the country. The zone has a land area of 97,268square kilometer representing nearly 10.53 percent of the country's total land area. It is located in the southern part of Nigeria and in the rain forest region of the country, and bounded by Kogi, Anambra, Imo, Abia, Ebonyi and Benue States to the north; Atlantic Ocean to the south; Republic of Cameroon to the east and Ondo State and the Republic of Benin to the west. 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. They cultivate staple food crops like rice, cassava, yam and vegetables because of the favourable climatic conditions with tropical rainforest [27]. Also notable among their career lines are civil servants, oil workers, pipe fitters, welders, and sand blasters.

Population and Sample Size Selection Technique

The population of the study was the arable 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).

Validation and Reliability of Instrument

The instrument for data collection in this study was validated by passing it through three experts in the Department of Agricultural Economics, University of Agriculture, Makurdi who gave their independent opinions on the adequacy and relevance of the research instrument to ensure that it possessed both face and content validity. Their observations were harmonized and necessary corrections effected on the instrument before data collection was commenced. More so, its reliability was determined using test re-test method. The research instrument was administered twice to a group of ten (10) respondents within the space of two weeks. The two sets of scores were then correlated to obtain a Pearson's correlation coefficient 0.72, significant at 1 percent which gave the internal consistency of the research instrument.

Method of Data Collection

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 questionnaires were administered with the assistance of Extension workers from Agricultural Development Projects (ADPs) of each State selected for the study. The data collection instrument was focused on land-use and land degradation characteristics, such as: arable land distribution and ownership patterns, land conservation methods and crop production practices; socio-economic characteristics of arable crop farmers; intensity of land degradation; indicators of land degradation; total output; value of output from arable crop production and food security indicators in the study area.

Figure 1: Map of South-South, Nigeria

Source: Calabar Reporters Enterprise, 2019.

Data Analysis Technique: The data collected for this study were analyzed using multiple linear regressions

Multiple Linear Regression Model

Multiple Linear regression models were employed to achieve the objective . The model is specified as follows:

$$Yi = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + \beta_{11} X_{11i} + \beta_{12} X_{12i} + \beta_{13} X_{13i} + \beta_{14} X_{14i} + \beta_{15} X_{15i} + \beta_{16} X_{16i} + \beta_{17} X_{17i} + \beta_{18} X_{18i} + \beta_{19} X_{19i} + \beta_{20} X_{20i} + \beta_{21} X_{21i} + \beta_{22} X_{22i} + e \quad (1)$$

where

Y = Agricultural Productivity (ratio of value of outputs to inputs in Naira)

X_{1i} = Land degradation intensity (Very High Intensity= 4 High Intensity =3, Low Intensity=2 and Very low Intensity=1)

X_{2i}= Fallow rotation index (Fallow Rotation Index, $0<R\geq1$)

X_{3i}= Farm Size (/ha)

X_{4i} = Plant Legumes (Yes = 1, No= 0)

X_{5i} = Bush burning (Yes=1; No = 0),

X_{6i}= Tillage Practice (Complete Tillage = 1,Zero Tillage=0)

X_{7i} = Manner of weeding (Yes = 1, No= 0)

X_{8i} = Frequency of weeding (3 or more times = 1, less than 3 times = 0)

X_{9i}=Irrigation (Yes = 1, No = 0)

X_{10i} = Grazing on Farmland (Yes = 1, No = 0)

X_{11} = Use of Improve variety (Yes=1; No = 0)

X_{12i} = Mulching (Yes = 1, No= 0)

X_{13} = Fertilizer use intensity (kg/ha).

X_{14}= Organic manure (Yes = 1, No= 0)

X_{15i} = Use of herbicides (l/ha)

X_{16i} = Water Channels (Yes = 1, No= 0)

X_{17i} = Plant trees (Yes = 1, No= 0)

X_{18i}= Mounds (Yes = 1, No= 0)

X_{19i}= Plants cultivated (Yes = 1, No= 0)

X_{20i} = Mining activity (1 if there is mining activities on respondent's farmland, and 0 otherwise),

X_{21i}= Land conflict (1 if experienced conflict and 0 otherwise)

X_{22i}= Terrace (1 for practiced terracing, 0 otherwise)

β_1-β_{22} = estimated parameters

e = error term

To ascertain the effects of land use and degradation on agricultural productivity Ordinary least squared multiple regression was estimated. The results are presented in Table 7. The F-statistics (12.417) is significant at 1 percent indicating that overall, land use and degradation has significant effect on agricultural productivity thus the null hypothesis which stated otherwise is rejected. The R^2 indicates that 84.2 percent of variation in agricultural productivity is explained by land use and degradation variables. The result for the intensity/extent of land degradation is significant at 1 percent and it will reduce agricultural productivity by -7.093. The effects include reduction in available arable land for cultivation and decrease in crop yield. It leads to loss of nutrients/organic as perceived by the farmers. Soil loss caused by erosion prompted by poor land use practices could be as large as 15 tons per hectare per year on a bare ploughed soil in Western Nigeria. About 850,000 hectares of land are badly affected annually or rendered useless for agricultural purposes and human settlement. Productivity declines may be due directly to soil degradation, through depletion of soil nutrients, soil toxicity, or soil water holding capacity, or indirectly, through infestation of degraded soils by persistent weeds that reduce yields, land poisoning, fire disaster and heavy rainfall. This agrees with the findings of [1] who asserted that environmental degradation is responsible for poor agricultural productivity.

Fallow rotation was found to be significant at 1 percent and a unit reduction in fallow rotation index will reduce agricultural productivity by -26.911. This could imply that arable farmers in the study area engaged their farmland on permanent and continuous cropping. The short fallow periods could be attributed to population pressure and the use of agricultural land for other developmental programmes such as parks, schools, road and estates construction. This supported the assertion of [28] Osabuomen and Okoedo-Okojie (2011), who noted that, long periods of bush fallow were no longer practiced commonly by farmers, because of population pressure on available land.

Use of Improved Variety: This variable was found to be significant at 5 percent and a unit reduction in the use of it will reduce agricultural productivity by-6.989. This implies that the a decrease in the adoption of the use of improved variety by farmers in the region will reduce their production capacity. This is particularly so because improved variety will help cushioned the deleterious effect of the degraded soil on the crop but when that is not the case the crop become more expose to the vulgaris of degraded soil and this in turn will affect agricultural productivity in the negative.

Fertilizer Use Intensity: The result shows that fertilizer use intensity is significant at 1 percent and a unit increase in the use of fertilizer will reduce agricultural

productivity by -4.816. This implies that the use of fertilizer has been abused by the farmers and has brought about soil nutrients disequilibrium. Thus instead of it contributing to increasing crop yield/productivity it is now reducing the agricultural productivity. Particularly, due to high cost of cultivating it for qualitative agricultural production. Further look at the result also revealed that use of organic manure is significant at 10 percent but negatively influence agricultural productivity by -1.900. This is owing to the fact that excessive and abusive use of organic manure could bring about soil nutrient disequilibrium.

Land Conflict was also revealed by the result to be significant and to have negatively influenced agricultural productivity at 5 percent (-7.254). Lack of ownership and tenure security undermines innovative technology adoptions and deinvestment in land management initiatives. There is inadequate budgetary allocations and lack of poorly articulated regulations on implementation of policies; inadequate capacity to enforce policies as well as lack of commitment and political will undermine management of land degradation. Also, networking is lacking among the stakeholders and there is failure to share vision; there is increased duplication of efforts leading to increased inefficiency and failure to create a critical mass of expertise around land degradation management issues.

Terrace Farming was also revealed by the result to be significant at 10 percent and reduces agricultural productivity by -16.170. This is expected as cultivating on the sloppy land will increase its exposure to erosion which will negatively affect crop production.

Manner of Weeding was significant at 5 percent and a unit increase in the manner of weeding was found to increase agricultural productivity by 4.412. This could be due to the adoption of manual (crude) form of weeding by farmers which helps in the increase of soil nutrient through the decomposition of the weeded grasses left on the farmland which will in turn boost the soil fertility and at the end enhanced crop yield.

Irrigation: The result from the table further revealed that irrigation was significant at 5 percent and positively influenced agricultural productivity by 27.226. This indicates that a unit increase in investment in irrigation and adoption of irrigation practices by more farmers in the region will bring about positive increase in agricultural productivity in the region. This finding aligns with [29] who asserts that irrigation has significant and positive effect on agricultural productivity and food security.

Construction of water channels was also significant at 10 percent and contributed positively to agricultural productivity by 19.222. This implies that with the adoption of better land management practices in the reduction of erosion will bring about a major increase in crop productivity with the attendant reduction in the washing away of the soil nutrient as a result of erosion in the region. So also is the revelation of the result on the use of mound as land management practice significant at 1 percent with attendant positive effect (6.849) on agricultural productivity. Thus signaling that with the adoption of improved land management practices agricultural productivity will significantly improve within the region. There is therefore the need for more extension agents visits to farmers in the region for better enlightenment on the best land management practices that could improve their productivity in the region.

Type of crop cultivated was also found to have significant effect at 1 percent and positive effect (12.398) on agricultural productivity in the region. This is particularly common with the cultivation of deep rooted tree crops like palm trees, rubber plantation whose deep roots helps in holding the soil together thus reducing the level of erosion in the region and boosting oil palm production output significantly.

Table 1: Effects of Land Use and Degradation on Agricultural Productivity

Variables	Coefficient	T	Sig.
Constant	27.957	8.566***	.000
Land degradation intensity	-7.093	-5.169***	.000
Fallow rotation index	-26.911	-11.753***	.000
Farm size	-.189	-.512	.611
Plant legumes	-.545	-.249	.804
Bush burning	-3.752	-1.308	.197
Tillage practice	-2.416	-.692	.492
Manner of weeding	4.412	1.990**	.052
Frequency of weeding	.659	.318	.751
Irrigation	27.226	2.338**	.023
Grazing of farm land	-3.985	-1.318	.193
Use of improved variety	-6.989	-2.495**	.016
Mulching	-.296	-.094	.925
Fertilizer use intensity	-4.816	-3.935***	.000
Organic manure	-17.350	-1.900*	.063
Use of herbicides	9.758	1.588	.119
Water channels	19.222	1.715*	.093
Plant trees	12.398	1.146	.257
Mounds	6.849	3.465***	.001
Plants cultivated	.177	3.906***	.000
Mining activity	1.067	1.092	.280
Landconflict	-7.254	-2.307**	.025
Terrace	-16.170	-1.802*	.078
R^2	0.842		
F	12.417***		0.00

***, **, * = significant at 1 percent, 5 percent and 10 percent levels respectively

Source: Computed from field survey data, 2019

Conclusion:

Arable land is the most indispensable agricultural production input. The intensity of land usage affects land quality, farming systems, ecological conditions, adoption and use of technology, food production and self-sufficiency, and overall environmental condition of the rural farm population. This study concludes that land use

and degradation impacted substantially on agricultural productivity. 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 are key instruments for achieving agricultural productivity and food security in the study area. In other words, poor land use practices among arable farmers is a disincentive to conservation of resources.

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Reference:

[1] Tsue, P.T. (2015). Effects of Arable Land Tenure and Utilisation On Environmental Degradation Among Small-Scale Farmers In North-Central Nigeria. Unpublish 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, NsukkaUchendu, V.C. (1980). State, land and society in Nigeria: A critical assessment of land use decree (1978). *Journal of African Studies*, *6*(2), 71.

[2] Raina, P., Joshi, D.C., and Kolarkar, A.S. Land Degradation Mapping By Remote Sensing in the Arid Region of India. Soil Use Manage. 1991. 7 (1) 47-51

[3] Reddy, V. Ratna. 2003. Land Degradation in India: Extent, Cost and Determinants. Economic and Political Economy. Vol 38, No.44.

[4] IFPRI. 2000 Global study reveals new warning signals: degraded agricultural lands threaten world's food production capacity. IFPRI News Release

[5] von Braun, J. (2013). International Co-Operation For Agricultural Development And Food And Nutrition Security. New Institutional Arrangements For Related Public Goods. WIDER WorkingPaper No. 2013/061.

[6] Fitzpatrick, R. W. (2002). Land Degradation Processes, (84), 119–129.

[7] Stocking, M., and Murnaghan, N. (2003). What is lands degradation? Land Degradation - Guidelines for Field Assessment, 7–16. Retrieved from <http://archive.unu.edu/env/plec/l-degrade/indextoc.html

[8] Foley, J. A., DeFries, R., Asner, G. P., Barford, C., Bonan, G., Carpenter, S. R., et al. (2005). Global Consequences of Land Use. Science, 309, 570. doi:10.1126/science.1111772

[9] 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).

[10] Meyfroidt, P. and Lambin, E.F. (2011).Global Forest Transition Prospect for an end to Deforestation.Annual review of environment and resources. Vol. 36:342-371.doi.org/annurev-environ-090710-143732.

[11]Laurance, W. F., Sayer, J., Cassman, K.G.(2014). Agricultural expansion and its impacts on tropical nature.Trends Ecol. Evol. 29, 107–116 (2014).Li, J, Zhang, Z., Ma, L., Gu, Q., Wang, K., and Xu, Z.(2016). Assessment on the Impact of Arable Land Protection Policies in a Rapidly Developing Region. International Journal of Geoinformation

[12] Akerele, D., Momoh, S., Aromolaran, A., Oguntona, C.R.B. and Shittu, A.M. (2013). Food insecurity and coping strategies in South-West Nigeria.Food Security 5(3). DOI: 10.1007/s12571-013-0264-x

[13] 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

[14] FAO, 2017

[15] FGN 2004

[16] Mirzabaev, A., Goedecke, J., Dubovyk, O., Djanibekov, U., Le, Q.B. and Aw-Hassan, A., (2016).Economics of Land Degradation in Central Asia. In: E. Nkonya et al. (eds.), Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development, DOI 10.1007/978-3-319-19168-3_10.

[17] Van der Ploeg, S. and R.S. de Groot (2010) The TEEB Valuation Database – a searchable database of 1310 estimates of monetary values of ecosystem services. Foundation for Sustainable Development, Wageningen, the Netherlands

[18] Deressa, T., Hassan, R.M. and Ringler, C. (2008). Measuring Ethiopian farmers' vulnerabilityto climate change across Regional States. *International Food Policy ResearchInstitute (IFPRI) Discussion Paper 00806.*

[19] Li, H., Liu, Z., Zheng, L. and Lei, Y. (2011). "Resilience analysis for agricultural systems of North China plain based on a dynamic system model," *Scientia Agricola*, vol. 68, no. 1, pp. 8–17.

[20] 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.

[21]Ezeaku, P.I. and A. Davidson, 2008. Analytical situations of land degradation and sustainable

management strategies in Africa. J. Agric. Soc. Sci., 4: 42-52.

[22]Aniagboso F.N and J.C. Iwuchukwu (2011). Effects of Land Degradation on Agriculture in Anambra State: Issue for Agricultural Extension Policy. Journal of Agricultural Extension. Vol. 15 No. 1 DOI: 10.4314/jae.v15i1.11

[23] Mohamed, A.A. and Nageye, A.I. (2021), "Measuring the effect of land degradation and environmental changes on agricultural production in Somalia with two structural breaks", *Management of Environmental Quality*, Vol. 32 No. 2, pp. 160-174. https://doi.org/10.1108/MEQ-02-2020-0032

[24] Eni, D. I., Upla, J. I., Oko, C.O., Obiefuna,J.N. and Njar, G. N(2010). Effects of Land Degradation on Soil Productivity in Calabar South Local Government Area, Nigeria. European Journal of Social Sciences – Volume 18, Number 1.

[25] National Population Commission, (NPC) (2007). Population Figure. Federal Republic of Nigeria, Abuja. Retrieved from http://www.npc.gov

[26]Emeh, J. U; Isangedighi, A. J; Asuquo, P; Kalu, I; and Ogaboh, A. M., 2011. Curriculum Review: Reactions from education stakeholders in South-South States of Nigeria. *Global Journal of Human Social Science*, 11, 2.

[27] Amnesty International, 2009

[28] Osabueme, J.I and D.U Okogie (2011). Analysis of the Effect of Arable Crop Production Practices among Farmers on Environmental Degradation in Edo State Nigeria. Archives of Applied Science Research 3(2)353-360.

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