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EFFECTS OF POVERTY OF ON LAND USE AND ENVIRONMENTAL DEGRADATION AMONG ARABLE CROP FARMERS IN NORTH CENTRAL NIGERIA

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ABSTRACT

This review examined the effects of poverty on land use practices and environmental degradation among arable crop farmers in Plateau, Benue, Kogi, and Niger states in North Central Nigeria. The Foster Greer Thorbecke (FGT) index revealed poverty head count of 64%, 42%, and 36.67% for Kogi, Plateau and Niger States respectively. For the separate study in Plateau state, the probit regression result revealed that the quantity of wood collected, number of animals allowed to graze and length of time they graze were significant ($P<0.01$). A unit increase in any of these variables would lead to the probability of an increase in the poverty depth of the farmers. But knowledge of natural resource conservation was significant ($P<0.05$) as well as farm size ($P<0.10$) and negatively correlated to poverty. In the case of Kogi State, the variables with significant negative relationship with poverty were farm size ($P< 0.01$), organic manure ($P< 0.10$), cover-cropping ($P<0.10$), and labour use intensity ($P< 0.10$). On the other hand, the coefficient of household size was found to be 0.331948, significant ($p< 0.01$), while mulching had a coefficient 0.827755 ($p< 0.10$). These latter set of variables therefore contribute to the poverty of farmers in the area. The study recommends the improvement of arable farmers' capacity by way of more training on the use of sustainable land use management practices so as achieve environmental sustainability, increase in yield and productivity and reduce the high poverty incidence among farmers in the zone.

1.1 Introduction

Nigerian agriculture, like that of many countries in Africa, contributes greatly to the economy. The sector employs about 60 percent of the labour force and contributed over 40 percent to GDP until recently (Oseni *et al*., 2014; World Bank, 2014*b*; Eboh, 2011). But subsequently, the economy contracted in terms of real growth rate after 2011 (NBS, 2015) and in the case of agriculture both growth rate and sectoral contribution to the nation's GDP was to decline (Table 1). Although, the country relapsed into recession all through 2016 with negative growth rates of -1.98 and – 2.44 for the industry and service sectors respectively and -1.51 for the economy as a whole, the agricultural sector ended on a positive note. Although the sector is made up of four sub-sectors namely crop production, livestock, forestry and fishing, crop production has been the largest and highest contributor to growth (NBS, 2017; Eboh *et al.*, 2012).

Table 1: Sectoral shares and real growth rates in Nigerian GDP for 2011-2016.

Sector	**2011**		**2012**		**2013**		**2014**		**2015***		**2016***	
	Share	Growth	Share	Growth	Share	Growth	Share	Growth	Share	Growth	Share	Growth
Agriculture	22.3	2.9	22.1	6.7	21.0	2.9	20.2	4.3	20.7	3.79	21.1	4.05
Industry	27.8	8.0	26.8	2.2	25.4	2.2	24.2	7.0	29.6	1.55	39.2	-1.98
Services	49.9	5.1	51.1	4.1	53.7	4.1	55.6	6.7	49.8	5.07	39.7	-2.44
Total	100	5.3	100	4.2	100	4.2	100	6.3	100	2.79	100	-1.51

Source: Adapted from the World Bank (2015); NBS 2015 & 2016 (Quarterly GDP Reports)*****.

However the large and persistent gap between agriculture's share in GDP and employment suggests that poverty is concentrated in agriculture and rural areas and that as non-agricultural growth accelerates, many of the rural poor remain poor (World Bank, 2007). Therefore, agriculture and poverty are closely linked. Most of the poor live and work in the agricultural sector and low agricultural productivity and incomes prevent their movement out of poverty (Eboh *et al.,* 2012). But this cannot be allowed to continue. Poverty in the agricultural sector must be addressed especially given its comparatively high multiplier effect on economic growth.

1.2 Agriculture, poverty and environmental degradation

Poverty is a state of deprivation of an individual of the basics of life at a given period and place. Poverty goes beyond lack of income, it entails: "denial of opportunities and choices most basic to human development - to lead a long, healthy, creative life and to enjoy a decent standard of living, freedom, dignity, self-esteem and the

respect of others" (UNDP, 1997). It is estimated that there are 1.2 billion extremely poor people globally. But more worrisome is that majority of these people live in rural areas accounting for as much as 80 percent, and of this, 64 percent work in agriculture - mostly involved in smallholder farming (World Bank, 2016$_{a;}$ World Bank, 2016$_{b}$; Pingali *et al*., 2014). Like in other Sub-Saharan African countries, poverty in Nigeria is more concentrated in the rural areas. For example despite the declining trend in poverty rate, gap and severity for the years 2004, 2011, and 2013 in Nigeria, the figures were higher in the rural areas than in the urban areas (Table 2).

Table 2: Sectoral distribution of poverty in Nigeria for 2004, 2011, 2013

	Poverty rate			Poverty gaps			Severity of poverty		
	2004	**2011**	**2013**	**2004**	**2011**	**2013**	**2004**	**2011**	**2013**
Rural	51.61	46.35	48.49	18.97	14.78	14.8	9.45	6.47	6.16
Urban	34.16	16.69	15.92	10.52	3.83	3.85	4.65	1.33	1.45
National	46.42	35.64	36.19	16.45	10.82	10.66	8.02	4.61	4.38

Source: World Bank (2016$_{b}$)

Poverty and environmental degradation are strongly linked and are conceived as reinforcing each other as explained by the poverty–environment trap model (Barbier, 2010), such that the poor are both agents and victims of environmental degradation (Mailumo *et al*., 2013; Haruna *et al*., 2012; Angelson and Vaino, 1998). Poverty is a major cause and effect of global environmental problems. But poor people are forced to over-use environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain (WCED, 1987).

Agriculture has been a driver for environmental degradation in Nigeria and globally too. For example, in the past two centuries, as much as 27% of the world's tropical forests, 45% of temperate forests, 50% of the savannahs and 70% of natural grasslands have been converted to agriculture, with agriculture being the major driver for deforestation worldwide, leading to the large share of GHG emissions (UN, 2013). Under this context, Nigeria was ranked first among the first ten countries with the highest rate of deforestation in the world having lost 8 million ha of land during the period (1990-2010) which is about 10% of its total land area (FAO, 2012).

This review intended to examine the poverty indices of arable farmers, their land use/management systems, and environmental degradation in North Central Nigeria. The empirical works of: Mailumo *et al* (2013), Tsue *et al* (2014), Sadiq and Kolo (2015), and Alawode *et al* (2016) was the framework of the review.

2.1 Demography of North Central Nigeria

North Central Nigeria consists of six states namely, Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau, as well as the Federal Capital Territory (FCT). The zone has a land area of 296, 898 km2 representing nearly 32 percent of the country's total land area (Tsue *et al*., 2014). The population mean age is 24 years, and half of it is between the ages of 9 and 37. Seventy-nine percent (79%) of households in the North Central zone use firewood as their main cooking fuel (World Bank and NBS, 2018).

2.2 Agricultural land use/management

The farmers in the study area adopted different agricultural land use practices in multiple combinations (Table 5) based on the study by Tsue *et al.* (2014). Although there were differences in the percentage of adoption based on the work Alawode *et al.* (2016) this is understandable because the latter covered only Kogi State.

Table 3: Percentage distribution of respondents by land-use management practices (n= 356)

Land use practice	*Frequency	*Percentage (%)
Intercropping	240	67.4
Bush clearing/burning	162	45.5
Complete tillage	296	83.2
Zero tillage	60	16.9
Irrigation	48	13.5
Improved seed	293	82.3
Cover cropping	245	68.8
Mulching	182	51.1
Fertilizer application	339	95.2
Manure use	147	41.3
Herbicide application	329	92.4
Tractorization	59	16.6
Mining activity	72	20.2

*Multiple responses
Source: Tsue *et al.* (2014).

2.3 Poverty indices

The Foster-Greer-Thorbecke (FGT) index was used in the four empirical studies for profiling poverty in the study area. It has a group of three measures, namely; poverty incidence/ rate, poverty gap, and poverty severity.

These measures have become the standard for international evaluations of poverty, by the World Bank, other UN agencies, and by individual countries (Foster, Greer and Thorbecke, 2010).

In Table 4, the poverty indices for Plateau, Kogi and Niger States are presented. The poverty indices in Plateau as presented are higher than that of Niger State. The poverty incidence in particular is higher than the North Central figure of 34, reported by the World Bank (2014).

Table 4. Summary of Poverty Indices

Poverty Index	**State**		
	Plateau	Kogi	Niger
Poverty Head count(P_0)	0.42	0.64	0.37
Poverty Gap (P_1)	0.21	0.21	0.18
Poverty Severity (P_2)	0.11	0.09	0.09

Source: Adapted from Tsue *et al*. (2014); Sadiq and Kolo (2015) & Mailumo *et al.* (2013).

2.4 Environmental sustainability (ES)

Measuring environmental sustainability is based on the understanding that the benefits of development are rarely evenly distributed and negative externalities of development on the environment and on the existing social structure often exist (Harris, 2000).

Tsue *et al*., 2014) in three states of Central Nigeria arrived at an environmental sustainability index (ESI) mean score of 16.38, with farmers from the Kogi (16.83) and Plateau (18.44) States having values above that average (Table 5) while farmers from Benue State had an average score of 13.82, which fell below the average for the full sample. Furthermore, the result of the analysis of variance showed a significant difference ($F = 28.28$; $p < 0.01$) in the ESI among the three states, implying that the capacity of the farmers to sustain the environment differed across these states.

Table 5: Descriptive Statistics of Environmental sustainability indices

Study area	N	Minimum	Maximum	Mean	ANOVA
Full sample	356	-0.41	28.09	16.38	
Kogi state	119	0.03	24.22	16.83	
Benue state	117	-0.41	25.57	13.82	28.28*
Plateau state	120	6.62	28.09	18.44	

*= F statistics at 1% level of significance
Source: Tsue *et al*. (2014)

2.5 Determinants of poverty among arable crop farmers

Sen (2013) and the World Bank (2003) noted that although environmental degradation is largely attributable to anthropogenic factors, with the poor contributing significantly to environmental degradation, but poverty itself

is often brought about by increased vulnerability and a lack of choices or freedom to pursue individual needs, insecurity or uncertainty of tenure, gender-based discrimination, or sudden external shocks. Studies in Central Nigeria corroborated this.

Mailumo *et al.* (2013) discovered that the poverty incidence of 0.42 (or 42%) in Plateau State (Table 6) correlated with land degradation practices and factors such as the quantity of wood collected, number of cattle that graze on farm lands, and duration of graze per week were all significant ($p< 0.1$), while knowledge of natural resource conservation and size of farm land were also significant at ($p< 0.5$) and ($p< 0.01$) respectively.

Table 6: Probit regression model of poverty level and factors that lead to environmental degradation in Plateau State.

Variable	Coefficient (b)	SE	Z-Value (B/SE)
Constant	0.75749467**	0.33608819	2.254
Quantity of wood(X_1)	0.04037402*	0.01060034	3.809
Grazing cattle (X_2)	0.25454326*	0.06577105	3.870
Fallow period (X_3)	-0.00057963	0.00091197	-0.636
Knowledge of Conservation (X_4)	-0.46295710**	0.19365504	2.391
Duration of graze (X_5)	0.13921086*	0.04049574	3.438
Farm size (X_6)	-0.04097757***	0.02341766	-1.750
Log-Likelihood = -128.6677			
McFadden Pseudo R-Squared = 0.6215161			
P-Value = 0.00011			

Note: *, **, *** = Significant @ 10%, 5% and 1% respectively
Source: Mailumo *et al.* (2013).

This trend was similar to findings of Tsue *et al.* (2014) who assessed the effects of arable land tenure and use on environmental sustainability in North-Central Nigeria which revealed on table 9 that changes in the environmental sustainability index (ESI) were 75 percent accounted for by the effects of arable land use and farmer-related factors (as given by the R^2 value, 0.759).

Table 7: Parameter estimates of some arable land use factors/practices affecting environmental sustainability in North-Central Nigeria

Variable	Linear	Exponential	Double Log
Constant	5.91(4.17)***	1.39 (4.57)***	1.46 (8.53)***
Education	0.40 (13.01)***	0.04 (5.96)***	0.10 (9.72)***
Farming experience	0.05 (3.35)***	0.002 (0.68)	-0.05 (-1.17)
Extension contact	0.07 (3.03)***	0.01 (1.85)	0.003 (0.36)
Crop diversification	0.34 (2.74)***	0.02 (0.86)	-0.05 (-0.89)
Farm size	0.93 (10.16)***	0.05 (2.75)***	0.06 (0.92)
Cropping intensification index (CII)	0.03 (0.10)	0.003 (0.04)	-0.03 (-0.46)
Irrigation use	1.77 (3.89)***	0.13 (1.30)	0.11 (1.57)
Fallow rotation index (FRI)	0.81 (0.76)	0.38 (1.67)	0.01 (0.10)
Bush burning	0.28 (0.96)	0.10 (1.68)	0.09 (2.03)**
Tree planting	3.13 (7.40)***	0.19 (2.07)**	0.11 (1.63)
Quantity of fertilizer	0.35 (7.84)***	0.04 (4.44)***	0.20 (15.87)***
R^2	0.759	0.359	0.658
Adjusted R^2	0.747	0.327	0.639
F-statistics	62.62	11.15	37.94
Prob>0.00	0.00	0.00	0.00

Note: *** and ** denote t-test (in parenthesis) at significant levels of 1% and 5% respectively.
Source: Adapted from Tsue *et al.* (2014)

In the case of the study by Alawode *et al*. (2016), the socio-economic characteristics: household size and farm size positively and negatively contributed to poverty respectively at 1% level of significance. While organic-manuring and cover-cropping had reducing effects on poverty, mulching just like labour-use intensity had the reverse effect at 10% level of significance.

Table 8: Probit regression showing the relationship between poverty and agricultural intensification in Niger State

Variables	Coefficient	Standard error	Z value (b/se)	P value
Constant	-0.170593	0.968413	-0.18	0.860
Level of education	-0.105232	0.100337	-1.05	0.294
Household size	0.331948***	0.059886	5.54	0.000
Farm size	-0.651942***	0.113566	5.54	0.000
Access to credit	-0.072393	0.236602	-5.74	0.000
Bush burning	0.214388	0.258137	-0.31	0.760
Crop rotation	0.119799	0.277105	0.83	0.406
Organic manure	-0.463504*	0.276622	0.43	0.666
Zero tillage	0.604186	0.455990	-1.68	0.094
Cover crops	-0.541516*	0.252736	-2.14	0.032
Mulching	0.827755*	0.350679	2.36	0.018
Land use intensity	0.959404	0.960092	1.00	0.318
Fertilizer use intensity	-0.566984	3.114212	-0.18	0.856
Labour use intensity	0.016772*	0.009721	-1.73	0.084
Log- likelihood = -96.914561				
McFadden Pseudo R-squared = 0.3090				
P-Value (chi square) = 0.0000				
Chi square value = 86.68				

Note: ***, * = significance @ 1% and 10% respectively
Source: Alawode *et al.* (2016).

3. CONCLUSION

This review disclosed poverty incidences 64 %, 42%, and 36.67% in the North Central states of Kogi, Plateau and Niger. This indicates the need for more concerted effort to move more of the farming population out of poverty in line with the Sustainable Development Goal (SDG) 1. The correlation established between some agricultural land use/ management practices and poverty underscore their relevance as key instruments for achieving environmental sustainability, increase in yield and productivity and addressing the high poverty incidence among farmers.

This review recommends that:

i. Farmers should be sensitized on best sustainable land management practices to adopt in order to improve their standard of living;
ii. There should be strong advocacy on the need for every community to own its woodlot and to embrace agro-forestry as a way of reducing the effect of indiscriminate wood felling;
iii. Policies should be made that will develop and promote input-intensive agricultural technologies in enhancing agricultural yields and reducing labour demands for production will go a long way.
iv. There is need to mainstream environmental sustainability into rural development process (such as changes in crop management practices like: small scale irrigation projects, increased fertilizer usage, increased tree planting and increased farm size);

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