



EFFECTIVENESS OF CROP FARMERS' USE OF INDIGENOUS KNOWLEDGE ON LAND DEGRADATION CONTROL PRACTICES IN IMO STATE, NIGERIA

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ABSTRACT: *This study analyzed the effectiveness of the crop farmers' use of indigenous knowledge on land degradation control practices in Imo State, Nigeria. A multistage sampling procedure was used to select 180 crop farmers for the study. Data were collected using a structured questionnaire and analyzed using mean, percentages, and multiple regression analysis. Crop farmers perceived zero tillage to help in conserving soil texture ($\bar{x}=3.52$), replanting of deforested areas enables them to maintain vegetative cover ($\bar{x}=3.45$), use of organic manure to improve soil's organic matter contents ($\bar{x}=3.42$) and controlling both water and wind erosions by making ridges ($\bar{x}=3.30$) and rainwater harvesting ($\bar{x}=3.10$) as highly effective in controlling soil degradation. Age, marital status, educational level, household size, monthly income, membership of association, extension contact and farm size) They significantly influenced their perceived effectiveness of using indigenous knowledge on land degradation control. The major constraints faced by crop farmers were inadequate funds to practice land degradation control practices (99.44%) and limited availability of farmland (98.31%), poor extension contact (86.44%), poor knowledge and education of land degradation control processes (86.44%), poor government support (81.92%) and poor access to information (75.14%). The study concludes that crop farmers experienced soil degradation and were practicing indigenous land degradation, although some factors constrained them. Therefore, crop farmers should come together to transform their indigenous knowledge and control practices, thereby discussing and looking for the best way to tackle their peculiar land degradation challenges.*

KEYWORDS: Crop farmers, Indigenous knowledge, land degradation, control practices, constraints.



INTRODUCTION

One of the greatest assets that a community has is indigenous knowledge; it is local knowledge that is unique to a particular society or culture and forms the basis for local-level decision-making in agriculture (Thompson et al., 2020). Ruskin (2020) defined indigenous knowledge as generally the type of knowledge taken to cover local, traditional, non-western beliefs, practices, customs and world views, and frequently also to refer to alternative, informal forms of knowledge from the onset indigenous people have had their peculiar means and ways of meeting the basic needs of life. Besides the instinct to survive, indigenous actions and tendencies can also be influenced by realities around the immediate community (Beatrice et al., 2020). Meanwhile, the peculiarities of the soil in the Southeast region of Nigeria make the area highly vulnerable to soil erosion and such causes the greatest form of land degradation to crop production, especially in erosion (Merem et al., 2019).

Some indigenous land degradation control practices deployed by farmers to boost crop production include cover cropping, organic farming, tree planting, minimal tillage, use of weaker walls, and changing planting and harvesting dates in light of climate change (Mohammad et al., 2020). Rotation of farmland at an average of two years leaves the bush without going through the fallowing process and a sufficient length of time. The continuous cultivation of land can be devastating as most lands do not grow trees but shrubs. The increase in bush burning has been a remarkable threat to land and homes are even ravaged and devastated. Indigenous knowledge of land degradation control is aimed at increasing crop yield output at the community level; a starting point is to understand farmers' thoughts and perceptions of their current management practices (FAO, 2021). Identifying and understanding indigenous practices applied by crop farmers in the study area is critical in appreciating features that make them effective and relevant in this modern time, or identifying attributes that discontinued the use of contemporary land degradation control practices (Rayne et al., 2020). Farmers' experiences, local knowledge and indigenous practices are necessary resources that should be developed with scientific knowledge (Latulippe and Klenk, 2020).

Through extension education, crop farmers are sensitized to the implications of their actions. The failure of Imo ADP extension services, according to Okoroma and Aneto (2013), is due to the widening extension of the agent-to-farmer ratio, which stands at 169 extension agents for millions of farmers. This makes it almost impossible for crop farmers in Imo State to be reached with extension education. Land degradation control should be given urgent attention because land degradation brings multiplier effects on the socioeconomic activities of the people (Sara and Satya, 2020). Imo State has a high population density, and most households, particularly in rural areas, depend primarily on the output of land and other natural resources to sustain. The high population or lowland per capita has intensified pressure on land, forest, and other natural resources, contributing to the increasing natural resources degradation in the State (Imo State Ministry of Environment, (ISME, 2011). Most worrisome is that modern land degradation control measures are not affordable. However, land indigenous control measures offer farmers more affordability, availability, and local content. Against this backdrop, this study was designed to systematically analyze the effectiveness of the crop farmers' use of indigenous knowledge on land degradation control practices in Imo State, Nigeria.



The research, therefore, analyzed the effectiveness of crop farmers' use of indigenous knowledge on land degradation control practices in Imo State, Nigeria. Specifically, the study ascertained crop farmers' awareness of land degradation; identified various indigenous knowledge on land degradation control practices used; assessed the perceived effectiveness of the use of the indigenous knowledge on land degradation control practices; ascertained constraints militating against the use of indigenous land degradation control practices by the crop farmers and determine the influence of socio-economic characteristics of crop farmers on the perceived effectiveness of the use of indigenous knowledge on land degradation control in the study area.

RESEARCH METHODOLOGY

The study was carried out in Imo State, Nigeria. Imo State is located in the eastern zone of Nigeria. The State lies between Latitudes 4°45'N and 7°15'N and Longitude 6°50'E and 7°25'E (Nigerian Meteorological Agency (NiMET), 2016). Crop production constitutes a significant source of livelihood for farmers in the State. Major arable crops cultivated in the area include cassava, yam, maize, and rice, amongst others and this constitutes the reason for the selection. The study used a multistage sampling procedure to select one hundred and eighty (180) crop farmers. Firstly, the State's three agricultural zones (Owerri, Orlu and Okigwe) were purposely selected for adequate coverage. The second stage involved randomly selecting four Local Government Areas (LGAs) from the selected zone. The third stage involved a random selection of three communities. Fourthly, five crop farmers were randomly selected to give a total sample size of one hundred and eighty (180) crop farmers for the study. However, after the socio-economic data collection and proceeding to data on awareness of crop farmers on land degradation, the finding shows that only 177 crop farmers were aware of land degradation. They were subsequently used in the analysis of other objectives of the study other than the socio-economic variables.

Primary data were collected with the aid of a structured questionnaire. The study utilized descriptive and inferential statistical tools to analyze the data for the study. Specifically, descriptive statistical tools such as frequency distribution, percentages and mean were used to realize the objectives. Specifically, a 4-point Likert-type rating scale was used to obtain data on the perceived effectiveness of the use of indigenous knowledge on land degradation control practices by the crop farmers and then divided by the number of scales to obtain the discriminating index, e.g. $(4+3+2+1)/4 = 2.50$ cut-off point., Very Effective (4); Effective (3); Less Effective (2) and; Not Effective (1). The decision rule is that a mean score of 2.50 and above indicates agreement with the statement, while a mean score of less than 2.50 posits disagreement. In the same way, the null hypothesis was modeled using multiple regression. The explicit form of the model is stated as follows:

$$Y = f(X_1, X_2, X_4, X_5, X_6, X_7, X_8, X_9, e_i)$$

Y = Perceived Effectiveness of the use of the Indigenous knowledge on Land Degradation Control Practices Used (Total Rating Score).

X₁ = Age (years)

X₂ = Sex (Male = 1, Female = 0)



X_3 = Marital status (married =1, unmarried = 0)

X_4 = Educational level (Number of years spent in school)

X_5 = Household size (Number of persons)

X_6 = Monthly Farm income (Naira)

X_7 = Membership of farmers' association (member = 1, non-member = 0)

X_8 = Extension contact (number of visits)

X_9 = Farm size (hectares)

e_i = error term

RESULTS AND DISCUSSION

Crop Farmers' Awareness of Land Degradation Menace

Results in Table 1 show that more significant percentages (98.33%) of farmers were aware of the menace of land degradation. The finding implies that the issue of land degradation menace is evident as some of the causes such as deforestation, bush burning, overgrazing by livestock and continuous cropping over time amongst others usually predominate in the area. The finding aligns with the study of Huang et al. (2020), who reported that awareness of causes, consequences, and preventive measures of land degradation is crucial for an increase in farm yield, income and standard of living. Ultimately, the number of crop farmers (177) aware of the land degradation menace as found in this present objective was used to analyze the subsequent objectives of the study.

Table 1: Distribution of the Farmers by Awareness of Land Degradation Menace

Awareness	Frequency	Percentage (%)
Yes	177	98.33
No	3	1.67
Total	180	100.0

Source: Field Survey Data, 2023

Various Indigenous Land Degradation Control Practices Used

Result entries of various indigenous land degradation control practices used in the area are computed in Table 2. The crop farmers majorly identified Zero tillage (98.87%), tree planting (97.18%), zero bush burning (94.92%), intercropping (93.22%) and rainwater harvesting (92.09%) as some of the various indigenous land degradation control practices used in the area. In the same way, depending on early warning signs (90.40%), crop rotation (89.27%), fetching feeds for my farm animals to reduce overgrazing (89.27%), maintaining gap in cropping pattern during the rainy season (83.05%), alley cropping (76.27%), crop residue and natural grass cultivation (73.45%) were reported by the crop farmers. The result shows that farmers understand the havoc associated with land degradation and measures to reduce it.



According to Mohammad et al. (2020), a greater proportion of farming households with limited farmland and do not effectively and efficiently manage the available farmland, may over-exploit farmland, consequently leading to degradation. This could further be exacerbated, mainly when the farmers are illiterate and lack various indigenous land degradation control practices. However, from the findings, it becomes evident that the crop farmers had good knowledge of land degradation and may have been effectively practicing the different forms of indigenous land degradation control measures to maintain infiltration, safe-disposal of runoff on their farms and increase crop yield, income and standard of living in the area.

Table 2 Various Indigenous Land Degradation Control Practices Used

S/No	Items	*Frequency	Percentage (%)
1	Zero tillage	175	98.87
2	Tree planting	172	97.18
3	Zero Bush Burning	168	94.92
4	Intercropping	165	93.22
5	Rainwater harvesting	163	92.09
6	Depending on early warning signs	160	90.40
7	Crop rotation	158	89.27
8	Fetching feeds for my farm animals to reduce overgrazing	154	87.01
10	Maintain gap in cropping pattern during rainy season	147	83.05
11	Alley cropping	135	76.27
12	Crop residue and natural grass cultivation	130	73.45
13	Shifting cultivation to less continuous cropping	62	35.03
14	Improving drainage and water channels in around farms	19	10.73

*Multiple responses were recorded; Source: *Field Survey Data, 2023*

Effectiveness of the Use of Indigenous Knowledge on Land Degradation Control Practices

The result in Table 3 reveals that crop farmers rightly perceive the effectiveness of using indigenous knowledge on land degradation control practices. Crop farmers perceived zero tillage to help in conserving soil texture as highly effective ($\bar{x}=3.52$), also controlling both water and wind erosions by making ridges ($\bar{x}=3.30$) and rainwater harvesting ($\bar{x}=3.10$), which were accepted implying that farmers perceived them as being effective in controlling degradation. The study of Amangabara et al. (2018) found a similar result. More so, replanting of deforested areas to maintain vegetative cover ($\bar{x}=3.45$) and use of organic manure to improve soil's organic matter contents ($\bar{x}=3.42$) were also helpful and effective practices in land degradation control as identified by the farmers. The study of Obiechefu et al. (2020) shares a view with the same findings. Finally, the aggregate mean ($\bar{x}=3.45$), which is above the discriminatory score ($\bar{x}\geq 2.50$), shows that the crop farmers rightly perceived the effectiveness of the use of indigenous knowledge on land degradation control practices and their perceptions are therefore accepted in the area.



Table 3: Effectiveness of the use of Indigenous knowledge on Control of Land Degradation

S/n	Items	Mean	SD
1	Bush fallowing helps us replenish soil nutrients	3.43	0.90
2	Use of organic manure improved our soil's organic matter contents	3.42	0.92
3	Replanting of deforested areas enables us maintain vegetative cover	3.45	0.96
4	Forest conservation ensures that the eco-system is not lost	3.35	0.87
5	Ridging across the slope helps us check surface erosion	3.30	0.85
6	Underground water harvesting enables us remove runoff water and harnessed into irrigation water	3.10	0.80
7	Zero tillage helps us conserve soil texture for enhanced performance	3.52	0.98
8	Construction of water channels are used to manage runoff to avoid flooding and erosion	3.32	0.82
9	Use of sand filled bags in checking runoff makes it easy to control erosion	3.35	0.86
10	Grassing of waterways enhances soil texture and check flooding	3.33	0.94
11	Cover cropping checks loss of soil water leading to drought	3.26	0.92
	Aggregate Mean Score	3.45	0.87

Discriminatory index: *Cut off point $\bar{x} \geq 2.50$ Agreed; Field Survey Data, 2023*

Constraints militating against the use of Indigenous Land Degradation Control Practices

Findings of constraints militating against the use of indigenous land degradation control practices in the area are shown in Table 4. The major constraints faced by crop farmers were inadequate funds to practice land degradation control practices (99.44%) and limited availability of farmland (98.31%), poor extension contact (86.44%), poor knowledge and education of land degradation control processes (86.44%), poor government support (81.92%) and poor access to information (75.14%). When farmers lack access to extension agents, they will lack information, education and knowledge of land degradation control processes. Agricultural extension is necessary to advance innovation and farmers' standard of living (Sahya et al., 2021). The study of Babagana et al. (2018) also stated that a farmer's level of education is essential in determining their ability to understand policies or programs that affect farming and to accept and adopt agricultural innovations.



Table 4: Constraints militating against the use of Indigenous Land Degradation Control Practices

S/No	Items	Frequency	Percentage(%)
1	Inadequate fund to practices land degradation control practices	176	99.44
2	Limited availability of farmland	174	98.31
3	Poor extension contact	153	86.44
4	Poor knowledge and education of land degradation control processes	147	83.05
5	Poor government support	145	81.92
6	Poor access to information	133	75.14
7	High cost of labour	130	73.45
8	Poor varieties of crops	124	70.06
9	Unavailability of land degradation control materials	110	62.15
10	Growing old/Ageing	87	49.15%
11	No respect to land/custom laws (Urbanization)	75	42.37%
12	Poor infrastructural development	69	38.98%

*Multiple responses were recorded; Source: *Field Survey Data, 2023*

Influence of Crop Farmers' Socio-economic Characteristics on Perceived Effectiveness of the Use of Indigenous Knowledge on Land Degradation Control

Findings on the influence of crop farmers' socio-economic characteristics on the perceived effectiveness of the use of indigenous knowledge on land degradation control in the area are compiled in Table 5. An Ordinary Least Square (OLS) multiple regression analysis was estimated in four functional forms (linear, semi-log, double log, and exponential forms). Based on the statistical significance of the coefficients, and the goodness of it that supports the socio-economic model, the linear regression function was chosen as the lead equation. The linear regression function was selected as the lead equation based on the values of R² (0.837) and F-Ratio (14.640), and it was statistically significant at a 1% probability level. Conformity of the signs with a priori expectations of the model and has the highest number of significant explanatory variables. This implies that crop farmers socio-economic characteristics (age, marital status, educational level, household size, monthly income, membership of association, extension contact and farm size) had a significant influence on their perceived effectiveness of the use of the indigenous knowledge on land degradation control in the area and that the regression model has a very high explanatory power. In addition, this indicates that the socio-economic variables statistically explained 83.70% of the variation in the perceived effectiveness of the use of indigenous knowledge on land degradation control in the area. In comparison, the stochastic variables explained the remaining 20.30%. This implies that crop farmers who are older, married, more educated, have a high household size, earn a higher income, belong to an association, have extension contact and have large farm sizes are more likely to perceive the effectiveness of using indigenous knowledge on land degradation control.

The study shares a view with the finding of Ewetola et al. (2021), who reported that an improved level of education brings about positive changes in knowledge, attitude and skills through research and extension services of the farmers. Kehinde et al. (2021) found that large



household size is a proxy for labour availability and farm expansion. Mohamed and Nageye (2021) opined that farmers with higher farm incomes will make better decisions and use necessary productive inputs efficiently to realize huge yields/outputs and other farm objectives compared to their counterparts with low farm incomes. The finding is also supported by the result of Olagunju et al. (2021), who found out that farmers' association members benefit from bargaining power, information flow, collective farm inputs and labour and economics of scale. Sahya et al. (2021) asserted that effective agricultural extension is perceived as one of the most important keys to advancing farmers' innovation and development. Ajanaw et al. (2021) revealed that the large farm size increases farmers' use of several indigenous practices to improve their crop yield and income.

Table 5: Estimated Influence of Crop Farmers' Socio-economic Characteristics on Effectiveness of the Use of Indigenous Knowledge on Land Degradation Control

Explanatory Variables	Linear	Semi-Log	Double-Log	Exponential
Constant	2.916 (25.078)**	3.975 (21.221)**	19.588 (8.710)**	12.337 (5.121)**
Age (X ₁)	-0.001 (-3.245)**	-0.018 (-1.751)	0.045 (3.216)**	-0.063 (-0.762)
Sex (X ₂)	0.091 (0.012)	-0.765 (-0.279)	2.139 (0.421)	0.181 (2.089)*
Marital Status (X ₃)	0.045 (5.455)**	-0.082 (-0.148)	-4.703 (-0.995)	0.747 (2.396)*
Educational Level (X ₄)	0.012 (3.943)**	0.057 (2.817)**	0.076 (2.129)**	0.039 (0.165)
Households Size (X ₅)	0.005 (2.137)*	0.018 (2.097)*	0.084 (0.052)	0.343 (2.131)*
Monthly Farm Income (X ₆)	2.131E-005 (3.745)**	2.941E-005 (2.425)**	-0.001 (0.394)	-8.170E-005 (-0.348)
Membership Of Social Association (X ₇)	0.032 (2.159)*	0.609 (0.875)	8.201 (1.388)	0.574 (0.243)
Extension Contact (X ₈)	0.044 (3.483)**	0.627 (1.214)	0.798 (3.182)**	1.436 (2.821)*
Farm Size (X ₉)	0.123 (4.573)**	0.200 (0.448)	0.949 (2.251)**	0.802 (1.533)
R ²	83.70	62.80	59.60	71.20
F-Ratio	14.640**	12.534**	10.495**	8.829**

Source: Computer Printout of SPSS (2023); values in Parenthesis are t-values *Statistically Significant at 5%; ** Statistically Significant at 1%



CONCLUSION AND RECOMMENDATION

The findings established that land degradation has negatively affected crop farmers' production. Crop farmers have started practicing and giving preference to indigenous measures such as zero tillage, tree planting and depending on early warning signs, amongst others, to thwart its negative effect. The crop farmers had their methods of controlling land degradation, thereby exposing the relevance of indigenous knowledge systems in agricultural development. Farmers reported that the practice of bush fallowing is effective in soil nutrient replenishment, replanting of deforested areas is effective in the maintenance of vegetative cover and zero tillage helps them to conserve soil texture for enhanced performance amongst others. However, crop farmers were majorly constrained by inadequate funds to practice land degradation control practices, limited availability of farmland and poor knowledge and education of land degradation control processes, amongst others in the area. Therefore, the study recommends that crop farmers come together to transform their indigenous knowledge and control practices, thereby discussing and looking for the best way to tackle their peculiar land degradation challenges. Also, since extension contact is significant to the increase in the use of indigenous knowledge on land degradation control practices, extension agents should intensify training and environmental farming to maximize their efforts in land degradation challenges.

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