SOIL DEGRADATION CAUSES AND EXTENT ECONOMICS: FARMER-PERSPECTIVE ANALYSIS

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Abstract

Soil is the most important of earth's natural resources because it hosts both animate and inanimate beings. This study assessed farmer's perception about the possible soil degrading causes and extent; identified the effectiveness-extent via farmers perception of soil degrading prevention and control practices applied in the study area. From the results, 9.2% of the respondents earn between 410001-590000, 8.3% earn in the range of 590001 to 770000 naira, 4.2% earn between 7700001-950000. 5.8% earn between 950001-1130000, 3.3% earn 1130001-1310000, 1.6% earns between 1310001-1670000, 1.7% earn above 1670000 while 1.7% earn 50000. Likert scale rating showed the possible causes of soil degradation as rain (3.79), deforestation (3.29), slope of the farm (3.15), poor road construction (3.15), overgrazing (2.68) and population density (2.93). Thus, government should improve on extension services for effective dissemination of agricultural and soil degrading prevention and erosion control technologies.

Keywords: Soil erosion; soil degradation; agricultural technologies; farmers' perceptions

Introduction

Land degradation has been a significant global issue since the 20th century and remains of high importance in the 21st century as it affects the

environment, agronomic productivity, food security and quality of life (Eswaran et al., 2001). Soil is the most important of earth's natural resources because it hosts both animate and inanimate beings. Consequently, over three quarters of the world's man-made developments are on soil. Soil existence is the basis for the performance of most disciplines of the world. Most earth's natural resources are directly linked to or found in the soil (Okin, 2001). Therefore, threat to soil is threat to life.

Soil degrading processes include the loss of topsoil by the action of water or wind, chemical deterioration such as nutrient depletion, physical degradation such as, compaction and biological deterioration of natural resources including the, reduction of soil biodiversity (Lal, 2001). Soil erosion is the wearing away of the land surface by physical forces such as rainfall, runoff water, wind, ice, temperature change, gravity or other natural or anthropogenic agents that abrade, detach and remove soil or geological material from one point on the earth's surface to be deposited elsewhere (Jones, 2007). Thomas et al. (2003) further explained that erosion can be "geologic" or "accelerated". Geologic erosion is naturally on-going within the earth crust such that the erosion rate is so slow and its effect is of less importance to human beings. But, accelerated erosion is caused by human-beings at so high erosion rates that it has resulted in diverse focus by soil scientists and scholars in related disciplines.

The expansion of agriculture into marginal areas, deforestation, the shortening or elimination of fallows, inappropriate farming practices, and low input inevitably have several environmental and economic impacts, especially in, sub-Saharan Africa where the resilience ability of the soil is limited (Lal, 2001). This expansion of agriculture causes onsite degradation of natural resources and productivity decline. Hence, low agricultural production, food insecurity, low income of the rural population and poverty are some consequences of soil erosion. Avoidance of soil loss by improved management and the conservation of natural resources are therefore

important to maintain the functions of the soil and contribute to food security today and for future generations (Ehui and Pender, 2005).

In the earliest crude years and era, people excavated soil for constructions and with time, these soil-excavated sites became channels for run-off rainwater that produced deep and wide canyons. In other words, some gullies have existed for more than a century and new ones are springing up daily. Post-70s, similar soil-excavated gully cases were been recorded in parts of the world although, some have been brought under control (Owens et al., 2000).

In Nigeria, increased development activity have since constituted a major ecological problem in parts of Southeastern Nigeria. Dugout pits created from soil excavation activities have, produced deep craters and gullies due to perennial erosion from torrential tropical rains. For instance, in year 2005, the inhabitants of Umuchiani, one of the villages that make up Ekwulobia community in Anambra state were woken up at night by a noise only to find some houses at the edge of the village giving way to landslide. They deserted their homes, taking refuge in nearby forests and villages. By the time they returned to their village the following morning several, houses, a church and some roads were washed away. Their farmlands, palm and cash-crop cashew trees were not spared either. This condition inflicted great losses in crop land potentials, crop quality potentials, biodiversity, genetic resources as well as field fragmentations. Though nobody died in the incident, more than 250 families (made up of more than 1,500 persons) were displaced (Olori, 2006). Again, the percentage of agriculture farmer population in and around the areas of Anambra, south-eastern Nigeria is estimated at about 85% with farmer populations that live in rural areas and depend on agriculture to earn a livelihood (Duvel et al., 2003). Thus, the need to investigate farmer-perspectives on soil degradation causes and extent.

Again, human activities involving deforestation, overgrazing, intensive cultivation, soil mismanagement, tillage, and urbanization

accelerate soil degradation hazard (Lal, 2001). Accelerated soil degradation causes both "on-site" and "off-site" problems. On-site impacts include decreases in agricultural productivity and ecological collapse both because of, loss of the nutrient-rich upper soil layers. In some cases, the eventual end result is desertification. Off-site effects include sedimentation of waterways and eutrophication of water bodies as well as, sediment-related damage to roads and houses (Blanco and Lal, 2010; Troeh et al., 2004). Intensive agriculture, deforestation, roads, anthropogenic climate change and urban sprawl are amongst the most significant human activities in this regard that impact on cum stimulate soil degradation (Julien, 2010). It is therefore imperative that farmers' perception about the negative impact of soil degradation as it affects agricultural production be sought and studied. In lieu, perception has a great influence on the type of behavior displayed by farmers. Thus, Duvel (2003) posit that top reason lingering the many unresolved agricultural problems especially tied to inappropriate adoption of agricultural technologies by farmers' is rooted in the perceptions-behavior of farmers. Thus, the need to investigate farmer-perspectives on soil degradation causes and extent.

Methodology

The study area is Anambra state. It has a total land area of about 4,415.54 square kilometers with about 70% arable land area. The State has a mean temperature of 30^{o}C during the hottest period of February to April and 21^{o}C during the coldest period of December to January and two seasons of dry and rainy seasons. The average annual rainfall is between 2000mm and 2300mm and distributed between April and November with bimodal peaks in July and September while the dry season lasts from mid-November to March with an intermittent harmattan. Two major land forms are recognized which are low lands with pH of 6.3 and uplands which are well drained and strongly acidic (FAO, 2002; 2006).


Ayamelum
Anambra West
Awka North
Anambra East
Dunukofia
Oyi
Awka South
Njikoka
Onitsha North
Dunukofia
Onitsha South
Idemili North
Orumba North
Anaocha
Idemili South
Nnewi North
Orumba South
Ekwusigo
Aguata
Nnewi South
Ogbaru
Ihiala
0
10
20

Figure 1: Map showing Anambra state

Purposive and random sampling techniques were employed for selection of the respondents. Three out of the four agricultural zones namely, Awka, Aguata and Anambra were purposively selected for the study. This is because of the intensity of agricultural production as well as being prone to soil degradation and erosion (Eze and Mba, 2013). Two local government areas were purposively selected from each of the zones. Aniocha and Njikoka were selected from Awka, Orumba north and Orumba south were selected from Aguata, while Anambra east and Anambra south were selected purposively from Anambra zone respectively. From each of the selected local government areas, two communities were randomly selected. Then two villages were further selected randomly from the selected communities, while five farmers were randomly selected from each of the selected villages to give a total of one hundred and twenty farmers for the study. The data for the study were obtained through the use of structured questionnaire and scheduled interview for the farmers. The questionnaire and interview schedule reflects issues on the specific objectives of the study.

Statistical package for the social sciences (SPSS) were used to analyze the data for the study. Descriptive statistics such as mean, percentages, frequencies and ranking, and likert scale rating was used to analyze study objectives

Likert Rating Scale Technique

The Likert rating scale was used to analyze study objectives of possible causes of soil degradation, extent and effectiveness of erosion prevention and control practices. The 4-point likert rating scale used was graded as Very effective =4, Effective =3, Less effective= 2, Not effective=1. The mean score of respondents (farmers) based on the 4-point rating scale was computed thus;

4 + 3 + 2 + 1 = 10/4 = 2.5 cut off point. On the basis of the cutoff point, mean score below 2.5 were regarded as Less effective and not effective, while mean score greater than or equal to 2.5 were regarded as Very effective and effective.

Discussion of findings

Socioeconomic characteristics of the farmers

Majority of the respondents (30%) were between the ages brackets of 31-40 years followed by (25% of the farmers) who were between the age bracket of 21-30 years. Thus youths and energetic farmers are fully involved in farming in the study area. Also, 55% of the farmers were male while 45% were females. Majority (66.7%) of the farmers were married, 22.5% were single while 10.8% were widows. This agrees with the findings of Ighodaro et al. (2016) who reported that male and married farmers assail due to the need to feed their families thus farm as a major occupation and source of income amid soil degradation controlled farming more than their female and single counterparts. Majority of the respondents (73.3%) have farming as their major occupation; 19.2% trade as their major occupation while 7.5% were civil service staff members as their major occupation. Majority of the farmers (77.5%) were NCE and OND holders reflecting an average of 11-15 years spent in school by these majority (77.5%) group. About 35% of the farmers had household size of 4-5 while, 31.7% had household size of 6-7. This implies that larger household provides family labour which helps to adopt some of the practices for soil degradation prevention and control. 6.7% had a household size of 2-3 while 7.5% had a household size of 8-9.

Table 1: Socioeconomic characteristics of the respondents

Variables	Percent
Age	
<= 20	0.8
21-30	25.0
31-40	30.0

41-50	24.2
51-60	16.7
60+	3.3
Total	**100.0**
Gender	
Male	55.0
Female	45.0
Total	**100.0**
Marital Status	
Single	22.5
Married	66.7
Widow	10.8
Total	**100.0**
Major occupation	
Farming	73.3
Trading	19.2
Civil service	7.5
Total	**100.0**
Years spent in school	
<= 5	0.8
6-10	10.8
11-15	77.5
16-20	9.2
21-25	1.7
Total	**100.0**
Household size	
<= 1	19.2
2-3	6.7

4-5	35.0
6-7	31.7
8-9	7.5
Total	**100.0**
Annual income	
<= 50000	1.7
50001-230000	37.5
230001-410000	26.7
410001-590000	9.2
590001-770000	8.3
770001-950000	4.2
950001-1130000	5.8
1130001-1310000	3.3
1310001-1490000	0.8
1490001-1670000	0.8
1670000+	1.7
Total	**100.0**

Source: ***Field survey, 2018***

Possible causes of soil degradation and extent from the farmer's perspective

Anthropogenic activities such as deforestation, overgrazing, intensive cultivation, soil mismanagement, tillage and urbanization aggravates soil degradation hazards (Lal, 2006). Therefore, conservation of natural resources, implies a good understanding of the challenges caused by the natural and man-made misuse of the environment (Lal, 2006). Causes of erosion and extent on the farmland was achieved using a 4-point likert scale rating.

According to the result in table 2, it was ascertained from the farmer's perspective that the effect of rain, deforestation, slope of the farm,

poor road construction, population density and overgrazing were obviously very serious causes of erosion in the study area. This is reflected by their high mean score (x) values of 3.79, 3.29, 3.15, 3.15, 2.93 and 2.68 respectively. It was also ascertained from the result (table 2) that factors such as soil type, poor farming system, excessive bush burning, quarrying of sand and other construction activities were less and not serious causes of erosion and thus were regarded as non-grave causes of erosion in the study area.

In line with the findings of Ning (2004), soil erosion by rainfall occurs in the humid areas where rainfall exceeds infiltration capacity of the soil. This corroborates the finding of the study which was carried out in the humid tropical rainforest zone and probably explain what makes the area more prone to erosion by rainfall (NPC, 2006). Also, Lal (2001), reported that rain is the main agent of farmland degradation in southern Nigeria. This also agrees with the findings of Eze (2012) who reported that rainfall is the major cause of farmland erosion in Enugu state Nigeria – neighboring the study area. Furthermore, unsustainable agricultural practices such as deforestation, overgrazing, tillage are single greatest causes of global increase in erosion rate (CCSA, 2010). Excessive logging and clear-cutting, expansion of agriculture to marginal lands and frequent fires are the main causes of denudation (Glover, 2006). Layer of leaf litter that cover the forest floor protects the soil by helping it to absorb the impact of rain drops (Sands, 2005). This implies that the vegetative cover acts to reduce the velocity of the raindrops that strike the foliage and stems before hitting the ground, reducing their kinetic energy (Goudie, 2000). The result also agrees with the submissions of Akamigbo and Titilola (1998); Zhifa and Xuezhen (2004); Eze (2012) that soil erosion is aggravated by factors such as overgrazing. Heavy grazing reduces vegetative cover and causes severe soil compaction, both of which increase erosion rates (Imeson, 2012). Copper (2009), also opined that animals such as cattle and sheep compact the soil and remove the vegetation which exposes the soil to agents of erosion.

Similarly James (1995); Randhir (2007) reported that road construction and urbanization which leads to increase in population density is no doubt a factor that contributes greatly to soil erosion. Denuding the soil of vegetative cover, altering drainage patterns and compacting the soil during road construction and covering the land in an impermeable layer of concrete that increases the amount of surface runoff has a major effect on soil and soil degradation rate. Yet factors such as poor farming system, excessive bush burning, soil type, quarrying of sand had low mean values and thus were not considered as serious causes of erosion in the study area but were reported to have been practiced.

Table 2: Possible causes of soil degradation on the farmland

Causes of erosion	Mean (x)	Rank	Remark
Rain	3.79	1st	very serious
Soil type	2.45	7th	less serious
Deforestation	3.29	2nd	very serious
Poor farming system	2.09	11th	less serious
Overgrazing	2.68	6th	serious
Slope of the farm	3.15	3rd	very serious
Excessive bush burning	2.44	8th	less serious
Population density	2.93	5th	serious
Poor road construction	3.15	4th	very serious
Other construction activities	2.35	10th	less serious
Quarrying of sand	2.40	9th	less serious

Source: Field survey 2018

Possible causes of soil erosion and extent

Anthropogenic activities such as deforestation, overgrazing, intensive cultivation, soil mismanagement, tillage and urbanization aggravates soil erosion hazards (Lal, 2006). Therefore, conservation of natural resources, implies a good understanding of the challenges caused by the natural and

man-made misuse of the environment (Lal, 2006). Causes of erosion and extent on the farmland was achieved using a 4-point likert scale rating.

According to the result on table 4.1.1, it was ascertained from the farmer's perspective that the effect of rain, deforestation, slope of the farm, poor road construction, population density and overgrazing were obviously very serious causes of erosion in the study area. This is reflected by their high mean score (x) values of 3.79, 3.29, 3.15, 3.15, 2.93 and 2.68 respectively. It was also ascertained from the results that factors such as soil type, poor farming system, excessive bush burning, quarrying of sand and other construction activities were less and not serious causes of erosion and thus were rejected as causes of erosion in the study area.

In line with the findings of Ning (2004), soil erosion by rainfall occurs in the humid areas where rainfall exceeds infiltration capacity of the soil. Thus, the study was carried out in the humid tropical rainforest zone which makes the area more prone to erosion by rainfall (NPC, 2006). Also, Lal (2001), reported that rain is the main agent of farmland degradation in southern Nigeria. This also agrees with the findings of Eze (2012) who reported that rainfall is the major cause of farmland erosion in Enugu state Nigeria. Furthermore, unsustainable agricultural practices such as deforestation, overgrazing, tillage are single greatest causes of global increase in erosion rate (CCSA, 2010). Excessive logging and clear-cutting, expansion of agriculture to marginal lands and frequent fires are the main causes of denudation (Glover, 2006). Layer of leaf litter that cover the forest floor protects the soil by helping it to absorb the impact of rain drops (Sands, 2005). This implies that the vegetative cover acts to reduce the velocity of the raindrops that strike the foliage and stems before hitting the ground, reducing their kinetic energy (Goudie, 2000). The result also agrees with the findings of (Akamigbo and Titilola, 1998; Zhifa and Xuezhen, 2004; Eze, 2012), where they submitted that soil erosion is aggravated by factors such as overgrazing. Heavy grazing reduces vegetative cover and causes severe soil compaction, both of which increase erosion rates (Imeson,

2012). Copper (2009), also opined that animals such as cattle and sheep compact the soil and remove the vegetation which exposes the soil to agents of erosion.

Similarly, (James, 1995; Randhir, 2007) reported that road construction and urbanization which leads to increase in population density is no doubt a factor that contributes greatly to soil erosion. Denuding the soil of vegetative cover, altering drainage patterns and compacting the soil during construction and covering the land in an impermeable layer of concrete that increases the amount of surface runoff has a major effect on soil erosion. While factors such as poor farming system, excessive bush burning, soil type, quarrying of sand had low mean values and thus were not considered as serious causes of erosion in the study area but were reported to have been practiced.

Effectiveness of soil degradation prevention and control practices

As reported by Amusa et al. (2015), farmers in the study area were willing to pay for Agronomic soil conservation practices because of its effectiveness in soil degradation prevention and control. The effectiveness of soil degradation prevention and control practices were assessed using a 4-point likert scale rating. The result in table 3 revealed that construction of bond, multiple cropping, cover cropping, construction of water ways, minimum tillage and avoidance of bush burning were very effective in erosion prevention and control in the study area.

This was reflected in their high mean score (x) values of 3.17, 3.14, 3.18, 3.22, 3.25 and 3.07 respectively. The result also shows that factors such as mulching, grassing of water ways and ridging across the slope were effective in soil degradation prevention and control with their mean (x) values of 2.81, 2.82 and 2.87 respectively. As stated by Eze (2012), factors such as multiple cropping, construction of bonds, cover cropping and ridging across the slope has been used by farmers in controlling farmland soil degradation. Thus, the high mean score (x) values of 3.14, 3.17, 3.18,

2.87 in this study is expected and connote multiple cropping, construction of bonds, cover cropping and ridging as very effective soil degradation prevention and control practice in lieu.

Table 3: Effectiveness of soil degradation prevention and control practices

Variables	Mean (x)	Rank	Remark
Construction of bonds	3.17	4th	very effective
Mulching	2.81	9th	Effective
Grassing of water ways	2.82	8th	Effective
Multiple cropping	3.14	5th	very effective
Ridging across the slope	2.87	7th	Effective
Cover cropping	3.18	3rd	very effective
Construction of water ways	3.22	2nd	very effective
Minimum tillage	3.25	1st	very effective
Avoid bush burning	3.07	6th	very effective

Source: ***Field survey, 2018***

Conclusion and recommendation

Soil degradation has been identified as one of the most serious ecological and economic problem facing Nigeria. This is because soil host both animate and inanimate beings and therefore threat to soil is threat to life. So, combating the accelerating trend of soil degradation to maintain soil productivity and ensure sustainable food security cannot be over-emphasized and thus the utmost basis for this study. Thus, farmers should be educated on the importance of prevention rather than control of soil degradation. Government should improve on extension services for effective dissemination of agricultural and soil degrading prevention and erosion control technologies.

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