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The perceived effect of soil degradation and coping strategies among arable crop farmers in Atisbo Local Government of Oyo State

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Abstract: Soil degradation is on the increase worldwide, especially in the countries within the tropics. Mis-management of arable areas by farmers and grazing areas by livestock owners are the major causes of soil degradation. However, effective management of lands would reduce environmental pressure. The study was therefore designed to determine the perceived effect of soil degradation and coping strategies among arable crop farmers in Atisbo Local Government of Oyo state. The objectives of the study are to determine the causes of soil degradation, arable crop farmers' perceived effect of soil degradation, coping strategies practices adopted in controlling soil degradation and constraints facing the farmers in adopting the coping strategies practices. Arable crop farmers in Atisbo LGA constitute the study population. Multi-stage sampling technique was used in selecting a total of One hundred and twenty-eight (128) respondents drawn from four (4) towns out of seven towns in Atisbo local government area through random sample. The instrument used in data gathering was questionnaire. Data gathered were analyzed using frequencies, percentages, mean, Chi-square and Pearson product moment correlation. The major finding revealed that majority (91.4%) of the respondents was male, with a mean age of 44.77 years. Majority (80.5%) of the respondents was married, 64.1% of them had formal education. The mean farming experience and household size were 12.5years and 8person respectively. Majority of respondents (86.8%) agreed that soil degradation result in loss of grazing pasture for farm animals and 87.5% of the respondents agreed that crop rotation is an important practice that helps to maintain soil fertility and controls weeds, pest, and diseases. The study revealed that majority (60.2%) of the respondents reported high level of perceived effect of soil degradation. Some of the constraints identified by the respondents were inadequate finance (82.0%), lack of incentive (77.3%), and unfavourable land tenure system (68.8%) in the study area. The major coping strategies were mulching, crop rotation and bush fallowing to effect soil degradation. However, chi-square revealed that religion ($\chi^2 = 8.918$, $P < 0.05$) and education qualification ($\chi^2 = 8.019$, $P < 0.05$) influenced farmers perceived effect of soil degradation in the area. Based on the finding from the study, it is concluded that farmers actively use coping strategies in controlling soil degradation which revealed that farmers are aware of what happens in their environment. It was recommended that government and non-governmental agencies and community leaders should as a matter of urgency intensify efforts at educating farmers on the need for adequate use of land without hampering the land.

Keywords: Arable crop; Coping: Constraints; Farmers; Soil degradation.

Introduction

It is no longer a dispute that mankind today is faced with a catalogue of environmental problems that seem to threaten the supportive ecosystem and indeed human existence on earth [1]. In Nigeria, result shows that the country is faced with a vast number of environmental problems such as desert encroachment, soil erosion, drought and water pollution [1]. Soil degradation is on the increase worldwide, especially in the countries within the tropics. Agriculture is now taken as a business is sub-Sahara African countries of the world. This is not only because of the huge income it provides. It is a good source of food to the farm families and it also creates employment to the teeming population [2]. Mis-management of arable areas by farmers and grazing areas by livestock owners is one of the major causes of soil degradation. Soil degradation can either be as a result of natural hazards or due to unsuitable land use and inappropriate land management practices. Natural hazards include land topography and climatic factors such as steep slopes, frequent floods and tornadoes, blowing of high velocity wind, rains of high intensity, strong leaching in humid regions and drought conditions in dry regions. Deforestation of fragile land, over cutting of vegetation, shifting cultivation, overgrazing, unbalanced fertilizer uses and non-adoption of soil conservation management practices, over-pumping of ground water (in excess of capacity for recharge) is some of the factors which comes under human intervention resulting in soil erosion.

More sustainable management of lands would reduce environmental pressure. Conservation tillage which is reduced or no tillage, is the key to sustainable arable land management as it protects the soil resources, increases the efficiency of water use and, of special importance in semi-arid areas, reduces the effects of droughts [3]. Physical degradation of the land productive base occurs through the process of de-fallowing, soil erosion, use of heavy machinery and trampling by cattle [4]. For many years, small-holder farmers in many rural areas have practiced the system of agriculture whereby soil fertility is restored by fallowing. But because of demographic and socio-economic pressure, the fallow phase has been declining in south eastern parts of the country [5]; [6]. [4] opined that soil erosion is a major physical process leading to physical degradation of soil. [7] describe it as the washing away, transportation or impoverishment of top soil by water and or wind improvement. [8] as reported by [4] asserted that soil erosion is the most striking features on the land surface of southern Nigeria. The causes can be divided into physical (geological) and anthropogenic (human components).

[7] posits that soil erosion by water is particularly acute in southern Nigeria while that of wind, though less acute, are found in the drier parts of the north. The reason for the high manifestation of this type of erosion in the southern eastern Nigeria is as a result of high annual total rainfall characterized by high intensity and erodible soil [4]. The extent of soil erosion in southern Nigeria has been estimated at 29% of the total land area, sheet erosion at 25 million tons, with maize yield declining from 6.5 tons per hectare to as little 1 ton per hectare [9]. According to [10], some of the environmental problems which affect land include soil exhaustion and unregulated use of pesticide, herbicides, fertilizer and other chemicals. The rearing of cattle also causes very serious physical and socio-economic, difficulties including overgrazing, deforestation, and soil erosion desertification. Mining and quarrying are among the greatest causes of land degradation in Nigerian. Other causes are oil spillage, soil and coastal erosion. Deforestation and soil erosion constitute major environmental concern in the wet forested areas of the south, the principal worries in the drier areas, of the north has to do with increasing desertification and occasional drought [4]. Therefore, it is necessary to determine the perceived effect of soil degradation and coping strategies among arable crop farmers in Atisbo local government area of Oyo state. Therefore, the research is to determine the perceived effect of soil degradation and coping strategies among arable farmers in Atisbo LGA. The specific objectives of the study are as follow to:

i. identify the personal characteristics of the farmers in the study area.
ii. determine the causes of soil degradation in the study area.
iii. describe the arable crop farmers perceived effect of soil degradation in the study area.
iv. ascertain the coping strategies practices adopted in controlling soil degradation in the study area.
v. describe the trend of crop yield of the farmer in the study area.
vi. determine the constraints facing the farmers in adopting the coping strategies practices in the study area.

Hypotheses of the study

1. Ho_1: There is no significant relationship between the personal characteristics of the farmers and perceived effect of soil degradation.

Methodology

The area of study is Atisbo Local Government Area of Oyo State. It is found within Oke Ogun area of Oyo state which has an area of 2,997 km² and a population of 110,792 [11]. Atisbo Local Government consist of seven towns. The name of the LGA is an acronym for Ago-Are community, Tede community, Irawo community, Sabe community, Baasi community, Ofiki and Owo communities. It falls between derived savannah zone with tropical wet and dry season with annual rainfall between 100mm-200 mm. The study area is situated on latitude and longitude of $7^{0}24^{1}$N $3^{0}53^{1}$E. The vegetation is a derived savannah with a mean annual rainfall of about 1289.2mm. Primary occupations of the people is farming.

Sampling Techniques and Sample Size

The population for this study constitutes arable crop farmers in towns of Atisbo local government. Multi stage sampling procedure was used for this study. Oyo state comprises of 33 LGAs from which Atisbo LGA was purposively selected because of their prominence in arable farming. Atisbo LGA mainly consist of seven (7) towns from which fifty percent of seven towns in local government area were randomly selected to give a total of four towns. Each of the town has a population of 528, 315, 228, and 196 as household [11] form this 10% of households in each of the selected town were randomly sampled to give a total of 128 respondents. Thus, 128 formed the sample size for the study.

Method of Data Collection

This study employed a structured questionnaire as the primary data collection instrument because it offers a standardized set of questions, guaranteeing that all participants in the study area respond to the same inquiries.

Method of Data Analysis

The data collected from the questionnaire was analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies, percentages, means, and standard deviation were used to analyze the data from the questionnaire, which were presented using tables. The inferential statistical tool used for data analysis was Chi-square and Pearson product moment correlation to establish the relationship between the personal characteristics of the farmers and perceived effect of soil degradation.

Personal characteristics of respondents

Table 1 shows that majority (28.1 percent) of the respondents fell between the ranges 51-60, 21.9 percent between the age brackets 61-70, 20.3 percent fell between the age bracket of 41 – 50. The mean age for the respondents in the study area is 55 years. This implies that majority of the respondent are not in active years of their life. This is in contrast with the findings of [12] that farmers below 50 years of age are more involved and active in farming activities. Table 1 revealed further that majority (91.4%) of the respondents was male while (8.6%) were female. This implies that majority of the arable crop farmer in Atisbo local government is male. Majority (80.5%) of the respondents were married while (3.1%) of the respondent were single. This shows that majority of the respondents that engage in farming activities were married. This result agrees with the findings of [13] that, majority of adult population in any society is made up of married people. Considering years of farming experience about (35.9%) of the respondents were within the range of 11-20 and (26.6%) of the respondent were within range between 21-30. This implies that the mean farming experience of the respondents was 16 years. This means that majority of the respondents have 16years of farming experience. On the religion of the respondents, (47.7%) are Christians, (34.4%) are Muslims while only (18.0%) are traditional worshippers. Majority (43.6%) of the respondents had between 4-6 person per household while only about (6%) had between 10 & above. The mean family size for respondents in the study area is 5.8. About (35%) of the respondents had non- formal education while (27.3%) had secondary education. This is in line with finding [14] result that most of the respondents in the study area are literate and thus would be responsive to land conservation education.

Table 1: Distribution of respondent's personal characteristics (N=128)

Variables	Frequency	Percentage	Mean	SD
Age				
21-30	7	5.5		
31-40	23	18.0		
41-50	26	20.3	44.77	7.4
51-60	36	28.1		

61-70	28	21.9		
Above 70	8	6.3		
Sex				
Male	117	91.4		
Female	11	8.6		
Marital status				
Single	4	3.1		
Married	103	80.5		
Divorced	10	7.8		
Widowed	11	8.6		
Farming experience				
1-10	26	20.3		
11-20	46	35.9		
21-30	34	26.6	12.5	3.3
31-40	12	9.4		
41-50	8	6.3		
51-60	2	1.6		
Religion				
Christianity	61	47.7		
Islam	44	34.4		
Traditional	23	18.0		
Number of households				
1-3	22	17.2		
4-6	56	43.6	7.5	2.3
7-9	42	32.8		
10& above	8	6.3		
Educational qualification				
Non formal	46	35.9		
Primary	31	24.2		
Secondary	35	27.3		
Tertiary	16	12.5		
Total	128	100		

Source: Field work, 2020.

Level of perceived effect of soil degradation in the area

Table 2 shows that majority of respondents (86.8%) agreed that soil degradation result in loss of grazing pasture for farm animals. In similar vein, about (62.5%) of the respondents also disagreed with the statement that farm productivity increased during degradation. On the other hand, however, the table reveals that (87.5%) of the respondents agreed that crop rotation is an important practice that helps to maintain soil fertility and controls weeds, pest, and diseases while (57.8%) of the respondents disagreed that increasing in soil fertility and soil structure, leading gradually to soil loss. This implies that majority of the respondents were aware of effect of soil degradation on their product.

Table 2. **Distribution of Respondents according to perceived effect of soil degradation in the area. (N=128)**

S/N	Perception statement of effect of soil degradation	SA		A		U		D		SD		$\bar{X}$	Decision
		F	%	F	%	F	%	F	%	F	%		
1	Soil degradation result in loss of farm animal graze	94	73.4	17	13.3	1	0.8	9	7.0	7	5.5	4.421	High
2	Continued loss of arable land will jeopardize our ability to feed the world population.	45	35.2	70	54.7	2	1.6	7	5.5	4	3.1	4.1328	High

3	Soil degradation causes the migration of people.	62	48.4	52	40.6	3	2.3	9	7.0	2	1.6	4.2734	High
4	It results in loss occupation	61	47.7	43	33.6	2	1.6	18	14.1	4	3.1	4.0859	High
5	Farm production increased during degradation	25	19.5	19	14.8	4	3.1	44	34.4	36	28.1	3.3672	High
6	Farms need more fertilizer application (both organic and inorganic) to support more crop yield.	52	40.6	49	38.3	4	3.1	17	13.3	6	4.7	3.9688	High
7	The risk of health	35	27.3	24	18.8	11	8.6	31	24.2	27	21.1	3.0703	Low
8	Increasing in soil fertility	31	24.2	20	15.6	3	2.3	36	28.1	38	29.7	3.2344	Low
9	Management of cover crop contribute to degradation	38	29.7	17	13.3	36	28.1	30	20.0	7	8.9	3.1328	Low
10	Soil organic matter is not essential for maintaining soil fertility and crop yields	38	29.7	23	18.0	6	4.7	29	22.7	32	25.0	2.9531	Low
11	Green leaf manure helps to reduce soil structure, and improve weed population	27	36.7	31	24.2	8	6.3	26	20.3	16	12.5	2.4766	Low
12	Changes in soil conservation practices can slow land degradation	52	40.6	42	32.8	7	5.5	18	14.1	9	7.0	3.8594	High
13	Declining soil quality leads to improving economic growth in countries where wealth is largely agrarian.	37	28.9	22	17.2	8	6.3	30	23.4	31	24.2	3.0313	Low

Source: Field work, 2020

Table 2.1 shows that majority (60.2%) of the respondents had high level of perceived effect of soil degradation while 39.8% of the respondents had low perceived effect of soil degradation in the area. This implies that the respondents are aware of soil degradation in the area. According to [4], the description of land degradation reflects, predominantly the physical perspectives, the other aspect include chemical degradation and it is aptly defined to include the loss of soil nutrient status and fertility as well as any disruption in the soil chemistry that diminishes the ability of soil to nourish and support optimum crop growth. The different forms of chemical degradation of soil include salinization, acidification and soil pollution [7].

Table 2.1: **Level of perceived effect of soil degradation in the area**

Level perceived	Score	F	%	Mean	SD
Low	<72.01	51	39.8	71.8	0.3
High	72.01-109.00	77	60.2		

Source: Field work, 2020.

Coping Strategies adopted in controlling soil degradation

Table 3 shows most respondents always used Mulching (77.7%) and about (54%) used crop rotation to control soil degradation, (45.3%) practices bush fallowing while (41.4%) made used of fertilizer to control soil degradation. A lower proportion of respondents (3.1%) used zero tillage farming technique and (1.6%) used taungya forestry to control soil degradation. This shows that farmers are aware of happenings in their environmental situation and make effort at controlling land degradation [14].

Table 3: Distribution of Respondents according to coping strategies as control measure to soil degradation (N=128)

Coping Strategies Practice	Fully Practice		Moderately Practice		Partially Practice		Not Practice	
	F	%	F	%	F	%	F	%
Crop rotation	69	53.9	36	28.1	15	11.7	8	6.3
Taungya/Agroforesty	2	1.6	5	3.9	6	4.7	115	89.8
Shifting cultivation	19	14.8	15	11.7	19	14.8	75	58.6
Planting of cover crops	45	35.2	57	44.5	19	14.8	7	5.5
Mulching	99	77.3	19	14.8	4	3.1	6	4.7
Intercropping	43	33.6	40	31.3	15	11.7	30	23.4
Planting pattern	20	15.6	15	11.7	18	14.1	75	58.6
Planting Indigenous Crops	16	12.5	23	18.0	22	17.2	67	52.3
No-till farming	4	3.1	2	1.6	9	7.0	113	88.3
Bush fallowing	58	45.3	36	28.1	13	10.2	21	16.4
Using of fertilizer	53	41.4	34	26.6	36	28.1	5	3.9

Source: Field work, 2020.

Constraint facing the farmer in adopting the coping strategies practices in the area

The table 4 shows that, majority (82.0%) of the respondents indicated that inadequate finance was very severe among the constraint faced by the farmers, (77.6%) of the respondent indicated lack of incentive as very severe while (27.3%) of the respondents said insufficient current knowledge to adapting method is severe. This implies that respondent's environment suffers one form of soil degradation or other. This has far reaching negative implication on food production and other income generating activities. This is in line with [15] findings that soil degradation has potentially severe implications for food security, rural livelihood, environmental attributes such as biological diversity and reduce quality of land resources.

Table 4: Distribution of respondents in constraint facing the farmer in adopting the coping strategies practices in the area.

S/N	Constraints	Very severe		Severe		Less severe	
		F	%	F	%	F	%
1	Unfavourable land tenure system	88	68.8	10	7.8	30	23.4
2	Lack of incentive	99	77.3	17	13.3	12	9.4
3	Cultural barrier	46	35.9	34	26.6	48	37.5
4	Inadequate finance	105	82.0	21	16.4	2	1.6
5	Availability of information	80	62.5	42	32.8	6	4.7
6	Population pressure on the land	56	43.8	33	25.8	39	30.5
7	Lack of knowledge on soil conservation Techniques	87	68.0	32	25.0	9	7.0
8	Inadequate information and education	79	61.7	30	23.4	19	14.8
9	Effect of urbanization	67	52.3	43	33.6	18	14.1
10	Insufficient current knowledge to adaption strategies Method	69	53.9	35	27.3	24	18.8

Source: Field work, 2020.

Test of hypotheses

Table 5 shows that there is no significant relationship between sex (χ^2 =1.085, P > 0.05), marital status (χ^2 = 0.702, P>0.05), however, significant at religion (χ^2 = 8.918, P < 0.05), education qualification (χ^2 = 8.019, P < 0.05). This implies that sex and marital status do not influence perceived effect of soil degradation, however religion and highest

education qualification influenced the perceived effect of soil degradation. That's is, the more one is educated the greater the person will be able to perceive effect of soil degradation.

Table 5: Relationship between the personal characteristics of the farmers and perceived effect of soil degradation

Variable	χ^2 Value	Df	P	Decision
Sex	1.085	1	0.298	NS
Marital Status	0.702	3	0.873	NS
Religion	8.918	2	0.012	S
Education qualification	8.019	3	0.046	S

Source: Field work, 2020.

Table 6 shows that there is no signification relationship between causes of soil degradation and coping strategies (r = -0.020, P > 0.05). However, the relationship is negative which implies that farmers' involvement in coping strategies reduced the causes of soil degradation. Economic analysis shows that while societies may gain from a reduction in negative externalities of environmental degradation due to use of conservation measures, farmers have to pay the price in term of time loss for income generation [15].

Table 6: Relationship between the causes of soil degradation and the coping strategies practices among arable crop farmers.

Variable	R-value	P-value	Decision
Causes of soil degradation and coping strategies	-0.02	0.825	NS

Source: Field work, 2020.

Conclusion and Recommendations

Based on the finding from the study, it can be concluded that most famers are literate. Therefore, they can be effectively mobilized for conservation education. It was further observed that farmers actively use coping strategies in controlling soil degradation which revealed that farmers are aware of what happenings in their environment. Deforestation of fragile land, over cutting of vegetation, shifting cultivation, overgrazing, unbalanced fertilizer use and non-adoption of soil conservation management practices, over-pumping of ground water (in excess of capacity for recharge) are some of the factors which comes under human intervention resulting in soil erosion.

Based on the findings of the study, it is recommended that will bring about a reduction in land deterioration and improvement in environmental resources conservation in the study area:

1. That government and non-governmental agencies and community leaders should as a matter of urgency intensify efforts at educating farmers on the need for adequate use of land without hampering the land.
2. Each and every one should be encouraged to protect his surrounding by planting of flowers and trees rather than opening the surrounding for erosion to wash away the top nutrient.
3. Farmers should be encouraged to practice the crop rotation techniques more, and cross fertilization of ideas between extension and farmers groups on sustainable use of natural resources.

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