Appraisal of Soil Conservation Practices Utilized by Crop Farmers in Orashi Region of Rivers State, Nigeria

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D.O.I: 10.56201/ijaes.v9.no5.2023.pg73.82

Abstract
This study investigated soil conservation practices utilized by crop farmers in Orashi Region of Rivers State consisting of Ogba/Egbema/Ndoni, Ahoada East and Ahoada West Local Government Areas. Data were collected using structured questionnaire based on 4-point Likert rating scale and interview schedule. A population sample of one hundred and twenty (120) respondents was selected to elicit information using the stratified sampling technique. Forty (40) crop farmers from each Local Government Area were selected for the study. Data were analyzed using descriptive and inferential statistics such as the arithmetic mean. Findings show that more than half (76.7%) were married and 45.8% had formal education. Majority of the respondents were within the ages of 40-49 years. The type of soil conservation practices adopted were application of manure ($\bar{X}$ =3.37), planting of cover crops ($\bar{X}$ =3.73), use of multiple cropping system ($\bar{X}$ =3.93), use of reduced tillage methods/direct seeding ($\bar{X}$ =3.83), bush fallowing ($\bar{X}$ =3.86), incorporation of crop residue ($\bar{X}$ =3.74), mulching ($\bar{X}$ =3.85), construction of bonds/other structures ($\bar{X}$ =3.93), shifting cultivation ($\bar{X}$ =3.54), and crop rotation ($\bar{X}$ =3.53). The level of adoption and utilization of the identified measures tends to agree with the farmer's year of experience, level of awareness of soil conservation measures, age-long cultural practices or cultural barrier and technical knowhow. The study concluded that government should enact favourable agricultural policies that will enlighten farmers on soil conservation practices in their cultivation exercise. The services of extension workers will be helpful in this direction.

Keywords: *Soil, Conservation, Farmers, Adoption*

Introduction

Soil being the core of agriculture plays vital roles in the agricultural production systems of a nation. The soil is a medium for anchorage of crop roots, supply of nutrients and water for plant growth. The productivity of the soil depends on its quality. Although, soil is a fixed asset, it is primarily essential to guarantee food security, industrial crop production and improved household financial status (Anjichi, 2017). Soil therefore is the most important resource on which sustainable agriculture and livelihood of the agricultural productivity of farmers' household depends. Hence, its conservation is of paramount importance to agronomists and agriculturalists. Soil conservation practices are those farming operations and management

strategies conducted with the goal to control soil erosion by preventing or limiting soil particle detachment and transport in water or air (Baumhardt & Blanco-Canqui, 2014).

Soil conservation practices are often discussed with water conservation because of the strong link between them. However, this article will concentrate on soil conservation measures involving both traditional and innovation management practices for preventing soil erosion driven by water. Soil conservation practices refer to the use of measures to protect the soil with the aim of maintaining or improving its national fertility (FAO, 2013). For this reason, conservation practices could be temporal or permanent measures used to increase the productive capacity of the soil. The term "Productive Capacity" is economic term used to denote the attainable annual output of crop yield, natural vegetation and water flow, at determined level of non-land inputs. In Nigeria, as in most sub-Saharan African Countries, conservation practices has become very necessary as a result of reduction in fallow periods occasioned by the shift from the traditional shifting cultivation to the conventional bush fallowing system and most recently to permanent cultivation caused by population pressure and agricultural activities.

Thus, the aim of soil conservation is to achieve sustainable and profitable agriculture that will improve the livelihood of farmers through the application of minimal soil disturbance, permanent soil cover and crop rotation. These three principles hold tremendous potential for all sizes of farms and agro-ecological systems. The principles are embedded in conservation agriculture approach which has been perceived by practitioners as a valid tool for sustainable land management (FAO, 2013). The author noted that effective soil conservation practices are necessary to maintain sustainable crop production hence classified the measures into three major strategies including agronomic soil conservation, soil management and mechanical conservation strategies. Of these three on-farm soil conservation measures preference is often given to agronomic treatments. Reasons being that they are less expensive and deal directly with reducing the impact of raindrops, increasing the infiltration capacity of the soil, reducing surface runoff volumes and decreasing surface waters velocities. Examples of common agronomic practices adopted by farmers include mulching, crop management and agro-forestry.

Rivers State is one of Thirty-Six (36) states of Nigeria, located in the Niger Delta Region (South-South Nigeria) which lies between latitude 5^{o} North and mid-way between 5^{o} East of the Greenwich Meridian (Howard, 2007).The state is bounded by Anambra and Imo States on the North, Abia and Akwa Ibom States on the East, Bayelsa and Delta States on the West and the Atlantic Ocean on the South. The State has mangrove swamps, tropical rainforest and many rivers. Before the discovery of crude oil in commercial quantities in the late 1950s, agriculture was the mainstay of the economy of the people. Despite the oil pipelines criss-crossing the farmlands, farmers will never give up on their farming business. Recently, increased population density, growing food and market demands, urbanization, proximity to major road infrastructure, soil conditions and deterioration in quality of land for agricultural purposes have brought about reduced agricultural productivity. These changes have resulted to increasing socio-economic pressure on land and differential access to farmland and intensification of cultivation with far reaching consequences on land-use management and the sustainability of the agricultural system. Several soil fertility and productivity decline, ecological damages including soil erosion losses and flood incidence are some of the outcomes of the uncontrolled land use and agricultural intensification in the state. The consequences might be worse in future

due to the fragile, heavily weathered and leached nature of the soil. But, it can be remedied by adoption of improved soil conservation practices in the farming system adopted in the area.

Arable lands in the state are facing degradation owing to excessive deforestation, rapid urbanization and other economic activities that threaten the natural environment. However, efforts are being made by some rural farmers to engage in soil conservation practices like mulching and bush fallowing. But, to what extent do the farmers adopt the soil conservation practices? To answer this question motivated this research work.

Objectives of the Study

The specific objectives of the study include, to:

1. Determine the socio-economic characteristics of the framers in Orashi region.
2. Identify the soil conservation practices commonly utilized by the farmers in the area of study.
3. Investigate the level of adoption of soil conservation practices amongst farmers in the region.

Research Questions

The following research questions were formulated to guide the study:

1. What are the socio-economic characteristics of crop farmers in Orashi region, Rivers State?
2. What ate the soil conservation practices commonly utilized by crop farmers in the area of study?
3. What is the level of adaptation of the soil conservation practices amongst crop farmers in the region?

Theoretical Framework

The importance of educational theory as a road map for guiding teaching and learning cannot be overemphasized. Therefore, the underpinning theory in this paper is that of Adoption Perceived Attribute Theory advance by Rogers in 1995. Adoption is a decision-making process in which an individual goes through a number of mental stages before making a final decision to adopt an innovation. Decision making is the process through which are individual passes knowledge of an innovation, to forming an attitude towards innovation, to a decision toadopt or reject, implementation of new ideas, and configuration of decision. Adoption of soil conservation practices by a farmer is necessarily based on his capacity to acquire and absorb information about new techniques and on his/her capacity to convert this knowledge into practice. According to the author, innovation in judged by adoption by a farmer when it can be tried out (triability) that results can be observed (observability) that it has an advantage over other innovations or the present circumstance (relative advantage), that it is not complex to learn or use (compatibility). Hence, introducing improved soil conservation practices with those attributes can be adopted at higher level by trained farmers to improve the growth and productivity of crops.

Methodology

The study was carried out in Ogba/Egbema/Ndoni, Ahoada East and Ahoada West Local Government Areas of Rivers State. Ogba/Egbema/Ndoni lies on the geographical coordinate within 506’0.000 to 5042’0.000 N latitude and 6018’0.000 to 703’0.000 E longitude (Nwaerema & Ikoro, 2021). Ahoada East lies on latitude: 5^{o}04’60.00”N and longitude 6^{o}38’59.99”E. While Ahoada West lies on latitude: 5^{o}08’28.17”N and longitude 6^{o}65’84.60”E.

These three (3) Local Government Areas are commonly called Orashi region of Rivers State. Ogba/Egbema/Ndoni Local Government Area (ONELGA) was created out of the old Ahoada L.G.A. under the Rivers West senatorial district, with its headquarters at Omoku town. ONELGA is located on the North-Eastern fringe of Rivers State bounded by Imo, Delta, Bayelsa, Abia and Anambra States. Other border areas are Ahoada East, Ahoada West and Emohua Local Government Areas of Rivers State. The L.G.A. is located in the dense rainforest zone of the state. The primary occupation of the people is farming and fishing. Ahoada East Local Government Area is located in the North-Western part of the state with its headquarters at Ahoada town. It is bounded by Ahoada West on the western border, Emohua and Ikwere Local Government Areas on the East, Ogba/Egbema/Ndoni Local Government Area on the North and Abua/Odual Local Government Area on the South. The area is also in the dense rainforest zone of the state. The traditional occupation of the people is farming hunting and fishing. Ahoada West Local Government Area of Rivers State, Nigeria, is located on the North-Western parts of the State, with its headquarters at Akinima town. The L.G.A. marks the end of Rivers State with Bayelsa State on the Western border. It is bordered on the East by Ahoada East Local Government Area, on the North by Ogba/Egbema/Ndoni Local Government Area of Rivers State and Sagbama Local Government Area of Bayelsa State, on the West by Yenagoa Local Government area of Bayelsa State, and on the South by Abua/Odual Local Government Area of Rivers State and Yenagoa Local Government Areas of Bayelsa State. The Orashi River crisscrosses the entire Local Government Area, which is predominantly in the dense rainforest zone of the State. The people are traditionally farmers, fishermen and hunters. These LGAs are known for agricultural practices because they possess massive arable land suitable for the cultivation of crops such as cassava, maize, cocoyam, yam, okra, fluted pumpkin etc. The zone is one of the major agriculture blocks in Rivers State.

The study adopted a descriptive survey design. A descriptive survey design is one that uses a questionnaire to collect data about the characteristics, experience, knowledge, or opinions of a sample or population (Gall *et al.*, 2007). The stratified sampling technique was adopted to stratify the crop farmers in the three Local Government Areas. Forty (40) crop farmers were selected from each of the three (3) Local Government Areas. This resulted to selecting six (6) communities for the study. A total of One Hundred and Twenty (120) respondents were selected for the study. A structured questionnaire titled "appraisal of soil conservation practices utilized by crop farmers' questionnaire" was used to collect information from the respondents. The instrument was structured on four (4) point Likert rating scale of Strongly Agree (SA), Agreed (A), Disagree (D), and Strongly Disagree (SD). The rating scale were SA = 4, A = 3, D = 2 and SD = 1 respectively. The instrument had two sections – A and B. Section A elicited information on the Socio-economic characteristics of the farmers while section B consists of the questionnaire items that sought answers to the research questions. Descriptive and inferential statistics (Percentage Frequency and Arithmetical Mean, respectively) were used to analyze the data. The benchmark for accepting an item was 2.50 and above, otherwise it was rejected.

Results and Discussion

The results of the study are presented according to the research questions.

Research Question 1: What are the socio-economic characteristics of the farmers in Orashi Region, Rivers State?

The results of the socio-economic characteristics of the respondents are presented in table 1. The result shows that high number (41.6%) of the respondents was between the age brackets of 40-49. The mean age of the majority of the respondents is 44.5 years, indicating that the

farmers are active, young and vibrant who are in their productive stage of life. This finding agrees with the findings of Elenwa and Emodi (2019) who observed the same age brackets to be actively involved arable crop production in Omuma Local Government Area of Rivers State. However, this finding disagrees with the finding of Albert *et al* (2015) who observed that the majority of arable crop farmers in Ahoada East were aged 50-60 years. More than half (51.67%) of the respondents were female farmers while 48.33% were male. This implies that female farmer dominated crop production in the area of study. This finding is in tandem with the finding of Albert and Okidim (2014) who observed that female arable crop farmers in Ahoada East were into the production of maize, pepper and fluted pumpkin. More than half (76.7%) of the respondents were married. This implies thatthe crop farmers were married and had the responsibility of assisting their husbands to provide the basic needs of the family. This finding agree with Albert and Nne-cosy (2014) who noted that marriage makes people to show sense of responsibility towards the family in the area of taking care of the children and meeting family needs. Greater percentage (86.5%) of the farmers could read and write. The highest percentage (45.8%) of education attainment was WASSC/NECO. This implies that most of the crop farmers literate. This will encourage and motivate the farmers to adopt soil conservation measures that will help to improve yields and increase output. The percentage of farming experience amongst the respondents was highest at 11-20years (38.33%). This indicates the crop farmers have long years of experience in the field of farming. Hence, they have enough knowledge on soil conservation measures used in crop production. This finding is in tandem with the finding of Albert, Harry & Ishikaku (2015) who stated that years of experience help in giving account of events. Furthermore, more than half (58.3%) of the respondents had household size of 4-5 persons. This implies that the crop farmers had moderate household size. This could be attributed to the economic reality of the time. Most families on longer prefer very large household. However, Okorji (2014) asserted that a large household size provides more labourers needed to manage agricultural activities.

Table 1: Distribution of the Socio-economic Characteristics of the Respondents (N=120)

Variables	Frequency	Percentage (%)
Age:		
< 20	6	5.00
20 – 29	9	7.50
30 – 39	40	33.30
40 – 49	50	41.60
50 – 59	10	8.30
60 and above	5	4.10
Sex		
Male	58	48.33
Female	62	51.67
Marital Status		
Single	28	23.30
Married	92	76.70
EducationAttainment		
No formal education	17	14.10
FSLC	20	16.60
WASSC/NECO	55	45.80
NCE/OND	26	21.60
B.Sc/B.Ed	3	2.50

FarmingExperience		
1 – 10	16	13.34
11 – 20	46	38.33
21 – 30	40	33.33
31 – 40	18	15.00
Household Size		
< 2	5	4.10
2 – 3	10	8.10
4 – 5	70	58.30
6 – 7	10	8.30
7 and above	25	20.80

Source: Field Source, 2022.

Research Question 2: What ate the soil conservation practices commonly utilized by crop farmers in the area of study?

The analysis of the crop farmers' response on the soil conservation practices commonly utilized in the area of study is shown in table 2. Majority of the respondents agreed that application of manure ($\bar{X}$ =3.37), planting of cover crops ($\bar{X}$ =3.73), use of multiple cropping system ($\bar{X}$ =3.93), use of reduced tillage methods/direct seeding ($\bar{X}$ =3.83), bush fallowing ($\bar{X}$ =3.86), incorporation of crop residue ($\bar{X}$ =3.74), mulching ($\bar{X}$ =3.85), construction of bonds/others structures ($\bar{X}$ =3.93), shifting cultivation ($\bar{X}$ =3.54), and crop rotation ($\bar{X}$ =3.53) were some of the soil conservation measures commonly utilized in the area of study. The variables were accepted because the analysis shows their mean scores were above the benchmark of 2.50. The result agrees with the findings of Anugwa (2016) who asserted that local farmers utilize different types of soil conservation practices such as bush fallowing, manure application, multiple cropping, cover cropping among others, to mitigate soil erosion. The finding is also in tandem with Oladipo (2017) who opined that there are various indigenous/local and modem methods employed in the process of utilizing and integrated approach to soil conservation by all stakeholders (local government and non-government organizations) to preserve the structures, water and nutrient retention and augmentation of the soil. Further, Elenwa & Emodi (2019) agreed that mulching, bush fallowing, planting of indigenous crops, crop rotation, planting pattern, multi-cropping, shifting cultivation and intercropping were conservative practices adopted by rural arable crop farmers in Omuma Local Government Area of Rivers State. Earlier, Obalum & Obi (2010) asserted that agronomic measures such as mulching and crop management (cover cropping), fallowing, multiple cropping, intercropping, planting pattern and crop rotation are measures used to enhance the quality of degraded soils.

Amongst other methods utilized by the farmers the incorporation of green manure ($\bar{X}$ =2.0) and agro-forestry ($\bar{X}$ =2.29) were rejected because their scores were less than the bench mark of 2.50. This finding is in tandem with Asogwa, Ifeanyieze & Ekele (2014) who reported that most farmers in Enugu State have very little knowledge of plants used as green manure; they have doubts on the efficacy of green manure in maintaining soil fertility without inorganic fertilizer and have not cultivated green manure in maintaining with the intension of using any of them to enhance fertility of the soil. The finding also agree with the report of Fabunmi & Balogun (2015) who asserted that inspite of the enormous benefits green manure, it is not commonly practiced among peasant farmers, who contribute up to 98% of the food consumed in Nigeria. Earlier, Peter, Rayns & Rosenfeld (2008) reported that the challenges militating against the use of green manuring include the fact that farmers are often reluctant to sacrifice time for food or cash crop production for improving the soil fertility only. The authors further

added that growing green manure results in direct costs of seeds, and increase field work necessary for preparing the seedbed, incorporating the residues and possibly for mowing. The result also agrees with the findings of Elenwa & Emodi (2019) who asserted that agro-forestry was not adopted by arable crop farmers in Omuma Local Government Area of Rivers State as a soil conservative practice.

Table 2: Soil conservation practices commonly utilized by crop farmers in the area of study

	Types of Soil Conservation Measures	SA	A	D	SD	Mean($\bar{X}$)	Remark
1	Application of manure	60	40	10	10	3.37	Accepted
2	Planting of cover crops	65	35	6	4	3.73	Accepted
3	Use of multiple cropping system	70	40	8	2	3.93	Accepted
4	Incorporation of green manure	5	45	15	55	2.00	Rejected
5	Use of reduced tillage methods/direct seeding	80	3	7	30	3.83	Accepted
6	Bush fallowing	90	10	12	8	3.86	Accepted
7	Incorporation of crop residue	60	40	2	18	3.74	Accepted
8	Mulching	90	10	16	4	3.85	Accepted
9	Construction of bonds/other control structures	70	40	8	2	3.93	Accepted
10	Shifting cultivation	80	30	5	5	3.54	Accepted
11	Crop rotation	78	32	6	4	3.53	Accepted
12	Agro-forestry	30	20	25	45	2.29	Rejected

Source: Field Survey 2022

Research Question 3: What is the level of adaptation of the soil conservation practices amongst crop farmers in the region?

Using the mean score of 2.50 as the benchmark, the data analysis in table 3 shows that almost all the soil conservation practices listed were adopted by the crop farmers except incorporation of green manure ($\bar{X}$ =2.34) and agro-forestry ($\bar{X}$ =2.04). This implies that application of organic manure ($\bar{X}$ =3.74), planting of cover crops ($\bar{X}$ =3.73), use of multiple cropping system ($\bar{X}$ =3.25), use of reduced tillage/direct seeding ($\bar{X}$ = 3.83), bushing fallowing ($\bar{X}$ =4.00), incorporation of crop residue ($\bar{X}$ =3.70), construction of bonds/other control structures ($\bar{X}$ = 3.92), mulching ($\bar{X}$ = 3.80), shifting cultivation ($\bar{X}$ = 3.85) and crop rotation ($\bar{X}$ =3.73) were adopted and utilized by the farmers. This finding agrees with Elenwa & Emodi (2019) who reported that mulching, bush fallowing, planting of indigenous crops, crop rotation, planting pattern, multi-cropping, shifting cultivation, manure application, cover cropping and intercropping were soil conservative practices adopted by rural arable crop farmers in Omuma Local Government Area of Rivers State. The finding also agrees with Junge, Deji, Abaidoo, Chikoye & Stahr (2009), and Obalum & Obi (2010) that agronomic measures such as mulching and crop management (cover cropping, fallowing, multiple cropping, intercropping, planting pattern and crop rotation are measures used to enhance the quality of degraded soils.

Table 3: The level of adoption of soil conservation practices amongst crop farmers in Orashi region, Rivers State, Nigeria.

	Factor	VHU	HU	LU	NU	Mean ($\bar{X}$)	Remark
1	Application of manure	80	30	5	5	3.74	VHU
2	Planting of cover crops	80	30	7	3	3.84	VHU
3	Use of multiple cropping system	40	50	30	10	3.25	HU
4	Incorporation of green manure	25	27	32	36	2.34	NU
5	Use of reduced tillage methods/direct seeding	85	25	7	3	3.83	VHU
6	Bush fallowing	92	26	16	2	4.00	VHU
7	Incorporation of crop residue	80	35	8	2	3.70	VHU
8	Mulching	101	15	4	0	3.81	VHU
9	Construction of bonds/other control structures	110	4	0	6	3.92	VHU
10	Shifting cultivation	110	6	4	0	3.82	VHU
11	Crop rotation	91	15	35	50	3.73	VHU
12	Agro-forestry	20	15	35	50	2.04	NU

Source: Field Survey 2022

Conclusion

The finding of the study shows that there are soil conservation practices adopted and utilized by crop farmers in Orashi Region of Rivers State, Nigeria. The socio-economic factors influencing the farming practice in the area include the gender of the farmers, age, household size and level of education attainment. The level of adoption and utilization of the conservation measures tends to agree the farming experience of the respondents, level of awareness, long cultural practices or cultural barriers, technical knowhow among others. For instance, most farmers are not conversant with agro-forestry system and so it is not utilized in the area of study. The choice of conservation measures to be adopted by the farmers could help address key environmental issues, especially climate change mitigation. It could also ensure sustainable food production capacity in the face of teeming population. Provision of basic amenities especially road network in the rural communities in the study area will help alleviate some of the challenge encountered by the farmers in their cultivation practices. More so, the government should enact favourable agricultural policies that will enlighten the farmers on the need to ensure conservation measures in their farming practices.

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