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CONSTRAINTS TO USE OF SOIL QUALITY MAINTAINING STRATEGIES IN A CLIMATE CHANGE STRICKEN AREA OF AKWA IBOM STATE, NIGERIA

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ABSTRACT: *The study assessed constraints to use of soil quality maintaining strategies among crop farmers in Ibesikpo Asutan Local Government Area of Akwa Ibom State, Nigeria. Multi-stage sampling technique was used to select 120 respondents for the study. Data were collected using interview schedule and analysed using descriptive and inferential statistical tools. Results show that 65.00% of the respondents were females. Majority (60.00%) were married, with 54.16% having household sizes of not less than 6 persons. Most serious constraints were inadequate finance and capital intensiveness of some strategies. Significant relationships existed between age ($r^2 = 0.152$, $p < 0.05$), sex ($\chi^2 = 5.21$, $p < 0.05$), household size ($r^2 < -0.212$, $p < 0.05$) and constraints to use of soil quality maintaining strategies. There was significant difference in the extent of constraints to use of the strategies between male and female respondents ($t = -1.12$, $p < 0.05$). It is recommended that individuals should save funds for soil quality maintenance. Moreover, programmes aimed at reducing constraints to use of the strategies should be patterned according to severity of the constraints between male and female farmers.*

KEYWORDS: Constraints, Soil Quality, Maintaining Strategies, Perception, Information

INTRODUCTION

Over the years, food production has always lagged population growth, leading to food insecurity. One of the major reasons for this is the decline in soil fertility due to man-made and natural factors. However, various attempts are made to reverse the trend. On the contrary, several factors are working against the realisation of this goal. Among these factors is the sub-optimal use of soil quality maintaining strategies in agricultural production by farmers. Compounding this problem is the effect of climate change on the soil and agriculture. Ayinde, Muchie and Olatunji (2011) noted that the effect of climate change is mostly felt in rain-fed agriculture and crop yield could greatly reduce during severe drought. These developments further widen the gap between food production and demand for agricultural produce. However, to ensure that food production keeps pace with food demand, soil quality must be maintained and effects of climate change on the soil checked.

Climate change, defined as a statistically significant variation in the mean state of the climate or its variability, persisting for an extended period (IPCC (2007a) is rather a global concern. It has multiple causal factors which include natural and man-made. Specifically, among the causes of climate change are changes in land use, pollution, gas flaring, deforestation, exploitation of natural resources and emission of green house gases. According to Adejuwon (2004), the impact of climate change could be measured in terms of its effects on crop growth, availability of soil water, soil erosion, incident of pest and diseases, sea level rises and decrease in soil fertility. Climate change can be reduced or controlled by abolition of gas flaring, deforestation and environmental pollution.

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Soil quality maintenance involves practices aimed at protecting the soil against all agents and forms of degradation. It can also be viewed as sustainable use of the soil for its various purposes. Moreover, it is the acts of using the soil today without jeopardising its ability to support and sustain its future use. Sustainable Agricultural production therefore, is the management and utilisation of agricultural ecosystem in a way that maintains its biological diversity, productivity, regeneration capacity, vitality and ability to function so that it can fulfil the present and future significant economic and social functions that do not harm other ecosystems (Budelman, 2002). For a system to be sustainable, it must meet the twain objectives of being economically viable and ecologically self-dependent (Agbonlahor, Aromolaran & Aibomi, 2003). Practices aimed at maintaining the quality of the soil are very essential. They help to increase crop yield, prevent or reduce pest and disease incidence and build-up, aids aeration and add nutrients to the soil. They also help in erosion control, moisture retention and addition of organic matter to the soil.

In Nigeria, many farmers still engage in practices that are detrimental to sustainable agricultural production. Among these practices is continuous bush burning. The adverse effects of this practice are enormous. It destroys soil organic matter, kills beneficial insects and micro-organisms, depletes soil moisture and destroys the structure of the soil. Aggravating the situation created by these practices is the effects of climate change on the soil and agricultural production. Climate change presents itself in the form of deviations and uncertainties in climatic elements including temperature regime and rainfall pattern (intensity and spatial distribution). More-over, there are incidences of rise in sea level, destruction of farmlands along river basins, incidence of new pests/diseases and increased erosion along rivers and sea-shores. These have adverse effects on agricultural production.

Every community has its own ways of coping or adapting to these changes in order to maintain soil quality (Uyigue and Agbo, 2009). However, most of these strategies require conscious effort and some levels of commitment by the stakeholders. Also, labour and other inputs which are scarce are required. These factors may lead to non-use or sub-optimal use of these soil quality maintaining strategies. This may further expose the soil to agents of degradation, making the soil unsustainable for agricultural production. To maintain the quality of the soil in the face of climate change, farmers must make unwavering commitment to the goal. They must also be encouraged and assisted to adapt or adopt measures to protect the soil and environment from degradation. Policies and guidelines must be put in place to protect agricultural production from the effects of obnoxious practices and of the vagaries of weather and climate. These are necessary because according to FAO (2009), prevention strategies and tactics must be pursued along with mitigation and adaptation.

Success in formulating policies and implementing programmes to maintain the quality of the soil depend largely on availability of dependable data. However, there is dearth of data on the constraints to use of soil quality maintaining strategies in Ibesikpo Asutan Local Governmenr Area of Akwa Ibom State. Insufficient data on these important aspects of soil quality maintenance makes it rather difficult at formulating policies and making informed decision to proof agricultural production against soil degradation and effects of climate change. This study therefore assessed the constraints to use of soil quality maintaining strategies in a climate change stricken farming communities of Ibesikpo Asutan Local Government Area of Akwa Ibom State, Nigeria.

The specific objectives were to:

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i. identify the socio-economic characteristics of crop farmers in Ibesikpo Asutan Local Government Area.

ii. assess the sources of information on sustainable agricultural practices available to crop farmers in the area

iii. examine the perception of the crop farmers on soil quality maintaining strategies in the area

iv. assess the constraints to use of soil quality maintaining strategies in the area

The following hypotheses were tested:

Ho_1: There is no significant relationship between the socio-economic characteristics of the respondents and constraints to use of soil quality maintaining strategies

Ho_2: There is no significant difference in constraints to use of soil quality maintaining strategies among male and female crop farmers in the study area.

METHODOLOGY

The study was carried out in Ibesikpo Asutan Local Government Area of Akwa Ibom State. The local government area is located within the fresh water swamp forest zone, characterized by low level land and shallow depressions and has a total land mass of about 149.49 square kilometres (Udofia, 2007). The people are generally homogenous and speak Ibibio language. Ibesikpo Asutan Local Government Area is blessed with mineral deposits including crude oil, clay and limestone. The major livelihood activities of the people are farming, trading and processing of agricultural products. The population of the study included all crop farmers in the study area. The study adopted a multi-stage sampling technique to select 120 respondents for the study. The first stage was a stratified sampling procedure where the 79 villages that make up the local government area were divided into four groups consisting of about 20 villages each. Two villages were randomly selected from each of the four groups making a total of 8 villages. The study then adopted a proportional sampling procedure to select 15 respondents from each of the 8 villages, making a total of 120 respondents. Structured questionnaires were used for data collection. Data were analysed using frequencies, percentages, means and ranks. Also, Chi-square and Spearman Rho Rank Correlation were used to test the hypotheses.

RESULTS AND DISCUSSION

Table 1 shows that the modal age class of the respondents was between 41-50 years, with a mean age of 47.77 years. According to the result, some farmers may be severely constrained in the use of some soil quality maintaining strategies that require youthful vigour and strength. The table also shows that female crop farmers (65.00%) were more than males (35.00%) in the area. This finding is in agreement with the observation of Okoro and Esu (2013) who noted that women are into farming than men in the area. Majority of the respondents (60.00%) were married, while singles, divorced and widowed accounted for 40.00%. This may be attributed to the high respect placed on marriage in the area and the

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desire for large households to increase family labour strength for agricultural production. Most farmers were educated (83.33%), with only 16.67% having no formal education. The high educational status of farmers in the South-south region of the country was earlier reported by Ndubueze-Ogaraku and Ekine (2014) who observed a very high educational status among cassava farmers in Rivers State which shares boarder with Akwa Ibom State. Moreover, 54.16% of the respondents had household sizes of not less than 6 persons. The large household sizes could be a source of relief in the constraints to use of soil quality maintaining strategies that has to do with insufficient labour, if the large household sizes translate to increased farm labour.

Table 1: Distribution of Respondents by Personal Characteristics

Age(years)	**Frequency**	**Percentage**	**Mean**
≤ 20	2	1.70	
21-30	5	4.17	
31-40	27	22.50	
41-50	40	33.33	44.77
51-60	38	31.70	
61 & above	8	6.70	
Sex			
Male	42	35.00	
Female	78	65.00	
Marital Status			
Single	18	15.00	
Married	72	60.00	
Divorced	6	5.00	
Widowed	24	20.00	
Educational Status			
Informal	20	16.67	
Primary	42	35.00	
Secondary	38	31.67	
Tertiary	20	16.67	
Religion			
Christianity	117	97.50	
Islam	0	0.00	
African Traditional Religion	3	2.50	
Household Size			
1-5 person(s)	55	45.83	
6-10 persons	64	53.33	
>10 persons	1	0.83	

Source: Field survey, 2014

Respondents' Farm Related Characteristics

Table 2 shows that 93.33% of the respondents had farm sizes of not more than 3 hectares, while only 6.16% had farm sizes of 4 hectares or above. Most farmers may be hindered in the use of some soil quality maintaining strategies, especially those that are more inclined to large farm holdings. The result in Table 2 also shows that 10.83% of the respondents practiced mono cropping, while 89.17% were into mixed cropping. This may be as a result of the high total yield experienced with mixed cropping than mono-cropping. This is in line with

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the findings of Youdeowei and Akinwunmi (1999) who noted that most farmers in Nigeria practice mixed cropping.

According to Table 2, 40.00% of the respondents had farming experience of between 11 to 20 years and 27.50% had farming experience above 20 years. This shows that most of the respondents were experienced farmers who may likely overcome some of the hindrances to use of soil maintaining strategies in agricultural production. Table 2 shows that 16.67% of the respondents used mostly family labour, while 67.50% of the respondents used both family and hired labour. This implies that the crop farmers do not depend on family labour alone, they also hire farm labour in the process of agricultural production.

Table 2: Distribution of Respondents by Farm Related Characteristics

Farm Size (Hectares)	**Frequency**	**Percentage**
1 – 3	112	93.33
4 – 6	4	3.33
7 – 9	1	0.83
10 & above	3	2.50
Cropping System		
Mono cropping	13	10.83
Mixed cropping	107	89.17
Farming Experience		
1-10	39	32.50
11-20	48	40.00
21-30	30	25.00
31& above	3	2.50
Labour used		
Family labour	20	16.67
Hired labour	19	15.83
Both	81	67.50

Source: Field survey, 2014

Sources/channels of Information on Soil Quality Maintenance

According to findings as presented in Table 3, the major source of information on soil quality maintenance available to farmers in the area is fellow farmers which ranked 1st among the sources. Others were friends/relatives, radio and extension agents with ranks of 2nd, 3rd and 4th major sources/channels of information respectively. Minor sources/channels of information were bulletin, magazine and news letter which ranked 10th, 9th and 8th respectively and are not considered major sources of information utilised by the farmers. This implies that if greater access to information on soil quality maintenance is to be achieved in the area, the information should be sent through the various major sources/channels to the farmers. On the other hand, contact farmers should be trained and empowered to disseminate information on soil quality maintenance as they are accessible to most of the farmers in the area. Okoedo-Okojie (2014) observed that farmers need information on various aspects of farming in order to increase agricultural production.

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Table 3: Sources/Channels of Information on Sustainable Agricultural Practices

Sources/Channels	Not a Source/ Channel	Minor Source/ Channel	Major Source/ Channel	Mean	Rank
Fellow farmers	2.5	9.2	88.3	1.86	1st
Friends/Relatives	3.33	24.17	72.50	1.69	2nd
Extension Agents	16.67	62.50	20.83	1.04	4th
Radio	14.17	65.00	20.83	1.07	3rd
Television	25.83	55.83	18.33	0.93	5th
Newspaper	45.00	48.33	6.67	0.62	6th
Magazine	69.17	30.00	0.83	0.32	9th
Bulletin	72.50	27.50	0.00	0.28	10th
Poster	57.50	41.67	0.83	0.43	7th
Newsletter	69.17	25.83	5.00	0.36	8th

Source: Field Survey, 2014.

Constraints to Use of Soil Quality Maintaining Strategies

Results in Table 5 reveal that inadequate finance, capital intensiveness and lack of incentives were the major constraints to use of soil quality maintaining strategies in the area which ranked 1st, 2nd and 3rd most severe constraints respectively. The intensity of inadequate finance and capital intensiveness as constraints could be reduced if conscious efforts are taken by the farmers to raise capital through various ways including personal savings to solve the problems. However, this finding corroborates an earlier observation in a related study by Edeoghon, Ajayi and Ugboya (2003) who noted that lack of finance and large capital requirement of some strategies are barriers to sustainable agricultural production. Moreover, geographical location of the land, lack of interest and effects of indigenous practices with ranks of 13th, 12th and 11th were mild hindrances to use of soil quality maintaining strategies in the area.

Table 5: Constraints to Use of Sustainable Agricultural Practices

Constraints	Not a constraint	Minor constraint	Major constraint	Mean	Rank
Difficulty in use of the practice	7.50	55.00	37.50	1.30	6th
Inadequate finance	2.50	5.83	91.67	1.89	1st
Poor knowledge of the practice	9.17	60.00	30.83	1.22	7th
Lack of incentive	7.50	21.67	70.83	1.63	3rd
Effect of climate change	19.17	55.83	25.00	1.06	10th
Lack of interest	31.67	54.17	14.17	0.83	12th
Effect of land tenure	17.50	50.00	32.50	1.15	8th
Geographical location	44.17	40.83	15.00	0.71	13th
Labour intensiveness	11.67	45.00	43.33	1.32	5th
Capital intensiveness	5.00	20.00	75.00	1.70	2nd
Conflict with indigenous practices	25.00	57.50	17.50	0.93	11th
Land fragmentation	25.83	35.83	38.33	1.13	9th
Insufficient extension education	7.50	50.83	41.67	1.34	4th

Source: Field survey, 2014

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Perception of Soil Quality Maintenance and Climate Change

According to Table 4, 86.67% of the respondents perceived that changes in climatic elements can affect the quality of the soil. Also, 96.67% of the respondents perceived that climate change can reduce crop yield. This is in consonant with the findings of IPCC (2007a) who projected that areas suited for agriculture in Africa will be negatively affected by climate change and that the yield potentials of many high profile crops will decrease. According to the results, 95.83% of the respondents perceived that application of organic manure can help to improve the nutrient content of the soil. Moreover, 68.33% of the respondents are of the perception that organic manure is better than inorganic manure in maintaining the quality of the soil. According to Rudel *et al* (2016), practices like manuring, mulching, minimum tillage and crop rotation foster more biodiversed soils and make the food system more resilient in the face of climate shocks.

The perception of 65.83% of the respondents is that excessive rainfall resulting in water logging of the soil can hinder soil aeration, while 84.17% of the respondents perceived that excessive high temperature can lead to depletion of soil moisture. As noted by Obioha (2008), reduction in the amount of surface water occasioned by climate change is a serious threat to some regions in Northern Nigeria. However, 75.00% of the respondents perceived that bush burning cannot deplete the nutrient content of the soil. Also, 40.83% of the respondents perceived that excessive tillage does not destroy the structure of the soil. This perception may be detrimental to efforts at maintaining the quality of the soil as many farmers in the area may embark on continuous bush burning and excessive tillage of the soil with no reference to their negative effects.

Table 4: Respondents' Perception of Soil Quality Maintenance and Climate Change

S/No	Statements	Perception (%)		
		Disagreed	Undecided	Agreed
1	Changes in climatic elements can affect the quality of the soil	11.67	1.67	86.67
2	Continuous planting of a particular crop on the same piece of land can encourage pest and disease build-up	53.33	2.50	44.17
3	Climate change can bring about sea-rise and destruction of crops on river basins	40.00	1.67	58.33
4	Contour ploughing helps to reduce soil erosion	31.67	0.00	68.33
5	Application of organic manure helps to improve the nutrient content of the soil	4.17	0.00	95.83
6	Bush burning can deplete the nutrient content of the soil	75.00	2.50	22.50
7	Organic manure is better than inorganic manure in maintaining the quality of the soil	31.67	0.00	68.33
8	Crop rotation helps to maintain the quality of the soil	55.83	2.50	41.67
9	Bush fallowing helps the soil to regain its fertility	0.00	0.83	99.17
10	Cover cropping protects the soil from erosion	21.67	1.67	76.67
11	Mulching does not protect the soil nor crops	62.5	0.00	37.5

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12	Excessive tillage destroys the structure of the soil	40.83	0.83	58.33
13	Over-irrigating the soil results in leaching	30.00	1.67	68.33
14	Crop pests can be controlled by introducing their predators	22.50	0.83	76.67
15	Excessive high temperature can lead to depletion of soil moisture	15.83	0.00	84.17
16	Excessive rainfall can prevent soil aeration	34.17	0.00	65.83
17	Deforestation may be encouraged by prolonged dry season	8.33	0.83	90.83
18	Changes in climatic elements can reduce crop yield	3.33	0.00	96.67

Source: Field Survey, 2014

Tested hypotheses

Ho_1: There is no significant relationship between personal characteristics of the respondents and constraints to use of soil quality maintaining strategies.

Table 6 shows that there are significant relationships between age ($r^2 = 0.152$, $p < 0.05$), sex ($\chi^2 = 5.214$, $p < 0.05$), household size ($r^2 = -0.212$, $p < 0.05$) and constraints to use of soil quality maintaining strategies. According to the results, the older an individual, the more constrained the individual is in the use of soil quality maintaining strategies. Again, the larger the household size, the less constrained the individual is in the use of soil quality maintaining strategies. This could be as a result of more persons available in the household that could be used as family labour in soil quality maintenance.

Table 6: Relationships between Personal Characteristics of the Respondents and Constraints to Use of Soil Quality Maintaining Strategies

Variable	**r^2**			**p**	**Remark**
Age	0.152			0.047	Significant
Household size	-0.212			0.033	Significant
Years of farming experience	0.265			0.066	Not significant
Variable	**χ^2**	**df**	**cc**	**p**	**Remark**
Educational status	0.621	1	0.262	0.655	Not Significant
Marital status	3.912	3	0.251	0.312	Not Significant
Sex	5.214	3	0.195	0.015	Significant

Ho_2: There is no significant difference in extent of constraints to use of soil quality maintaining strategies between male and female crop farmers in the study area.

According to Table 7, there is a significant difference in the extent of constraints to use of soil quality maintaining strategies between male and female farmers in the area ($t = -1.121$, $p < 0.05$). The result shows that females are more constrained than males in the use of soil quality maintaining strategies. This could be as a result of the energy sapping nature of some of the practices or the hindrances posed by land tenure system in the area.

Table 7: Differences in Constraints to Use of Soil Quality Maintaining Strategies between Male and Female Farmers

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Variable	Mean Constraints Index	t-value	p-value	Remark
Male	1.202	-1.121	0.047	Significant
Female	1.324			

CONCLUSION AND RECOMMENDATION

Most serious constraints to use of soil quality maintaining strategies among crop farmers in the study area are inadequate finance, capital intensiveness of use of some of the strategies and lack of incentives. Females were more constrained in the use of the strategies than males. It is recommended that individuals should save funds for use in maintaining soil quality. Also, in the case of capital intensive strategies which require costly equipments, government should help farmers in providing these equipments for easy access and utilisation. Moreover, programmes aimed at reducing constraints to use of these strategies should be patterned according to severity of the constraints between male and female farmers.

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