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UTILIZATION OF SOIL MANAGEMENT PRACTICES AMONG ROOT AND TUBER CROP FARMERS IN ASA LOCAL GOVERNMENT AREA OF KWARA STATE, NIGERIA

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Abstract:
One of the most severe threats to the sustainability of crop production in Nigeria is declining productivity as a result of low soil fertility. This study, therefore, assesses the soil management practices among root and tuber crop farmers in Asa Local Government Area of Kwara State, Nigeria. A two-stage sampling techniques was employed to select a total of 150 respondents for the study. Data were collected and analysed using both descriptive and inferential statistics. The findings of the study revealed that the mean age of the respondents was approximately 45 years, with the majority (75.3%) being male, and about 68% had one form of formal education or another. Results showed that mixed cropping ($\bar{x}$=2.56), organic manure application ($\bar{x}$=2.55) and crop rotation ($\bar{x}$=2.45) were the most frequently utilised soil management practices among the farmers. Further findings revealed strong positive perception towards soil management practices among the respondents, with the majority in agreement with statements such as "application of manure improves soil fertility" ($\bar{x}$=4.68). The study also revealed that inadequate knowledge of modern techniques ($\bar{x}$=2.73) is the most severe constraint to the utilization of soil management practices among the farmers. There was a positive and significant relationship between educational level (B=1.07), household size (B=0.36) and the extent of usage of soil management practices at 5% level of significance. It is recommended that extension agents allocated to Asa LGA should consider it important to train crop farmers on modern soil management techniques and improve their technical know-how on the implementation.

Keywords*: Farmers, Root and Tuber crops, Soil management practices, Utilization.*

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Introduction

Root and tuber crops, encompassing staple crops like cassava, yams, and sweet potatoes, have emerged as vital contributors to global food security, serving as primary sources of dietary calories and essential nutrients for millions of people worldwide **(**FAO**,** 2018). These crops are particularly significant in regions where they constitute staple foods, offering resilience in the face of changing climatic conditions and contributing to the overall food diversity and nutrition of communities **(**Bouis, McClafferty and Meenakshi, 2011).

In the broader context of agricultural practices, the management of soil resources stands out as a pivotal determinant of the productivity and

sustainability of root and tuber crops. Soil health directly influences crop yields, and efficient soil management practices play a crucial role in optimising nutrient availability, water retention, and overall soil structure **(**Lal**,** 2009). As a consequence, understanding the specific soil management practices employed by farmers becomes imperative for enhancing agricultural productivity, ensuring food security, and mitigating environmental impacts associated with intensive farming practices.

Root and tuber crops form the backbone of agriculture in Kwara State, Nigeria, contributing significantly to both food security and the local economy (Adebayo and Adejumo, 2022). Despite their importance, there exists a critical gap in the understanding of the soil management practices employed by farmers cultivating these crops. The lack of comprehensive studies on this subject hinders the development of informed strategies and interventions that are essential for sustainable agricultural practices in the region.

The consequences of inadequate soil management are multifaceted and pose substantial challenges to agricultural sustainability. Reduced crop yields, a direct outcome of suboptimal soil conditions, directly impact the livelihoods of farmers and exacerbate food insecurity among the local population **(**FAO**,** 2011). Furthermore, improper soil management practices can lead to soil degradation, a phenomenon that adversely affects soil structure, fertility, and overall health (Lal, 2015). The degradation of soil quality, in turn, has far-reaching implications for the long-term sustainability of agricultural activities in Kwara State.

Beyond the immediate agricultural concerns, poor soil management can have negative environmental consequences. Soil degradation contributes to increased greenhouse gas emissions, loss of biodiversity, and compromised water quality **(**IPBES, 2018). These environmental ramifications not only affect the local ecosystem but also have broader implications for global environmental sustainability.

Therefore, understanding the current state of soil management practices among root and tuber crop farmers in Kwara State is not merely an academic exercise but a crucial step toward addressing these pressing challenges. Without a comprehensive understanding of the prevailing practices and their implications, formulating targeted interventions and policies becomes a daunting task.

The specific objectives of the study were to;

i. Describe the socio-economic characteristics of root and tuber crop farmers in the study area.
ii. Determine the extent of usage of soil management practices among root and tuber crop farmers in the study area.
iii. Assess farmers perception towards soil management practices in the study area.
iv. Examine the perceived constraints limiting the use of soil management practices in the study area.

Methodology

The study was conducted in Asa Local Government Area (LGA) Kwara State, Nigeria. The population of the study comprised all root and tuber crop farmers in Asa Local Government Area (LGA), Kwara State, Nigeria. The sample procedure involved two-stage sampling techniques. The first stage involved a random selection of five (5) communities from the Local Government Area, while the second stage involved a random selection of 30 root and tuber crop farmers to give a total sample size of 150 respondents.

The extent of usage of soil management practices was measured on a 3-point Likert-type scale where Never use = 1, Occasionally used = 2 and Always use = 3. The perception of farmers towards soil management practices was measured on a 5-point Likert scale where Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5. The factors affecting the use

of soil management practices among the respondents were measured on a 3-point Likert scale where Not severe = 1, Less severe = 2, Severe = 3 and Very severe = 4. Descriptive statistics such as frequency counts, percentages and means were used to analyse the findings of the study, while inferential statistics (logit Regression) was used to analyse the hypothesis.

Results and discussion

Table 1: Socio-economic Characteristics of Respondents

Variable	Frequency	Percentage	Mean	SD
Age (years)				
≤ 30	15	10.0		
31 – 40	54	36.0	45.08	11.95
41 – 50	38	25.3		
51 – 60	23	15.3		
≥ 61	20	13.3		
Sex				
Male	113	75.3		
Female	37	24.7		
Marital Status				
Single	26	17.3		
Married	94	62.7		
Divorced	6	4.0		
Widowed	24	16.0		
Level of education				
No formal education	48	32.0		
Primary education	39	26.0		
Secondary education	35	23.3		
Tertiary education	28	18.7		
Household size (persons)				
≤ 5	75	50.0		
6 – 10	69	46.0	6.07	2.34
≥ 11	6	4.0		
Farming experience (years)				
1 – 10	66	44.0		
11 – 20	52	34.7	15.30	9.91
21 – 30	17	11.3		
≥31	15	10.0		
Farm size (hectares)				
≤ 1	105	70.0		
1.1 – 2.0	26	17.3	1.29	0.89
2.1 and above	19	12.7		
Sources of labour				
Communal	11	7.3		
Family	41	27.3		
Hired	85	56.7		
All of the above	13	8.7		

Variable	Frequency	Percentage	Mean	SD
Membership of farmers group				
Yes	55	36.7		
No	95	63.3		
Contact with extension agents				
Yes	14	9.3		
No	136	90.7		

Source: Field survey, 2024

The result presented in Table 1 shows that an appreciable percentage of the respondents (36.0%) were aged between 31 to 40 years, as 25.3% were aged between 41 – 50 years, 13.3% were between 51 to 60 years, while 10% were 30 years and below. The average years of age was 45 years, indicating that many of the root and tuber farmers were young and thus, are expected to be agile and strong to perform strenuous cultural operations involved in root and tuber farming. The results in Table 1 further show that 75.3% of the respondents were male while the remaining 24.7% were female. This shows that the majority of root and tuber farmers in the study area are male. This finding may be attributed to the rigour involved in root and tuber farming, which could be handled by men only.

More result on the marital status of the respondent in Table 1 shows that 17.3% were single, 62.7% were married, only 4.0% were divorced, while 16.0% were widows. This implies that the majority of the root and tuber farmers in the study area were married. Marriage is expected to come with additional responsibility and labour that could significantly influence one to use innovation for soil management that is capable of enhancing productivity for improved livelihood. Regarding the educational level of the respondents, 32.0% had no formal education, 26.0% had primary education, 23.3% had secondary education, while 18.7% had tertiary education. This implies that the root and tuber farmers in the study area had one form of education or the other and were able to read and understand instructions disseminated through extension agents which could translate to improve soil fertility and improved yield. Primary occupations of the respondents was farming (69.3%), 10.0% were civil servants, 11.3% were involved in trading/business, while 9.3% engaged in artisanal works. This indicates that farming is the main occupation of root and tuber farmers in the study area. On household size, Table 1 shows that 50.0% had 5 persons or below, 46.0% had 6 to 10 persons, while 4.0% had above 10 persons in their household. The average number of households was 6 persons. Farmers could take advantage of their family members for farm labour to implement soil management practices.

Data on years of farming experience shows that 44.0% had 1 to 10 years, 34.7% had 11 to 20 years of experience, 11.3% had 21 to 30 years of experience, while 10.0% had below 30 years of experience. The average year of experience was 15.3 in root and tuber farming. This shows that root and tuber farmers in the study area had accumulated appreciable years of experience long enough to understand some soil management practices that promote crop growth and yield. A similar observation was made by Handio and Yuansheng (2018) in Pakistan, where shorter experience in farming, lower farmers' level of education on soil management practices were observed. Regarding the farm size of the respondents, 70.0% had 1 ha^{-1} or below, 17.3% had between 1.1 to 2.0 ha^{-1} of farm land, while 12.7% had between 2.1 ha^{-1} and above. The average farm size was 1.29 ha^{-1} of root and tuber farming. This shows that root and tuber farmers in the study area are small-scale farmers.

Further information on socioeconomic characteristics of respondents in Table 1 revealed that 56.7% hired labour, 27.3% used family

labour, 7.3% used communal labour, while 8.7% used all available sources of labour to cultivate roots and tubers. This implies that activities of root and tuber cultivation in the study area are being performed by hired labour. On membership of the farmers group, 36.7% were members while 63.3% were non-members of the farmers group. This shows that root and tuber growers in the study area are not members of a farmers group where they could jointly access information and other assets that could help members for soil fertility management. Studies have affirmed that group membership encouraged the uptake of soil management practices, possibly because group membership improves technical efficiency and crop yields by enhancing the exchange of agricultural information and inputs among members (Abdul-Rahaman and Abdulai, 2018). In the same trend, 90.7% had no contact with extension agents, indicating that root and tuber farmers may have no access to modern innovations on soil management practices that are mostly disseminated through extension agents.

Table 2: Extent of usage of soil management practices by respondents

Soil Management Practices	Never	Occasionally	Always	Mean	SD	Rank
Mixed cropping	19(12.7)	28(18.7)	103(68.7)	2.56	0.71	1st
Organic manure	9(6.0)	49(32.7)	92(61.3)	2.55	0.61	2nd
Crop rotation	26(17.3)	31(20.7)	93(62.0)	2.45	0.77	3rd
Cover cropping	49(32.7)	63(42.7)	38(25.3)	1.93	0.76	4th
Bush fallowing	52(34.7)	56(37.3)	42(28.0)	1.93	0.79	5th
Conservation tillage	57(38.0)	65(43.3)	28(18.7)	1.81	0.73	6th
Agro-forestry	124(82.7)	13(8.7)	13(8.7)	1.27	0.67	7th

Source: Field survey, 2024

Table 2 provides information on the extent of usage of soil management practices by respondents. Findings revealed that use of mixed cropping (mean=2.56) was ranked first position, use of organic manure (mean=2.55) was ranked second position, crop rotation (mean=2.45) was ranked third position, cover cropping (mean=1.93) was ranked fourth position, bush fallowing (mean=1.93) was ranked fifth position, conservation tillage (mean=1.81) was ranked sixth position while agroforestry (mean=1.27) was ranked seventh position as the least used of soil management practices indicated by respondents. This finding indicates that the use of mixed cropping, organic manure and crop rotation practices was the leading practice for soil management by root and tuber farmers in the study area. This finding concurs with a report that stated that mixed cropping, organic manure and crop rotation are the common soil management practices among farmers in Nigeria (Suleiman et al., 2021; Ojediran et al., 2023).

Table 3: Perception on the use of soil management practices by respondents

Perception Statement	SD	D	U	A	SA	Mean	SD	Rank
Proper soil use is enhanced by tree planting	0	11(7.3)	16(10.7)	82(54.7)	41(27.3)	4.02	0.82	6th
Waterlogging can be prevented by drainage	0	0	5(3.3)	112(74.7)	33(22.0)	4.19	0.47	5th

Perception Statement	SD	D	U	A	SA	Mean	SD	Rank
Perception Statement	**SD**	**D**	**U**	**A**	**SA**	**Mean**	**SD**	**Rank**
Only farmers engage in soil management	2(1.3)	19(12.7)	28(18.7)	51(34.0)	50(33.3)	3.85	1.06	7th
Application of manure increases soil fertility	0	2(1.3)		42(28.0)	106(70.7)	4.68	0.55	1st
Soil texture can be improved by crop rotation	0	1(0.7)	2(1.3)	78(52.0)	69(46.0)	4.43	0.56	2nd
Additional information would cause farmers to engage in more soil management activities	0	0	3(2.0)	83(55.3)	64(42.7)	4.41	0.53	3rd
Future generation will benefit from soil management	0	0	10(6.7)	68(45.3)	72(48.0)	4.41	0.62	3rd

Source: Field survey, 2024

The perception of farmers on the use of soil management practices was presented in Table 3. The table showed that perception of the farmers on application of manure increases soil fertility (mean=4.68) was ranked first position; soil texture can be improved by crop rotation (mean=4.43) was ranked second position; future generation will benefit from soil management (mean=4.41) was ranked third position; additional information would cause farmers to engage in more soil management activities (mean=4.41) was ranked fourth position, water logging can be prevented by drainage (mean=4.19) was ranked fifth position, proper soil use is enhanced by tree planting (mean=4.02) was ranked sixth position while only farmers engage in soil management (mean=3.85) was ranked the seventh position as the least perception of statement on the use of soil management practices. This finding implies that statements on application of manure increase soil fertility, soil texture can be improved by crop rotation, and future generations will benefit from soil management were the topmost favourable perceptions of farmers on the use of soil management practices in growing root and tuber crops in the study area. This is probably because improving soil fertility will translate to an increase in crop yield (Abdul-Rahaman and Abdulai, 2018; Agegnehu and Amede, 2017; Maharjan et al., 2018).

Table 4: Perceived Constraints affecting the use of soil management practices by respondents

Perceived Constraints	Not severe	Less severe	Severe	Very severe	Mean	SD	Rank
Problem of pests and diseases	29(19.3)	62(41.3)	44(29.3)	15(10.0)	2.30	0.90	7th
Inadequate knowledge of soil quality indicators	21(14.0)	57(38.0)	60(40.0)	12(8.0)	2.42	0.83	5th

Perceived Constraints	Not severe	Less severe	Severe	Very severe	Mean	SD	Rank
Lack of technical know-how on the implementation of soil management practice	17(11.3)	51(34.0)	63(42.0)	19(12.7)	2.56	0.86	2nd
Transportation problems	17(11.3)	79(52.7)	24(16.0)	30(20.0)	2.45	0.94	4th
Inadequate knowledge of modern techniques	13(8.7)	33(22.0)	85(56.7)	19(12.7)	2.73	0.79	1st
Inadequate farm land	29(19.3)	53(35.3)	59(39.3)	9(6.0)	2.32	0.85	6th
Lack of funds	24(16.0)	71(47.3)	13(8.7)	42(28.0)	2.49	1.07	3rd
Low produce price	28(18.7)	88(58.7)	27(18.0)	7(4.7)	2.09	0.74	8th

Source: Field survey, 2024

Findings on the constraints to the use of soil management practices among root and tuber farmers in Table 4 shows that inadequate knowledge of modern techniques (mean=2.73) was ranked first position; lack of technical know-how on implementation of soil management practice (mean=2.56) was ranked second position, lack of fund (mean=2.49) was ranked third position, transportation problems (mean=2.45) was ranked fourth position, while low produce price (mean=2.09) was ranked eightieth position as the least constraint to the use of soil management practices. This implies that inadequate knowledge of modern techniques, lack of technical know-how on the implementation of soil management practice and lack of funds were the main constraints to the use of soil management practices among root and tuber farmers in the study area.

Table 5: Results of logistic regression showing the effects of selected socio-economic characteristics on the use of soil management practices of root and tuber farmers.

Variables in the Equation	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Age	-0.06	0.04	2.26	0.13	0.95	0.88	1.02
Sex	1.11*	0.66	2.81	0.09	0.33	0.09	1.21
Marital status	0.04	0.31	0.02	0.89	1.04	0.57	1.91
Level of education	1.07*	0.31	12.29	0.00	2.92	1.61	5.33
Household size	0.36*	0.15	5.79	0.02	1.43	1.07	1.92
Years of experience	0.05	0.04	1.49	0.22	1.05	0.97	1.15
Farm size	-0.44*	0.16	7.84	0.01	0.64	0.47	0.88
Labour type	1.64*	0.42	15.19	0.00	5.14	2.26	11.71
Membership of a farmers group	-0.55	0.58	0.91	0.34	0.58	0.18	1.80
Access to extension	-1.28	0.90	2.06	0.15	0.28	0.05	1.60
Constant	-1.79	1.94	0.85	0.36	0.17		

Model Summary: -2 Log likelihood=130.296[a] Cox & Snell R Square=0.305; Nagelkerke R Square= 0.431

Results of the logistic regression in Table 5 showed that sex (B=1.11), level of education (B=1.07), primary occupation (B= -0.65), household size (B=0.36), farm size (B= -0.44), and labour type (B=1.64) significantly influence the use of soil management practices among root and tuber farmers at $p<0.05$ level of significance. Findings imply that an increase in the level of education, an increase in the number of persons per household, and an increase in current types of labour used, a greater use of soil management practices among root and tuber farmers. However, an increase in farm size will decrease farmers' use of soil management practices. Findings of this study have been similarly found in previous studies. Technology uptake pattern has been attributed to socioeconomic and biophysical determinants like human planned behaviour (level of education, and household size) (Otieno et al., 2021; Despotović et al., 2019). Also, socioeconomic (gender, education level, and age of the household) factors influenced the uptake of soil and water conservation measures in Ethiopia (Asfaw and Neka, 2017). In contrast, Daudu et al. (2017) identified the need for gender capacity building among the female smallholder farmers in Kwara State, Nigeria, on soil fertility management.

Conclusion

Based on the findings of this study, the study revealed that the roots and tubers crop farmers in Asa LGA, Kwara state are smallholder farmers with no access to extension services, and the majority of them do not belong to any farmers' group. Mixed cropping, application of organic manure and crop rotation were the prominent soil management practices adopted by root and tuber farmers in the study area. The application of manure increases soil fertility, and soil texture can be improved by crop rotation, which is the topmost favourable perception of farmers on the use of soil management practices. Inadequate knowledge of modern techniques and a lack of technical know-how on the implementation of soil management practices were the main constraints to the use of soil management practices among the farmers. Factors that support the use of soil management practices are an increase in the level of education, an increase in the number of persons per household, and an increase in the current types of labour used by the farmers.

Recommendations

Based on the conclusion drawn from the findings, the following recommendations were made:

i. Due to low access to extension services among the root and tuber crop farmers, both government and private agricultural extension organisations in Kwara State should increase their activities among roots and tubers crop farmers in Asa LGA of the state.
ii. The agricultural extension agents covering Asa LGA should intensify effort to encourage roots and tubers crop farmers to form or join an association of root and tuber crop farmers in their various communities where none is existing, by enlightening them on the power of collective effort to overcome production challenges.
iii. Agroforestry is not well practised among root and tuber crop farmers. Thus, agricultural extension agents should consider it important to train crop farmers on agroforestry skills in managing soil fertility.
iv. Concerned government agencies and financial institutions should come to the aid of root and tuber crop farmers in Asa by facilitating more opportunities for the farmers to access funds to improve their productivity.
v. Agricultural extension programme aimed to improve farmers' capacity in soil management practices should first consider farmers with an increased level of education, increased number of persons per household available for farm labour,

or available hired types of labour with no other job as primary occupation other than root and tuber cultivation.

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