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INDIGENOUS KNOWLEDGE AND SOIL CONSERVATION PRACTICES AMONG SMALL-HOLDING FARMERS IN OGBIA

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Abstract
The study investigated the indigenous knowledge and soil conservation practices among smallholder farmers in Ogbia LGA, Bayelsa State. The study's population comprised all smallholder farmers involved in arable crop production within Ogbia LGA. A purposive sampling technique was employed to select 80 farmers involved in arable crop production. We used the Indigenous Knowledge and Soil Conservation Practices Questionnaire (IKSCPQ) to gather data. The instrument underwent validation and reliability testing, achieving a reliability index of 0.84 via the Cronbach's Alpha method. The research questions were addressed using mean and standard deviation, while the null hypotheses were evaluated through an independent sample t-test and ANOVA at the 0.05 significance level. The study's results indicated that the indigenous knowledge of soil conservation among male and female farmers involved in arable crop production varies marginally. The corresponding hypothesis, which revealed no noteworthy disparity, further confirms that gender does not play a decisive role in determining indigenous soil conservation knowledge among farmers. The study concluded that indigenous soil conservation practices are widely known, applied, and perceived as effective among smallholder farmers in the study area, regardless of gender, farming experience, or educational level. The study recommended, among others, that agricultural extension agencies and local government authorities should design and implement gender-inclusive training programmes to sustain and further enhance the already similar levels of indigenous knowledge among male and female farmers.

Keywords: Indigenous knowledge, Soil Conservation Practices, Smallholder Farmers, Arable Crop Production

Introduction

Farming systems in the humid tropical regions of Nigeria are largely influenced by environmental limitations, especially soil degradation challenges like leaching, erosion, and the gradual loss of soil nutrients, which are intensified by high rainfall and fragile geomorphological conditions typical of the Niger Delta (Igbokwe & Akinyemi, 2020). In Bayelsa State, especially in Ogbia LGA, smallholder farmers dominate agricultural production and depend heavily on land resources for livelihood sustenance. However, continuous cultivation without adequate soil management has led to declining soil fertility and reduced productivity in many rural farming systems (Adebayo & Ojo, 2019). In response, indigenous knowledge systems have become central to farmers' adaptation strategies. Traditional soil conservation methods such as crop rotation, mulching, bush fallowing, and the use of organic manure are locally developed strategies designed to sustain soil structure, improve fertility, and preserve ecological balance, particularly in environments with limited resources (FAO, 2022). From a geographical perspective, these practices are embedded within specific environmental contexts and reflect long-term human-environment interaction.

Indigenous knowledge is understood as cumulative, place-based knowledge generated through sustained interaction between local communities and their environment, transmitted across generations through cultural learning and practice (World Bank, 2021). In agricultural geography, it is recognized as a critical component of sustainable land management, particularly in regions where formal agricultural inputs are limited or inaccessible. Soil conservation practices (SCP), in turn, refer

to deliberate land management strategies designed to decrease soil erosion, improve fertility, and maintain ecosystem productivity (Lal, 2015). In Ogbia LGA, where soils are largely alluvial and hydromorphic, indigenous techniques such as mulching and organic amendments are particularly important for nutrient retention and moisture conservation. However, the distribution of indigenous knowledge is not uniform across populations, as factors such as gender influence access to land, farming roles, and participation in agricultural decision-making (Doss, 2018). This makes it necessary to examine disparities in indigenous knowledge between female and male farmers.

The application of indigenous SCP is also shaped by farming experience and educational attainment, which influence farmers' interaction with their environment and decision-making processes. Experienced farmers tend to possess deeper ecological knowledge due to prolonged engagement with land-use cycles, seasonal variations, and soil behaviour, whereas less experienced farmers often rely on observational learning or intergenerational knowledge transfer (Pretty et al., 2010). Education, on the other hand, enhances farmers' ability to integrate scientific understanding with traditional practices, potentially improving soil management outcomes. Nevertheless, empirical evidence suggests that indigenous practices remain widely utilized across both educated and non-educated farmers because of their low cost, accessibility, and ecological compatibility (Agadaga et al., 2024; Ogunkolu et al., 2025). This highlights the resilience of indigenous knowledge systems even in the presence of formal agricultural education.

Furthermore, socio-economic factors play a decisive role in shaping farmers' land management decisions within rural agrarian landscapes. Income level, farm size, access to extension services, labour availability, and cultural norms interact to influence the extent of indigenous knowledge utilization (Tsado et al., 2021). In economically constrained environments such as Ogbia LGA, farmers with limited financial capacity are more likely to depend on indigenous soil conservation methods due to their low input requirements. Conversely, access to extension services can facilitate the integration of indigenous and modern agricultural technologies, thereby improving soil conservation outcomes (FAO, 2022). Cultural beliefs also reinforce the continuity of traditional practices, ensuring their transmission across generations. Therefore, understanding indigenous knowledge and SCP requires a geographical approach that integrates physical environmental conditions with socio-economic and cultural determinants of land use.

Statement of the Problem

Agriculture continues to serve as the chief source of living for the majority of rural households in Nigeria, particularly in the Niger Delta region, where smallholder farming dominates food production systems. Despite the reliance on agriculture, several interconnected problems continue to limit effective soil conservation among smallholder farmers. Many farmers face declining soil fertility as a result of continuous cultivation without sufficient nutrient replacement. At the same time, others have limited access to improved agricultural technologies and extension services that could support more sustainable land management practices. Socio-economic constraints such as low income, limited farm size, inadequate labour, and poor access to credit further restrict farmers' ability to adopt or maintain effective soil conservation actions.

These challenges directly affect the effectiveness of SCP and ultimately threaten food security in the region. Poor soil management leads to reduced crop yields, land degradation, and declining farm productivity, thereby increasing vulnerability to food shortages among rural households. However, indigenous knowledge offers valuable locally adapted solutions such as crop rotation, mulching, organic manure application, and bush fallowing, which have been shown to improve soil fertility and reduce erosion under resource-limited conditions. Despite its potential, the extent to which this knowledge is applied and its effectiveness across different farmer categories remains insufficiently understood. Therefore, there is a need to systematically examine indigenous knowledge and SCP

among smallholder farmers in Ogbia LGA to provide empirical evidence that can support sustainable agricultural development and food security planning.

Aim and Objectives of the Study

This study aims to examine the indigenous knowledge and SCP among smallholder farmers in Ogbia LGA, Bayelsa State. Specifically, the study aims to:

1. assess the level of indigenous knowledge of soil conservation posed by male and female smallholder farmers in Ogbia LGA.
2. examine the extent to which experienced and less experienced smallholder farmers apply indigenous SCP in Ogbia LGA.
3. determine the effectiveness of indigenous SCP in maintaining soil fertility and preventing land degradation among educated and non-educated farmers in Ogbia LGA.
4. analyze the socio-economic factors influencing the use of indigenous knowledge for soil conservation among smallholder farmers in Ogbia LGA.

Research Question

1. What level of indigenous knowledge of soil conservation do male and female smallholder farmers possess in Ogbia LGA?
2. To what extent do experienced and less experienced smallholder farmers apply indigenous SCP?
3. How effective are indigenous SCP in maintaining soil fertility and preventing land degradation among educated and non-educated farmers in Ogbia LGA?
4. What socio-economic factors influence the use of indigenous knowledge for soil conservation among smallholder farmers?

Hypotheses

1. There is no noteworthy disparity in the mean indigenous knowledge of soil conservation between male and female smallholder farmers.
2. There is no noteworthy disparity in the mean application of SCP between experienced and less experienced smallholder farmers.
3. There is no noteworthy disparity in the perceived effectiveness of indigenous SCP between educated and non-educated smallholder farmers.
4. There is no noteworthy disparity in the influence of socio-economic factors on the use of indigenous knowledge for soil conservation among smallholder farmers in the study area.

Methodology

Ogbia LGA in Bayelsa State was the study area. The area is largely populated by the Ijaw ethnic group and is bordered by neighboring communities. The main economic activities of the residents include farming, fishing, trading, and palm wine tapping. It falls within the tropical rainforest zone, with an average annual rainfall of about 2,400 mm, which supports the cultivation of crops like yams, cassava, and plantain. The study employed a descriptive survey research design. This approach was deemed suitable because it enables the systematic collection and description of data on existing conditions without manipulating any variables.

The study's population comprised all smallholder farmers engaged in arable crop production in Ogbia LGA. A purposive sampling technique was adopted to select Ogbia LGA due to its prominence in smallholder agricultural activities and its ecological relevance to soil conservation studies. From the selected LGA, eight (8) communities were chosen, and ten (10) smallholder farmers were selected using a random sampling technique from each community, resulting in a total sample size of eighty (80) respondents.

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Data for the study were collected using a structured questionnaire titled "Indigenous Knowledge and Soil Conservation Practices Questionnaire (IKSCPQ)". The instrument consisted of 28 items divided into four sections corresponding to the study objectives: indigenous knowledge, application of SCP, effectiveness of these practices, and socio-economic influencing factors. The questionnaire was designed using a four-point Likert scale comprising Strongly Agree (SA = 4), Agree (A = 3), Disagree (D = 2), and Strongly Disagree (SD = 1). A criterion mean of 2.50 was used as the benchmark for making decisions.

The instrument underwent face and content validation by specialists in Environmental Science, Agricultural Extension, and Soil Science to ensure that the items were clear, relevant, and adequate for measuring the variables of interest. Its reliability was determined using the Cronbach's Alpha method, which produced a coefficient of 0.84, indicating a high level of internal consistency and confirming its suitability for the study.

Trained research assistants helped with data collection by giving the questionnaires directly to the people who lived in their communities. The respondents were given help when they needed it to make sure they filled out the instrument correctly. We got all of the filled-out questionnaires back right away to make sure a high response rate. The research questions were analyzed using mean and standard deviation, whereas the hypotheses were tested using an independent samples t-test and Analysis of Variance (ANOVA) at a 0.05 level of significance.

Results

Socio-demographic Characteristics of Respondents

Variable	Sub-category	Frequency (n=80)	Percentage (%)
Gender	Male	34	42.50
	Female	46	57.50
Age	18-30	10	12.50
	31-40	16	20.00
	41-50	33	41.25
	51-Above	21	26.25
Educational Level	No Formal Education	31	38.75
	Primary	14	17.50
	Secondary	23	28.75
	Tertiary	12	15.00
Farming Experience	Below 10 years	21	26.25
	10 years and Above	59	73.75
Farm Size	Small (≤2 hectares)	46	57.50
	Medium (2.1–4 hectares)	32	40.00
	Large (>4 hectares)	2	2.50
Marital Status	Single	9	11.25
	Married	43	53.75
	Widowed	13	16.25
	Divorced	10	12.50
	Separated	5	6.25
Monthly Income Level	₦26,000-₦50,000	6	7.50
	₦51,000-₦75,000	7	8.75
	₦76,000-₦100,000	8	10.00
	₦101,000-₦125,000	14	17.50
	₦126,000-₦150,000	13	16.25

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	₦151,000-₦175,000	11	13.75
	₦176,000-₦200,000	15	18.75
	₦201,000 –Above	6	7.50

Table 1 shows the socio-demographic characteristics of respondents. The gender distribution indicates that females constitute the majority with 46 (57.50%), while males account for 34 (42.50%), suggesting that women are more actively involved in the farming activities.

The age distribution indicates that the majority of respondents fall within the economically active age group. Specifically, 33 (41.25%) are aged 41–50 years, followed by 21 (26.25%) who are 51 years and above. Those aged 31–40 years represent 16 (20.00%), while only 10 (12.50%) fall within 18–30 years. This suggests that farming in the area is dominated by middle-aged and older individuals.

In terms of educational level, a noteworthy proportion of respondents, 31 (38.75%), have no formal education. This is followed by those with secondary education, 23 (28.75%), primary education, 14 (17.50%), and tertiary education, 12 (15.00%). This suggests a relatively low level of formal education among the farmers.

The distribution of farming experience reveals that the majority, 59 (73.75%), have 10 years and above farming experience, while 21 (26.25%) have less than 10 years. This indicates that most respondents are experienced farmers.

Regarding farm size, more than half of the respondents, 46 (57.50%), operate small-scale farms (≤2 hectares), while 32 (40.00%) manage medium-sized farms (2.1–4 hectares), and only 2 (2.50%) operate large farms (>4 hectares). This shows that farming activities in the area are predominantly small-scale.

The marital status distribution shows that most respondents are married, accounting for 43 (53.75%). This is followed by widowed respondents, 13 (16.25%), divorced respondents, 10 (12.50%), single respondents, 9 (11.25%), and separated respondents, 5 (6.25%). This indicates that farming is largely undertaken by individuals with family responsibilities.

Finally, the monthly income distribution reveals that the highest proportion of respondents, 15 (18.75%), earn between ₦176,000–₦200,000. This is closely followed by those earning ₦101,000–₦125,000, 14 (17.50%), and ₦126,000–₦150,000, 13 (16.25%). Smaller proportions are observed in other income categories, with the least proportions (7.50% each) earning ₦26,000–₦50,000 and ₦201,000 and above. This suggests a moderate income distribution among the respondents, with a concentration in the middle-income range.

Research Question One: What level of indigenous knowledge of soil conservation do male and female smallholder farmers possess in Ogbia LGA?

Table 2: Mean and SD of the level of indigenous knowledge of soil conservation that male and female smallholder farmers possess in Ogbia LGA

S/N	Items	Male (n=34)			Female (n=46)		
		$\bar{x}$	SD	Decision	$\bar{x}$	SD	Decision
.1	I can identify fertile soil based on its colour and texture	3.15	0.93	Agree	3.07	0.95	Agree
.2	I use local indicators such as plant growth to assess soil quality	2.94	0.92	Agree	3.07	0.93	Agree
.3	I know traditional methods of maintaining soil fertility	3.32	0.68	Agree	3.20	0.91	Agree

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.4	I understand the importance of following soil conservation	3.41	0.50	Agree	3.30	0.79	Agree
.5	I am aware of indigenous techniques for preventing soil erosion	3.21	0.85	Agree	3.04	0.92	Agree
.6	I gained my soil conservation knowledge from elders or community members	3.21	0.85	Agree	3.00	0.97	Agree
.7	I can make decisions about land use and soil management	3.32	0.68	Agree	3.20	0.91	Agree
	Grand Mean	**3.22**			**3.13**		

(Criterion Mean = 2.5, Mean ≥ 2.5, Agree, Mean < 2.5, Disagree)

Table 2 shows how much indigenous knowledge of soil conservation that male and female smallholder farmers in Ogbia LGA have. A large proportion of the male crop farmers agreed with items 1–7, with mean scores at or above the criterion mean of 2.5. Conversely, only a few respondents indicated disagreement with the items. Additionally, most of the female farmers who grew crops agreed with items 1–7, and their average scores were higher than or equal to the criterion mean (2.5). Only a few of the respondents disagreed with the items. With a grand mean of 3.22 for males and 3.13 for females, the result implies that the level of indigenous knowledge of soil conservation of male and female farmers engaged in arable crop production differs slightly.

Research Question Two: To what extent do experienced and less experienced smallholder farmers apply indigenous SCP?

Table 3: Mean and SD of how experienced and less experienced smallholder farmers apply indigenous SCP in the study area

S/N	Items	Below 10 years (n=21)			10 years and Above (n=59)		
		$\bar{x}$	SD	Decision	$\bar{x}$	SD	Decision
.8	I practice crop rotation to maintain soil fertility	3.19	0.81	Agree	3.29	0.79	Agree
.9	I use mulching to protect and enrich the soil	3.10	0.83	Agree	3.08	0.90	Agree
.10	I apply organic manure or compost to improve soil quality	3.00	0.89	Agree	3.05	0.94	Agree
.11	I practice bush fallowing to restore soil nutrients	3.10	0.94	Agree	3.14	0.82	Agree
.12	I use cover cropping to reduce soil erosion	2.81	0.98	Agree	3.08	0.90	Agree
.13	I apply traditional methods to control water runoff on my farm	3.14	0.73	Agree	3.19	0.94	Agree
.14	I regularly implement indigenous SCP on my farm	3.33	0.66	Agree	3.15	0.83	Agree
	Grand Mean	**3.10**			**3.14**		

(Criterion Mean = 2.5, Mean ≥ 2.5, Agree, Mean < 2.5, Disagree)

Table 3 shows how much experienced and less experienced smallholder farmers in the study area use traditional methods to protect the soil. Most of the farmers who had been farming for less than 10 years agreed with items 8–14, and their mean scores were higher than or equal to the

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criterion mean (2.5). Only a small number of respondents disagreed with the items. Also, most of the farmers who had been farming for 10 years or more agreed with items 8–14, and their average scores were higher than or equal to the criterion mean (2.5). Only a few of the respondents disagreed with the items. With a grand mean of 3.10 for farmers with below 10 years of experience and 3.14 for those with 10 years and above, the result implies that the extent of application of indigenous SCP by experienced and less experienced smallholder farmers differs slightly.

Research Question Three: How effective are indigenous SCP in maintaining soil fertility and preventing land degradation among educated and non-formally educated farmers in Ogbia LGA?

Table 4: Mean and SD of how effective indigenous SCP in maintaining soil fertility and preventing land degradation among educated and non-formally educated farmers in Ogbia LGA

S/N	Items	Educated (n=49)			Non-formal (n=31)		
		$\bar{x}$	SD	Decision	$\bar{x}$	SD	Decision
.15	Indigenous SCP improves soil fertility on my farm	2.98	0.92	Agree	3.00	0.93	Agree
.16	These practices help reduce soil erosion in my area	2.82	0.93	Agree	3.16	0.90	Agree
.17	Indigenous methods increase my crop yield	3.20	0.84	Agree	3.23	0.92	Agree
.18	Indigenous practices help maintain soil moisture	3.33	0.75	Agree	3.13	0.76	Agree
.19	These practices are effective in preventing land degradation	2.94	0.92	Agree	3.10	0.91	Agree
.20	Indigenous SCPs are reliable compared to modern methods	2.92	0.95	Agree	3.19	0.87	Agree
.21	I consider indigenous practices effective regardless of my level of education	3.12	0.83	Agree	2.97	0.98	Agree
	Grand Mean	**3.04**			**3.11**		

(Criterion Mean = 2.5, Mean ≥ 2.5, Agree, Mean < 2.5, Disagree)

Table 4 shows how effective indigenous SCPs are in maintaining soil fertility and preventing land degradation among educated and non-formally educated farmers in Ogbia LGA. Most of the farmers with formal education showed agreement with items 15–21, as reflected in their mean scores meeting or exceeding the benchmark of 2.5, while only a small number expressed disagreement. Similarly, a large proportion of farmers without formal education also agreed with items 15–21, with their mean scores at or above the 2.5 threshold, and only a few respondents indicated otherwise. With a grand mean of 3.04 for educated farmers and 3.11 for non-formally educated farmers, the result implies that the perceived effectiveness of indigenous SCP among educated and non-formally educated farmers differs slightly.

Research Question Four: What socio-economic factors influence the use of indigenous knowledge for soil conservation among smallholder farmers?

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Table 5: Mean and SD of the socio-economic factors influencing the use of indigenous knowledge for soil conservation among smallholder farmers

S/N	Items	Responses (n=80)		
		$\bar{x}$	SD	Decision
.22	My level of education influences my use of indigenous SCP	2.99	0.92	Agree
.23	My farming experience affects how I use indigenous knowledge	3.10	0.92	Agree
.24	My income level determines whether I apply indigenous soil conservation methods	3.29	0.78	Agree
.25	The size of my farm influences my choice of SCP	3.16	0.83	Agree
.26	Access to extension services affects my use of indigenous knowledge	3.10	0.85	Agree
.27	Availability of labour influences my use of SCP	3.08	0.87	Agree
.28	Cultural beliefs and traditions influence my use of indigenous SCP	3.12	0.86	Agree
	Grand Mean	**3.12**		

(Criterion Mean = 2.5, Mean ≥ 2.5, Agree, Mean < 2.5, Disagree)

Table 5 presents the socio-economic factors affecting the use of indigenous knowledge for soil conservation among smallholder farmers in the study area. The results indicate that most respondents agreed with items 22–28, as their mean scores were equal to or above the benchmark value of 2.5, while only a small proportion of the respondents expressed disagreement. With a grand mean of 3.12, the result implies that socio-economic factors significantly influence the use of indigenous knowledge for soil conservation among smallholder farmers.

Hypothesis One: There is no noteworthy disparity in the mean indigenous knowledge of soil conservation between male and female smallholder farmers.

Table 6: Summary of the independent sample t-test on the disparity in the mean indigenous knowledge of soil conservation between male and female smallholder farmers

Gender	n	$\bar{x}$	SD	df	t_{cal}	t_{tab}	Sig.	Decision
Male	34	22.56	2.27	78	1.07	1.96	0.29	Retain:H_{01}
Female	46	21.87	3.19					

Table 6 indicates that t_{cal} = 1.07, df = 78, and t_{tab} = 1.96. Therefore, since $t_{cal} < t_{tab}$ and P > 0.05, there is no noteworthy disparity in the mean indigenous knowledge of soil conservation between male and female smallholder farmers. Hence, the null hypothesis is retained at the 0.05 alpha level.

Hypothesis Two: There is no noteworthy disparity in the mean application of SCP between experienced and less experienced smallholder farmers.

Table 7: Summary of the independent sample t-test on the disparity in the mean application of SCP between experienced and less experienced smallholder farmers

Experience Level	n	$\bar{x}$	SD	df	t_{cal}	t_{tab}	Sig.	Decision

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Below 10 years	21	21.67	2.92	78	0.45	1.96	0.65	Retain:H_{02}
10 years and Above	59	21.98	2.69					

Table 7 indicates that t_{cal} = 0.45, df = 78, and t_{tab} = 1.96. Therefore, since $t_{cal} < t_{tab}$ and P > 0.05, there is no noteworthy disparity in the mean application of SCP between experienced and less experienced smallholder farmers. Hence, the null hypothesis is retained at the 0.05 alpha level.

Hypothesis Three: There is no noteworthy disparity in the perceived effectiveness of indigenous SCP between educated and non-formally educated smallholder farmers.

Table 8: Summary of the independent sample t-test on the disparity in the perceived effectiveness of indigenous SCP between educated and non-formally educated smallholder farmers

Education Level	n	$\bar{x}$	SD	df	t_{cal}	t_{tab}	Sig.	Decision
Formal Education	49	21.31	3.91	78	0.53	1.96	0.60	Retain:H_{03}
Non-formal	31	21.77	3.84					

Table 8 indicates that t_{cal} = 0.53, df = 78, and t_{tab} = 1.96. Therefore, since $t_{cal} < t_{tab}$ and P > 0.05, there is no noteworthy disparity in the perceived effectiveness of indigenous SCP between educated and non-formally educated smallholder farmers. Hence, the null hypothesis is retained at the 0.05 alpha level.

Hypothesis Four: There is no noteworthy disparity in the influence of socio-economic factors on the use of indigenous knowledge for soil conservation among smallholder farmers in the study area.

Table 9: Summary of ANOVA on the disparity in the influence of socio-economic factors on the use of indigenous knowledge for soil conservation among smallholder farmers in the study area

ANOVA

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	41.97	6	7.00	0.79	0.58
Within Groups	642.92	73	8.81		
Total	684.89	79			

The result of Table 9 revealed that there is no noteworthy disparity in the influence of socio-economic factors on the use of indigenous knowledge for soil conservation among smallholder farmers in the study area (F6, = 079, df = 73, p > 0.05). Hence, the null hypothesis was retained at the 0.05 alpha level.

Discussion of Findings

The findings for research question one show that there is a slight difference in the level of indigenous knowledge of soil conservation between male and female farmers involved in arable crop production. This suggests that both male and female farmers possess relatively similar levels of indigenous knowledge, with only minimal variation that does not create a meaningful gap in knowledge distribution. The corresponding hypothesis, which revealed no noteworthy disparity, further

confirms that gender does not play a decisive role in determining indigenous soil conservation knowledge among farmers. This finding aligns with Ominikari (2022), who found no noteworthy disparity in respondents' ratings regarding the benefits of indigenous knowledge, suggesting uniformity in knowledge and perception across groups. It is also consistent with Ogunkolu et al. (2025), who reported that indigenous knowledge is widely shared through intergenerational transmission, making it accessible across different demographic groups, including gender.

The result of research question two revealed that the extent of application of indigenous SCP by experienced and less experienced smallholder farmers differs slightly. This indicates that both categories of farmers actively apply indigenous practices, and farming experience only results in marginal disparities in application levels. The corresponding hypothesis showing no noteworthy disparity suggests that experience is not a strong determinant of application, possibly because such practices are commonly known and easily adopted. This finding is supported by Tsado et al. (2021), who identified widespread adoption of practices such as mulching, crop rotation, and cover cropping among farmers, regardless of varying characteristics. Similarly, Ominikari (2022) reported that indigenous practices like crop rotation and soil fertility management are commonly utilized by farmers, reinforcing the idea that these practices are broadly applied irrespective of experience level.

The result of research question three revealed that the perceived effectiveness of indigenous SCP among educated and non-formally educated farmers differs slightly. This suggests that education level does not substantially influence how farmers perceive the effectiveness of indigenous practices, as both groups recognize their value in improving soil fertility and preventing land degradation. The corresponding hypothesis, which showed no noteworthy disparity, confirms that perceptions are largely uniform across educational backgrounds. This finding is in agreement with Ogunkolu et al. (2025), who found that a large proportion of farmers, regardless of educational level, utilized and valued indigenous soil fertility practices. It also aligns with Ominikari (2022), which reported generally positive assessments of the benefits of indigenous knowledge among farmers, indicating a shared perception of effectiveness across different groups.

The result of research question four revealed that socio-economic factors significantly influence the use of indigenous knowledge for soil conservation among smallholder farmers in the study area. This means that variables such as income, education, farm size, labour availability, and access to extension services play a crucial role in determining whether and how farmers utilize indigenous practices. Although the hypothesis indicated no noteworthy disparity, the descriptive result highlights the practical importance of these factors in shaping farmers' decisions. This finding is consistent with Tsado et al. (2021), which showed that adoption of SCP is noteworthyly influenced by factors such as education, access to credit, farm size, and extension contact. It is also supported by Agadaga et al. (2024), who identified constraints such as the cost of farm operations, labour, land size, and limited capital as key factors affecting the adoption of farmland management practices. Together, these studies reinforce the conclusion that socio-economic conditions are critical determinants of the use of indigenous SCP.

Conclusion

The study concludes that indigenous SCPs are widely known, applied, and perceived as effective among smallholder farmers in the study area, regardless of gender, farming experience, or educational level. The minimal disparities observed across these groups, alongside the absence of noteworthy disparities in the tested hypotheses, indicate that indigenous knowledge is broadly shared and uniformly utilized among farmers. However, the study also establishes that socio-economic factors such as income, farm size, education, labour availability, and access to extension services play a critical role in influencing the extent to which these practices are utilized. Consequently, while indigenous soil conservation remains a valuable and sustainable approach to

maintaining soil fertility and preventing land degradation, its optimal use is largely dependent on the socio-economic conditions of the farmers.

Recommendations

1. Agricultural extension agencies and local government authorities should design and implement gender-inclusive training programmes to sustain and further enhance the already similar levels of indigenous knowledge among male and female farmers.
2. Farmer cooperatives and community-based organizations should facilitate mentorship and knowledge-sharing platforms where experienced farmers can interact with less experienced farmers to strengthen the consistent application of indigenous SCP.
3. Educational institutions and extension service providers should promote the integration of indigenous and modern agricultural knowledge through training and awareness campaigns to reinforce the perceived effectiveness of these practices among both educated and non-formally educated farmers.
4. Government agencies, non-governmental organizations, and financial institutions should improve farmers' access to credit, extension services, and farm inputs, while also addressing labour and land constraints.

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