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Understanding the Perspectives of Small-Scale Arable Crop Farmers on Soil Management Practices in Uhen L.G.A, Edo State

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ABSTRACT

This study provides insights into the perceptions of small-scale arable crop farmers in Uhen L.G.A regarding soil management practices. A total of 50 questionnaires were administered to randomly selected farmers and the questionnaires covered various aspects, including demographics, farming and soil fertility management practices, awareness of organic agriculture, soil health, and soil fertility, as well as acceptance, viability, and sustainability of organic inputs. The findings revealed that the majority of the respondents were male, with a range of ages and educational backgrounds, mostly attaining secondary education with varying levels of farming and agricultural experience. Regarding farming and soil fertility management practices, respondents reported adopting practices such as tillage, mound/heaps/ridges, bush burning, mulching, and mixed cropping. Organic fertilization was more commonly used than inorganic fertilization, with reasons cited including availability, low cost, crop response, and long-term effects. Farmers recognized the importance of organic residue and soil organisms for soil health. However, the respondents had limited awareness of organic agriculture, and their knowledge of soil organisms and their contributions to soil health was moderate. The findings highlight the need for increased awareness and knowledge of organic agriculture and the potential benefits of organic inputs for soil health and fertility.

INTRODUCTION

Soil management practices serve as mechanisms aimed at safeguarding soil integrity, preventing degradation, and enhancing its nutrient content through the utilization of locally sourced materials such as animal manure and recycled crop residue. These practices, including soil conservation, amendment, and the promotion of optimal soil health, are vital for sustainable food crop production without causing adverse effects (Nwachuku *et al.*, 2012; George, 2013). Implementing soil management involves applying processes like crop rotation, cover cropping, planting windbreaks, and conservation tillage, which have been employed for centuries. Soil conservation practices encompass various farming operations and strategies to control soil erosion by preventing or reducing the detachment and transport of soil particles in air or water (Dabney *et al.*, 2012). The inception of soil conservation aimed to protect the ecology from the potentially harmful impacts of agricultural production, initially relying on unproven technologies that did not align with the natural requirements of the land. Understanding the evolving trend of land degradation requires discerning whether it results from natural occurrences or unwise land use (Tanner, 2012). To maintain soil quality and prevent mismanagement, some farmers adopt practices like regular manure application, cover cropping, mulching, planting shelter belts, crop rotation, intercropping, multiple cropping, and minimum tillage (Ejike & Osuji, 2013). Despite the significance of soil health and management, these aspects have received limited attention over the years, overshadowed by the widespread use of chemical and organic fertilizers. In Ovia North-East, Edo State, Nigeria, there is a notable absence of comprehensive studies clarifying the relationship between soil health, crop production practices, and the prevalent use of fertilizers. As Edo State is a significant agricultural producer, there is a pressing need for further research to emphasize the importance of soil health, advocate for appropriate soil management practices, and promote organic agriculture in the region.

LITERATURE REVIEW

Soil health and Soil Degradation

Soil health denotes the sustained ability of soil to operate as a vital living system, recognizing its biological components crucial for ecosystem function within specified land-use boundaries. This aims to uphold biological activity, enhance air and water quality, and preserve the health of plants, animals, and humans (Doran & Zeiss, 2000). A robust soil should support essential life processes such as plant anchorage and nutrient provision, retain optimal water and soil characteristics, sustain soil food webs, recycle nutrients, preserve microbial diversity, address pollutants, sequester heavy metals, and contribute to disease control. In contrast, soil degradation signifies the deterioration in soil quality resulting from various factors, with agriculture being a principal contributor. Soils play a pivotal role in biodiversity conservation and are essential for ensuring adequate food production and water supply (Hemphill, 2000). This degradation manifests through issues such as salting, waterlogging, compaction, pesticide contamination, loss of soil structure, reduced fertility,

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increased acidity, alkalinity, salinity, and erosion. Soil erosion, caused by water, wind, or agricultural activities, leads to the removal of the topsoil layer (Kidd, 2000).

Agriculture significantly contributes to soil degradation, primarily through the excessive use of inorganic fertilizers, synthetic pesticides, and other chemicals. These practices result in the release of greenhouse gases like carbon dioxide, methane, and nitrous oxide. Furthermore, conventional agricultural methods such as tillage, fertilization, and pesticide application release harmful substances like ammonia, nitrate, and phosphorus, polluting the air, water, and soil, impacting biodiversity. Agriculture also alters the Earth's land cover, affecting its ability to absorb or reflect heat and light, contributing to radiative forcing. Soil degradation adversely impacts biological processes, disrupting the soil's microbial community and altering nutrient cycling, pest and disease control, and chemical transformation processes (Lichtfouse *et al.*, 2009).

Soil Management and Conservation

The soil plays a pivotal role in maintaining the health of ecosystems, but extensive human exploitation has resulted in substantial degradation and the spread of pollutants. About 36.5% of the Earth's land is utilized for agriculture (FAOSTAT, 2008). While these human activities are often justified in the name of development, the persistent degradation of ecosystems and exposure to various contaminants pose risks to society and the environment, essential for supporting all life forms. Miner *et al.* (2020) underscored in their study that global food systems encounter challenges such as mitigating environmental impacts, adapting to climate change, increasing yields, and preserving or enhancing crop nutritional quality. Managing soil health emerges as a promising solution to mitigate some environmental impacts and potentially enhance economic returns. Soil conservation entails diverse farming practices and management strategies geared toward controlling soil erosion, aiming to prevent or minimize the detachment and movement of soil particles by water or air. It also addresses the loss of topsoil layer and fertility due to soil contamination. Understanding soil erosion processes and factors is crucial for implementing effective control practices and promoting soil conservation. Soil erosion involves the detachment or entrainment of soil particles by wind or water, their transportation, and subsequent deposition as soil sediments. Time-tested conservation methods like crop rotation, cover cropping, planting windbreaks, and conservation tillage have been practiced for centuries, contributing significantly to soil conservation.

Soil conservation practices encompass various farming operations and soil management strategies conducted to prevent or reduce soil particle detachment and transport in air or water (Dabney *et al.*, 2012). Historically, soil conservation aimed to protect the environment from agricultural practices using unproven technologies that did not align with the land's natural requirements. To address evolving land degradation trends, it is essential to determine whether the causes are natural or the result of unwise human activities (Tanner, 2012). In Europe, the Common Agricultural Policy (CAP) has been implemented to promote best management practices such as winter cover crops, reduced tillage, plant residues, and grass margins to enhance conservation efforts (Panagos *et al.*, 2015). These traditional approaches, including no-tillage, form part of a continuous spectrum of land management practices that promote agricultural conservation and sustainable land management, leading to increased productivity, environmental benefits, and profits. These practices are interconnected and contribute to the overall goal of sustainable agriculture.

Soil Management and Conservation Methods

Cover Cropping and Mulching

This approach is recognized as an effective method for reducing topsoil migration by maintaining a protective cover over the soil, thereby mitigating soil displacement caused by the impact of raindrops on soil particles. The utilization of cover crops and mulching plays a crucial role in diminishing runoff and its velocity across the soil. Mulching, involving the application of organic materials on exposed soil, provides a protective covering that decomposes over time. While straw can serve as mulch, hay has been proven to be the most effective, with the caveat of harvesting it before weed maturation. These crops are essential for erosion control, particularly in cases where the primary crops planted do not yield sufficient residue for conventional erosion control based on residue management (Keeling *et al.*, 2000).

In regions with ample precipitation, cover crops like peas can effectively safeguard against wind erosion and contribute nitrogen to the soil. The nitrogen released from the roots of these legumes serves as an energy source for microbial metabolic activities, fostering an active microbial community in the rhizosphere soil. This live mulch or cover crop approach proves beneficial for maintaining soil health and preventing erosion.

Crop Rotation

Crop rotation stands as a traditional and practical method for managing agro-ecosystem biodiversity, contributing to enhanced soil health while minimizing the occurrence of pests and diseases (Barbieri *et al.*, 2019). This approach empowers farmers to enhance soil structure, increase soil organic matter, and deepen rooting depth by cultivating secondary crops that promote overall soil health. Root crops, owing to the extensive shattering of soil aggregates during seedbed preparation and harvesting, can adversely affect soil structure. Therefore, it is recommended to grow root crops once every three years. A suggested rotation involves growing corn in the subsequent year, followed by two years of silage, and then three or more years of forage.

Leguminous crops, such as peas and chickpeas, introduced into crop rotation play a role in modifying soil functional microbial communities. Additionally, incorporating cover cropping, mulching, and zero tillage into the rotation further enhances soil health. Crop rotations offer favorable conditions for the growth of diverse soil functional microorganisms. This contributes to rich biodiversity within the soil ecosystem, as both shallow feeding crops and deep-rooted crops activate varying species of microorganisms over time, leading to the accumulation of microbes with diverse characteristics colonizing the soil. Consequently, different crops contribute various residues and root exudates, fostering soil microbial diversity and activity, increasing soil microbial biomass, and enhancing carbon and nitrogen cycling (Gurr *et al.*, 2016).

Conservation Tillage

The objective of this method is to safeguard soil aggregates, organic matter, and crop residues (Skaalsveen, 2019). Conservation tillage involves modifying traditional tillage practices by using less disruptive implements (e.g., replacing moldboard plows with chisel plows), minimizing tillage (e.g., reducing the number of turns), and leaving crop residues on the soil surface to prevent erosion. Traditional agricultural practices often rely on plowing and tilling the land to prepare the seedbed. However, these practices have been proven to be highly detrimental to the soil, contributing to the degradation of 24% of global agricultural land (Bai *et al.*, 2008). A new approach, focused on conserving and improving soil health, is gradually replacing conventional soil tillage. In a conventional tillage system, the soil is typically inverted to a depth of less than 20 cm using a moldboard plow. In contrast, conservation tillage involves either minimal disturbance or disturbance to a lesser degree (Morris *et al.*, 2010).

This conservation method has demonstrated its effectiveness in improving soil structure, reducing soil erosion, enhancing drainage and water-holding capacity, increasing soil organic matter, and promoting microbial and earthworm activity (Abdollahi & Munkholm, 2014).

Residues Management

This method is the most preferable for controlling wind erosion across various crops and climates (Miner *et al.*, 2013). It encompasses multiple tillage practices that involve maintaining residue from a previously harvested crop as a surface cover to prevent soil erosion effectively. Residue management also involves the preservation of mulches, which can either be standing or flat, serving to intercept soil grains by impeding their movement (Miner *et al.*, 2013). Leaving the residue from the prior crop on the soil surface yields several benefits. It enhances soil water storage independently of runoff-controlling contours, increases rain infiltration, and reduces soil evaporation. Moreover, the microclimate created is conducive to microbial activities, fostering a continuous supply of energy from decomposing biomass residues. This process leads to the mineralization of organic compounds and the breakdown of complex molecules, further contributing to the overall health and productivity of the soil.

Effects of Agriculture on Environmental Health

Soil health is inherently defined as the inherent capability of soil to operate within the confines of ecosystem boundaries, whether natural or managed. This involves sustaining plant productivity, preserving water and air quality, supporting human well-being, and providing habitats for biodiversity (Doran & Zeiss, 2000). The intensification of agriculture is exerting immense pressure on the soil's inherent potential to maintain these functions, leading to widespread ecosystem degradation and long-term loss of productivity (Tilman *et al.*, 2001). Over the past few decades, significant efforts have been invested in enhancing agricultural productivity. This includes increased fertilization and pesticide application, improved irrigation practices, advancements in soil management regimes and crop varieties, and extensive land conversions (Tilman *et al.*, 2002). However, there is a growing apprehension that the utilization of natural ecosystems for agricultural purposes has incurred substantial environmental costs. These costs encompass issues such as desertification, heightened greenhouse gas emissions, reduced organic matter in soils, loss of biodiversity, and alterations to biogeochemical and hydrological cycles (Balmford *et al.*, 2005).

In contrast, soil quality is an extrinsic feature that changes based on the intended human use of that soil. This could be linked to agricultural production and its ability to support wildlife, watershed production, or recreational outputs. Various environmental challenges associated with agriculture manifest as pollutants, climate change, soil degradation, and deforestation (van der Warf *et al.*, 2002).

MATERIAL AND METHOD

This research was carried out in Uhen community, situated within the Ovia North East Local Government Area of Edo State, Nigeria. The geographical coordinates of the site are enclosed within Latitude N6026'49.9" and E5030'26.1", falling within the rainforest region of Edo State. The specific location is characterized by a hot and humid tropical climate, exhibiting seasonal rainfall, high temperatures, and relative humidity, as reported by Oviasogie and Okoro in 2020. The climate is distinctly marked by two seasons: rainy and dry periods throughout the year. The annual total rainfall in the area exceeds 1,500 mm, with peak precipitation occurring in September/October. The mean air temperature varies between 28 °C to 36 °C, while the relative humidity fluctuates between 70% to 80%. The soils in the study area originated from coastal plain sand and alluvial deposits. The terrain is relatively flat with gentle slopes exceeding 4%, gradually declining, and positioned at an elevation of 100 meters above sea level, according to information from the Nigerian Institute for Oil Palm Research (NIFOR, 2013).

Uhen, Ovia North-East Study Area Map

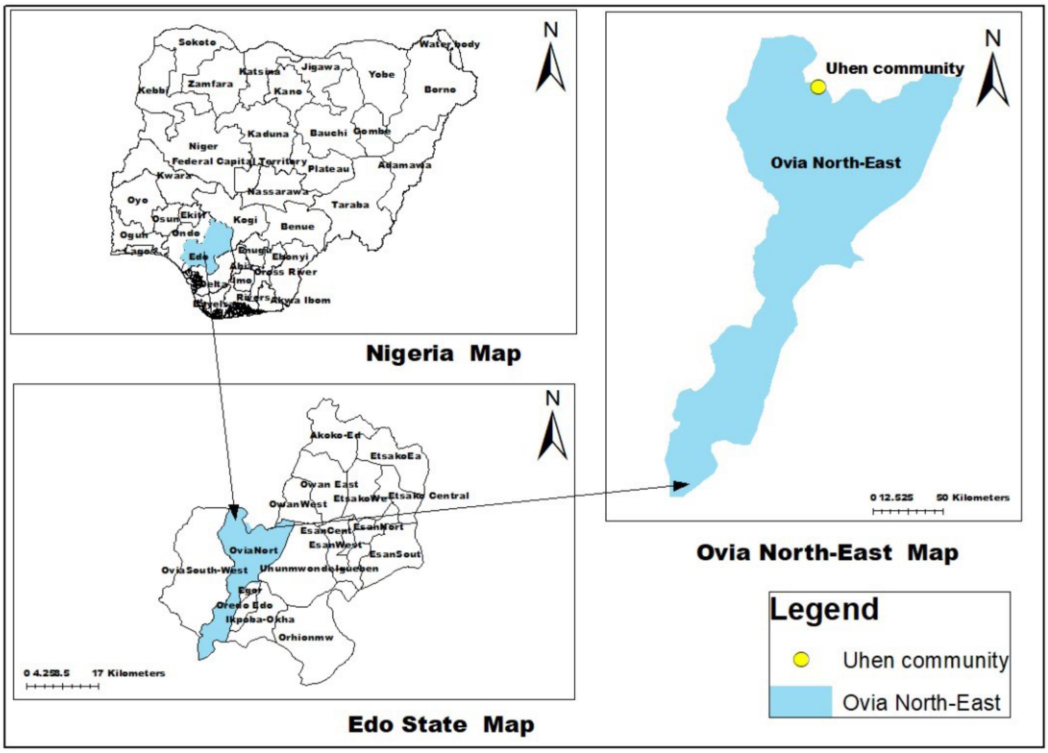

Figure 1: Uhen Community, Edo State, Nigeria Study Map
Source: Image Created and Extracted from Nigerian Map, 2022

Figure 2: Google Earth Image of Uhen Community, Edo State, Nigeria
Source: Google Earth Engine Image, 2022

Administration of Questionnaires / Sample Size
In the study conducted in Uhen community, Ovia North East Local Government Area, Edo State, Nigeria, data was collected through the administration of questionnaires to 50 randomly selected respondents, who were farmers living in the study area. The selection of the village was based on factors such as agricultural potential, location, population density, and representation of socio-economic characteristics of rural life in the state. To collect the data, the researcher visited the local farmers in their farms, shops, and fields. The questionnaires took approximately 15-20 minutes to complete, and assistance was provided to those who had difficulty reading or understanding certain agricultural terms in the questionnaire. The questionnaire consisted of four sections. The first section focused on gathering information about the farmers' demographics, including gender, age, educational qualification, farming and agricultural experience, and more. The second section

aimed to assess the farmers' knowledge of farming and soil fertility management practices. The third section aimed to capture the farmers' perspectives on organic agriculture, soil health, and soil fertility. Finally, the fourth section aimed to assess the acceptance, viability, and sustainability of organic farming. This section included 10 questions related to farm profitability, awareness of organic inputs, and other relevant factors.

RESULTS AND DISCUSSION

From the questionnaires administered to farmers in Uhen community, Ovia North East L.G.A; the 50 questionnaires shared were completed by the farmers. Regarding the gender distribution of the respondents, 74% were male and 26% were female. The age range of the respondents varied, with 38% falling between 24-37 years, 22% between 38-50 years, and 40% being 50 years and above. In terms of educational background, 20% had no formal education, 28% had primary education, 50% had secondary education, and only 2% had tertiary education. This suggests that most farmers in the study area had secondary education or below, which might impact their knowledge of soil management practices and their understanding of soil health.

Respondent's Demographics

Table 1 provides an overview of the respondent's demographics and farming characteristics. The farming experience of the respondents varied, with 20% having 20 years of experience, 18% with 11-20 years, 11-20 years, and 24% with less than 5 years of experience. Similarly, in terms of agricultural experience, 40% had less than 5 years, 20% had 5-10 years, 14% had 11-20 years, and 26% had 20 years of experience. The main crop grown by the farmers was cassava (64%), followed by cocoa (20%), plantain (2%), and yam (14%). The growing cycle of the crops varied, with 14% lasting for 6 months, 66% lasting between 8-12 months, and 20% lasting for 36 months. Regarding farm size, 20% had less than 1 acre/homestead, 42% had between 1-2.5 acres, 36% had between 2.5-5 acres, and 2% had more than 10 acres of land. In terms of tenancy, 6% of respondents leased their land, 16% rented it, 72% owned it, and 2% had community-owned land. Additionally, 4% of the respondents practiced mono-cropping, while 96% practiced mixed cropping. These findings indicate that the farmers in the area were primarily engaged in medium-scale farming as their main occupation. The demographic data also revealed that the respondents grew other crops alongside their main crop.

Table 1: Demographic of the respondents in the study area

Variables	Frequency	Percentage (%)
Gender		
Male	37	74
Female	13	26
Age (years)		
10 – 23	-	-
24 – 37	19	38
38 – 50	11	22
50 above	20	40
Educational Background		
None	10	20
Primary	14	28
Secondary	25	50
Tertiary	1	2
Farming Experiences		
<5 years	12	24
5 – 10 years	9	18
11 – 20 years	9	18
20 years	20	40
Agricultural Experiences		
<5 years	20	40
5 – 10 years	10	20
11 – 20 years	7	14
20 years	13	26
Major crop grown		

Cassava	32	64
Cocoa	10	20
Plantain	1	2
Yam	7	14
How many months does each growing cycle last		
6 Months	7	14
8 - 12 Months	33	66
36 Months	10	20
Above 36 Months	-	-
Size of land holding under operation (Ha)		
Below 1 acre/Homesteads	10	20
Between 1 – 2.5 acres	21	42
Between 2.5 – 5 acres	18	36
Above 10 acres	1	2
Types of Tenements		
Lease	3	6
Rent	8	16
Owned	36	72
Community owned	1	2
Type of cropping system		
Mono-cropping	2	4
Mixed cropping	48	96
Total	**50**	**100**

n = 50

Respondent's Response on Farming and Soil Fertility Management Practices

According to the study findings in Table 2; 54% of the respondents indicated that they leave their fields fallow for less than a month, 42% do so for 1-6 months, and 4% for 6-12 months. In terms of farming practices, 12% adopt tillage, 4% make mounds/heaps/ridges, 62% practice bush burning, 16% use mulching, and 6% employ mixed cropping. Regarding fertilization, 74% of the respondents use organic fertilizers, 2% use inorganic, 6% use both organic and inorganic, and 18% use none. When asked about their reasons for using organic fertilizers, 6% mentioned availability in the community, 30% cited the low cost, 40% mentioned crop response, and 24% mentioned the long-term effects. This result of high utilization of organic manure by the arable crop farmers is in tandem with the findings of Nwachukwu *et al*., (2012); Mazza and Olojede (2016). This study further agrees with the findings of Ejike and Osuji (2013); Iwena (2008) who posited that over 50% of farmers in Imo State approved soil management techniques that cut across application of organic manure regularly, mulching, crop rotation, growing cover crops, multiple crops, shifting cultivation and bush fallowing as ways of enhancing nutrients, sustaining crop growth and food production without adverse effect.

None of the respondents mentioned reasons for using inorganic fertilizers. In terms of knowledge about organic residue, 12% of the respondents considered their knowledge high, 18% considered it medium, and 70% considered it low. Additionally, 8% of the respondents said organic materials are always available, 42% said they are available, and 50% said they are not available. The study found that 70% of the respondents mainly use plant-based organic materials, 10% use animal-based materials, and 20% use both. Regarding the utilization of plant materials after harvest, 10% use them for mulch, 10% burn them, and 80% plow them into the soil for decomposition. When asked about changes in crop yield over the years, 50% of the respondents reported an increase, 10% reported a decrease, and 40% reported no change. As for the causes of decreased yield, 4% mentioned weed/disease/pest infestation, 44% mentioned rainfall failure, and 8% mentioned soil degradation or related problems. The study also found that 80% of the respondents attributed low soil nutrients to continuous cultivation, while 20% attributed it to insufficient fertilization. In terms of the impact of organic fertilizer application on crop yield, 30% of the respondents reported a high increase, 70% reported a slight increase. Regarding the application time, 74% of the respondents apply fertilizers before planting, and 24% apply them during crop growth.

Table 2: Farming and soil fertility management practices

Variables	Frequency	Percentage (%)
How long do you leave your field fallow before planting?		
Less than a month	27	54
1 – 6 months	21	42
6 – 12 months	2	4
Above 12 months	-	-
Farming practices adopted		
Tillage	6	12
Making mounds/heaps/ridges	2	4
Bush burning	31	62
Mulching	8	16
Planting hedge crops	-	
Farming under tress	-	
Use different crop varieties	-	
Cover cropping	-	
Mixed cropping	3	6
Kind of fertilization adopted		
Organic	37	74
Inorganic	1	2
Both	3	6
None	9	18
If organic fertilization, what is your reason?		
Availability in the community	3	6
Low cost	15	30
Crop residue	20	40
Long term effects	12	24
If inorganic fertilization, what is your reason?		
Readily available in the community		
Low cost		
Good crop response		
Positive long term effects		
Knowledge in organic residue management		
High	6	12
Medium	9	18
Low	35	70
Availability of organic materials in the community		
Always available	4	8
Available	21	42
Not available	25	50
Organic materials mostly used		
Plant source	35	70
Animal source	5	10
Both	10	20
How are plant material (crop residues) utilized after harvest		
Mulch	5	10
Burn	5	10
Ploughed to decompose	40	80

Firewood and fuel	-	
Fodder	-	
Composting	-	
Disposed of as garbage	-	
Other	-	
How would you describe the changes in crop yield over the years		
Increasing	25	50
Decreasing	5	10
Same	20	40
What do you think is the cause for the decrease in crop yield?		
Weed/disease/pest infestation	2	4
Rainfall failure	44	88
Low yielding varieties	-	
Soil degradation/related problems	4	8
Perceived reason(s) for low soil nutrients		
Soil erosion	-	
Continuous cultivation	40	80
Low fertilizer/manure application rate	10	20
Burning	-	
Poor adherence to recommended fertilizer/manure application	-	
Significant increase in crop yield during organic fertilizer application		
High	15	30
Slight	35	70
None	-	
Significant increase in crop yield during inorganic fertilizer application		
High		
Slight		
None		
What is the time of application		
Before planting	37	74
During crop growth	13	26
Total	**50**	**100**

n = 50

Respondents' Awareness of Organic Agriculture, Soil Health and Soil Fertility

Table 3 presents the findings related to respondents' awareness of organic agriculture, soil health, and soil fertility. Regarding awareness of organic residue, 8% of the respondents had high awareness, 32% had medium awareness, and 60% had low awareness. The presence of soil organisms on their farms was acknowledged by 94% of the respondents, with 6% believing they were always available. In terms of the contribution of soil organisms to soil health, 56% of the respondents recognized their importance, while 44% were unsure or unaware of their role. When it came to preserving soil fertility, 4% considered fertilization as the key factor, 68% emphasized crop rotation, 6% mentioned intercropping, and 22% favored the tillage system. Regarding organic fertilizers used, 54% of the respondents preferred livestock manure, 20% used poultry manure, and 26% used other types without specifying. Only 10% of the respondents reported integrating legumes with crop rotation, intercropping, or green manure, while the majority (90%) did not practice these methods. In terms of pest and disease control, 20% of the respondents employed biological and organic methods, 70% used chemical pesticides (specifically Gammalin), and 10% used other methods such as traps. This finding agrees with the field research carried out by Omokaro *et al.* (2023) at Songhai Community, Delta State, Nigeria. For non-chemical methods of plant protection, 90% used physical and pheromone traps, while 10% utilized biological enemies of pests. For weed control, 70% of the respondents relied on manual weeding, 20% used crop rotation and/or intercropping, and 10% used chemical herbicides called uproots. Surprisingly, 100% of the respondents indicated that they had not heard of organic farming. However, when asked if inorganic inputs lead to soil fertility loss, 46% agreed, while 54% disagreed. Additionally, 90% of the respondents believed that earthworms in the soil contribute to increased soil fertility, while 10% had no knowledge about this relationship.

Table 3: Awareness of organic agriculture, soil health and soil fertility

Variables	Frequency	Percentage (%)
How would you rate your organic residue management knowledge		
High	4	8
Medium	16	32
Low	30	60
How would you describe the soil organism's presence in your farm		
Always available	3	6
Available	47	94
Not available	-	
Can these soil organisms be seen as contributors to soil health		
Very well	28	56
Slightly well	22	44
Not at all		
How do you preserve soil fertility		
Fertilization	2	4
Crop rotation	34	68
Intercropping	3	6
Tillage	11	22
Other:		
If organic fertilizer are used can you specify the type		
Livestock manure	27	54
Poultry manure	10	20
Green manure		
Other:	13	26
If crop rotation, and/or intercropping and/or green manure are practiced, do you integrate legumes		
Yes	5	10
No	45	90
In what way do you control pests and diseases		
Biological and organic control methods	10	20
Integrated pest management (IPM) methods		
Chemical pesticides (treatment), specify what do you use: Gammalin	35	70
Other Methods: Traps	5	10
If you use non-chemical methods for plant protection, which of the following do you use		
Mechanical ways	-	
Physical and pheromone traps	45	90
Biological enemies of pest	5	10
Other	-	
In what way do you control weeds		
Mechanical weeding	-	
Manual weeding	35	70
Crop rotation and/or intercropping	10	20
Chemical herbicides, specify: Uproot	5	10

Have you ever heard about organic farming		
Yes	-	
No	50	100
Does the usage of inorganic inputs (fertilizer, herbicides, pesticides) lead to soil fertility loss on your farm		
Yes	23	46
No	27	54
What do you think about earthworms on your farm		
Increased soil fertility	45	90
Reduced soil fertility	-	
Nothing	5	10
Others	-	
Total	**50**	**100**

n = 50

Respondent's Awareness on Acceptance, Variability and Sustainability

Table 4 presents the findings related to farmers' responses regarding the acceptance, viability, and sustainability of their farming practices. In terms of selling farm produce, 10% of the respondents sell everything, 50% sell most, and 40% sell half of their produce. The majority of respondents (94%) reported that their farming business is profitable year-round, while 6% indicated it is not. When it comes to annual income from farming, 28% of the respondents earn between 50,000 and 150,000, while 72% earn over 150,000. Looking ahead, 74% of the respondents plan to continue their farming business as usual in the next 10 years, 20% intend to expand their business, and 6% have different plans, such as discontinuing their farming activities. Regarding the willingness to increase organic inputs on their farms, 90% of the respondents expressed willingness to do so, while 10% stated they would not, possibly due to a lack of awareness and knowledge about organic inputs and their impact on soil health. All respondents (100%) believed that increasing organic inputs would help improve soil fertility and crop yield. When asked about the comparison of yields between organic and inorganic fertilization, 6% of the respondents believed that organic yields are lower, 24% disagreed, and 70% were unsure. In terms of their awareness of whether the use of organic inputs could improve soil fertility and structure on their farms, 68% of the respondents answered "Yes," while 32% were uncertain. Regarding their willingness to use soil microbial inputs on their farms, 88% of the respondents agreed, while 12% did not.

Table 4: Acceptance, variability, and sustainability

Variables	**Frequency**	**Percentage (%)**
What share of your farm produce do you or your family sell		
Well sell everything	5	10
We sell most	25	50
We sell about half	20	40
Is your farming business profitable during the whole year		
Yes	47	94
No	3	6
How much income do you receive from your farm in a year		
50,000 – 150,000	14	28
150,000 and above	36	72
How do you imagine the future of your farm in the next 10 years		
You will continue business as usual	37	74
You will continue and expand farming business	10	20
You will allow family member(s) to manage the farm		
You will sell/rent it for agricultural purpose		
Other	3	6
Are you willing to increase organic farm inputs to your farm		

Yes	45	90
No	5	10
Do you think increase in organic farm inputs will help the good soil microbes which would lead to improve soil fertility and higher crop yield		
Yes	50	100
No	-	
Do you think yields from organic fertilization are too low compared to yields from inorganic fertilization		
Yes	3	6
No	12	24
I don't know	35	70
Do you think the use of organic inputs in your farm can improve soil fertility and soil structure		
Yes	34	68
No	-	
I don't know	16	32
Are you willing to use soil microbial inputs in your farm		
Yes	44	88
No	-	
Other: Don't know	6	12
Total	**50**	**100**

n = 50

CONCLUSION

The findings of this study reveal that farmers in the Uhen community have a strong attachment to traditional indigenous knowledge of soil management practices. However, farmers need to understand how these practices can impact soil health and be open to accepting organic farming methods. The data suggest that farmers' knowledge is influenced by their current farming system and their past experiences, making them resistant to change. New practices that require adjustments are often viewed as costly, time-consuming, and potentially harmful to crop yields, leading farmers to dismiss their importance. The majority of farmers still rely on practices like bush burning or the use of herbicides, such as Uproots and Gammalin (Lindane), although the extent of chemical usage remains uncertain, particularly among respondents with lower levels of education.

Overusing these chemicals, which can become persistent organic pollutants (POPs), can have adverse effects on human health, soil quality, and the environment. While the overall index score from the questionnaire indicates that most farmers are willing to adopt organic inputs to improve soil health and are aware of the benefits of soil microbes in enhancing fertility, it does not guarantee the actual adoption of these practices. Therefore, there is a pressing need for increased awareness and education about organic agriculture in the Uhen community, particularly in the context of climate change and environmental management. Liaising with local leaders to ensure major environmental policies, educational and awareness programs are in place for human and environmental protection is crucial.

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