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**Original Article**

# Evaluation of soil suitability for Tomato and Pepper sufficiency production in Odeda Area of Ogun State, Nigeria

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**ABSTRACT**

The increasing food demands and world population pose pressure on the agricultural sector. This has led to cultivating the land without proper soil assessment; hence, this study aimed to evaluate the suitability of some lands in the Odeda area of Ogun State, Nigeria, for the cultivation of tomatoes and pepper. A 3 hectare of land was surveyed using the free survey method, and the soil morphological properties were examined. The morphological result was used to grid the soils into four mapping units. Representative profile pits (P1, P2, P3, P4) were dug, and soil samples were collected at the pedogenic horizons. The samples were air dried and processed using laboratory standard methods. The laboratory result obtained was matched with the soil characteristics for tomato and pepper. The suitability evaluation (current and potential) was calculated using both linear and square root approaches of the parametric model. The organic carbon was moderate (1.23-2.97 %) at the surface in all the profiles except in P3. The total nitrogen and available phosphorus were moderate (0.21% and 21.57 mg/kg), respectively, at the surface in P2. All the soils were moderately suitable and potentially highly suitable for pepper. However, P1, P2, and P3 were marginally not suitable for tomato production. Soil suitability evaluation is highly recommended to ascertain the kind of crop a land is suitable for.

KEYWORDS: *Linear method, Morphology, Parametric approach, Soil, Square root method*

## INTRODUCTION

For the world to sustain and maintain its population, food security has remained one of, if not the only key to achieve this purpose. In Nigeria today, food security is seriously coming under threat and one of the ways to combat this menace is massive food production (Nwozor *et al*., 2019). Large expanse of land has been prepared for agricultural purpose but little or no cognizance was given to suitability evaluation of this land (Mugiyo *et al*., 2021). The full potential of any given land can only be optimally exploited by carrying out its suitability analysis (Nguyen *et al*., 2015). Various factors are considered in computing for suitability evaluation for any crop of which tomato and pepper are not left out. Among these factors is the climatic factor which has made tomato and pepper to be

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successfully produced in Nigeria today. Zakari *et al.*, (2017) in his estimation from the Food and Agriculture Organization, submitted that fresh tomato fruit of 1,785 tons per day or 651,525 tons per annum is under demand by 178.5 million Nigerian people. Nigeria is also ranked second largest producer of tomato in Africa and thirtieth largest in the world, producing 1.701 million tonnes of tomato annually at an average of 25-30 tonnes per hectare (Onuwa and Folorunsho, 2022). Currently, the northern part of the country serves as the major supplier of tomatoes to the country's markets (Olugbire *et al.*, 2020), as well as from neighboring countries including Ghana and Benin Republic, importing about 65,809 tonnes of processed tomato annually worth over ₦11.7 billion despite its massive local production (Zakari *et al.*, 2017). Good soil texture is of primary importance in tomato production. Although poor or medium quality textured land produces good early tomatoes but if properly managed. The rate at which the world wants to meet the food demands of its population increase has put pressure on the agricultural sector (Fukase & Martin, 2020). This has led to cultivating the land without proper soil assessment. It is on this premise that this research was based. The objective of this research was to assess the soil characteristics and evaluate the suitability of some of the land in Odeda area for the cultivation of tomato and pepper.

## MATERIALS AND METHODS

### Description of the study area

The research location is at Itoko- Jayeoba community in Odeda Local government area of Ogun state. It is a cultivated land, and it is a 3 hectare land. The coordinate of the study area is between longitude $3.301^0$ E to $3.304^0$ E and latitude $7.101^0$ N to $7.106^0$ N. The climatic data of the study area were collected from the department of Agro-meteorological and Water Resource Management, Federal University of Agriculture, Abeokuta, Ogun State. The weather data for 2020 shows the mean annual rainfall to be about 1100 mm while the mean monthly temperature ranges between $28^0$C and $32^0$C (Basil *et al*, 2023).

### Field procedure

The field gridded into regular polygons at an interval of 50 m x 50 m using the Arc GIS (Geographic Information System) and the center coordinates was taken, with the appropriate Longitude and Latitude. The determined coordinates were loaded into a hand held GPS (Global Positioning System) to locate the positions of the coordinate. Sampling was done at intervals of 15 cm from the top of the soil to a depth of 90 cm using the soil auger. The morphological properties of the soil were done in-situ. The determined characteristics were used to partition the soil into mapping units. A profile pit was dug in each determined unit. Samples were taken from the pedogenic horizon of each profile according to the FAO (2006) guidelines.

### Laboratory procedures

The soil samples collected were air dried, after which they were sieved using a 2 mm sieve. For organic carbon analysis and nitrogen determination, a portion of the samples were ground to finer particles and 0.5 g of the finer particles was weighed for the organic carbon. The pH was measured with a hand-held Hanna pH meter using Mclean (1965) method. The particle size analysis was done by dispersing the samples with calgon salt for 24 hours as described by Bouyoucos (Gee & Bauder, 1986). The exchangeable bases were extracted using 1N ammonium acetate at pH7. The magnesium and potassium were read using atomic absorption spectrometer while the sodium and calcium were read using flame photometer. The available phosphorus was determined using Bray 1 blue colorimetric method. The organic carbon was determined using Walkley & Black (1934) method and the total nitrogen was determined using micro-kheldjal method of Jackson (1962). The exchangeable acidity was determined using kcl as an extractant and titrated with NaOH (Mclean, 1965). The micronutrients were determined using EDTA as an extractant and the filtrate read with Atomic Absorption Spectrophotometer (AAS).

### Suitability evaluation

#### *Parametric square root approach*

Using the parametric method, each limiting characteristic was rated. The index of productivity (actual and potential) was calculated using the following equation;

$$IPc = A \times \sqrt{\left(\frac{B}{\frac{100}{c}} \times \frac{C}{\frac{100}{t}} \times \frac{D}{\frac{100}{w}} \times \frac{E}{\frac{100}{s}} \times \frac{F}{\frac{100}{f}}\right)} \qquad (1)$$

Where IP= Index of productivity, A= the overall lowest characteristic rating and B, C…F are the lowest characteristic ratings for each land quality group (Sys *et al.*, 1993).

#### *The parametric linear modeling*

The current and potential suitability were computed linearly using index of current (Actual) productivity (IPC) of Storie (1933)

$$IPc = A \times \left(\frac{B}{\frac{100}{c}} \times \frac{C}{\frac{100}{t}} \times \frac{D}{\frac{100}{w}} \times \frac{E}{\frac{100}{s}} \times \frac{F}{\frac{100}{f}}\right) \qquad (2)$$

Where IPc is index of current (actual) productivity, A the overall least rating characteristic and B,C….are the least rating characteristic for each land quality group.

The current and potential suitability (IPp) were similarly computed using the potential index of productivity.

***Soil classification***: Soil classification was done using the USDA Classification system of 2022 and FAO/UNESCO (2010) Classification system.

## RESULT AND DISCUSSION

### Results

***Physical properties of the pedons***

The physical properties of the pedons are presented in Table 1. Generally, the soil textural fractions of sand, clay and silt varied from profile to profile. The particle size distribution showed that the pedons have very high sand content (>75%) and this fluctuated with depth across the profile. The clay content also ranged from 9% to 40% across the profiles and increased with depth. The silt contents fluctuated with no definite pattern across the profiles. It ranged from 0.9% to 1.4%.

***Morphological properties of the pedons***

The morphological properties of the soils are presented in Table 2. Across all the pedons, the soil colour recorded very dark brown (10YR2/2) at the surface and varied from yellowish red to red as the soil depth increased. The texture was loamy sand at the surface but the sub-surface ranged from sandyclayloam to sandy clay. The structure was single grain at the surface and sub-angular blocky at the sub-surface with a lot of coarse materials present. The pedons were all well drained with very few fine to medium roots at the surface but few coarse root were present at the sub-surface. Pedons 1, 2 and 4 had manganese and iron concretions at the sub-surface.

***Chemical Properties of the Pedons***

The data on the chemical properties of the soil are given in the Table 3. The pH values of the pedons ranged from 7.3 to 7.8, although this value followed no definite pattern in their distribution down the profiles. The pH showed that the pedons were slightly alkaline (>7.3). The exchangeable bases (Ca, Na, Mg, K) in all the profiles were very low except for Mg which was moderate (1.18-1.51 cmol/kg) only at the surface in all the profiles. The exchangeable acidity was generally low with values ranging from 0.4 to 0.8 cmol/kg. The organic carbon varied across the profiles. The organic carbon was moderate (1.23-2.97 %) at the surface in all the profiles except in profile 3 which was low. The total N was only moderate (0.21 %) at the surface in profile 2 while low in all the profiles. The available P was moderate (21.57 mg/kg) at the surface also in profile 2 and low as the depth increased in all other profiles.

***Suitability evaluation for pepper cultivation***

The suitability evaluation was done by matching the land/climatic requirement for pepper (Table 4) with the physical and chemical properties of the study area (Tables 1 and 3). The result is presented in Table 6. Using both square root and linear methods, the pedons actually were moderately suitable for pepper. Calculating it potentials, it was found out to be highly suitable for pepper.

***Suitability evaluation for tomato cultivation***

The suitability evaluation was done by matching the land/climatic requirement for tomato (Table 5) with the physical and chemical properties of the study area (Tables 1 and 3). Using the square root method for the suitability evaluation as presented in Table 7, the pedons were actually not suitable for tomato cultivation except for pedon 4 which was highly suitable (S173-89). The major constraints to this were the fertility and the texture of the soil. The soil texture cannot be amended and therefore with amendment to the fertility of the soil, pedons 1,2 and 3 were marginally suitable for tomato. The soil texture would not allow the fertility amendment carried out to be effective as this are easily leached or washed away by rainfall. The linear method showed moreover that pedons 1, 2 and 3 were actually and potentially not suitable for tomato except for pedon 4.

**Table 1: Physical Properties of the Pedons**

| | Horizon Depth | Sand % | Silt % | Clay % | Textural class |
|---|---|---|---|---|---|
| P1 | 0-14 | 86.96 | 4.88 | 8.16 | Sand |
| | 14-42 | 88.93 | 0.91 | 10.16 | Sand |
| | 42-88 | 80.93 | 1.94 | 14.16 | Sand |
| | 88-133 | 78.90 | 1.97 | 7.13 | Sandy loam |
| | 133-197 | 81.93 | 3.94 | 19.13 | sandy loam |
| P2 | 0-7 | 86.96 | 7.91 | 14.13 | sandy loam |
| | 7-37 | 92.93 | 1.94 | 5.13 | loamy sand |
| | 37-114 | 87.93 | 1.91 | 5.13 | Sand |
| | 114-159 | 84.96 | 2.88 | 10.16 | loamy sand |
| | 159-198 | 81.93 | 3.94 | 12.16 | loamy sand |
| P3 | 0-14 | 95.40 | 1.00 | 14.13 | sandy loam |
| | 14-30 | 92.93 | 1.94 | 3.60 | Sand |
| | 30-110 | 86.96 | 0.94 | 5.13 | Sand |
| | 110-168 | 81.93 | 4.94 | 12.10 | loamy sand |
| P4 | 0-11 | 91.96 | 3.97 | 13.13 | sandy loam |
| | 11-26 | 94.93 | 0.94 | 4.07 | Sand |
| | 26-79 | 88.90 | 1.97 | 4.13 | Sand |
| | 79-138 | 75.90 | 3.97 | 9.13 | loamy sand |
| | 138-173 | 73.96 | 3.94 | 20.13 | sandy clay loam |

**Table 2: Morphological properties of pedons**

| Pit No | Depth | Colour | Text | Structure | Consistency | Root conc | Drainage | Concretions | Bioactive | Boundary |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pit 1** | 0-14 | 10YR2/2 very dark brown | S | SG | VFr | VfM | WD | A | F | SS |
| | 14-42 | 5YR4/4 reddish brown | S | SAB | Fr | VfMC | WD | A | F | SS |
| | 42-88 | 5YR4/6 Yellowish red | S | SAB | F | VfF | MD | MnC | A | IC |
| | 88-133 | 5YR5/6 Yellowish red | SL | SAB | F | A | ID | MnC | A | WC |
| | 133-197 | 5YR5/8 yellowish red | SL | SAB | VFI | A | PD | MnM | A | |
| **Pit 2** | 0-7 | 10YR2/2 very dark brown | LS | SG | VFr | VfMC | WD | A | F | SS |
| | 7-37 | 5YR5/4 reddish brown | S | SAB | Fr | VfMC | WD | A | F | SS |
| | 37-114 | 5YR4/6 yellowish red | LS | SAB | Fr | VfF | MD | A | F | WC |
| | 114-159 | 5YR5/8 yellowish red | LS | SAB | Fi | A | ID | MnC | A | IG |
| | 159-198 | 5YR6/8 reddish yellow | SL | SAB | VFi | A | PD | MnC | A | |
| **Pit 3** | 0-14 | 10YR4/4 dark yellowish brown | S | SG | L | VfMC | WD | A | F | WS |
| | 14-30 | 5YR3/6 dark reddish brown | S | SG | Fr | VfMC | WD | A | F | WC |
| | 30-110 | 2.5YR4/8 red | LS | SAB | Fr | VfF | ID | A | F | IG |
| | 110-168 | 5YR3/6 dark reddish brown | SL | SAB | VFi | A | PD | A | A | |
| **Pit 4** | 0-11 | 5YR3/1 very dark gray | S | SG | VFr | VfMC | WD | A | S | SG |
| | 11-26 | 5YR4/3 reddish brown | S | SAB | Fr | VfCM | WD | A | S | SAB |
| | 26-79 | 2.5YR4/6 red | LS | SAB | FI | VfF | ID | A | LS | SAB |
| | 79-138 | 10R4/8 red | SCL | SAB | FI | VfF | ID | MnC | SCL | SAB |
| | 138-173 | 10R4/6 red | SCL | SAB | VFI | A | PD | MnC | SCL | SAB |

Note: LS= S= sandy; loamysand, SCL= sandyclayloam, SAB= sub-angular blocky; SG=single grain; VFr= very friable; Fr= friable; VFI= very firm; VfMC= very few medium to common root; Vff= very few fine roots

**Table 3: Chemical properties of the pedons**

| Depth | pH | OC | TSN | P in soil | TEA | Ca | Mg | Na | K | ECEC | Bsat | Cu | Fe | Mn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | % | mg/kg | | | Cmol kg$^{-1}$ | | | | % | | mg kg$^{-1}$ | | |
| 0-14 | 7.7 | 1.50 | 0.10 | 10.58 | 0.5 | 2.06 | 1.51 | 0.23 | 0.22 | 4.53 | 88.95 | 0.017 | 7.17 | 8.82 | 1.237 |
| 14-42 | 7.8 | 0.27 | 0.01 | 4.79 | 0.5 | 0.84 | 0.67 | 0.25 | 0.06 | 2.32 | 78.43 | 0.142 | 4.34 | 5.68 | 1.650 |
| 42-88 | 7.8 | 0.27 | 0.01 | 3.24 | 0.6 | 0.96 | 0.93 | 0.21 | 0.06 | 2.76 | 78.30 | 0.115 | 1.76 | 1.45 | 1.734 |
| 88-133 | 7.8 | 0.31 | 0.01 | 3.10 | 0.4 | 1.43 | 1.25 | 0.25 | 0.09 | 3.43 | 88.33 | 0.153 | 2.30 | 1.40 | 1.477 |
| 133-197 | 7.8 | 1.66 | 0.11 | 3.81 | 0.6 | 1.25 | 1.04 | 0.27 | 0.08 | 3.23 | 81.45 | 0.098 | 1.59 | 2.05 | 1.387 |
| 0-7 | 7.3 | 2.97 | 0.21 | 21.57 | 0.5 | 1.98 | 1.50 | 0.36 | 0.40 | 4.73 | 89.44 | 0.068 | 8.58 | 8.20 | 2.509 |
| 7-37 | 7.6 | 0.27 | 0.01 | 3.24 | 0.8 | 1.12 | 0.83 | 0.21 | 0.14 | 3.10 | 74.21 | 0.169 | 4.21 | 4.52 | 2.216 |
| 37-114 | 7.5 | 1.04 | 0.07 | 9.17 | 0.5 | 1.38 | 0.99 | 0.27 | 0.12 | 3.25 | 84.62 | 0.159 | 2.80 | 1.89 | 1.903 |
| 114-159 | 7.5 | 1.85 | 0.13 | 8.04 | 0.5 | 1.69 | 0.92 | 0.23 | 0.11 | 3.45 | 85.49 | 0.144 | 4.52 | 0.92 | 1.601 |
| 159-198 | 7.4 | 0.15 | 0.00 | 2.82 | 0.5 | 1.47 | 1.13 | 0.27 | 0.11 | 3.47 | 85.60 | 0.148 | 1.69 | 0.94 | 1.250 |
| 0-14 | 7.5 | 0.27 | 0.01 | 11.28 | 0.8 | 0.92 | 0.68 | 0.18 | 0.08 | 2.66 | 69.89 | 0.118 | 3.19 | 1.51 | 1.787 |
| 14-30 | 7.5 | 0.69 | 0.04 | 5.36 | 0.5 | 0.91 | 0.99 | 0.20 | 0.21 | 2.81 | 82.18 | 0.385 | 6.75 | 3.71 | 2.054 |
| 30-110 | 7.3 | 1.31 | 0.09 | 3.10 | 0.4 | 1.25 | 1.01 | 0.20 | 0.16 | 3.02 | 86.76 | 0.143 | 2.58 | 0.41 | 1.344 |
| 110-168 | 7.7 | 0.39 | 0.02 | 2.82 | 0.3 | 1.67 | 0.87 | 0.18 | 0.13 | 3.15 | 90.47 | 0.134 | 4.09 | 0.36 | 1.489 |
| 0-11 | 7.6 | 1.23 | 0.08 | 8.32 | 0.6 | 2.33 | 1.18 | 0.23 | 0.16 | 4.51 | 86.70 | 0.022 | 9.64 | 6.67 | 2.371 |
| 11-26 | 7.6 | 2.35 | 0.16 | 6.49 | 0.5 | 1.45 | 0.79 | 0.20 | 0.09 | 3.03 | 83.50 | 0.028 | 4.87 | 5.81 | 1.061 |
| 26-79 | 7.6 | 1.93 | 0.13 | 3.53 | 0.4 | 1.25 | 1.04 | 0.18 | 0.12 | 2.98 | 86.58 | 0.129 | 3.26 | 1.51 | 0.515 |
| 79-138 | 7.5 | 1.31 | 0.09 | 0.14 | 0.4 | 2.20 | 1.65 | 0.23 | 0.12 | 4.60 | 91.31 | 0.024 | 3.14 | 0.53 | 1.211 |
| 138-173 | 7.6 | 1.77 | 0.12 | 1.55 | 0.6 | 1.94 | 1.99 | 0.23 | 0.08 | 4.84 | 87.60 | 0.224 | 2.56 | 0.27 | 0.397 |

**Table 4: Climatic and Land Requirement for Suitability Evaluation for pepper**

| Land characteristics | S1 100% | S2 74% | S3 49% | N 24% |
|---|---|---|---|---|
| Climate (c) | | | | |
| Annual rainfall | 750-900 | 900-1200 | 500-600&>1200 | <500 |
| Mean annual temp($^{O}$c) | 25-32 | 30-35 | 36-38 | >38 |
| Wetness (w) | | | | |
| Soil drainage | Well drained | Moderately to imperfectly drained | Poorly drained | Very poorly drained |
| Soil Phy Prop (s) | | | | |
| Texture | L,Scl,cl,Sil | Sl,Sc,Sic | C(ss),Ls,S | C(ss),Ls |
| Effective soil depth | >75 | 50-70 | 25-50 | <25 |
| Fertility (f) | | | | |
| Soil pH | 6-7 | 7-8 | 8.1-9.0&5.0-5.9 | >9.00&<5.00 |
| Soil organic carbon | >2.0 | 1.5-2.0 | 1.0-1.5 | <0.4 |
| Topography (t) | | | | |
| Slope | <3 | 3-5 | 6-10 | >10 |
| Salinity | Non saline | 1-2 | 3-4 | >4 |

S1= highly suitable; S2= moderately suitable; S3= marginally suitable; N=not suitable;L=loam;Scl= sandy clay loam; Sil= silt loam; C(ss)=shrink swell clay. Source: Modified from Naidu *et al* 2006

**Table 5: Climatic and Land Requirement for Suitability Evaluation for Tomato**

| Land characteristics | S1 100% | S2 74% | S3 49% | N 24% |
|---|---|---|---|---|
| Climate (c) | | | | |
| Annual rainfall | 600-750 | 500-600 | 450-500 | <450 |
| Mean annual temp($^{O}$c) | 25-28 | 29-32 | 33-36 | >38 or <15 |
| Wetness (w) | | | | |
| Soil drainage | Well drained | Moderately to imperfectly drained | Poorly drained | Very poorly drained |
| Soil Phy Prop (s) | | | | |
| Texture | SL,CL,L,SCL | SiCL,SiC,SC,C | C | S,LS |
| Effective soil depth | >75 | 50-75 | 50-25 | <25 |
| Fertility (f) | | | | |
| Soil pH | 6-7 | 5.-5.9 or7-8.5 | 8.6-9.0&4.4-4.9 | >9.00&<5.00 |
| Avail. P | >20 | 20-10 | <10 | <5 |
| Topography (t) | | | | |
| Slope | <3 | 3-5 | 6-10 | >10 |
| Salinity | Non saline | 1-2 | 3-4 | >4 |

S1= highly suitable; S2= moderately suitable; S3= marginally suitable; N=not suitable;L=loam;Scl= sandy clay loam; Sil= silt loam; C(ss)=shrink swell clay

**Table 6: Suitability Class Scores and Aggregate Suitability of the Representative Pedons for pepper**

| | Annual rainfall(mm) | Mean Annual Temp (Oc) | Topography Slope (%) | Net(w) Drainage | Soil physical characteristics Texture /structure | Soil pH | %O.C | Parametric Square root method Actual | Potential | Parametric Linear method Actual | potential |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P1 | S1(100) | S1(100) | S1(100) | S1(100) | S1(95) | S1(100) | S2(74) | S2fc(62) | S1(92) | S2(70) | S1(90) |
| P2 | S1(100) | S1(100) | S1(100) | S1(100) | S1(95) | S1(100) | S2(74) | S2fc(62) | S1(92) | S2(70) | S1(90) |
| P3 | S1(100) | S1(100) | S1(100) | S1(100) | S1(95) | S1(100) | S3(49) | S2fc(62) | S1(92) | S3(47) | S1(90) |
| P4 | S1(100) | S1(100) | S1(100) | S1(100) | S1(95) | S1(100) | S3(49) | S2fc(62) | S1(92) | S3(47) | S1(90) |

**Table 7: Suitability rating of land characteristics for tomato production**

| | P1 | P2 | P3 | P4 |
|---|---|---|---|---|
| **Climate (c)** | | | | |
| Annual rainfall | S3 (80) | S3 (80) | S3 (80) | S3 (80) |
| Mean annual temperature | S1 (100) | S1 (100) | S1 (100) | S1 (100) |
| **Topography (t)** | | | | |
| Slope | S1 (100) | S1 (100) | S1 (100) | S1 (100) |
| Wetness (w) | | | | |
| Soil drainage | S1 (100) | S1 (100) | S1 (100) | S1 (100) |
| **Soil Physical Characteristics (s)** | | | | |
| Soil texture | N1 (39) | N1(39) | N1 (39) | S1 (100) |
| Soil depth | S1 (100) | S1 (100) | S1 (100) | S1 (100) |
| **Soil Fertility (f)** | | | | |
| Total. N | S1 (97) | S1 (98) | S1 (98) | S1 (98) |
| pH | S2 (94) | S2 (90) | S2 (90) | S2 (92) |
| Avail. P | S1 (98) | S1 (98) | S1 (98) | S1 (98) |
| **Linear method** | | | | |
| Actual | N1 (29) | N1 (28) | N1 (28) | S1 (73) |
| Potential | N1 (31) | N1 (31) | N1 (31) | S1 (80) |
| **Square root method** | | | | |
| Actual | N1 (21) | N1 (21) | N1 (21) | S1 (89) |
| Potential | S3 (52) | S3 (47) | S3 (47) | S1 (78) |

### *Soil classification*

The classification of the pedons is given in Table 8. The soils fall within soil order Alfisols in the USDA Soil Taxonomy (Soil Survey Staff, 2022). All the pedons with argillic B horizons and high base saturation (>35%) were classified as Alfisols or Luvisol (FAO/UNESCO, 2006). Pedon 3 was classified as Typic Eutrudalf (Soil Survey Staff, 2022) or Rhodic Luvisol (FAO/UNESCO 2010) while pedons 1,2,4 were classified as Rhodic Plinthiudalf (Soil Survey Staff, 2022) or Plinthic Luvisol (FAO/UNESCO, 2006).

**Table 8: Classification of the Pedons**

| Pedons | USDA classification | FAO classification |
|---|---|---|
| 1 | Rhodic plinthiudalf | Plinthic luvisol |
| 2 | Rhodic plinthiudalf | Plinthic luvisol |
| 3 | Typic Eutruudalf | Rhodic luvisol |
| 4 | Rhodic plinthiudalf | Plinthic luvisol |

## DISCUSSION

The colour variation recorded could be as a result of the drainage pattern around the profiles as the profiles were well drained due to the high sand content recorded also according to Ajiboye *et al.* (2015). This was also in support of the claim of Basil *et al.* (2023) who reported that pedons with sand content >70% would support infiltration. The colour variation could also be as a result of different amount of organic matter at each pedogenic horizon. This is an indication that a lot of anthropogenic activities have taken place at the surface (Senjobi *et al.*, 2010). The exchangeable bases were low which could result from the effect of leaching. The sandy nature of the pedons would support this claim according to Ajiboye *et al.* (2015). The low in calcium, potassium and sodium could be as a result of leaching. The low total nitrogen content could be as a result of mineralization aided by microorganism.

Although there is a strong correlation between organic carbon and total nitrogen which shows that higher organic carbon could likely give higher total nitrogen content. The available phosphorus was also low. This could be as a result of erosion, plant uptake, run-off or leaching which cannot be replenished except by external forces according to Johan *et al.*, (2021). According to Liang *et al.*, (2024), low pH in natural ecosystem would result to increasing soil organic carbon because soil microbial activities decreased as pH decreased. This submission favours the result in this research as it was seen that the pH was neutral to slightly alkaline which favours the activities of the microorganism thereby reducing the soil organic carbon. The fertility however was yet actually suitable for pepper production but marginally suitable for tomato. In suitability evaluation, the actual value explains the nature of the land at the present while the potential value explains the nature of the land after amendment therefore from the result, the potentiality of the land explains that the land was not still suitable for tomato cultivation as the limiting factor was the texture which is an inherent property of the soil. Fagwalawa *et al.*, (2015) reported that tomato thrives in a sandy clay loam, sandy clay or loamy soil. The texture however does not affect pepper production as the land was highly suitable for pepper.

**CONCLUSION AND RECOMMENDATION**

It was concluded that the land has a sandy property and the nutrients status was low. It was also concluded that currently, the land was not suitable for tomato cultivation but potentially, it was marginally suitable for tomato. However, the soils were suitable for pepper cultivation in both current and its potentiality. Before an expanse of land is deployed for agricultural purposes, it is strongly advised to carry out the suitability evaluation first to ascertain the kind of crop the land is suitable for. This will aid the maximization of land to it full potentials.

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**Authors' contributions**

CEB interpreted and wrote the manuscript, JAA managed data collection. ACOU & MSO reviewed the manuscript

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