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CONTENTS

Land suitability evaluation for avocado pear (*Persea americana* Mill.) and pineapple (*Ananas comosus* L. Merr) in rain forest zone of Edo State, Nigeria

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ABSTRACT: This study was conducted in the rain forest zone of Edo state, Nigeria to evaluate the suitability of some soils for avocado pear and pineapple cultivation. The methodology involved a rigid grid soil survey at a detailed scale. Four mapping units were delineated and suitable guidelines specific for each crop were used in establishing suitability of the land for avocado pear and pineapple. The result revealed that by limitation method, on potential basis, 110.98 ha (Inceptisols and Ultisols) which amounts to 86.64% of the study area was moderately suitable (S2) while 17.13 ha (Entisols) which amounts to 13.37% of the study area was marginally suitable for avocado pear and pineapple. However, by parametric method, 110.98 ha (Inceptisols and Ultisols) covering 86.64% of the study area was highly suitable (S1) while 17.13 ha (Entisols) representing to 13.37% of the study area was only marginally suitable for avocado pear and pineapple production. Thus, the limitation method should be preferred for land suitability evaluation as it captures the true state of land characteristics in the study area.

Key words: Avocado pear, Edo state, land suitability, pineapple, rainforest

Conservation and precision land management practices involves appropriate use of soils for the purpose that is best suited in order to sustain maximum productivity with minimum or no land degradation (Oko-oboh, 2016). Land suitability assessments are fundamental to land potential evaluation for agricultural purposes and management decisions, planning, and utilization. Land suitability status is based on intrinsic properties of soil (such as soil texture, depth) and other soil characteristics that can be altered by human activities (drainage, salinity, nutrient content and vegetation cover) (FAO, 1985; 1993).The need for land suitability evaluation before starting any agricultural project can't be over emphasized as such neglect in the past has led to massive failure of agricultural projects (Okunsebor *et al*., 2021). Avocado pear popularly called Avocado and Pineapple are key tropical and subtropical fruits that are increasingly gaining worldwide acceptance. They are cultivated in tropical and subtropical regions of the world both for local consumption and export (Dhar *et al.,* 2008). Their fruits are rich sources of vitamins (Hossain, 2016; Osinuga *et al*., 2020). Avocado fruit is a rich source of proteins; fat-soluble vitamins like vitamins A, D, and E; and other vitamins like B complex (Darakshan *et al.,* 2020). In Nigeria, marketing of the fruits constitutes more than a significant volume of the economic activities in rural areas (Ogunwusi and Ibrahim, 2017).

Due to the health benefits of Avocado and pineapple and their contribution to the nation's economic development (Ogunwusi and Ibrahim, 2017; Osinuga *et al*., 2020), it is important to increase their production especially in the rain forest zone of Nigeria where the soils are highly leached. This can only be achieved when there is detailed information on the suitability of the soils in the area for cultivation. Studies related to various aspects of land suitability for crop production have been done based on FAO frame work in different parts of Nigeria (Sys, *et al*., 1993; Aruleba and Ayodele, 2015; Peter and Umweni, 2020a). The present study provides the information on the suitability status of the study area for production of avocado and pineapple.

MATERIALS AND METHODS

Study Area

This study was carried out on a 128 hectare land in Isua community (Uhunmwode Local Government Area) of Edo state. The site lies within latitude 6

18’24.08"N and 6 18’30.56"N and Longitude 5 57’12.23"E and 5 57’58.3"E (Okunsebor *et al.*, 2021) in the rain forest ecological zone and south-south geo-political zone of Nigeria.

The area has two distinct climatic seasons, namely; the rainy and dry seasons. The rainy season is between April and October with a 2-week break in August. The dry season lasts from November to April, with a cloudy, humid and dusty *harmattan* period between December and January. The annual rainfall is within the range of 1500 mm to 2500 mm with an average of 1900 mm per annum. The average annual temperature ranges from 23-37°C (NIFOR, 2020). Some of the crops cultivated in the area include cassava, plantain, Oil palm etc.

Okunsebor *et al*. (2021) has identified three soil orders in the study area: Entisols (Ahiara), Inceptisols (Kulfo) and Ultisols (Orlu). These soils are generally the red Ferrasols, derived from coastal plain sands (unconsolidated sands and sandy clay) and alluvial deposits which are formations of sedimentary rock (Umweni, 2007). The topography is gentle sloppy (0.3-9%).

Field Studies

Soil survey was carried out using the rigid grid method at a detailed scale in 128.11 ha land. Traverses were cut at intervals of 100 m from predetermined baseline with the transverses running in both vertical and horizontal directions, making a total of 10 traverses. Auger examinations were performed at 100 m apart along the traverses (one observation point in every 2 ha), making a total of 64 auger sampling points. Areas with similar properties were put together to form the various soil mapping units, in which four mapping units were delineated. Each mapping unit was represented by a pedon; the pedons were described according to Food and Agriculture Organization (2006) norms.

Laboratory Analysis

Soil samples collected from each horizon were air-dried and crushed to pass through a 2 mm sieve. The sieved samples were analysed using standard laboratory procedures. Determination of particle size distribution was done by the hydrometer method (Gee and Or, 2002) after the removal of organic matter with hydrogen peroxide and dispersion with sodium hexametaphosphate (International Institute for Tropical Agriculture, 1979). Soil textural classes were determined using textural triangle (Soil survey staff, 2003). Soil pH was determined with pH meter using a glass electrode in soil and water suspension of 1:1 (Mclean, 1982).Organic C was determined by dichromate wet oxidation method of Walkley and Black (Page**,** 1982). Available phosphorus was determined according to Bray1method (Olsen and Sommers, 1982).Total Nitrogen was determined by

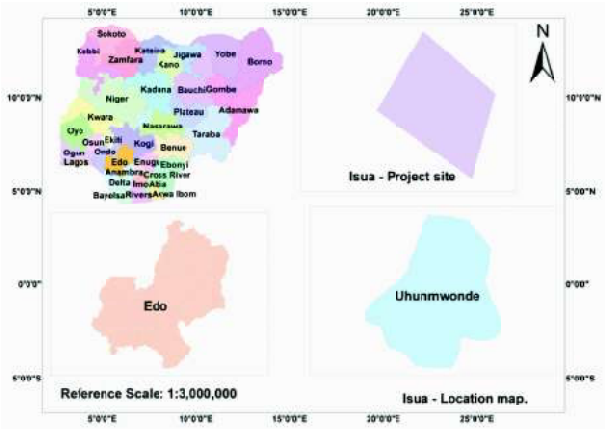

Fig.1: Location map of study area

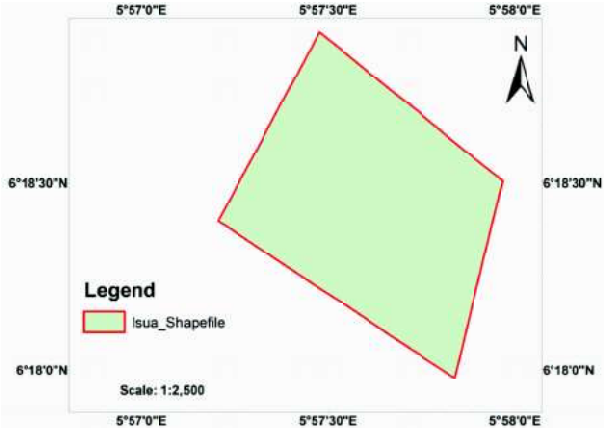

Fig 2: Shape file of study area

macro-Kjedhal method (Bremner, 1996). Exchangeable cations (Na, K, Ca, and Mg) were determined by extraction with neutral normal ammonium acetate (NH4OAC at pH 7.0) method, Na and K were determined by flame photometer, while Ca and Mg were determined by atomic absorption spectrophotometer (Thomas, 1982).Exchangeable Acidity determination was done by titration method (Anderson and Ingram, 1993).Effective Cation Exchange Capacity (ECEC) was obtained by the summation of exchangeable bases and exchangeable acidity (Tan, 1996). Calculation of base saturation was done by dividing the sum of exchangeable bases (Na, K, Ca and Mg) by ECEC and multiplying the quotient by 100.

Land Suitability Evaluation

Land evaluation was done by using both limitation and parametric (index of productivity) (Storie, 1976; Ogunkunle, 1993) of the FAO (1979) framework. Pedons were placed in suitability classes by matching their characteristics / qualities with the established requirements for avocado pear and pineapple production (Sys, 1985; Aruleba and Ayodele, 2015). Aggregate suitability class of a pedon (aggregate suitability) was obtained by picking the poorest or most limiting characteristic of the pedon. The land qualities considered for evaluation of avocado pear and pineapple were climate (c), topography (t), wetness (w), soil physical characteristics (s) and fertility characteristics (f).

Parametric method was done by calculating the index of productivity using the Square root model (Storie, 1976). Scores were given to the land qualities of each pedon and index of productivity was calculated using the formula:

Each characteristic was first rated as follows: No limitation: 100-85, (S1); Moderate limitation: 84-60 (S2); Severe limitation: 59-40 (S3); Very severe limitation 39-0 (N). The index of productivity for each pedon was expressed from the rating of each characteristic of the land qualities of each group, using the lowest rating. Index of productivity was rated into classes as follows: Highly suitable (S1) 100-75, moderately suitable (S2) 74-50, marginally suitable (S3) 49-25 and Non suitable (N) 24-0. (Ogunkunle, 1993)

RESULTS AND DISCUSSION

Some physical and chemical properties of the soils of the study area are shown in Table 2. Sand fraction was dominant in pedon1 as well as in all the surface horizons of pedons 2, 3 and 4. It varied from 859 g kg^{-1} to 940 g kg^{-1} in pedon 1 and 834 g kg^{-1} to 859 g kg^{-1} in pedons 2, 3 and 4. The dominance of sand fraction in surface horizon could be attributed to the parent material of the study area (coastal plain sands) (Peter and Umweni, 2020b). Silt fraction varied from 10 g kg^{-1} to 51 g kg^{-1} in all the horizons. The low silt content could be due to high intensity of leaching in the study area. Clay fraction of particle size varied from 40 g kg^{-1} to 250 g kg^{-1}. Clay content increased with increase in depth, suggesting active eluviation with illuviation processes. Soil pH ranged from 5.3–6.4 in pedon 1, 4.3–5.1 in pedon 2, 4.6–5.5 in pedon 3, and 4.6–6.3 in pedon 4. Organic carbon ranged from 1.01 % to 3.46 % in all the pedons, and it decreased irregularly from top to bottom of the profile. The organic carbon content is in line with the findings of Peter and Umweni (2021). Total nitrogen was low, ranging from 0.09 % to 0.19 % in all the pedons. This could be as a result of the high rainfall amount in the study area (Peter and Umweni, 2020b).

$$IPc = A\sqrt{(B/100)_{(c)} * (C/100)_{(t)} * (D/100)_{(w)} * (E/100)_{(s)} * (F/100)_{(f)}} \quad \text{(Eq. 2) (Sys 1985)}$$

Where IPc = index of productivity, √ = square root, A is the overall least characteristic rating, B,C——E is the least rating characteristic for each land group quality; c = climate, t = topography, w = wetness, s = slope, f = fertility.

Table 1: Land requirements for avocado pear production

Land qualities	100-85	84-60	59-40	39-00
Suitability classes	S1	S2	S3	NS
Climate (c)				
Rainfall (mm)	1700 - 2000+	1450-1700	1250-1450	<1200
Dry season 2 – 3	3 – 4	4 – 5	>5	
Annual Temperature (°c)	25 – 32	20 – 25	20 – 22	<20
Wetness (w)				
Drainage Well	Moderate	-	-	
Flooding F0	F1	-	-	
Soil physical characteristics (s)				
Soil depth (cm)	>100	75 - 100	50 – 75	<50
Texture LS, SCL, CL	SC	S, LC	C	
soil fertility (f)				
CEC, clay (cmolkg-¹)	>16	8 - 16	4 – 8	<4
Base saturation (%)	>35	-	-	-
Organic matter	0.8 – 1.2	0.4 - 0.8	-	<0.4
Ph 6-7	5.5 – 6.0	4.5 - 5.5	<4.0	
TOPOGRAPHY (t)				
Slope (%) 0-8	8 -30	30 – 50	>50	

Source: Aruleba and Ayodele (2015)

Table 2: land requirements for pineapple (*Ananas comosus*) production

Land qualities	100-85	84-60	59-40	39-00
Suitability classes	S1	S2	S3	NS
CLIMATE (c)				
Rainfall (mm)	2000	1450-2000	800-1450.	>800
Dry season (months)	1-2.	2-4	4 -6	>6
Temperature (°C)	25 - 30	20 - 25	15 - 20	<15 - >14
WETNESS (W)				
Drainage	Well	Moderate	-	Imperfect
Flooding	F0	F1	-	F2
TOPOGRAPHY (t)				
Slope (%)	0 - 8	8-30	30- 50	>50
SOIL PHYSICAL CHARACTERISTICS (S)				
Soil depth (cm)	>100	50 - 100	20 - 50	<20
Texture	SL, SCL, CL	LS	S	C
FERTILITY (f)				
CEC Clay, (ECEC) (cmolkg-¹)	>16	12 - 16	10 - 12	<10
Base Saturation (%)	>35	20 - 35	10-20	<10
Organic matter	>1.8	1.2 - 1.8	0.6 - 1.2	<0.6
pH (0 - 30cm)	5 .5- 6 .0	4.0 - 5.5	6.0 – 6.9	<4.0

Source: Aruleba and Ayodele (2015)

Land suitability evaluation

Climate (c): The climatic parameters considered were mean annual rainfall, length of dry season and mean annual temperatures. In the study area, mean annual rainfall and mean annual temperatures did not pose any threat to cultivation of avocado pear and pineapple. The entire study area was rated as highly suitable (S1) for avocado pear and pineapple cultivation. This was due to the fact that the study area has rainfall amount > 1,700 mm and mean annual temperatures >25°C. Length of dry season (3 months) was rated moderately suitable (S2) for both crops, indicating that it was sub-optimal for avocado pear and pineapple cultivation (Sys, 1985; Aruleba and Ayodele 2015; Oko-oboh *et al.*, 2018).

Table 4: Summary of land suitability evaluation for avocado pear and pineapple all the pedons

Land Characteristics	AVOCADO PEAR				PINEAPPLE			
Pedons	1	2	3	4	1	2	3	4
CLIMATE (c)								
Rainfall (mm)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
Dry season (months)	75(S2)	75(S2)	75(S2)	75(S2)	75(S2)	75(S2)	75(S2)	75(S2)
Temperature (°C)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
WETNESS (W)								
Drainage	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
Flooding	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
TOPOGRAPHY (t)								
Slope (%)	100(S1)	100(S1)	75(S2)	100(S1)	100(S1)	100(S1)	75(S2)	100(S1)
SOIL PHYSICAL CHARACTERISTICS (S)								
Soil depth (cm)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
Texture	50(S3)	100(S1)	100(S1)	100(S1)	50(S3)	75(S2)	75(S2)	100(S1)
FERTILITY (f)								
CEC	75(S2)	75(S2)	75(S2)	75(S2)	20(Ns)	75(S2)	75(S2)	100(S1)
Base Saturation (%)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
Organic matter	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)	100(S1)
pH (0 - 30cm)	75(S2)	50(S3)	50(S3)	75(S2)	75(S2)	75(S2)	75(S2)	75(S2)
Agg. Suitability Class								
*Current	S3(s)	S3(f)	S3(f)	S2(c, f)	NS(f)	S2(c, s, f)	S2(c, s, f)	S2(c, f)
*Potential	S3(s)	S2(c)	S2(c)	S2(c)	S3(s)	S2(c, s)	S2(c, s)	S2(c)
!Current	37.5(S3)	43.3(S3)	37.5(S3)	75(S1)	12.3(NS)	75(S1)	75(S1)	75(S1)
!Potential	37.5(S3)	75(S1)	75(S1)	75(S1)	30(S3)	75(S1)	75(S1)	75(S1)
Size (Hectares)	17.13	54.25	25.27	31.46	17.13	54.25	25.27	31.46
% Coverage	13.37	42.35	19.73	24.56	13.37	42.35	19.73	24.56

*Limitation method
!Parametric method
S1= Highly suitable; S2=Moderately suitable; S3= Marginally suitable, NS= Not suitable.
Aggregate suitability scores: 100-75 = S1, 74-50 = S2, 49-25 =S3, 24-0 = N

Table 5: Summary of aggregate land suitability for both crops

Pedon	USDA taxonomy	Size (Ha)	Limitation				Parametric			
			Current		Potential		Current		Potential	
			Avocado Pear	Pineapple	Avocado Pear	Pineapple	Avocado Pear	Pineapple	Avocado Pear	Pineapple
1	Typic Udipsamment (Ahiara)	17.13	S3(s)	NS (f)	S3(s)	S3(c)	37.5(S3)	12.3(NS)	37.5(S3)	30(S3)
2	Typic Dystrudept (Kulfo)	54.25	S3(f)	S2(c, s, f)	S2(c)	S2(c, s)	43.3(S3)	60(S2)	75(S1)	75(S1)
3	Typic Rhodudults (Orlu-Normal)	25.27	S3(f)	S2(c, s, f)	S2(c)	S2(c, s)	37.5(S3)	60(S2)	75(S1)	75(S1)
4	Rhodic Kandiudult (Orlu-Clayey)	31.46	S_2(c, f)	S2(c, f)	S2(c)	S2(c)	75(S1)	60(S2)	75(S1)	75(S1)

Wetness (w): The parameters considered under this characteristic were flooding and drainage. The study area was rated as highly suitable (S1) and the wetness characteristic was optimal for avocado pear and pineapple production (Aruleba and Ayodele, 2015).

Topography: Topography expressed as slope was optimal in pedons 1, 2 and 4 (0-8%) but sub optimal in pedon 3(> 8%). Thus, while pedons 1, 2 and 4 were rated as highly suitable, pedon 3 was rated only as moderately suitable (S2) for avocado pear and pineapple cultivation.

Soil Physical Characteristics: Soil depth was

Table 3: Some physical and chemical properties of the study area

Horizon Design.	Depth (cm)	pH	EC µS/cm	Org. C %	Org. M gkg^{-1}	T.N. gkg^{-1}	Av. P. $Mgkg^{-1}$	Na	K	Ca	Mg	ECEC	Al	H	CEC	BS (Soil) %	BS (CEC) %	CLAY	SILT	SAND	TEXTURAL CLASS
								Cmolkg^{-1}										gkg^{-1}			
Pedon 1 Typic Udipsamment (Ahiara)																					
Ap	0-12	5.3	91.6	2.03	3.49	0.19	2.02	0.06	0.23	0.41	0.14	1.93	0.80	0.3	8.98	43.12	9.24	40	20	940	Sand
A	12-26	5.3	83.1	1.64	2.82	0.15	2.16	0.11	0.43	0.79	0.19	2.33	0.60	0.2	8.39	65.62	18.24	55	21	924	Sand
AB	26-62	5.8	61.2	1.28	2.2	0.12	2.96	0.08	0.32	0.57	0.10	1.87	0.50	0.3	7.65	57.33	13.99	65	26	909	Sand
BA	62-89	6.4	59.4	1.16	1.99	0.11	2.9	0.06	0.21	0.40	0.09	1.27	0.30	0.2	7.73	60.71	9.96	75	31	894	Sand
Bh	89-156	6.4	83.5	1.44	2.48	0.13	3.74	0.10	0.41	0.70	0.18	1.9	0.30	0.2	7.53	73.68	18.59	105	36	859	Loamy Sand
Pedon2 Typic Dystrudept (Kulfo)																					
A	0-12	4.4	91.1	2.12	3.65	0.19	4.56	0.14	0.59	0.91	0.29	3.53	1.00	0.6	8.99	54.75	21.47	95	10	895	Sand
Bw1	12-31	4.3	88.2	1.71	2.94	0.16	3.22	0.13	0.52	0.87	0.27	3.3	1.10	0.4	11.38	54.36	15.82	110	36	854	Loamy Sand
Bw2	31-54	4.7	81.5	1.64	2.82	0.15	3.18	0.12	0.51	0.77	0.26	3.06	0.90	0.5	15.14	54.28	10.96	190	46	764	Sandy Loam
Bw3	54-86	4.5	74.1	1.54	2.65	0.14	2.28	0.09	0.51	0.71	0.26	3.07	1.00	0.5	15.30	51.17	10.26	200	36	764	Sandy Loam
Bw4	86-128	5.1	68.5	1.36	2.34	0.12	1.92	0.08	0.49	0.65	0.19	2.61	0.80	0.4	14.68	54.10	9.60	200	16	784	Sandy Loam
Pedon 3 Typic Rhodudults (Orlu-Normal)																					
Ap	0-12	5.5	121.6	2.52	4.33	0.23	5.86	0.22	0.49	0.64	0.26	2.61	0.70	0.3	13.66	61.69	11.79	100	31	869	Loamy Sand
A	12-36	5.4	105.3	1.18	2.03	0.11	3.4	0.24	0.73	1.08	0.52	3.58	0.70	0.3	9.56	71.98	26.96	110	51	839	Loamy Sand
Bt	36-70	4.6	93.3	1.01	1.74	0.09	2.22	0.07	0.30	0.47	0.19	3.63	1.60	1	14.48	28.32	7.09	220	31	749	Sandy Clay Loam
Bth	70-123	4.6	94.4	1.16	1.99	0.11	1.84	0.16	0.69	0.98	0.38	4.01	1.10	0.7	14.98	55.16	14.77	220	36	744	Sandy Clay Loam
Pedon 4 Rhodic Kandiudult (Orlu-Clayey)																					
A	0-14	6.3	131.4	3.46	5.95	0.32	7.18	0.14	0.56	0.71	0.34	4.34	0.80	1.8	17.4	40.04	9.977	110	36	854	Loamy Sand
Bt1	14-68	4.7	94.3	2.04	3.51	0.19	2.84	0.09	0.31	0.47	0.24	4.017	0.90	2	16.58	37.81	6.737	250	31	719	Sandy Clay Loam
Bt2	68-122	4.6	85.4	1.8	3.09	0.16	2.68	0.15	0.59	0.82	0.28	3.25	1.00	0.4	15.35	56.89	12.046	235	26	739	Sandy Clay Loam

optimum for the pedons and could be rated highly suitable (S1) for cultivation of avocado pear and pineapple. These findings are in corroboration to the results of Osinuga *et al.*, (2020), who stated that soil depth was one of the physical characteristics which was very important for land evaluation. Soil texture for pedon 1 was marginal (S3) for both crop while for pedons 2 and 3, it was optimal (S1) for avocado production but it was nearly optimal (S2) for pineapple while the soil texture of pedon 4 was optimal for both of the crops. Soil texture for optimum pineapple performance was sandy loam or loam while for avocado it was Loamy sand, Sandy clay loam or Clay loam (Sys, 1993; Aruleba and Ayodele, 2015).

Soil Fertility: This considers the current fertility status of the soil. Non-mutable properties such as Cation Exchange Capacity clay, Base Saturation, pH and organic matter content and other potential fertility characteristics affecting the production of avocado pear and pineapple were considered.

Soil fertility is one of the major constraints affecting production of crops in the tropics, especially in rainforest zone, where there is high rate of leaching. Base saturation and organic matter were rated as optimum (S1) in all the pedons. Cation exchange capacity – CEC was rated as sub-optimum (S2) for both crops in pedons 2

and 3; sub-optimum (S2) for avocado in pedons 1and 4; not suitable (NS) in pedon 1 and optimum in pedon 4 for pineapple production. Soil pH was rated as sub-optimum (S2) in all the pedons for pineapple, pedons 1 and 4 for avocado; it was rated as grossly inadequate (S3) in pedons 2 and 3 for avocado (Sys, 1993; Aruleba and Ayodele 2015;Osinuga, 2020).

Aggregate suitability for avocado and pineapple cultivation

A summary of the aggregate suitability evaluation for avocado pear and pineapple is presented in Table 5. Under limitation method, for avocado pear cultivation on current basis, pedons 1, 2 and 3 (96.65 ha and 74.45%) were grossly inadequate- (S3) (pedon 1 had limitation in soil physical characteristics (texture); pedons 2 and 3 had limitations in fertility characteristics- pH); pedon 4 (31.46 ha and 24.56%) was near optimum (S2) due to limitations in climate and fertility characteristics (length of dry season and pH). On potential basis, pedons 2, 3 and 4 were near optimum (S2) due to limitation in climate (length of dry season) while pedon 1 was marginally suitable (S3), due to limitation in soil texture for avocado pear cultivation. For pineapple cultivation, on current basis, Pedon 1(17.13 ha and 13.37%) was not suitable due to limitation in fertility (cation exchange capacity); pedons 2, 3 and 4 were near optimum (S2) for pineapple cultivation due to limitations in climate, soil physical characteristics and fertility. On potential basis, pedons 2,3 and 4 (110.98 ha) were moderately suitable (S2) due to limitations in climate and soil physical characteristics while pedon 1 was only marginally suitable due to limitation in soil physical characteristics (soil texture).

Parametric method revealed that on current basis, pedons 1, 2 and 3 were marginally suitable (S3), while pedon 4 was optimum for avocado cultivation. On potential basis, pedon 1 was marginally suitable (S3) while pedons 2, 3 and 4 were optimum for avocado pear cultivation. However, pedons 2, 3 and 4 were optimum for pineapple cultivation while pedon 1 was grossly inadequate (S3) for pineapple cultivation on both current and potential basis

The limitations encountered in the study were climate (length of dry season), soil physical characteristics (texture) which cannot be changed easily (Peter and Umweni, 2020b) and fertility (soil pH, CEC). Thus, in order to improve the suitability status of the areas represented by pedons 2, 3 and 4, there is need for the application of suitable soil amendment.

The disparity in results indicates the differences in the two methods for the suitability evaluation used in this study. However, limitation method of land evaluation is preferred because it captures the poorest limitation and gives information on the true state of soil characteristics.

CONCLUSION

Limitation method revealed that on potential basis, 110.98 ha (pedons 2, 3, 4) which amounts to 86.64% of the study area was moderately suitable (S2) due to limitations in climate (length of dry season) and soil physical characteristics (soil texture) while 17.13 ha which amounts to 13.37% of the study area was marginally suitable (S3) for avocado pear and pineapple production due to limitations in soil physical characteristics (soil texture). However, by parametric method,110.98 ha (pedons 2,3,4) which amounts to 86.64% of the study area was highly suitable (S1) while 17.13 ha amounting to 13.37% of the study area was marginally suitable (S3) for avocado pear and pineapple production on potential basis. Major limitations encountered were climate, soil physical characteristics and fertility. The area represented by pedon 4-Ultisols (31.46 ha) should be used for cultivation of avocado pear and pineapple; the area represented by pedons 2 Inceptisols and pedon 3-Ultisols (79.52 ha) may be used for cultivation of both crops when there is enough justification; however, the area represented by pedon 1-Entisols (117.13 ha) could be used for any other best suiting purpose. The study revealed that limitation method is preferable because it showed the true state of soil characteristics in the study area.

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