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ORIGINAL ARTICLE

Tillage Effects on Soil Properties and Performance of Sweet Potato on an Alfisol in Southwestern Nigeria

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ABSTRACT

The data on tillage systems are needed to identify appropriate tillage methods for managing the fragile soils of the humid tropics to ensure sustained productivity. Hence, five tillage methods were compared as to their effect on soil physical and chemical properties, leaf nutrient concentration, growth and yield of sweet potato (Ipomoea batatas (L.). Tillage methods compared during 3 years on an Oxic Tropuldalf at Owo in the forest-savanna transition zone of southwest Nigeria were manual clearing (MC), manual mounding (MM), manual ridging (MR), row tillage (RT) and conventional tillage (CT). These were replicated three times in a randomized complete block design. Tilled plots (manual mounding), (manual ridging), (row tillage) and (conventional tillage) resulted in higher soil N, P, K and Ca and leaf N, P, K, Ca and Mg concentrations, growth and yield of sweet potato compared with untilled (manual clearing) plot. The growth and yield were in increasing order; manual clearing, row tillage, manual mounding, manual ridging and conventional tillage. This was consistent with the decreasing order of bulk density and increasing order of porosity. Bulk density and total porosity were negatively and positively correlated with yield, respectively. Compared with manual clearing, manual mounding, manual ridging, row tillage and conventional tillage increased tuber weight by 64, 66, 45 and 92%, respectively. The highest yield was obtained with conventional tillage with the lowest soil bulk density and highest porosity. It is concluded that sweet potato can be grown successfully on well tiled soils of marginal fertility.

Key words: Tillage; Sweet potato; Soil properties; Soil bulk density; Nigeria; Nutrient

Introduction

One of the major constraints to crop production in the tropics is the low fertility status of most of the soils which is a reflection of the low level of organic matter, nitrogen, phosphorus and exchangeable cations (West *et al.*, 1984; de Ridder and van Keulen, 1990). The challenge of food production in continuous cropping systems in the humid and sub-humid tropics of Nigeria is to manage the fragile soils to ensure sustained productivity without reverting to the bush fallow or shifting cultivation of traditional agriculture (Ndaeyo *et al.,* 1995).

In the humid tropics where most of the farmers are smallholders and chemical fertilizer is scarce and expensive, soil working and tillage methods can be a suitable alternative to enhance nutrient availability to crops (Adekiya and Ojeniyi, 2002). Tillage is the post clearing physical manipulation of soil aimed at modifying its structure, although it controls weeds. It initially improves aeration, water transmission and

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enhances root growth and nutrient uptake. It induces soil nutrients to be released faster (Ojeniyi, 1990, 1992). In the Alfisol of southwest Nigeria, tillage has been found to be essential for good growth and yield of cowpea (Vigna unguiculata (L.) Walp) (Lal, 1976; Ojeniyi, 1989), tomato (Lycopersicon lycopersicum, Mill) (Adekiya and Ojeniyi, 2002), rice (Oryza sativa L.) (Ogunremi *et al.,* 1986), yam (Dioscorea rotundata, Poir) (Agbede, 2006) and cassava (Manihot esculenta, Crantz) (Aina, 1979 cited by Agbede, 2007). For sweet potato (Ipomoea batatas L.), no such study existed in the Alfisol of southwest Nigeria, whereas sweet potato is grown extensively across the agroecological zones. No study has dealt with tillage practices for sweet potato production under forest-savanna transition zone of southwest Nigeria. Few studies carried out were outside the humid tropical conditions of southwest Nigeria and the studies gave contradictory results. For instance, in India, Ravindran and Mohankumar (1985) compared the effect of ridge, bed and furrow, flat and mound tillage practices on the yield of sweet potato grown under upland conditions. They found that tilled soils, especially mound significantly increased sweet potato root yield compared with flat planting. Whereas, in Peru studied by Midmore (1991) found no significant differences in the root yield of sweet potato under row-ridge, two-row bed, on-the-flat and row furrow. Tillage method for crops is known to vary widely depending upon soil type and depth, micro-climate and topography (Agbede, 2006, 2008).

For crop production, manual clearing of soil, ridging and mounding are common practices among majority small holding farmers in the humid tropics. Lal (1979) reported that in areas of Alfisols with gravel layer at shallow depth, farmers plant their crops on hillocks or mounds. Ridge cropping has also evolved as an integral component of subsistence farming and is well adapted for small, low inputs subsistence farms (Lal, 1987). Row tillage which combines the attributes of tilth formation and minimum tillage has been found (Ojeniyi, 1991, 1993) to be as effective as traditional hoe tillage in cowpea and maize production. The use of conventional tillage is inevitable during soil preparation for large scale production. To this end, there is a dire need to investigate the potential of growing sweet potato using traditional tillage, minimum/reduced and conventional tillage methods. Thus, the objective of this present study is to assess the effects of manual clearing, manual mounding, manual ridging, row tillage and conventional tillage on soil properties, leaf nutrient concentration, growth and yield of sweet potato.

Materials and methods

Site Description and Tillage Treatments:

A 3 year field study was carried out at Owo ($7^0$12'N; $5^0$35'E) in the forest-savanna transition zone of southwest Nigeria during the growing seasons of 2005, 2006 and 2007. The soil at the experimental site is a sandy loam, Oxic Tropuldalf or Luvisol (FAO) derived from quartz, gneiss and schist (Adepetu *et al.,* 1979; Agbede, 2006). Composite soil samples (0-20 cm) were taken before experimentation and analysed for physical and chemical properties as described by Carter (1993). This forest-savanna zone has a bimodal pattern of rainfall with first season commencing from March to July, and a dry spell in August followed by the second season, September to November. The annual rainfall totals were 1015, 1241 and 1335 mm for 2005, 2006 and 2007, respectively. The site of the experiment was dominated by weeds such as Siam weed [*Chromolaena odorata* (L) King and Robinson] and Haemorrhage plant (*Aspilia africana*). The experiment followed 2 years of bush fallow.

Five tillage treatments were replicated three times in a randomized complete block design. The treatments were (a) manual clearing (MC): manual clearing with cutlass and weeds removed from the plot before planting, (b) manual mounding (MM): construction of mounds, (c) manual ridging (MR): construction of ridges, (d) row tillage (RT): in which the planting row (15 cm wide) was hoe tilled to a depth of 10 cm and the interrow spaced (approximately 45 cm wide) treated with gramoxone (a non-selective herbicide) at 3.5 litres ha^{-1} (Ojeniyi, 1993) and (e) conventional tillage (CT): ploughing to a depth of 20 cm followed by harrowing and ridging.

The 15 plots in each year were 12 m x 10 m. There were 120 mounds or ridges per plot depending on the treatment. The same tillage method was maintained on each plot for the 3 years of the experiments.

Planting of Sweet Potato:

In 2005 and 2006 cropping seasons, planting was done on May 13 each year while in 2007 cropping season, planting was done on May 20, 2007, Sweet potato vines (Owo local variety) about 40 cm long were planted on the prepared seedbeds at a spacing of 1 m x 1 m, giving a population of 10,000 plants ha^{-1}. Weeding was done regularly using hoe. Fertilizer was not applied during the experiment.

Determination of Soil Properties:

Particle size analysis was determined by hydrometer method (Sheldrick and Hand Wang, 1993) in air-dried 2 mm sieve soil sample collected from 0-20 cm depth at each of the 15 plots before the start of the experiment. Ten core samplers (5 cm diameter, 10 cm high) were collected randomly before the start of the experiment for the determination of bulk density using the core method (Campbell and Henshall, 1991).

At one month from imposition of tillage treatments, determination of certain soil physical properties in all plots started and this was done at 1 month interval on four occasions for each year. Six core samplers (5 cm diameter, 10 cm high) were collected per plot for the determination of bulk density, gravimetric water content and total porosity (calculated from bulk density and particle density) after oven-drying of samples at 100^0C for 24 h. Soil temperature was determined at 15.00 h by inserting a soil thermometer to 10 cm depth. Six determinations were made per plot and mean data were calculated.

Soil samples were collected randomly at 0-20 cm depth from the centre of each plot at 5 cores per plot at the beginning of harvest in 2006 and 2007 (5 months after planting) and analysed for chemical properties as described by Carter (1993). Soil organic C was determined using the dichromate wet oxidation method (Nelson and Sommers, 1996), total N was determined by the micro-Kjeldahl digestion method (Bremner, 1996), available P was extracted using Bray-1 solution and determined by molybdenum blue colorimetry (Frank *et al.,* 1998). Exchangeable K, Ca and Mg were extracted using ammonium acetate. Potassium was determined using a flame photometer and Ca and Mg by the EDTA titration method (Hendershot and Lalande, 1993).

Leaf Analysis:

Leaf samples were collected at 3 months after planting from five plants per plot for chemical analysis. Leaf samples were oven-dried for 24 h at 80^0C and ground in a Willey-mill. Leaf N was determined by micro-Kjeldahl digestion method. Samples were dry ashed in a furnace for 6 h at 450^0C and extracted using 10% HCL for determination of P, K, Ca and Mg. Phosphorus was determined colorimetrically by the vanadomolybdate method, K was determined by flame photometry, and Ca and Mg by atomic absorption spectrophotometry (AOAC, 1997).

Growth and Yield Parameters:

Twenty plants were randomly selected for the determination of growth and yield parameters. The number of leaves and leaf area were determined at 3 months after planting. Vine length measurement was done at harvest (5 months after planting). Tuber weight and number were also determined at harvest.

Statistical Analysis:

The data collected were subjected to analysis of variance (ANOVA) and the treatment means were separated using Duncan's multiple range test at 5% probability level (Hinkelmann and Kempthorne, 1994).

Results and Discussion

Results:

The soil physical and chemical properties of the site before experimentation are shown in Table 1. The soil is sandy loam in texture with a pH of 5.6, a level suitable for sweet potato production and many tropical crops. The soil had high bulk density of 1.56 Mg m^{-3}. The soil organic C of 2.34 g kg^{-1} and total N of 0.18 g kg^{-1} were low. The available P of 10.6 mg kg^{-1} and the exchangeable bases (K, Ca and Mg) were adequate. Tillage methods significantly influenced soil temperature, bulk density, total porosity and soil water content in the 3 years (Table 2). MC consistently produced relatively low temperature in the 3 years compared with other tillage treatments. The highest temperature was recorded by CT and it was not significantly different from temperatures of mound and ridge surfaces, although on the average MM had slight high temperature than ridge. MC produced the highest value of soil bulk density while the least value was produced by CT. The mean value of soil bulk density recorded in the 3 years was in the order MC > RT > (MM and MR) > CT and these were significantly different from each other in that order except in MM and MR with similar values. The highest bulk density recorded for manually cleared soil is matched by least porosity. CT expectedly had the highest value of total porosity. Soil water content in the 3 years significantly decreased in the order MC, RT, (MM and MR) and CT.

The effect of tillage methods on soil chemical properties is shown in Table 3. There were no significant differences in soil organic C and exchangeable Mg between tilled and untilled soils in 2006 and 2007. The values of N, P, K and Ca were significantly enhanced in tilled soils compared with untilled (MC) soil. MM, MR and RT produced higher values of N, P and K compared with CT. MC had significantly lower (p=0.05) N, P, K and Ca concentrations compared with other tillage methods. The values of Ca for MM, MR, RT and CT were not significantly different in 2006 and 2007. Tillage methods reduced soil organic C, N, and Mg concentrations after 3 years of continuous sweet potato cultivation (Tables 1 and 3). Tillage significantly increased (p=0.05) the values of leaf N, P, K, Ca and Mg concentrations compared with untilled MC. The values of leaf N, P, K, Ca and Mg for MM, MR, RT and CT were not significantly different (Table 4).

Tillage methods significantly influenced the growth of sweet potato. This is shown by the trend in the values of vine length, number of leaves and leaf area per plant (Table 5). In all cases MC had the least values of growth parameters that were significantly lower (p=0.05) than other tillage methods. MM and MR produced similar growth parameters and these were significantly higher (p=0.05) than RT. The highest values of growth parameters was recorded by CT and values of growth parameters produced by this treatment were significantly higher (p=0.05) than other tillage treatments. The mean of the 3 years showed correlation coefficients (r) of -0.99, -0.98 and -0.97 between soil bulk density and vine length, number of leaves per plant and leaf area per plant, respectively.

Tillage methods significantly influenced the yield of sweet potato in the 3 years (Table 6). In term of overall yield (tuber weight Mg ha^{-1} and number of tubers per plant), tillage treatments are ranked in the declining order CT, MM and MR, RT and MC. There were no significant differences in tuber yield and number of tubers per plant between planting on mound and ridge surfaces. Pooled over the 3 years, a correlation coefficient (r) of -0.99 was recorded between soil bulk density and tuber weight and -0.99 was recorded between soil bulk density and number of tubers per plant. Total porosity was positively correlated with yield. The mean of the 3 years showed a correlation coefficient (r) of 0.99 between total porosity and tuber weight and number of tubers per plant. Compared with MC, MM, MR, RT and CT increased tuber weight of sweet potato by 64, 66, 45 and 92%, respectively and in the same vein, number of tubers per plant were increased by 90, 94, 55 and 133%, respectively.

Table1: Mean ± standard deviation of physical and chemical properties of the Experimental site (0-20 cm) before planting in 2005.

Parameter	Value
Sand (g kg^{-1})	664 ± 8.6
Silt (g kg^{-1})	153 ± 6.3
Clay (g kg^{-1})	183 ± 5.7
Textural class	Sandy loam
pH (H_2O)	5.6 ± 0.3
Bulk density (Mg m^{-3})	1.56 ± 0.06
Total porosity (%, v/v)	41.1 ± 0.5
Organic C (g kg^{-1})	2.34 ± 0.08
Total N (g kg^{-1})	0.18 ± 0.02
Available P (mg kg^{-1})	10.6 ± 0.3
Exchangeable K (cmol kg^{-1})	0.40 ± 0.04
Exchangeable Ca (cmol kg^{-1})	2.5 ± 0.09
Exchangeable Mg (cmol kg^{-1})	1.0 ± 0.03

Table2: Effect of tillage methods on soil physical properties (0-10 cm depth) when averaged across four sampling periods (1, 2, 3 and 4 months after planting).

Tillage	Bulk density (Mg m^{-3})				Total porosity (%, v/v)				Water content (g kg^{-1})				Temperature (^{0}C)			
method	2005	2006	2007	Mean	2005	2006	2007	Mean	2005	2006	2007	Mean	2005	2006	2007	Mean
Manual clearing (MC)	1.56a	1.57a	1.57a	1.57	41.1d	40.8d	40.8d	40.8	105a	97a	100a	100.7	27.1c	27.3c	27.2c	27.2
Manual mounding (MM)	1.26c	1.26c	1.27c	1.26	52.5b	52.5b	52.1b	52.4	75c	61c	70c	68.7	32.6a	32.7a	32.8a	32.7
Manual Ridging (MR)	1.25c	1.25c	1.26c	1.26	52.8b	52.8b	52.5b	52.7	77c	62c	72c	70.3	32.1a	32.4a	32.5a	32.3
Row tillage (RT)	1.39b	1.39b	1.40b	1.39	47.5c	47.5c	47.2c	47.4	91b	76b	80b	82.3	30.3ab	30.3ab	30.4ab	30.3
Conventional tillage (CT)	1.12d	1.13d	1.13d	1.13	57.8a	57.4a	57.4a	57.5	60d	52d	60d	57.3	33.3a	33.6a	33.5a	33.5

Values followed by the same letters (a-d) in the same column are not significantly different at p=0.05, according to Duncan's multiple range test.

Table3: Effect of tillage methods on soil chemical properties (0-20 cm depth) in 2006 and 2007.

Tillage method	Organic C(g kg^{-1})		N(g kg^{-1})		P(mg kg^{-1})		K(cmol kg^{-1})		Ca(cmol kg^{-1})		Mg(cmol kg^{-1})	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Manual clearing (MC)	2.05a	2.00a	0.11c	0.10c	10.0c	9.8c	0.35c	0.34c	2.0b	2.0b	0.89a	0.87a
Manual mounding (MM)	2.01a	1.98a	0.16a	0.14a	16.0a	15.8a	0.70a	0.69a	2.9a	2.7a	0.91a	0.90a
Manual ridging (MR)	2.01a	2.00a	0.16a	0.14a	16.4a	16.0a	0.71a	0.70a	2.8a	2.8a	0.89a	0.89a
Row tillage (RT)	2.05a	1.99a	0.16a	0.14a	16.1a	16.0a	0.71a	0.71a	2.8a	2.8a	0.89a	0.88a
Conventional tillage (CT)	2.00a	1.97a	0.14b	0.12b	14.4b	14.0b	0.59b	0.50b	2.9a	2.8a	0.90a	0.90a

Values followed by the same letters (a-c) in the same column are not significantly different at p=0.05, according to Duncan's multiple range test.

Table4: Effect of tillage methods on leaf nutrient concentration of sweet potato in 2006 and 2007

Tillage method	N (g 100g^{-1})		P (g 100g^{-1})		K (g 100g^{-1})		Ca (g 100g^{-1})		Mg (g 100g^{-1})	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Manual clearing (MC)	2.5b	2.4b	0.25b	0.23b	1.40b	1.38b	1.52b	1.40b	0.60b	0.59b
Manual mounding (MM)	3.0a	2.8a	0.29a	0.29a	1.59a	1.58a	2.15a	2.10a	0.71a	0.71a
Manual ridging (MR)	3.0a	2.9a	0.30a	0.29a	1.60a	1.58a	2.17a	2.11a	0.71a	0.70a
Row tillage (RT)	2.9a	2.8a	0.30a	0.28a	1.60a	1.59a	2.10a	2.10a	0.68a	0.69a
Conventional tillage (CT)	2.9a	2.8a	0.29a	0.29a	1.58a	1.58a	2.20a	2.10a	0.68a	0.68a

Values followed by the same letters (a-b) in the same column are not significantly different at p=0.05, according to Duncan's multiple range test.

Table5: Effect of tillage methods on vine length, number of leaves and leaf area per sweet potato plant.

Tillage method	Vine length (m)				Number of leaves per plant				Leaf area per plant (m^2)			
	2005	2006	2007	Mean	2005	2006	2007	Mean	2005	2006	2007	Mean
Manual clearing (MC)	1.86d	1.76d	1.88d	1.83	160d	155d	168d	161	0.89d	0.91d	0.93d	0.91
Manual mounding (MM)	2.82b	2.75b	2.90b	2.82	220b	200b	225b	215	1.50b	1.52b	1.52b	1.52
Manual ridging (MR)	2.88b	2.80b	2.91b	2.86	229b	205b	228b	220	1.59b	1.60b	1.60b	1.60
Row tillage (RT)	2.10c	2.40c	2.39c	2.30	189c	180c	192c	187	1.30c	1.31c	1.32c	1.31
Conventional tillage (CT)	3.21a	3.10a	3.25a	3.19	260a	250a	268a	259	2.11a	2.11a	2.18a	2.13

Values followed by the same letters (a-d) in the same column are not significantly different at p=0.05, according to Duncan's multiple range test.

Table6: Effect of tillage methods on sweet potato yield components.

Tillage method	Tuber weight (Mg ha^{-1})				Number of tubers per plant			
	2005	2006	2007	Mean	2005	2006	2007	Mean
Manual clearing (MC)	5.2d	5.0d	5.0d	5.1	10d	11d	10d	10.3
Manual mounding (MM)	8.5b	8.5b	8.3b	8.4	19b	20b	20b	19.6
Manual ridging (MR)	8.6b	8.6b	8.4b	8.5	20b	20b	20b	20.0
Row tillage (RT)	7.2c	7.6c	7.5c	7.4	15c	16c	17c	16.0
Conventional tillage (CT)	9.8a	9.9a	9.6a	9.8	25a	24a	23a	24.0

Values followed by the same letters (a-d) in the same column are not significantly different at p= 0.05, according to Duncan's multiple range test.

Discussion:

MM, MR, RT and CT gave relatively low soil bulk density, water content and relatively high soil temperature compared with MC. The lower value of bulk density and higher total porosity produced by tilled plots compared with MC was attributed to the loosening effects of tillage (Agbede, 2006). The higher water content in the untilled manually cleared soil could be related to its higher bulk density, lower porosity and reduced evaporation rate (Bankole and Ojeniyi, 2005). Maurya and Lal (1979) also found that for loamy sand and sandy clay soil in southwest Nigeria, volumetric water contents increased with bulk density. This shows that soil water was highest in the manually cleared soil due to reduced evaporation rate associated with its relatively high bulk density. This observation is in line with Hillet *et al.* (1975) that no-till plots are protected by a layer of low conductivity (dry soil) on the surface which reduces evaporation losses. It is possibly this phenomenon of differential in evaporation rates that explains the relatively high water regimes in the reduced tillage systems. Hence, untilled manually cleared soil with high bulk density value recorded high water content. The findings that soil temperature of tilled soil was higher than that of untilled soil had been previously confirmed by other workers (Gupta *et al.,* 1983; Agbede, 2007). The slight higher temperature (though not significant) of MM compared with MR could be due to the fact that mound being isolated is beating by sun rays from many angles.

The finding that soil N, P, K and Ca were significantly enhanced in tilled soils compared with untilled (MC) could be due to enhanced mineralisation of soil organic matter and consequent release of nutrients, since tillage is known to enhance mineralisation of soil organic matter (Allison, 1973; Janzen *et al.,* 1998). Tillage methods reduced the soil organic C, N and Mg concentrations after 3 years of continuous sweet potato cultivation. Similar observation were reported by Juo and Lal (1978), Godo and Yeboua (1990) and Agbede (2007, 2008).

The inferior status of leaf nutrient concentrations of MC compared with tilled soils is consistent with its high bulk density. Also tillage enhanced mineralization of organic matter leading to increased availability of nutrients into the tilled soils compared to untilled manually cleared soil.

The finding that growth and yield parameters were in the increasing order of MC, RT, MM and MR and CT is consistent with the decreasing order of soil bulk density and increasing order of total porosity. High tuber yield of sweet potato on conventionally tilled soil compared with other tillage treatments could be adduced to its lower bulk density and higher porosity rather than soil nutrients (although soil nutrients of CT lower than that of MM and MR). Sweet potato is known to tolerate low soil fertility and therefore, can be grown on marginal land (Howeler *et al.,* 1993) but rather requires loose soils or light-textured soils. The high soil bulk density could cause mechanical impedance to root and tuber growth and this would adversely affect nutrient and water uptake. Hence, sweet potato grown on untilled soil had lower leaf nutrient status compared with tilled soils. Therefore, the effect of soil bulk density and porosity on the performance of sweet potato is most prominent in this study. The results of the study suggested that a small increase in soil bulk density can considerably decrease sweet potato tuber yield (Fig. 1). Increasing soil bulk density from 1.1 to 1.4 Mg m^{-3} reduced sweet potato tuber yield by (35%) and (89%) from 1.1 to 1.6 Mg m^{-3}. The mean bulk density recorded for the untilled soil (MC) (1.57 Mg m^{-3}) was clearly above the optimum required for the growth and development of a number of important crops in the tropics (Obi and Nnabude, 1988 cited by Adekiya and Ojeniyi, 2002). Values reported by Villanueva (1985) suggested that a bulk density of more than 1.40 Mg m^{-3} will reduce storage root yield of sweet potato. Furthermore, the high bulk density in untilled plots meant low porosity and poor aeration and oxygen concentration around roots and tuber, hence poor yield. This is consistent with the finding of Zeroni *et al.,* (1983) that tomato fruit production increased linearly with concentration of oxygen around the roots. This study agrees with the findings of Chua and Kays (1981) that depletion of oxygen can halt induction and development of storage roots of sweet potato. Howeler *et al.* (1993) suggested that root crops are sensitive to lack of soil oxygen which may affect the induction of storage roots or result in rotting of already established roots. Thus, adequate loosening of the soil during land preparation will generally improve drainage and soil aeration, reduce root and tuber rot and increase yields of sweet potato. The reported superiority of planting sweet potato on tilled soils; ridges, raised beds or mounds and conventionally tilled soils than on the flat (Abenoja and Baterna, 1982; Labra and Forio, 1982, Anikwe and Ubochi, 2007), reflects enhanced soil aeration, resulting from both a greater soil surface to soil volume ratio and a lower bulk density. Therefore, sweet potato grown on Alfisol in the humid tropics requires tillage for reducing bulk density and loosening of compacted soils and making oxygen available to the tuber and therefore increase yield.

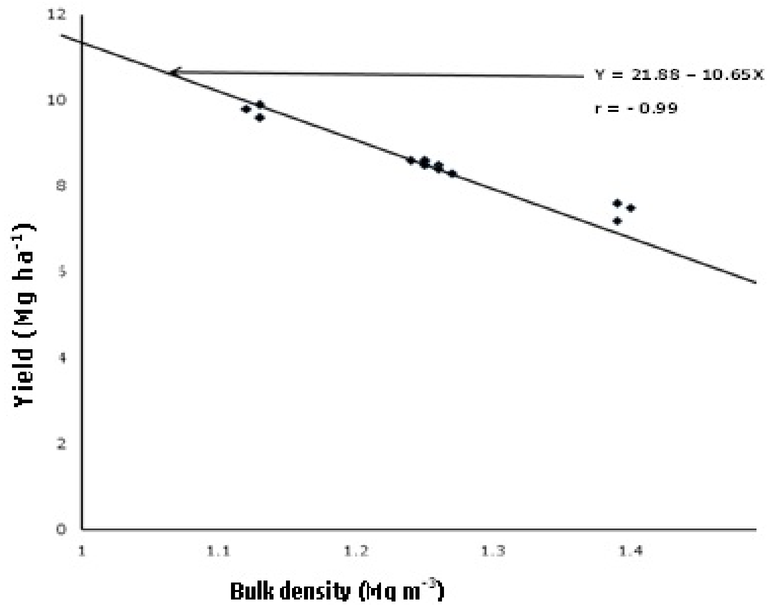

Fig. 1: Relationship between soil bulk density and yield in 3 years (2005, 2006 and 2007). Points on the graph are the means of three trials.

Conclusion:

Variation in soil bulk density and total porosity caused by tillage induced variation in vine length, number of leaves per plant, leaf area, number of tubers per plant and tuber weight. There were better growth, leaf nutrient status and yield observed for sweet potato grown on tilled soils compared with untilled soil. The highest growth and yield was obtained from conventional tillage with the lowest bulk density and highest porosity. Therefore, it is concluded that sweet potato requires tillage for optimum productivity on an Alfisol of southwest Nigeria.

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