POTENTIALS AND MANAGEMENT OF NUTRIENT STATUS OF SOILS OF IKWUANO AREA OF ABIA STATE NIGERIA FOR SUSTAINABLE CASSAVA PRODUCTION

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ABSTRACT
The study was carried out to evaluate the nutrient status of the nine farming zones of Ikwuano local government Area of Abia State, to quantify in relation to their cassava crop production potentials. Free survey method was applied in a reconnaissance soil survey to collect soil samples at 0-30cm depth. Nine samples were collected and analysed. Result showed that the nine farming zones have nice textures of sandy clay, sandy clay loam, and sandy loam. The soils showed a reaction ranging from moderate to slightly acidic of pHof 4-5, accept the soils of Ukalanta which has a neutral value of 7.40 pH level, low moderate organic carbon (1.35-3,05%), low bulk density (1.60-1.65) and low to moderate total N (0.15-0.20%). The level of P and K were less than 15ppm and 0.20ml equivalent respectively. Exchangeable cation ratios are relatively low, C/N ratio (10.0-22.6), Ca/mg ratio (1.3-2.4) and kg/mg ratio (0.04-0.20). It was suggested that liming the soil is not necessary due to slight acidic nature of the soil and remedial measures which include; integrated use of the organic manure and mineral fertilizer to supplement the existing soil nutrient levels.

Keywords: Nutrient status, Potential and Cassava Production

INTRODUCTION
Root and tuber crops are a group of staples cherished all over the world for their underground storage organs. This group includes; cassava, yam, sweet potato, cocoyam, ginger and a host of other under utilized crops. Cassava (*Manihot esculenta crants*) is an important root in Nigeria. It is best known for its starchy roots and product world wide. Cassava the "miracle crop" of Nigeria remains the highest amongst the root and tuber crops of economic importance (Akoroda, 2011). Micronutrients play many complex roles in plant nutrition; they are essential inputs in cassava nutrition. The absence of some micronutrients in cassava nutrition causes about 30% reduction in cassava yield (Mortvdt, 1985). This problem could only be alleviated through the characterisation of soils of the area (Ikwuano). This will lead to a better understanding of the production potential and in the development, planning and management of the soil for cassava production. The objectives are to study the characteristics of the soil of this area and to assess the plant nutrients status and organic matter characteristics of these farming zones as a pointer to the nutrient supplying capability of the soil cassava production.

MATERIALS AND METHODS
The study was conducted in nine representative locations in Ikwuano L.G.A in Abia State. These are; Oka, Okpula, Inyilaukwu, Alaocha, Ukalanta, Udensiko, Okohie, Ugwuelu and Odonyi. The samples were collected with soil auger using a free survey method at a depth of 0-30cm. The soil samples were collected in soil bags with labelling for physiochemical analysis. The samples were dried for 48hrs and crushed with a wooden roller, then sieved with a 2mm diameter sieve and stored in the soil bags for the physical and chemical analysis.
Soil pH was determined by subjecting the soil to re-wetting processes with water to establish the probable range of pH values it will have in its natural state. Particle size distribution was

determined by the bouyoucous hydrometer method, organic matter was determined by the Walkley-Black wet oxidation method. Total nitrogen was determined by Kjeidahl method. Determination of available phosphorous and exchangeable cations was done by Bray No 1 method and by Ammonium acetate extraction method respectively, while determination of calcium and magnesium was done by the versenate titration using EDTA. Potassium and sodium determination was carried out by flame photometry method.

RESULTS AND DISCUSSIONS

The sand fraction (Table1) of the soil ranged from 43.20-78.20% with a mean value of 67.40%. There was a relatively low range of silt ranging from 3.40-7.40% and a mean value of 5.41%. The textual classifications of all the soils were predominantly sandy clay, sandy clay loam and sandy loam, and low bulk density of 1.60-1.65% with a mean value of 1.62%. This proved optimum production of tuber crops which require light medium loam sandy soil that is responsible for unhindered anchorage and bulking of root tuber and for easy harvest (IITA, 1990). This implies that the soils are good for cassava production.

Results in Table 2 show a low to moderate level of the key elements (N.P.K). The percentage total nitrogen of three locations; Oka which has 0.12%, Ukalanta with 0.14% and Alaocha with the lowest value of 0.10% of nitrogen are low, but other locations were within the middle range of 0.15-0.20% nitrogen with mean value of 0.15% of nitrogen. With the soil analysis estimates, the level of phosphorous (P) and potassium (K) in all the locations are less than 15ppm (FPDD, 1991), and less than 0.20ml equivalent of potassium respectively. This low level of potasium may be as a result of unrestricted amount of leaching in this location.

Furthermore, Table3 showed a reaction ranging from moderate to slightly acidic i.e. pH of 4-5 with a mean value of 5.16. This indicates that most of the soils are moderate except the soil of Oka, Okpula, Udensiko and Ugwuelu which are slightly acidic. Liming the soil may not be necessary since pH are not too low and can increase cassava production. The organic carbon content ranged from low to moderate (1.35-3.05%) with a mean value of 2.10%. The exchangeable Ca content of the soils ranged from 1.20-4.00 cmol (+) $kg^{\neg 1}$ with a mean value of 2.71 cmol (+) $kg^{\neg 1}$. Inyilaukwu has 8.4 while Alocha has 6.8 to 8.40 me/100g. This implies fairly high CEC for these two farming zones. It is expected that these two studied sites may have some 2:1 silicate clay minerals such as mica and illite or 1:1 type like kaolonite.

Table 4 showed the C/N and exchangeable cation ratios of the studied soils. The C/N ratio content of the soil ranged from 10.0 to 22.6 with a mean value of 15.26. All the values obtained were below 25, being separating index for mineralization and immobilization of nitrogen as established by Paul and Clark (1989). There is need to apply low rate of N to the soils to accelerate mineralization (FPDD, 2002). Ca/mg ratio content of the soil were low ranging from 1.3-2.4 with a mean value of 1.77. This shows that there is possibility of P inhibition as well Ca deficiency, since the Ca/mg values were below 3 (Table4). The k/mg ratio content of the soil ranged from 0.04-0.20 with a mean value of 0.11 while soil of Ugwuelu gave the highest value. The k/mg value of the soil were lower than 2, indicating that mg uptake by the cassava will not be a major constraint.

CONCLUSION

The soil of Ikwuano area are light textured which is good for cassava production. The soil reaction is slightly acidic, which indicates that liming may not be necessary. The organic carbon, primary nutrients and effective cation exchange capacity reserves were relatively

low. There should be some remedial measures which include integrated use of organic manure and mineral fertilizer to supplement the existing soil nutrient levels.

Table 1: Physical properties of the soils studied

S/N	Location	Sand(%)	Particle Silt %	Size(%) clay	Textual Class	Bulk (g/cm^2)
1	Oka	43.20	5.40	46.40	Sandy clay	1.60
2	Okpula	64.20	5.40	30.40	Sandy clay loam	1.63
3	Inyilaukwu	78.20	7.40	14.40	Sandy loam	1.60
4	Alaocha	66.20	5.40	28.40	Sandy clay loam	1.65
5	Ukalanta	74.20	7.50	18.40	Sandy loam	1.62
6	Udensiko	58.20	5.40	36.40	Sandy clay	1.60
7	Okohie	73.80	3.40	22.80	Sandy clay loam	1.64
8	Ugwuelu	75.80	5.40	18.80	Sandy loam	
9	Odonyi	72.80	3.50	23.70	Sandy clay loam	1.61
	Mean	67.40	5.41	26.63		1.62

Table 2: Primary Nutrients of the Soil Studied

S/N	Location	Total N (%)	Available P $Mgkg\neg^{1}$	Exchangeable K ($cmolkg\neg^{1}$)
1	Oka	0.13	15.95	0.09
2	Okpula	0.17	15.78	0.07
3	Inyilaukwu	0.15	14.90	0.4
4	Alaocha	0.10	18.40	0.12
5	Ukalanta	0.14	15.78	0.11
6	Udensiko	0.17	17.70	0.24
7	Okohie	0.14	15.43	0.19
8	Ugwuelu	0.18	15.10	0.20
9	Odonyi	0.15	15.08	0.15
	Mean	0.15	16.01	0.17

Table 3: Some chemical properties of the soils studied

S/N	Location	P^H	Organic Carbon (%)	Exch Ca	Exch mg (cmolkg¬1)	Exch Na
1	Oka	4.9	1.35	1.20	0.60	0.08
2	Okpula	4.7	2.48	1.40	0.80	0.13
3	Inyilaukwu	5.9	3.05	3.40	2.40	047
4	Alaocha	5.5	1.47	4.40	1.80	0.22
5	Ukalanta	5.7	2.28	3.60	2.80	0.18
6	Udensiko	4.8	2.61	4.00	1.80	0.29
7	Okohie	5.0	1.40	2.60	2.00	0.19
8	Ugwuelu	4.8	2.00	1.80	1.00	0.20
9	Odonyi	5.1	2.22	2.00	1.20	0.18
	Mean	5.16	2.10	2.71	1.60	0.22

Table 4: C/N and Exchangeable Cation ratio of the soil studied

S/N	Location	C/N	Ca/mg	K/mg
1	Oka	12.3	2.0	0.15
2	Okpula	22.6	1.8	0.09
3	Inyilaukwu	20.3	1.4	0.17
4	Alaocha	14.7	2.4	0.07
5	Ukalanta	16.3	1.3	0.04
6	Udensiko	15.3	2.2	0.13
7	Okohie	10.0	1.3	0.09
8	Ugwuelu	11.1	1.8	0.20
9	Odonyi	14.8	1.7	0.13
	Mean	15.26	1.77	0.11

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