Didee Publications International Journal, Vol. 1, Issue 4, May 2026.pp. 621-642

ISSN 3121- 7974

EFFECT OF COMBINED APPLICATION OF VERMICOMPOST MANURE WITH INORGANIC FERTILIZER ON YAM PRODUCTIVITY AND SOIL PROPERTIES OF A NUTRIENT DEPLETED TROPICAL ALFISOL.

EDWIN IDENYI OTOZI[1].

MICHEAL ONWUMERE[2]

NWANKWO CLARA UKAMAKA[3]

DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION

ALEX-EKWUEME FEDERAL UNIVERSITY NDUFU-ALIKE, IKWO EBONYI STATE, NIGERIA.

DEPARTMENT OF AGRICULTURAL EDUCATION

UNIVERSITY OF NIGERIA, NSUKKA

Email: ***otoziedwin@gmail.com***

ABSTRACT

This study investigated the effect of combined application of vermicompost with inorganic fertilizer on yam productivity and soil properties of a nutrient depleted tropical alfiso. The combined use of vermicompost and inorganic manure are a source of much needed nutrient by yam. The main objective of this study was to determine the ratio of vermincompost and NKP 20:10:10 to be combined for the attainment of maximum yield of yam and the impact of the treatment materials on the soil properties. The investigation was conducted between March, 2024 and December 2024. The experiment was a 3x4 factorial design laid out in randomized complete block design (RCBD) with three replicates. Data generated was subjected to statistical analysis using analysis of variance (ANOVA) with sheffe's test. The result of the study showed that growth and yield of yam was lowest on no manure treatment (97.3kg) and highest on the plot dressed with 20 tones/ha of vermicompost and 200kg/ha of NPK 20:10:10 in combined application. The application of vermicompost decreases soil bulk density and increased water

holding capacity of soil media among others. On basis of one year result, it may be concluded that the treatment FDO and FDI was found better in terms of yield and net retunes compared to other treatment options and the integration of vermicompost in the treatment materials positively influences the physical properties of the soil. Based on the result the combined application of vermincompost and NPK 20:10:10 at the rate of 20 tons/ha and 2ookg/ha respectively was recommended.

Key words: Vermicompost, inorganic fertilizer, soil properties, nutrient deplete and alfisol.

Back ground of the study

Yam (Dioscorea spp) is an important food and cash crop in West Africa (the yam belt) whose production is traditionally non sedentary due to its substantial nutrient demand are mostly grown in the rain forest and savannah zones of Nigeria. Population growth, urbanization and existing soil degradation have made non sedentary farming virtually impossible. These limitations imposed on soil productivity in the tropic in terms soil fertility loss and pressure on land use due to non-significant agricultural development, which is forcing farmers to cultivate depredated or nutrient depleted soils for yam production. It is therefore, necessary to explore alternative means to improve the nutrient status of the soils for increased yam growth and yield. Ironkwe and Ewuziem (2010) maintained that yam need heavy nutrient to grow and maintains its prestigious status as king crop which are viewed and received with high respect in south East of Nigeria. Hence, it is an important food crop economically and culturally in Eastern Nigeria. It is notable that Africa alone is responsible for 90% of the world production and Nigeria 70% of the world production Agbede in Idenyi (2010). And yam account for 56% of the daily carbohydrate intake of people in the forest and savannah region of Nigeria (Agbede, Adekiya & Oge, 2013). It is presented in marriage, burial ceremonies and birth rites.

Nigeria achieved highest producer of yam, producing about 36.72 million metric tons annually (FAO, 2008). Nigeria's yam production moved from 16 million tons in early eighties to 19.8 million tons in 1986 but declined to 16 million metric tons in 1988 and continued to go down (FAO, 2008). This resulted from irregular soil amendment regime. It is worthwhile to note

that the south-Eastern Nigeria account for 40% of the world estimated annual yam production and was attributed to viable soil nutrient management regime in the area. To sustain and improve upon this standard it becomes imperative to sort for non-cost and cheapest means of soil fertility management regime to reduce farmers' cost of production.

One major problem limiting crop production is soil fertility; this indeed necessitated the search for alternative means that would replace to a reasonable extend the conventional soil management procedure via sole application of chemical fertilizer. However, organic manure in view of Abdissa, markku and Tesfaye (2018) maintained that it helps to recondition the soil and create microclimate, which modifies the physical, chemical and biological conditions of the soil. Based on these premises the need arises to use vermicompost as most viable organic manure in our tuber cropping system.

The study was considered worthwhile because by its utility in developing an inexpensive, diffusible, and practical technology as an alternative to the sole use of expensive chemical fertilizer. Vermicompost therefore utilizes forest litters, agro-waste, food waste and weeds lying around as raw material for composing, are vital in amending soil fertility. Agricultural wastes are being generated in huge quantities and in most cases are being left to rot without being recycled to the soil to renew the nutrient status of the depleted soil. This usually result in increased green house gas emission. These potential vermicompost materials (waste) have the ability to be vermicomposted to produce bio-fertilizer in solid form (Manyuchi and Whingwiri, 2014). During the process of composting using grasses, leaves, and waste, the earthworm and other micro-organism feed on the waste and excrete them as organic fertilizer. These materials incorporate worm casting, living earthworm and their cocoon and other organism. Bhajch and Y,soni Ak, Garhwal Op and Netwal, (2020) maintained that wasteland can be effectively turned to viable arable land for tuber, fruit and vegetable production through the introduction vermicompost. Vermicompost has 4.19 nitrogen, 1.15 phosphorus and 6.18 potassium as its nutritional composition (Manyuchi, 2016). Therefore combination of organic (vc) and inorganic (NPK) source of nutrient in a specific crop and cropping system to achieve

more yield and improved soil properties is an effective soil fertility amendment strategy (Bhahchand, Aksoni, Gorbival and manja, 2020). It is therefore, more reasonable to integrate organic (vc) and inorganic which will be superior than the use of each component separately.

Statement of the problem

Today farmers used more dose of expensive and scare chemical fertilizer to get a better yield of various field crops. Although, very many are still unable to access the material for use thereby limiting their crop growth and yield. But these chemical fertilizers are known to decrease soil fertility and cause health problem to the consumer

Moreso, agricultural lands are drastically declining in their productivity because of improper soil management measures. Even though these chemical can increases crop yield but only for few years and eventually, their residual effects destabilize the soil environment, make it unsuitable for yam and root crop production. Hence, due to the adverse effects of chemical fertilizer interest has been stimulated for the uses of organic manure. This could encourage sustainably soil fertility and productivity of the soil and produce nutritive and safe food for consumers; thereby ensuring sustainable food security.

Objective of the study

The general purpose of the study is to examine the influence of the combination of vermicompost and inorganic fertilizer on the growth and yield of yam crop. specifically, the study tend to determine the quantity of vermicompost and NPK 20:10:10 to be combined for the attainment of maximum yield of yam, determine the effect of vermicompost in maintain the fertility of Ikwo soil environment for sustainable crop production and determine the effect of vermicompost on the properties of the soil.

Ho: There is no significant effect on mean yield of yam under different dosage of vermicompost manure and inorganic fertilizer.

Scope of the study

The study is delimited to the use vermicompost manure and inorganic fertilizer (NPK 20:10:10) in yam production in Ikwo Local Government Area land environment of Ebonyi State.

Significance of the study

The findings of this study will be beneficial to farmers, agricultural science teachers, extension officers (work), and general public.

The result of the study will help farmer who would acquire information, knowledge and skills on alternative measures for improving soil fertility status of agricultural land for sustainable crop production at reduced cost of production. In other hand, the findings of the study would be utilized by extension officers who would incorporate the knowledge and procedure of combining the two factors into the extension package, which would form a guide for teaching soil fertility management education in schools.

More so, agricultural science teachers would benefit from the findings of this study by planning their lesson on soil fertility management education to reflect how organic and inorganic manure can be utilized in soil amendment regime. Then the society and the general public at large would benefit from the information generated from this study, because increase in yam production will lead to reduction in prices of yam and other food stuff item in the market. Hence, the envisaged decrease in the use of inorganic fertilizer would likely have multiplier effects on the prices of inorganic fertilizer in the market and reduced the incidence of bio-gas emission due to waste recycling effects; when the result of this study has been implemental there by achieving sustainable food security in the study area.

Review of related literature

The central idea or concept of the study were based on the ability of micro-organism in decomposing, conversion of good for nothing and useless waste trashes, leaves, forest litters, waste food into productive bio-resources for improvement of soil fertility. It utilizes the biological activities of earthworms and other micro-organism to decompose the cellulose and lignin content of the useless composting materials into simple and useful organic compound for soil mineralization.

The soil is our most essential natural heritage which in its virgin states is the storehouse of plant food. The fertility of the soil is measured by its capacity to produce crops and is dependent on its ability to supply the root of the growing plant with water, oxygen, and nutrient (padamolath, 2014). With fertile soil crops grow uninterrupted. Unfortunately farm land tend to degrade once cleared for farming activities, hence, it is essential to ensure proper maintenance of the soil. Soil

productivity actually depends not only on its inherent fertility but on the way in which it is used and maintained.

More so, soils in humid tropic are fragile and are characterized with low cation exchange capacity, thereby suffer from declining soil fertility, hence, crop yield from these depleted soils tend to be relatively low because the conventional long fallow period are no longer feasible as a result of overpopulation which tend to exact pressure on land for farming and developmental projects. Hence, inorganic fertilizer becomes an alternative option for amending the fertility of the soil, although they suffer from a lot of leaching looses in heavy rain fall period. Girma, Spillance, and Gedil, (2016) maintained that combined application of organic and inorganic fertilizer could buffer the effect of chemical fertilizer, thereby increase yield of crops than over yields of inorganic fertilizer only. Thus using this alternative soil amendment regime to reduce cost of production and improve yield is a good strategy for cushioning the effect of population pressure on land use and enhance income generation (wealth creation).

Manyunchi, and whingwiri, (2014). Reported that this practice of using vermicompost as conceived by tribal people in south Gujarat India, who suffer from small and degraded farm with expensive nature of commercial organic fertilizer decided to produce organic manure locally using forest litters, agro-waste, grasses and weeds lying around as alternative to inorganic and commercial organic manure, thereby ensuring appropriate waste disposal measure. Moreso, the project earned women in the practice an additional source of income locally to meet domestic and consumption needs and eliminate the needs to migrate to the town to earn daily wages.

However, practical measure to improve soil fertility involves protecting the soil by good cultural practices, adoption of suitable crop rotation system, and application of fertilizer (organic or inorganic). Fertilizer is generally known as crop promoter. In the contest of this study, fertilizer is referred to chemical substance, generally in form of powder, granules, pellets or crystals which can be added to the soil when soil test shows lack of some essential element mainly to promote crop growth. The key fertilizer elements are: nitrogen, phosphorous and potassium (NPK)

which may occur as single, compound or mixture.

Organic manure are of plant or animal origin which may be compost, farm yard, or green manure and animal droppings added to the soil to supply nutrient element to the soil (Idenyi, 2010). Organic residues incorporated increase organic matters content of the soil and enhances microbial activities in the soil. Apart from the supply of nutrient element for plant, organic manure performs other important soil regulating roles in achieving soil suitability for crop productions.

Plant nutrient input into the soil is mainly through fertilization using organic or inorganic amendment (ohaman and pope, 2000). This is to supplement depleted nutrient to ensure good growth and yield. Organic amendments are added either as raw manure or compost. Isirimah, Jacksand and Igwe (2003) opined that the use of compost have obvious benefits, which include; a means of efficient manure management, reduction in substrate ration and facilitation of ease nitrogen release and other two key elements (PK). The application of organic amendment is usually accompanied by transformation processes resulting to the soil nutrient mineralization. The amount mineralized varies with time depending on compost (organic) quality and environment. Therefore, it becomes necessary that for efficient management the knowledge of nutrient mineralization pattern and influences on soil reaction is imperative. However, the knowledge of N dynamics is requires for efficient compost management so as to plan application to symphonize peak N release with period of maximum crop uptake (Abdissa, Markku and Testaye, 2018).

Soils in humid tropic are fragile and characterized with low cation exchanges capacity and they suffer from declining soil fertility. Hence crop yield from these depleted soils are generally low because of long fallow as a mean of improving soil fertility is no longer feasible as a result of over population. Therefore, inorganic fertilizer becomes an alternative option for maintaining the fertility of the soil. But inorganic fertilizer applied to these soils suffers a lot of leaching losses in heavy rainfall period. Studies have found that combinations of organic manure especially those from animal source and inorganic fertilizer could buffer the effect thereby increasing yield of crops than over yields of

inorganic fertilizer only (Idenyi and owo, 2012). Thus increase in yam production using alternative soil amendment regime to reduce cost of production is good strategy for cushioning the effect of population pressure on land; enhanced poverty level, achieve sustainable food and nutrition security and income generation (Nkamleu and Goekocoshi, 2016).

Moreso, adoption of chemical fertilizer alone to achieve increased crop yield in Nigeria farming system has been found to be unsuitable coupled with its scares and relative high cost beyond the reach of poor subsistence farmers in rural area who are the real food producers. In view of these circumstance scientists are advocating complementing use of organic and inorganic in maintaining the fertility and physical conditions of soils in amid tropics.

Girma, Gedil, and spillance, (2015) maintained that consistent high crop yield are obtained using NPK fertilizer mixed with farmyard manure and farmers gain more on substituting a proportion of the inorganic fertilizer requirement of the crops with organic manure especially poultry manure because these farmers generate the organic manure in their farming system. This combination is expected to reduce cost of production, thereby giving farmers a breathing gap to make additional profit and increase the size of their farm.

Theoretical Background

In Line with this study Agricultural innovation theory was found appropriate and the study was anchored on this fact based framework for describing a phenomenon propounded by Everette Rogers in 1962. Theory states that the diffusion process involves five stages; knowledge, persuasion, decision, implementation and confirmation. Innovation and early adopters are crucial in spreading new technology and practice. Combining application inorganic fertilize (20:10:10) with vermicompost is a noval practice and in view of the theory, innovation and diffusion follows a predictable pattern influenced by social systems and communication channel. The theory focused on the transformation of agricultural sector as a crucial part of economic development. The Theory lays emphasis on improving productivity through technological innovations, improving access to less expense local technology source and sustainable practices (adoption). In relation to this study, agricultural innovation theory is particularly relevant because the theory is

centered on the practical implementation of new ideas and technologies, which aligns directly with the goals of increasing yam production. The theory provides a framework for understanding how new technologies and methods (incorporating waste and useless materials with inorganic in soil amendment regime) can be useful to farmers and improve productivity and efficiency. By applying the theory, the study can identify the most effective strategies that can enhance yam productivity.

Empirical review

This section of the literature lays emphasis on available empirical studies on organic manuring in maintaining soil conditions for crop production. Omisoro, Kasali and Chukwu (2001) investigated the performance of maize (zea May) in response to different rates of poultry manure on a loam-clay sand soil at llorin in the southern Guinea savannah of Nigeria. Five treatment of 0,15,30,45 tons of poultry manure per hectare and inorganic fertilizer NPK 120; 60:60 were used in randomized complete block design (RCBD) with four replicates. The trial showed that poultry manure could be valuable fertilizer and may serve as alternative to inorganic fertilizer in the Guinea savannah. The result also indicted that as the rate of poultry manure increased from 0-45, values for plant height, cob weight and grain yield also increased linearly. The study related to the present study in that it evaluated the effect of poultry manure (organic) application on the growth and yield maize. But there was no trial on the effect of combined application of the both materials.

In another development, okonkwo, Okora, Chukwu and olojede 2009 studied the agronomic potentials of poultry manure (PM) and defatted palm kerned cake in sweet potato production typic paleudult. Two rates of poultry manure 5.5t/ha defatted palm kernel cake (DPKC) 2.1 and 4.2t/ha respectively and their combination were evaluated against a control on yields of sweet potato (Ipeoma batata) on a Haplic Acrisol; Typic paleudult-at umudike south eastern Nigeria in 2006 and 2007. The treatment was laid in a randomized complete block design with three replicates. The result showed the application of either source of the soil amendment reduce soil acidity by increasing the soil PH from 4.5 in their control plot to 5.5 to 6.9 in the organic waste amended plot. The study further revealed that the use pm is superior to DPKC in sweet potato production. The result indicated that the use of DPKC alone should

not be encouraged but the use of pm alone at the rate of 5.5 ut/ha-1 or its combination with DPKC at 2.1 -4.2t/. In this study review there was no trial on the effect of the combined application of the two source materials with inorganic material source, which is the key emphasis in the present study.

In similar study Olaniyi and Tella (2010) determined the effect of N and P fertilizer on the growth and yield performance of "Egusi" melon (citruilus Lanatus) in Ogbomso south west Nigeria. Two level of N from urea is O and 60kg-ha treatment combined with five rate of potassium fertilizer to produce 2x5 factorial experiments arranged in a randomized completed block design with three replications. The trial showed the mean vine length, number of leaves and dry matter yield were significantly influenced by the application of N and P fertilizer. The investigation indicated that the various growth parameters increased with increase in potassium level up to 40kg k2oha, and a decline set in. Similarly, the highest yield attribute were recorded at 30kgk2o/ha and a decline thereafter. The study related to the present study in that it determined the effect of the application of two different chemical fertilizers on the growth and yield of "Egusi" melon crop, though the study did not try the effect of combining organic with N and P applications.

The related literature reviewed in this study showed that the use of agro-waste in soil amendment is a sustainable means of improving soil productivity and reducing environmental pollution. But none of the studies reviewed tried the effect of combined application of organic (Agro-waste) and inorganic (chemical) manure on the growth and yield component of crops to enable farmers determine levels of combination (dosage). Hence, the need to investigate the effect of combined application of the two factors (vermicompost and NPK 20:10:10).

Research Methodology

The investigation was carried out at the proposed demonstration farm of Ebonyi State College Education, Ikwo soil in 2024 cropping season. The area lies between latitude 06^0 4/N and longitude 08^0 65/E in the derived savannah ecological zone of south-east Nigeria. Ebonyi state is virtually an agrarian state made up of 13 L.G.A with viable land area of 5, 985km^2. The study lasted 13 mouths.

The experimental crop was white yam (Dioscorea rotundata). The choice of this

variety was because it offers farmers good quality food and possesses high yield potentials, obtained from African yam research unit of Ebonyi State University Abakaliki, Ebonyi State. Land preparation was by minimum tillage and the dry trashes derived from cleaning operations formed part of what was used in preparing (composting) the vermicompost. Vermicompost and NPK 20:10:10 was the experimental treatment materials for the study.

The design of the study was a split plot factorial experiment designed in a randomized complete block design (RCBD) or latain square (LS) design. The treatment combination for factors 'A' and 'B' was vermicompost and inorganic fertilizer NPK 20:1O:10) in 3x3 (3^2) factorial experiment represent 2-factors each having 3 levels (dosage).

Experimental field layout .

Experimental field layout

Blocks	**Treatment Description**		
Block 1			
R1	FDO	PVC + PCF$^{(R1)}$	FDI
R2	FD1	FDO	PVC + PCF$^{(R2)}$
R3	PVC + PCF$^{(R3)}$	FDI	FDO
CONTROL	NIL	NIL	NIL
Block 2			
R1	FDI	FDO	PVC + PCF$^{(R1)}$
R2	FD1	FD1	FDO
R3	PVC + PCF$^{(R2)}$	PVC + PCF$^{(R3)}$	FDI
CONTROL	NIL	NIL	NIL
Block 3			
R1	PVC + PCF$^{(R2)}$	FDI	FDO
R2	FDI	FDO	PVC + PCF$^{(R3)}$
R3	FDO	PVC + PCF$^{(R2)}$	FDI
CONTROL	NIL	NIL	NIL
Block 4			
R1	FDI	FDO	PVC + PCF$^{(R2)}$
R2	PVC + PCF$^{(R1)}$	FDI	FDO
R3	FDO	PVC + PCF$^{(R3)}$	FDI
CONTROL	NIL	NIL	NIL

Key:

- FDO = full dose organic
- FDI = full dose inorganic
- PVC = part vermicompost

- PCF = part chemical fertilizer
- R^1, R^2 and R^3 = different dosage of PVC + PCF.

The experiment was in RCBD and consisted of three replicable with no control portion. In all there were four blocks and each block measures 5 x 6m with 2m spacing between blocks and had guard area round the experiment site. The application of the plant promoter was by broadcasting after ploughing before harrowing (heaping/ridging) to ensure proper mixture of the material

Data collection

Samples were collected from the experimental site at the depth of 10-15cm bulked together and taken to laboratory to determining nutrient strength of the experimental soil at the beginning and then at end of the experiment for pre-planting and post-planting chemical characteristic of the soil (before and after the experiment).

However, soil organic matter was determined using modified walking and black method, nitrogen (N) was by modified Icro-kjeeldaji digest method, phosphorus(p) and exchangeable potassium(k) was by BrayII method and flame photometry respectively. Calcium(ca) and magnesium (mg) were determined using the atomic absorption spectrophometry (AAS), while the soil PH was determined in distilled water.

Twelve plants per plot were sampled from each treatment plot used to record the average growth and yield attributes such as sprout count, plant height (canopy diameter), number of leaves, leaf area, leaf index and harvested crop yield. The measurement of the above growth and yield attributes were taken at 8,16, 24, 32, 40 weeks after planting (WAP) data on yield was obtained after harvesting and subsequent weighting of fresh tuber harvested based on the treatment (FDI, FDO and HDI + HDO), sprout count was obtained by counting the number of sprouting observed per plot, leaf index was obtained by adding the leaf area per plot and dividing with plot area, leaf area was gotten using the counting square method of placing graph sheet, then count squares cover by leaves, whereas plant height was by measuring the plant from the ground level to petiole.

Data Analysis

Data collected were subjected to statistical analysis using mean (x) and standard error of the mean (SEM) to describe the growth performance in various aspect to (attributes) indicated while analysis of variance (ANOVA) was used for testing significance of the sample means between various parameters measured, but schefers test was used to know which particular group (dosage) creates the difference or superior.

Result and Discussion

The soil properties (chemical) before planting showed that the nutrient elements (N,P,K,MG,Ca) and organic matter value were very low as essential element for plant growths, which revealed the low fertility status of the experimental soil as shown in table 1. Table 2, showed the height, leaf area, leaf index, and canopy diameter. At early age below 8 weeks (WAP) no significant difference occurred in the plant height of yam treated with various manure levels (FDO 0:30:40:50t/ha, FDI 0:300:45 600kg/ha and HDO + HDI 0:15:20:25t/has +0:150:225:300kg/ha then from 8. To 40 WAP significant difference started occurring among difference levels of manure treatment. The highest plant height was recorded for manure treatment of 25t/ha with 600kg/ha combined application of vermicompost and NPK20:10:10 respectively. This indicates that yam treated with highest manure level (25t/ha and 600kg/ha organic and inorganic respectively) attained the highest mean plant height of 3.20m and FDO and FDI treated plant attained average height of 1.55m and 1.0m respectively. Then the control reached a maximum average height of 1.27m. Ibeawache in Idenyi (2012) maintained that combined application of organic and inorganic manure enhances plant growth more rapidly, due to increase in organic and mineral content of the soil.

The result in table 3 indicated that fresh tuber harvest weight per plant and per plot increase with increase in quantity of manure applied. Yam treated with 25t/ha and 600kg/ha of vermicompost and NPK 20:10:10 respectively had highest average height of 173kg, whereas plants treated with sole organic (FDO) and inorganic (FDI) had average height of 97.7kg and 84.7 respectively. This showed that to obtain maximum yield per plot yam farmer is expected to apply organic and inorganic manure together at the rate of 25t/ha vermicompost and 300kg/ha of NPK

20:10:10. Agbede, Adekiya and Oge (2013) reported that tuber crops require well drained soil with high organic content; which is an ideal for tuber crops production in tropics. Ogbonna (2018) in support opinioned that combination of poultry manure and inorganic fertilizer produces the best yield in egg plant per hectare. It was equally observed in this study that the canopy diameter of plant dressed with HDI is more (98.7) compared with sole FDO and FDI dose (78.5 and 81.2) respectively

Table 1: Mean soil fertility level before and after experiment

%	Om	N	P	K	Mg	Ca	PH
Before experiment	1.05	0.008	6.02	0.62	0.54	0.91	4.7
After experiment							
FDI	1.01	0.10	6.65	0.85	0.87	1.12	5.01
FDO	6.25	3.05	8.73	1.03	0.93	1.40	6.75
ADI + HDO	4.56	3.89	9.58	2.04	2.25	1.45	6.75
Control	1.92	0.85	4.65	0.69	0.58	0.94	4.75

Table 2: Growth rate on various Accribute

	Plant height	**Leaf area**	**Leaf index**	**Canopy**
FDI	1.70	7.56(m)	0.13	81.2
FDO	1.55	7.23(m)	0.18	78.5
HDI + HDO	3.20	9.95	0.028	98.7
Control	1.27	4.68	0.12	72.03

Fresh harvested tubers compared

$PVC + PCF^{(R2)}$

(Part vermicompost + part chemical fertilizer)

FDO

(Full dose organic)

FD1

FDI = full dose inorganic

Table 3: X yield and total yield per plot after harvest

Treatment	**Plot 1**	**Plot 2**	**Plot 3**	**X mean**
FDI	73kg	82kg	99kg	84.7
FDO	87kg	98	108kg	97.7
HDO + HDI	158kg	187	175kg	173
Control	67kg	75kg	71	71

Table 4: analysis of variance (ANOVA) on the mean yield and total yield per plot after harvest

Source of variance	df	Sum of squares (SS)	Mean squares	F –cal	F – critical	Significance	Decision
Between group	2			272	1.59	S	Reject
Within group	33						
Total	35						

- In conclusion, the interaction effect as described in tables indicated that the complementary use of vermicompost and inorganic fertilizer at the rate of 25t/ha of vermicompost and 300kg/ha of NPK 20:10:10 gave the highest yield by weight and number of tubers.
- Moreso, significant difference existed between the yield of the crops treated with half dose of organic and half dose of inorganic manure with those treated with sole dosage of the two treatment materials.
- From the result obtained farmers are advised to adopt complementary use of vermicompost with recommended dose of 25t/ha and 300kg/ha of inorganic fertilizer (NPK 20:10:10) since the composting materials are readily and ever available to farmers locally, unlike other organic source for crop production. In addition, this practice aids in reducing farmers cost of production considering

the economic limitation imposed in procuring chemical fertilizer for entire soil fertility amendment practices. Enviromentally, recycling these agro-wastes into useful soil fertility material encourages reduced green house gas emission

- The summary of the analysis on table 4 indicated that the critical value of F with 2 and 33 degree of freedom at 0.05 level of significance is 1.59. Then the computed value of F is 272 which is greater than the critical value of 1.59, hence there is a good reason to reject the null hypothesis. Therefore the yield of crops dressed with combination of vermicompost and NPK 20:10:10 differs significantly. Since significant difference exists in their yield (plot) the null hypothesis is rejected. Then schelfe's test was now used to detect the source of the difference or superior dosage via (20t/ha and 300kg/ha of vermicompost and NPK 20:10:10 respectively (HDO +HDI).

REFERENCES

Abdissa B. Markku, V and Tesfuye S. (2018). Effect of line, verimcompost and chemical ferlizer on selected properties of acid soils of Ebontu district western Highland of Ethriolpia *Applied and environmental soil science voli 2018.*

Agbede, T.M. Adekiya and Oge, J.S. (2013). *Effect of organic fertilizer on yam productivity and some soil properties of a nutrient depleted tropical alfisol achieves of agronomy and soil science 59(6) 803-822.*

Ano, A.O. and Emeliute, J.K.U (2004) complementary use of poultry and inorganic fertilizer in Ginger production on anutisal of south Eastern Nigeria. *The Nigeria agricultural journal 35:51-58*

Bhagch and .Y. Soni Ak, Garhwal op and Netwal m (2020). Integrated effect of NPK with vermic compos and boron on yield and economics of bringal *(Solanum Mehongena h.) Journal of Pharmecognosy and pharmdermistry.val9(i) 1637 – 1640*

Girma, G, Spillance, C and Gedil M. (2016) DNA Barcoding of the main Cultivated yams and selected wild species in the genus Dioscorea. *Journal of Systematics and evolution 54(3) 228 – 237*

Girma, G., Gedil, M and Spillance, C.(2015) Morphological, SSR and Ploidy analysis of water yam (Dioscorea Acata L.) *accession for utilization of aerial tuber as planting materials.*

Genetic Resources and Crop

Evolutions: DOi:10.1007/s 10722 – 015 – 0351 – 2

Hamon, M.O. and Pope, N.V. (2000). Nitrogen fertilizer movement in the soil as influenced by nitrogen rate and timing in irrigated water soil science society journal 64:1883-1892.

Idenyi, E.O (2010) Practical guide to farm skill acquisition in agriculture for schools *wilhyrose & Apple seed publishes copy P.37*

Idenyi, E.O and Owo, E.E (2012). Effect of combined application of verm-compost manure and inorganic fertilizer on growth and yield of cassava. *Journal of science of the agriculture, food technology and environment vl 12:37-40.*

Ironkwe, A.G. (2010). Influencing of personal characteristic of farmers on the use of yam *minisott technology in south eastern Nigeria.*

Manyuchi, M.M. (2016). Production of vermicompost and verm-waste bio fertilizer from food waster. *International journal of award for young agricultural researchers.*

Manyuchi, M.M. and Whingwiri. (2014). Effect of vermic composting period, substrate quality, cow dung composition and their interaction On Eisenia Fetida during vermicomposting international journel of current. *Micro biology and Applied Science. 3(8) 1021 – 10 28*

Nkomleu, G. and Goekowski, B.J. (2016). Study of root and tuber consumption in rural households of the forest zones of Cameron. *Journal of agriculture and food economics, 1:81-91.*

Ogbonna, P.E (2008). Effect of combined application of organic and inorganic fertilizer on fruit yield of agg plent. *Proceeding of the 42nd annual conference of agricultural society of Nigeria, Abakaliki, PP 252-256*

Okonkwo, B.C., Okora, I.K., Chukwu, J.U and Olojede O.A. (2009). Agronomia potentials of poultry manure and

defatted palm kernel cake in sweet potato production on typic palendult. Agricultural society of Nigeria, Abuja. For entire soil fertility amendment practices. *Environmentally veccling these agro-waste into useful soil fertility material encourages reduced green house gas omission.*

Olaniyi, J.O and Tella, B. A (2010). The effect of nitrogen and potassium fertilizer on growth and yield of "Egusi" melon (itrullus lanatus) in Ogbomoso south west Nigeria. Proceeding of 44th annual conference of agricultural society of Nigeria *"LAUTECH"*

Omisoro, J.K; Kasali M.Y. and Chukwu, U.C (2009) determination of optimium poultry manure rate on maize production. *Proceeding of 43rd annual conference of the agriculture society of Nigeria, Abuja.*