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EVALUATION OF THE EFFECT OF COW DUNG AND POULTRY DROPPING ON MAIZE KERNEL YIELD

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ABSTRACT: *Organic agriculture is the application of organic fertilizers such as Poultry dropping and Cow dung in a nutrient deficient soil to increase and enhance vigorous growth of plant and crop yield, in which all input is based on natural sources of agriculture which has no negative effect on the performance of crops, improves the fertility in the soil and causes no harm to the environment. A comparative study on the "The evaluation of the Effect of Cow Dung and Poultry Dropping" on Maize (Zea mays) Kernel Yield was carried out at Niger Delta University Teaching and Research Farm, Amassoma, in 2013/2014 cropping season. The treatments consisting of 20t/ha of Poultry dropping, 20t/ha of Cow dung and No treatment in which each treatment was replicated four (4) times. The treatments were arranged in Randomized Complete Block Design (RCBD). Some baseline agronomic data were collected such as, Plant height, Leaf area, Number of nodes, First cob attachment, Weight of 1000 kernels of corn and as well as the physicochemical characterization of the soil. The result was subjected to analysis of variance and it shows that the treatment with 20t/ha of Poultry dropping had significant difference compare to Cow dung and that of the control. 1000 kernel weight of Maize with the highest mean value of 154.97g and 144.91g were obtained from the treatment applied with 20t/ha of poultry dropping and 20t/ha of cow dung respectively. The mean Corn kernel yield in ton per hectare had the highest mean value of 1.49 was obtained from the treatment with 20t/ha of poultry dropping followed by 20t/ha of cow dung while the least mean of corn kernel yield in t/ha was obtained from the treatment with no application of organic manure. Findings indicate that, the organic manures applied enhanced the growth and yield performances of the crop.*

KEYWORDS: poultry dropping, cow dung, organic manure, fertilizer, yield

INTRODUCTION

Organic farming is a form of agriculture that completely relies on techniques and methods such as crop rotation, green manure, compost, and biological pest control. Organic farming uses fertilizers and pesticides (which include herbicides, insecticides and fungicides) if they are considered natural (such as bone meal from animals or pyrethrin from flowers), but it excludes or strictly limits the use of various methods (including synthetic petrochemical fertilizers and pesticides; plant growth regulators such as hormones; antibiotic use in livestock; genetically modified organisms; human sewage sludge; and nanomaterials) for reasons including sustainability, openness, independence, health, and safety. Organic agricultural methods are internationally regulated and legally enforced by many nations, based in large part on the standards set by the International Federation of Organic Agriculture Movements (IFOAM), an international umbrella organization for organic farming

organizations established in 1972. The USDA National Organic Standards Board (NOSB) definition as of April 1995 is: "Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and hence ecological harmony.

This system of farming requires a relationship between human and natural resources in the production of quality food products for human needs and services (human and industrial use). This farming system is to create an integrated environmentally sound and economically sustainable agricultural production (Acquach, 2001).In contrast to inorganic fertilizers (synthetic fertilizers) such as nitrates, phosphate, organochlorine etc are environmentally hazardous to human health, aquatic organisms and other organisms.Animal manure (called manure) according to Defoer *et al*, (2000) is an organic fertilizer consisting of decomposed mixture of dung.McCalla 1975 revealed that the finer the spread, the better the fertilizing effect of farmyard manure, the higher the N content and the Calcium and Nitrogen ratio.

In addition to supplying of plant nutrients, Fulhage (2000) further explained that manure generally improves soil tilth, aeration, and water holding capacity of the soil and promotes growth of beneficial soil organisms. Manure applied in the proper amounts at appropriate time can supply some, if not all of the nutrient requirements of many crops. According to Collins and Younos (1996), solid manure can be incorporated by tillage immediately following its application, and liquid manure slurry can be injected into soil, manure application should be applied close to time of planting to maximize N uptake by crops and minimize the loss of N through runoff or leaching down the soil profile.

Manure is recognized as key resources in sustaining soil fertility in the tropics supplying the soil with a range of macro and micro-nutrients and organic matter (Defoer *et al* 2000).

Although much work had been done in Northern Nigeria during colonial period on the value of manure to various crops, manure of various groups, livestock were not characterized as to their content of plant nutrients (Kallah and Adam, 1989).

Fresh cow dung in India has an average N content of 0.3%. This contributes almost 50% of N per hectare of crop land (Jaiswal *et al* 1971). Renald (1997) reported nutrient content ranges of fresh cattle manure as follows: 1.4-2.8%N, 0.5-1.01%P and 5-0.6%K.Muller-Samann and Kotschi (1997) explained that, exactly how much is lost depends on the form of animal husbandry, the method of storage and the way manure is used.Poultry manure is the organic waste material from poultry consisting of bird faeces and urine. In a broad view, poultry manure includes litter from bedding materials (wood shavings or sawdust) and feathers. It is the mixture of bedding material, manure and feathers that result from intensive poultry production. This also includes litter from meat chickens (broilers), egg laying chickens (layers) kept under confined conditions, turkeys, ducks and quail. Poultry manure is an excellent fertilizer material because of its high nutrient content, especially for nitrogen (N), phosphorus (P), and potassium (K). These nutrients plus others

come largely from the bird faeces. Manures decompose (mineralize) in the soil releasing nutrients for crop uptake.

If poultry litter is readily available locally, it can help reduce fertilizer costs in vegetable production. The vegetable producer should conduct a cost analysis between litter and chemical fertilizers to determine the economic benefit. In addition to supplying nutrients, poultry manure or litter helps to amend the soil by increasing the soil organic matter content.Maize (*Zea mays*) belongs to the family Poaceae. It is a cereal monoecious plant. Maize is the third most important and available food in the world today. Maize originated from Central America "Mexico" (center of origin) and is mostly produced in U.S, Russia and U.K etc. (Dowswell *et al*., 1996).

Maize plant is one of nature's most important energy storing plant. Maize plant can develop to a height 3m-4m in two or three months, and can produce 600 to 1000 kernels similar to the one from which it originated. Maize is an essential tropical crop for food, feed and industrial utilization. It grows well in the low land tropics and also grows on many soil types. It also grows well within the temperature range of 10^oC to 40^oC specifically, maize is a hot season crop and is grown principally in areas with temperature range of 21^oC to 30^oC (Sowunmi and Akintola, 2010). It requires a rainfall of 250mm to 750mm. Maize requires sufficient water supply at its critical growth period. Maize is a short-day plant and requires warm sunlight and enough water supplies to grow well. Maize has a very low ability to extract water from the soil, so it must have steady water supply during its critical growth period.

It is ranked as the second largest cereal crop in the world surpassed only by wheat. Maize is an important cereal crop of the world. Maize has worldwide significance as human food, animal feed, different industrial product such as fermentation and distillation industries. Corn starch can be used to produce corn oil and corn syrup. Result from other scientists' shows that maize grows well in different climatic regions in the world from 58^0N to 40^0S, from below sea level to altitude higher, 3000mm of rainfall per year and in area with 250mm to more than 5000mm of rainfall per year (Shaw 1988, Dowswell *et al*., 1996).Maize is the only cereal that can be harvested and used at various stages of plant development in developed and developing countries; maize is used as an animal feed in India, about 55% of maize produced is used for food purposes, about 14% as starch and oil production and 1% as planting material.

Maize is sown at 25cm x 70cm between row and for one plant per stand, sown at 90cm between row and 30cm within row for two plants per stand. To sow one hectare, 25kg of seed is required and one should make sure the space due to un-germinated seeds are supplied within one week.
Organic fertilizers are sources of plant nutrient that can be added to supplement soil depleted natural fertility. They are intended to supply plant needs directly through modification of soil pH and structure. Great improvements on both quality and quantity of grain result were recorded when appropriate quantities are added at appropriate stage of plant growth.

An area with negligible cow dung or where stable manure is produced in small amounts in other countries where stabilizing is almost non-existent, green manuring can provide available supplement of nutrients in maize cultivation. Deficiency of potash may be observed resulting in

retarded plant growth. Organic manure supports better root development, leading to higher crop yield, improvement of environmental conditions and public health as well as the need to reduce costs of fertilizing crops are also important reasons for advocating increased use of organic materials. The soil fertility status is improved by activating the soil microbial biomass, to meet crops nutrient requirement, organic fertilizers are however, required in rather large quantities.Application of organic manure sustains cropping systems through better nutrient recycling. Application of organic manure plays a direct role in plant growth as a source of all necessary macro and micro-nutrients in available forms during physical and biological processes of the soil.

Organic manures decompose to give humus which provides the nutrients in available forms during physical and biological processes of the soil. Organic manures decompose to give humus which plays an important role in the chemical behavior of several metals in the soil through the flavonic and humic acid content and organic manures also improve the water holding capacity of the soil; improve the soil structure and the soil aeration.

MATERIALS AND METHODS

The experiment was conducted in 2013/2014 at the Niger Delta University Agricultural Teaching and Research Farm, Amassoma, Bayelsa State. The site was acquired by the university and was cleared for various agricultural operations which has a well drain soil with a secondary vegetation that is made up of weeds, herbaceous plants, annuals and perennial grasses, weeds such as *Chromolaena odorata, Aspilla africana, Panicum maximum, Setaria babata, Melanthera scandens* etc were all identified at the site.

The treatments were arranged in randomized complete block design.
Maize seeds (Yere yere) were obtained locally from the Amassoma market and seed viability test was carried out to ensure that quality and viable seeds are been obtained.
The seeds were sown at the seed rate of two (2) per hole at a spacing of 70cm x 25cm which were thinned down to one plant per stand to avoid competition for sunlight, nutrients, carbon dioxide and to prevent overcrowding to improve their performance.

Data were collected which include Date of planting, Date of emergence, Plant height, Number of nodes and Internodes, Height of first Cob attachment, Leaf area, Date of anthesis, Length and Diameter of Cob, Number of rows per cob, Number of kernels per Cob, Weight of 1000 kernels and Corn kernel yield in tons per hectare.

ANOVA method was used to analyze both growth and yield parameters as recommended by Steele and Torrie (1960) and means were tested using Tukey means method of grouping at 5% level of probability (Minitab, 2010).

RESULTS AND DISCUSSION

Growth Parameter at Anthesis

Mean growth parameters at flowering are shown in table 1 in which plant height was highest in treatment with 20t/ha of poultry dropping per hectare (249.48cm) which is significantly different from the other treatments followed by 20t/ha of cow dung. The findings indicate that 20t/ha of poultry dropping had the potential to enhance the vegetative growth of the plant than the other treatments due to its high content of nitrogen composition. The control which was 0ton per hectare was significantly different from the other treatments shown in table 1. The 0ton per hectare happens to produce the least plant height compare to the other treatments. The height of a plant in most cases it's a function of the nutrient composition of the soil which also indicates the yielding capacity of the plant.

Number of nodes were also counted and are shown in table 1. The least number of nodes were obtained from treatment with 20t/ha of poultry dropping with a mean of 11.30 which is significantly different from the other treatments while treatment with 0t/ha and 20t/ha of cow dung were not significantly different from one another. The taller the plant the lesser the node and the shorter the plant the more the nodes.The heights of first cob attachment were also measured shown in table 1. The highest height of first cob attachment was obtained from the treatment with 20t/ha of poultry dropping with a mean of 103.75cm which is not significantly different from the treatment with 20t/ha of cow dung, though significantly different from the treatment with 0t/ha (control). Leaf area of individual treatments are also shown in table 1 in which the highest were obtained from treatment with 20t/ha of cow dung (623.8) which was not significantly different from treatment with neither 20t/ha of poultry dropping nor the control (0t/ha).

Table 1: Mean Growth Parameters at Anthesis

Growth Parameters	0t/ha	20t Cow dung/ha	20t Poultry dropping/ha
Plant Height (cm)	215.30^{b}	246.9^{ab}	249.48^{a}
Number of Nodes	13.18^{a}	12.58^{a}	11.30^{b}
Length of First Cob Attachment (cm)	91.27^{b}	94.82^{a}	103.75^{a}
Leaf Area (m^2)	576.9^{a}	623.8^{a}	595.3^{a}

*Means that do not share same letter are significantly different (Turkey method at 95% confidence level)

Some Baseline Agronomic yield parameter

Length of cobs are shown in table 2. The highest length of cob was obtained from treatment with 20t/ha of poultry dropping with a mean value of 11.68cm followed by 20t/ha of cow dung, though both of the treatment did not differ significantly from one another which is attributed to the essential nutrients embedded in them while they are significantly different from the control with 0t/ha. In 0t/ha, the plant depends solely on the nutrients in the soil which had probably led to the drop in both the growth and yield parameters.

The diameter of cobs also shown in table 2. The least diameter of cob was obtained from treatment with 0t/ha which was not significantly different from treatment with 20t/ha of cow dung with a mean value of 6.68 while the highest mean value was obtained from treatment with 20t/ha of poultry dropping which was not significantly different from 20t/ha of cow dung.

The number of Maize kernels per cob is also shown in table 2 where the highest mean value was obtained from treatment with 20t/ha followed by treatment with 20t/ha of cow dung and both of the treatments did not differ significantly from one another. The least number of kernels per cob was obtained from treatment with 0t/ha with a mean value of 72.00 which is significantly different from treatment with 20t/ha of cow dung and poultry dropping.

Number of rows of kernels per cob of Maize was also counted and shown in table 2. The highest and least number of rows of kernels per cob were obtained from treatments with 20t/ha of poultry dropping and 0t/ha with mean value of 10.25 and 7.48 respectively. The highest mean value was obtained from treatment with 20t/ha of poultry dropping followed by treatment with 20t/ha of cow dung and though both of the treatments did not differ significantly from one another. 0t/ha as a treatment differ significantly from the other two treatments.

Table 2: Some Baseline Yield Parameter

Growth Parameters	0t/ha	20t Cow dung/ha	20t Poultry dropping/ha
Length of Cob (cm)	8.80^{b}	11.63^{a}	11.68^{a}
Diameter of Cob (cm)	6.14^{b}	6.68^{ab}	6.88^{a}
Number of Kernels per Cob	72.00^{b}	146.70^{a}	151.82^{a}
Number of Rows of Kernels per Cob	7.48^{b}	9.50^{a}	10.25^{a}

*Means that do not share same letter are significantly different (Turkey method at 95% confidence level)

1000 kernel Weight of Maize

1000 kernel weight of Maize is shown in fig 1 in which the highest mean value was obtained from the treatment applied with 20t/ha of poultry dropping followed by treatment with 20t/ha of cow dung and the least was obtained from the treatment of no application of either cow dung or poultry dropping. The highest 1000 kernel weight of Maize obtained from the treatment with 20t/ha of poultry dropping followed by 20t/ha of cow dung was attributed to the high nutrient constituents of the respective treatments.

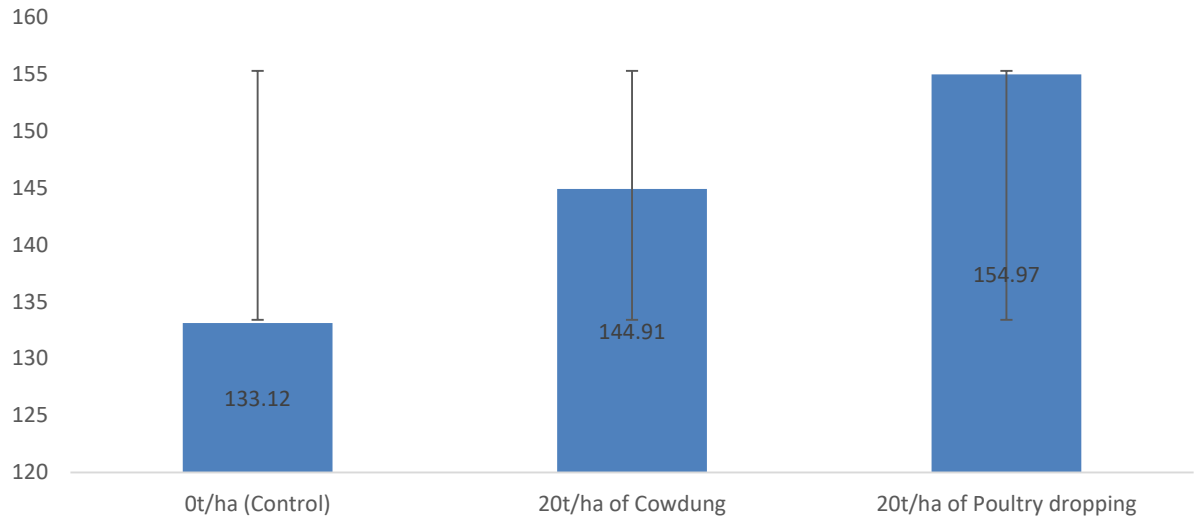

Fig 1: Mean 1000 Kernel Weight of Maize in Gram

Mean Corn Kernel Yield in t/ha

The mean Corn kernel yield in ton per hectare is shown in fig 2. The highest mean value (1.49t/ha) was obtained from the treatment with 20t/ha of poultry dropping followed by 20t/ha of cow dung while the least number of corn kernel yield in t/ha was obtained from the treatment with no application of organic manure. Findings indicate that, the organic manures applied enhanced the growth and yield performances of the crop.

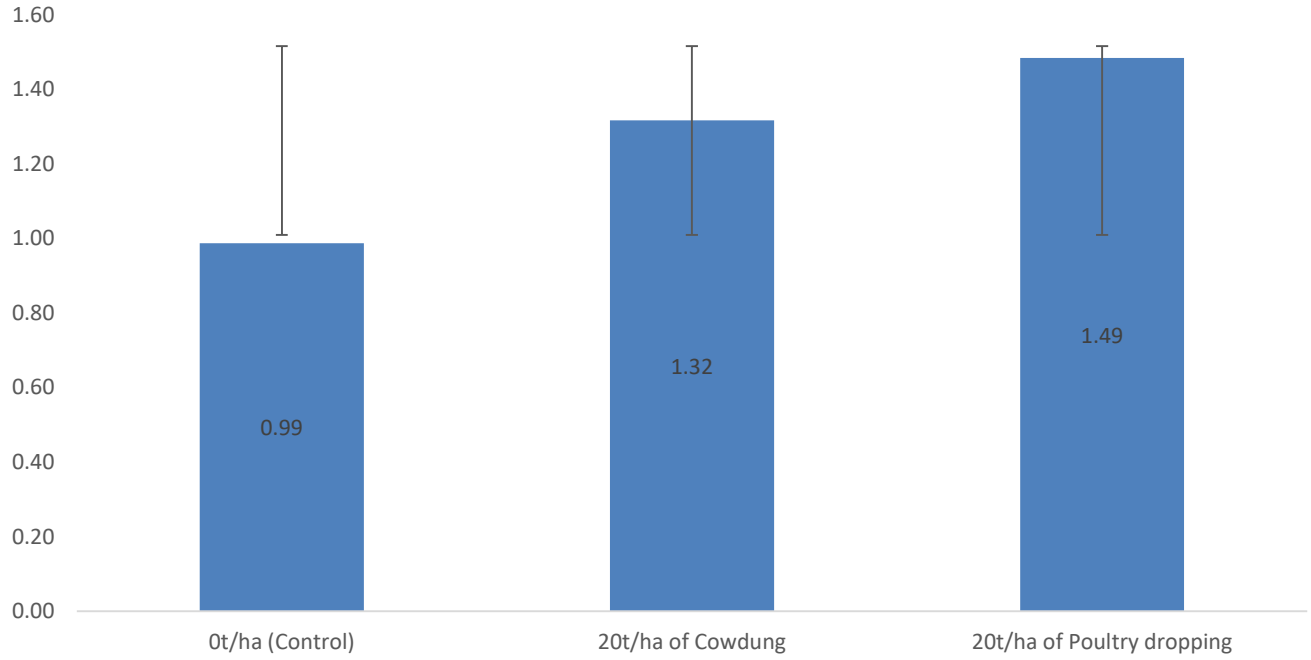

Fig 2: Corn Kernel Yield in t/ha

CONCLUSION

The result of the study on 1000 kernel weight of corn indicated that 20t/ha of Poultry dropping applied gave a higher significant result compare to its controls and that of 20t/ha of Cow dung.
It was also observed that 20t/ha of Poultry dropping applied gave a better Corn kernel yield compare to that of 20t/ha of Cow dung applied.

The treatments were compared using parameters such as the number of kernels per cob, length of cob, number of kernel rows per cob, diameter of cob which indicate that 20t/ha of Poultry Dropping had advantages compare to that of 20t/ha Cow dung and the treatment with no application of organic manure. The finding indicates that poultry dropping is a better organic manure which should be used to substitute inorganic fertilizer due to their environmental friendliness and no health hazard posed on human being.

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