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Effect of Organic and Inorganic Fertilizers on Yield of Maize in Mubi North Local Government Area, Adamawa State, Nigeria

Mohammed D. TOUNGOS (Ph.D.)

Crop Science Department, Adamawa State University Mubi, Adamawa State, Nigeria.
Corresponding Author Email: dahiru.toungos@gmail.com; toungosm@adsu.edu.ng

ABSTRACT
The study on the effect of organic and inorganic fertilizer on yield of maize in Mubi North Local Government Area, Adamawa State, was conducted at the Food and Agricultural organization/ Tree Crop Production (FAO/TCP) Teaching and Research Farm of Adamawa State University Mubi. The field work was conducted during 2018 cropping season. Mubi is geographically located within Latitude 10^{o} 05" N of the equator and longitude 13^{o} 16" E Greenwich meridian time on altitude of 696m above the sea level. The mean plant height of maize was different due to sources of fertilizer and levels applied. During the growth stages it showed that, the mean plant heights were recorded after 3, 6 and 9 WAS. Those applied with cow dung had the tallest plant at 3 WAS with 18.27cm, followed by NPK applied with 18.07cm. The combination of cow dung and NPK recorded 15.66cm, while the controlled had 13.96cm. The trends followed at 6 WAS with cow dung, recorded the tallest plant with 49.02cm followed by NPK with 48.52cm while combined had 46.11cm and the controlled with 41,06cm. The effect of organic and inorganic fertilizer on the growth and yield parameter of maize has significant difference. Subsequently, the tallest plants were obtained with those applied with NPK, while control has the shortest plant. NPK also records shorter days to tasseling and silking with 59 and 62 days respectively, while control records 61 and 63 days.' Plants supplied with NPK gave the highest yield of 4,620.6kg/ha^{-1} even though there were no significant difference with those applied with combination of NPK and cow dung which gave 4,430.7kg/ha^{-1}. The control plots recorded the lowest yield with 2,035.2kg/ha^{-1} . The research shows that application of NPK gave significantly higher yield and grain weight than plants that were supplied with cow dung; NPK, cow dung combined. The study recommends that the farmers in Mubi North should adopt the proper method and time of application of NPK in their farms for higher yield. Therefore, application of NPK should be adopted for greater achievement by farmers in the study area.
Keywords: inorganic, fertilizer, plants, cow dung.

INTRODUCTION

Maize [*Zea mays* (L.)] is a member of the grass family Poaceae, a classification it shares with many other important agricultural crops, including wheat, rice, oats, sorghum, barley, and sugarcane. Maize crop is one of the world's leading crops cultivated over an area of 159 million hectares with a worldwide production of 817 million metrics tones, which was more than wheat, 682 million tones or rice 678 million tons in 2009 (Wikipedia, 2011).

It is now grown and distributed in almost all parts of the Country over an area, that none of the cereal crops occupies such a larger hectares (Ado *et al.*, 2004). In 2008, Nigeria produced 7.5 million metric tons of maize on 4.7 million hectares of land with average yield of 1.6 ha^{-1} (FAO, 2008). According to CBN (2003) and FAO data (2008), Guinea Savannah is the largest maize producing Zone in Nigeria. Maize is a staple food in Nigeria with consumption quantity of 53.2g capital per day (Ayinde, 2010).

NPK Fertilizer Requirement by Maize: Nigeria farmers have for long relied on shifting cultivation as a mean of restoring soil fertility under the pressure of increasing population and competing land use, long fallow periods are no longer practicable. Therefore, the shortening of fallow period have led to a decline in

soil fertility. In this regard, to obtain optimum maize crop yield fertilizer application plays a vital role. Maize takes up N P and K from the soil as primary nutrient clement required for growth and development. The precise requirement of these nutrients depends upon the fertility status of the soil, previous cropping history and duration of variety to be grown. However, a balanced application of 60 – 120kg N, 40 – 60kg P_2O_5 and 40kg K_2Oha^{-1} is recommended for various ecosystems for maize production in Nigeria (Ado *et al.*, 2004). 400kg of NPK 15:15:15 plus 120kg urea per hectare.

Organic Fertilizer on the Performance of Maize Production: In many traditional agro ecosystem, small scale farmers use cattle manure as a plant nutrient. In this way, the management of manure causes a transfer of plant nutrient from grazing land or house to cropping areas which results in substantial contribution to the crop nutrient supply (FAO and IAEA, 2008).

Cattle manure is valuable when used carefully as fertilizer for crop production and improvement of soil quality. The compositions of measure is variable due to factors of housing bedding and feed, this being true even for manure of one animal category. When manure is applied to the surface of grassland soils, the manure materials will normally be incorporated by soil found particularly earthworm. This organic matter and the activities of soil Fauna will have a positive effect on the soil physical properties (FAO and IAEA, 2008). This is due to the nutrient contained in cattle manure are not immediately available for use by plants but must first be broken down by soil micro-organism in order to release the nutrient in a form that plant will be able to utilize, a process called mineralization.

It has been reported that maize crop responds very well to variable rates of nitrogen and thus, increases grain yield and protein content (Singh and Dukey, 1991). Study has showed increase in plant height and number of grain per ear with increasing nitrogen level when 50,100 and 150kg N/ha^{-1} were applied to three maize cultivars (Arain *et al.*, 1989). Uwah *et al.*, (2011) also showed highest rates of poultry manure and NPK maximized Leaf Area Index (LAI), number of grain/cob and harvest index (HI) whereas total dry matter (TDM), weight of grain/cob yield/$ha^{-1}$and total grain yield packed at $10t/ha^{-1}$ poultry manure and $499kg/ha^{-1}$ NPK fertilizer. Total of $10t/ha^{-1}$ NPK was also found to increase TDM by 43 and 91% and total grain yield by 101 and 34% in south eastern rain forest zone of Nigeria.

Arvind Verma *et al.*, (2006) evaluated the effect of integrated nutrient supply on the productivity of maize in sandy clay loam soils of Udaipu, results indicated that maximum plant height leaf area index and dry matter (9 plant) at harvest was observed by applying 150 percent recommended NPK., significantly higher grain yield ($34.15ha^{-1}$) and Stover yield ($47.65ha^{-1}$) were obtained with the application of 150 percent NPK, though the results were on per with 100 percent NPK plus FYM $10t\ ha^{-1}$.

Many farmers in Nigeria apply only 10 kilograms of fertilizer per hectare as against 400 kilograms (Prasad and Prasad, 1996). This results into low yield and low returns on investment. Maize production is of strategic importance to food security and socio-economic stability in Nigeria. Nigeria farming systems are saddled with insufficient input such as inadequate fertilizer and improved seeds. Thus, declining soil fertility and limited use of fertilizer for maize production are common factors that reduce maize production in the country. In view of the high prices of soil applied NPK fertilizers in the year 2010, local farmers in Mubi North Local Government Area adopt cow dung as a substitute to the conventional NPK granular fertilizer.

Yield difference in maize varieties is compose from two components, number of grain and the grain per cob weight based on ability of adequate grains filling which results from sink – source relationship heavier grains result from proper grain filling (Jones and Simons, 2003) and this is one of the important factors in determining yield potentials in Maize varieties (Rufino, M; *et al* 2006). Although, Maize grain provides macro and micro nutrient required for human diet it lacks adequate amount of essential amino acids, lysine and tryptophan. Thus, a superior maize cultivars named quality protein Maize (QPM) was discovered to improve maize nutrition compared to the traditional maize types (Emily and Sherry, 2012).

Economic Effect of Organic Fertilizer on the Performance of Maize Production: Animal manures are valuable sources of nutrients and the yield-increasing effect of manure is well established. Apart from the nutrients in manure, its effects on the improvement of soil organic matter, soil structure and the biological life of the soil are well recognized particularly at high rates of application. Cattle manure has become more important as a source of soil nutrients in situations where use of inorganic fertilizer is not affordable, such as in Sub-Saharan Africa, as they are often the source of carbon, nitrogen and other nutrients (Rufino *et al.,* 2006). In view of the apparent decline in soil fertility, deliberate efforts are required to promote utilization of cattle manure for crop production (Maerere *et al.,* 2001). Different types of cattle manure have been identified such as FYM and bio-slurry from bio gas plant. However, not much is known on management practices and application methods of the two types of manures in maize production in smallholder farming manure is placed in small heaps all over the field and then uniform spread (Nyamugafata and Wuta, 2012).

Cattle manure application methods include broadcasting, dibbling direct to the plant, placing on ridges or use of liquid manure to the plant. However, it is not well known yet which manure application methods in the study area is better in maize production, and whether the method is efficiently practiced for the plant to get required nutrients. Farmers have to apply manure from August to October; with 72% applying Manure during the month of October (Nyamugafata and Wuta. 2012). According to Jackson (2005), 40% of nitrogen and 60% of potassium is lost from cow urine due to poor urine collection during manure management, which ends up with low availability of nitrogen from manure. However, the means of preserving nutrient loss from urine are not much understood. The problems on production, management and applications of cattle manure at a farmer level has not been established yet, and therefore, there are no recommendations which have been made to help a farmer to use cattle manure efficiently for sustainable soil productivity. Studies conducted by (Jackson 2005; Lisuma and Mrema 1999; and Maerere *et al.,* 2001) concentrated on availability of nutrients per unit of different types of manure source and management.

There has also been little research on manure management and manure storage in Africa where most studies of soil N-mineralization from manures comprise mainly laboratory incubations (Rufino *et al.,* 2006). Hence, there is a need for conducting research on manure use and its impact on maize yield for sustainable soil productivity and farmer level recommendation and understand the farmer's attitude towards cattle manure. Use of Manure as a fertilizer increases yields and can avoid total maize crop failure of a farmer Manure quality is important because it indicates the ability to supply nutrients and improve yields. For example, FYM used to be available where cattle are kept, but due to distribution of cattle, it has become more uneven and therefore manure availability becomes a problem (Kajisa and Palanichamy, 2009).

In many traditional agro-ecosystems, smallholder farmers use cattle manure to collect and concentrate plant nutrients. In this way, the management of manure causes a transfer of plant nutrients from grazing land or house to cropping areas which results in substantial contribution to the crop nutrient supply (FAO; 2008).

Cattle manures are valuable when used carefully as fertilizer for crop production and improvement of soil quality. The composition of manures is variable due to factors of housing, beddings and feeds, this being true even for the manure of one animal category. When manure is applied to the surface of grassland soils, the manure materials will normally be incorporated by soil fauna, particularly earthworms. This organic matter and the activities of soil fauna will have a positive effect on the soil physical properties (FAO; 2008). This is because the nutrients contained in cattle manure are not immediately available for use by plants, but must first be broken down by soil microorganisms in order to release the nutrients in a form that plants will be able to utilize, a process called mineralization (KATC, 2004).

Time of application, method and rate of manure application are very important for efficient nutrient uptake and for minimizing environmental risk in farming system. This means that applying the manure just before the start of crop growth activate nutrient uptake. The rate of manure application does not exceed the nutrient requirement of the crop. Either application method does not limit nitrogen losses in form of

ammonium ions. Also rate of application should avoid damaging the soil (e.g. compaction) and crop development.

However, application of cattle manure differs among smallholder farmers depending on the crop type. For example, in the study by Jackson (2005) was reported that 58% of respondent farmers utilized most of their manure on maize plots. This could be due to the importance of the maize crop in food security and high economic return to farmers. The application Farm Yard Manure (FYM) reduced infestation by striga species and improved crop yield (Leanard 1986). Farmers in Nigeria commonly apply cattle dung through broadcasting on the soil surface (Gana, 2010). According to Gana, this method is cheap, simple and easy, and does not require the use of any special equipment. Women who cultivate chewing sugarcane find it also easy. Farmers worked the inorganic fertilizer into the top 5 to 7cm of soil and being careful not to damage plant roots by applying too close to roots (Gibberd, 1995). Row or band fertilizing is a common and economical method of application (Hseih, 1996).

Economic Effect of Inorganic Fertilizer on the Performance of Maize production

Chemical fertilizers are used in modem agriculture to correct known plant- nutrient deficiencies; to provide high levels of nutrition, which aid plants in withstanding stress conditions; to maintain optimum soil fertility conditions; and to improve crop quality. Adequate fertilization programmes supply the amounts of plant nutrients needed to sustain maximum net returns (Leonard, 1986). In essence, fertilizers are used to make certain that soil fertility is not a limiting factor in crop production. Chemical fertilizer application improved the soil organic C, total N, P and K status. Increase in microbial biomass C and N was observed in soils receiving organic manures only or with the combined application of organic manures and chemical fertilizers compared to soils receiving chemical fertilizers. Fertilizer applications improved the soil as opposed to heavy fertilizer doses alone or mere application of crop residues. Quansah (1998) and Prasad (1996) also obtained significant increase in crop yields when a combination of organic and mineral fertilizers was applied compared with sole application of organic or mineral fertilizer (Prasithikhet *et al.*1993).

Effect of Organic Fertilizer Mix with Inorganic fertilizer on the Performance of Maize Production

Microorganisms play important roles in ecological functions of soils, such as nutrient cycling and degradation of organic pollutants. Biological fertilizer can enhance soil microbial activity of the soil, such as improving the activity of soil enzymes and increasing soil microbial biomass, Organic fertilizers which are from animal byproduct and crop residues contain high level of nutrients, organic matter content, and a variety of micronutrients which are used as fertilizers for organically grown fields. The soil quality could be improved with the application of organic manure and is more profitable in the environment protection in contrast to the application of chemical fertilizers alone. Organic matter inclusion in the form of farmyard manure has proven to enhance soil structure and water retention, decrease bulk density and increase infiltration rates. However, the supply of plant available nitrogen deficiency from organic fertilizer which is due to slow rate of mineralization lowers crop yields compared to those treated with chemical fertilizer Neither organic nor inorganic amendments alone are able to maintain organic matter status of soil and maintain the productivity in semi-arid tropic. A combined application of organic and inorganic sources of nutrients is important to maintain soil health and improve nutrient efficiency.

The method of applying combined organic manure and inorganic fertilizers as a total basal dressing is useful to the balanced nutrient release and reduction of N loss, which increased the N use efficiency. The combined application of commercial organic manure and inorganic fertilizers proved to be an effective way to fertilize plants. The nutrient removal and by crops and the addition of nutrient to soil from fertilizers or manure are crucial in the nutrient balance of cropping system. Generally, the immobilization and mineralization of N can be affected by the application of manure, which promotes the release of soluble P and speeds up the process of the release of structural K causing it to be closer to that needed by the crops. They also believe that the application of organic manure is more profitable in environment protection and could enhance soil quality compared with chemical fertilizer application alone hence, this will eventually increase crop production.

MATERIALS AND METHODS

Experimental Site: The field trial was conducted at the Food and Agricultural organization/ Tree Crop Production (FAO/TCP) Research Farm of Adamawa State University Mubi, during 2018 cropping season. Mubi is geographically located within Latitude 10^{o} 05" N of the equator and longitude 13^{o} 16" E Green wish

meridian time on altitude of 696m above the sea level. The mean annual rainfall of Mubi ranges from 700mm to 1,050mm (Adebayo, 2004). The climate is characterized by alternating dry and wet season. The rain begins from April to October. The vegetation is typically Sudan savannah type, which comprises of grass land interpose by shrubs and few trees mostly acacia, locust bean and eucalyptus among others (Adebayo, 2004).

Experimental Design: The experimental area was 15m x 20.5m (307.7m^2), the gross plot size was 4m x 3m (12m^2), 1.5m and 1m was left between block and between plots respectively. The net plot was 2m x 2m = 4m^2. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications in FAO/TCP Research farm Adamawa State University Mubi.

Treatments: The treatments consisted of organic fertilizer, inorganic fertilizer, combination of organic and inorganic fertilizer and control. **A,**T_1 = NPK 400kg per ha, B,T_2 = Organic (cow dung) 20 tons per ha, C,T_3 = Combination (200kg NPK and Cow dung 10 tons per ha) and D,T4 = Control

Cultural Practices

Land Preparation and Layout: The Experimental field was cleared and ploughed with Tractor and was level manually with hoe. The field was laid out according to experimental design.

Sowing and Spacing: The seeds for this research (white maize) were obtained from open market. The sowing was done on June 11th, 2018, two seeds were sown per hill at the spacing of 25cm x 75cm and thinned to one plant per stand at 2 weeks after sowing (WAS).

Fertilizer Application: Compound NPK fertilizer 15:15:15 grade was applied at 2 WAS according to the rate for each treatment. The remaining half dose of N was applied at 6 WAS in the form of Urea (46%N). Organic fertilizer (Cow dung) was incorporated with the top soil during land preparation.

Weed Control: Hand-weeding was carried at 3 weeks interval starting from 3 WAS. The weeded weeds were allowed to decompose in the field.

Data Collection:

Plant Height (cm): By the use of measuring tape, the height of five tagged plants selected randomly in each net plot were measured from the ground level to the last flag leaf at 3, 6, and 9 WAS and their means determined.

Number of leaves per plant: Number of leaves from five randomly selected plants was tagged, the plant samples in each net plot was counted at 3, 6 and 9 WAS and their mean determined.

Stem girth (cm): Stem girth at 5 cm above ground was measured from 5 randomly selected and tagged plants in each net plot at 3, 6 and 9 WAS. This was done using Vernier calipers and their means values were recorded.

Phenological Character

Day to 50% tasseling: This was determined for each net plot as the number of days from sowing to the time that 50% of the plants in the net plots produced tassel.

Day to 50% Silking: This was determined for each net plot as the number of days from sowing to the time that 50% of the plants in the net plots produced silk.

Yield Components

Number of seed per row: Number of seed per row from five randomly selected and tagged plants sampled in each net plot was counted at 3, 6 and 9 WAS and their mean determined.

Ear height at harvest (cm): By the use of measuring tape the ear height of five tagged plants selected randomly in each net plot were measure from the ground level to the ear where attached to plant at 3, 6 and 9 WAS their determined.

Corn weight (g) per plot at harvest: Corn weight was collected from the yield in each net plot and the weight determined.

Corn length (cm): By the use of measuring tape the length of five tagged plants selected randomly in each net plot were measured and their mean determined.

Cob diameter after shelling: The mean diameter of five samples from each plant was determined using Vernier calipers.

Shelling Percentage: The shelling percentage of maize in each net plot was calculated as follows:

$$\text{Shelling \%} = \frac{\textit{Grain weight after shelling}}{\textit{Corn weight before shelling}} \times 100$$

100 grains weight (g): Hundred grain were collected from the yield in each net plot and the weight determined as grain yield (kgha^{-1}).

Yield per hectare (kgha^{-1}): Yield per hectare was calculated from grain yield per plot and recorded.

Statistical Analyses: The data acquired was subjected to analysis of variance (ANOVA). The means of treatment found to be significantly different at $p \leq 0.5$ were separated using the (LSD) least significant difference method.

RESULTS

Physical and Chemical Properties of Soil of the Experimental Site

A composite soil sample from 0 – 30cm depth was collected using augur from eight different points of the experimental area and some of its physical and chemical properties before and after harvest were determined as presented in Table 1.

Table 1. Soil Physical and Chemical Properties of the Experimental Site

EXPERIMENTAL SITE	Before	After
Physical Properties	**2018**	
Particle size analysis (%)	55.2	59.3
Sand	55.2	59.3
Silt	32.6	30.6
Clay	12.2	15.1
Soil texture	Sandy loam	Sandy loam
Chemical Properties		
Soil P^H 1:2 (H_2O)	6.42	6.50
Organic carbon (Kg^{-1})	4.10	3.75
Cat ion exchange capacity [cmoi (+) kg^{-1}]	3.10	3.25
Available nitrogen (g/kg^{-1})	0.20	0.21
Available Phosphorus (Mg/kg^{-1})	7.21	6.81
Available potassium ($Mgpkg^{-1}$)	0.50	0.45
Available Magnesium [(cmoI (+) kg^{-1}]	7.21	6.81
Available Sodium [cmoI (+) kg^{-1}]	0.37	0.36
Available Calcium [CmoI (+) kg^{-1}]	2.20	2.16

Plant height at 3, 6 and 9 weeks after sowing (WAS)

The percent mean plant height of maize as influenced by different source of fertilizer is presented in Table 2. The mean growth stages shows that, cow dung has the tallest plant at 3 WAS with 18.27cm, followed by NPK with 18.01cm while combination of cow dung and NPK recorded 15.66cm and the control recorded 13.96cm. At 6 WAS the trends was similar as cow dung has recorded the tallest plant with 49.02cm followed by NPK applied with 48.52cm while combination gave 46.11cm and the controlled plots gave 41.06cm. This is in agreement with IITA (2009) on Nigerian maize production. There was a little variation at 9 WAS with NPK applied gave the tallest plant with 192.28cm, followed by combination of NPK and cow dung (T3) then organic had 190.28cm, then organic with 179.28cm and lastly the controlled with 173.00cm respectively.

Table 2: Mean plant height of maize (*Zea mays*) influence by different source of fertilizer

Treatment	3 WAS	6 WAS	9 WAS
A	18.00[a]	48.52[a]	192.28[a]
B	18.27[a]	49.02[a]	179.22[a]
C	15.66[a]	46.11[a]	190.28[a]
D	13.96[a]	41.06[a]	173.00[a]
Probability	0.28	0.43	0.35
L.S.D	5.50	12.34	27.49

Means in the same column followed with the same letter are not significantly different

But at the early stages of growth cow dung has dominated in terms of tallness of plants in all the treatments but at 9 WAS NPK supersede cow dung, this indicates that, NPK last longer for effective utilization by plants than cow dung which shows diminishing returns at old age of the plant growth.

Number of Leaves at 3, 6 and 9 WAS.

The number of leaves per plant at 3, 6, and 9 WAS is presented on table 3 below. The table indicates that, cow dung and combination has the highest number of leaves at 3 WAS with 7 leaves each per plant, followed by NPK applied with 6 leaves and control had 5 leaves, while at 6 WAS NPK treatment has the highest number of leaves (11) per plant, and at 9 WAS and there were no difference between the rest of the treatments in terms of leaves number at 6 WAS as all had 10 leaves per plant. At 9WAS, NPK and NPK combination of cow dung recorded 13 leaves per plant followed by cow dung with 12 and control had the least of 10 numbers of leaves per plant. It is in line with the work of Rhesus 2006 on soil nutrient status and cover crops in maize production.

Table 3: Means number of leaves of Maize (*Zea mays*) influence by different source of fertilizer

Treatment	3 WAS	6 WAS	9 WAS
A	6.33^{ab}	11.22^{a}	13.72^{a}
B	7.23^{a}	10.89^{a}	12.11^{ba}
C	7.22^{a}	10.89^{a}	13.17^{a}
D	5.61^{b}	10.50^{a}	10.94^{b}
Probability	0.02	0.54	0.05
L.S.D	1.04	1.14	2.01

Means in the same column followed with the same letter are not significantly different

Stem girth: Table 4 presents the mean stem girth of as influenced by different sources of fertilizers. Significant differences was only recorded at 9 WAS with combination recording the highest stem girth of 6.33cm while NPK and cow dung followed with 4.94 and 4.60 respectively. The least stem girth was recorded at 3WAS at the control plots with 1.31cm.

Table 4: Mean stem girth of maize (*Zea mays*) influence by different source of fertilizer

Treatment	3 WAS	6 WAS	9 WAS
A	2.58^{a}	2.45^{a}	4.94^{a}
B	1.84^{ab}	2.27^{ab}	4.60^{a}
C	1.88^{ab}	2.34^{ab}	6.33^{a}
D	1.31^{b}	1.967^{b}	2.13^{a}
Probability	0.04	0.15	0.47
L.S.D	0.79	0.44	6.22

Means in the same column followed with the same letter are not significantly different

The highest mean corn weight was recorded at treatment 3, combination of NPK and cow dung with 1,642.1g closely followed by NPK applied with 1,535.2g while the least was recorded at control with 789.9g. corn length were at par with NPK applied and combination of NPK and cow dung with 17.30cm. the trends in corn weight also followed in corn length while it varies in number of seeds per row as there were no significant differences observed on number od seeds per row on all the treatments. But significant difference were recorded in terms of ear height with NPK applied and NPK and cow dung recorded the highest ear height of 107.93 and 107.38 respectively. Closely followed by cow dung applied while the control recorded the least with 92.50cm as can be seen on table 5 below.

Table 5: Mean Corn Weight, Corn length, Number of seeds per row and Ear height at harvest of Maize (*Zea mays*) as influenced by different source of fertilizer

Treatment	Corn W	Corn L	No of S	Ear Height
A	1535.2[ab]	17.33[a]	14.77[a]	107.95[a]
B	1058.9[bc]	15.73[ab]	15.53[a]	98.06[a]
C	1642.1[a]	17.30[a]	15.20[a]	107.38[a]
D	789.9[c]	13.60[b]	14.07[a]	92.50[a]
Probability	0.01	0.07	0.40	0.44
L.S.D	508.43	2.34	2.05	25.69

Means in the same column followed with the same letter are not significantly different

In terms of 100 grain weight, NPK treated has the highest mean number with 22.77g closely followed by organic cow dung applied with 20.62g. For grain yield per hectare, the results showed that, NPK applied recorded 4,620.60kg per hectare following by combination of NPK and cow dung followed with 4,430.70kg. The results are in line with the work of Singh 2003 on modern techniques of raising field crops. Cow dung applied recorded 3,990.60kg and control having the least with 2,035.20kg per hectare respectively, table 6.

Table 6: Means 100 grain weight and grain yield per hectare

Treatment	100GW	GYPH
A	22.77[a]	4620.6[a]
B	20.62[a]	3.9956[a]
C	17.77[b]	4430.7[a]
D	13.26[c]	2035.2[b]
Probability	0.00	0.00
L.S.D	2.60	1024.1

Means in the same column followed with the same letter are not significantly different

DISCUSSION

The effects of organic and inorganic fertilizer on growth parameter of maize, showed that NPK response well than the combines and sole cow dung applied at almost all stages of growth. The exceptions are on the number of leaves where cow dung applied and combination of cow dung and NPK produces the highest number of leaves at 3 WAS. Stem girth was better with combination at 3 WAS but at 6 and 9 WAS NPK supersedes in stem girth, though with just a slight difference. Regarding to tasseling and silking, plants that were supplied with NPK produced earlier tassels and silk at 9WAS.

Plant that were supplied with NPK and combination of NPK and cow dung produced the tallest plants at harvest while combine ones has the highest corn weight follow by NPK. In terms of seed per con, cow dung produced the best number of seed per corn followed by combination of cow dung and NPK, the control has the least. The trends followed in corn diameter before shelling and after shelling, but NPK applied has the highest shelling percentage and 100 grain followed by those supplied with cow dung. NPK alone gives the highest yield of 45 bags of 100kg/ha.

CONCLUSION AND RECOMMENDATION

The effect of organic and inorganic fertilizer on the growth and yield parameter of maize has significant difference. The tallest plants were obtained with those applied with NPK, while control has the shortest plant. NPK also records shorter days to tasseling and silking with 59 and 62 days respectively, while control records 61 and 63 days.' Plant supplied with NPK applied gave the highest yield of 4,620.6kg/ha^{-1}.

The research shows that application of NPK gives significantly higher yield and weight than plant that are supplied with cow dung and NPK cow dung combined.

The study recommends that the farmers are advised to adopt the proper method and time of application of NPK in their farms for higher yield. Therefore, application of NPK should be adopted for greater achievement in terms of yield production and higher income..

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