STATISTICAL ANALYSIS OF THE EFFECTS OF POULTRY MANURE AND NPK FERTILIZER ON THE YIELD OF MAIZE

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ABSTRACT: This study is aimed at analysing the effects of Poultry manure and NPK fertilizer on fresh weight, dry weight and yield of Maize at the Institute of Agricultural Research and Training, Moore Plantation, Apata, Ibadan in 2015 and 2016 Cropping Sessions. The study adopted the statistical model for analysing the effects of Poultry manure and NPK fertilizer applications on the growth and yield of Maize (Zea Mays). This model was based on factorial experiment and the results obtained showed that poultry manure and NPK fertilizers equally contributed significantly to the fresh plant weights of maize for a bumper harvest while the interaction of the two factors did not indicate any significant difference. In the analysis of dry weight of maize the contribution of the two factors considered was the same to the quality of dry weight of maize.The results also showed that the two factors contributed greatly to the quality and bumper harvest of maize. However, the interaction of the factors gave the impression that poultry manure and NPK fertilizer have equal contributions to the quality and bumper harvest of seed yield of maize.

***KEYWORDS*:** Analysis, Factorial experiment, Maize, Model, Yield.

1. INTRODUCTION

Maize (Zea mays) is the third most important cereal that is next to wheat and rice. This crop is commonly cultivated in the tropics and warm sub-tropics for food, livestock and other industrial uses. In Nigeria, maize is considered as an important food, fodder and industrial crop grown both commercially and as subsistence crop. Maize is used for the production of indigenous and commercial food products that are enjoyed for their unique and distinctive flavours. It can be eaten fresh or milled into flour and serves as a valuable ingredient for baby food, cookies, biscuits, ice cream, pancake mixes, livestock feed and a variety of traditional beverages. Efforts made to obtain a high yield of maize would necessitate the augmentation of the nutrient status of the soil in order to meet the crop's requirements for optimum productivity and maintenance of soil fertility. The nutrient status of the soil can be increased by boosting the soil nutrient content either by the use of inorganic fertilizers such as NPK fertilizer or organic materials such as poultry manure, farm yard manure or the use of compost Annual Report ([IIT87]).

In fact, maize crop requires an adequate supply of nutrients particularly nitrogen, phosphorus and potassium (NPK) for optimum growth and yield. The most important micronutrients especially in the savannah zone and under continuous cropping in the forest ecology are sulphur, zinc and magnesium. Nitrogen, a major component of poultry manure is associated with high photosynthetic activity, vigorous vegetative growth and a dark green colouration of the leaves. At the other extreme, excessive supply of nitrogen may result in luxury consumption and the production of vegetative growth at the expense of high grain yield. Being a heavy feeder of nitrogen, adequate supply of nitrogen can be a limiting factor closely associated with the magnitude of its yield. The optimum fertilizer requirement recommended for optimum yield of the maize crop in South-Eastern Nigeria is 300 – 450 Kg/ha of NPK. This study was limited to only few experimental locations. The study conducted by the International Institute of Tropical Agriculture ([IIT90]) has shown that the application of fertilizer both from organic and inorganic sources significantly improves the growth and yield of maize. Thus, an integral use of both organic and inorganic fertilizer to ensure adequate supply of plant nutrients and sustain maximum crop yield and profitability has been advocated. However, inorganic fertilizer is expensive and may be largely unaffordable and not available to the resource-poor farmers in Nigeria. Conversely, organic manure such as poultry droppings is readily available as a cheap source of nitrogen for sustainable crop production. Organic fertilizer supplies the essential micro and macro nutrient elements to plants, as well as improves soil physico-chemical conditions for better growth and yield of maize. The application of poultry manure is expected to enhance soil productivity, increase the soil organic carbon content, soil flora and fauna and improve soil crumb structure and the nutrient status of the soil towards attaining sustainably high yields.

The role of organic manure in maintaining organic matter and raising the growth and yield of cereal crops had long been recognized in most agro-ecological zones. Poultry manure is the richest animal manure in NPK relative to other organic manures such as cow, horse, steer, sheep, swine and rabbit manure. The nutrient value in these manures varies greatly depending on the diet and age of the animals ([ATB01]). In view of the significance of maize as a grain crop and the role of Poultry Manure and NPK fertilizers in its high productivity, this study is, therefore, aimed at examining the effects of varying Poultry Manure and NPK fertilizer on the growth and yield of maize. Many experiments have been carried out in different countries of West Africa on the application of fertilizers to crops and soil fertility trials have also been conducted not only on tree and economic crop but also on animal and food crops such as okro, cassava, maize and tomatoes among others in Nigeria, Ghana and Senegal. The results of such efforts were reviewed by ([AO82]). Early work at the International Institute of Tropical Agriculture ([IIT74]) also involved the applications of fertilizers. This paved way for a number of Nitrogen, Phosphorus or NPK fertilizers and Poultry manure trials to be carried out on okro, oranges and tomatoes on peasant and experimental farms in various parts of Western Nigeria ([IIT84]). [Oje00] affirmed that the idea of using all combinations of various sets of treatments in fertilizer experiments is archaic. [PA17] also conducted a study on the factorial analysis of the effect of NPK fertilizer on the yield of white yam.

The treatments involved this study were measured on four rates of Poultry Manure (0, 500, 1000 and 1500 kgha-1) and NPK fertilizer levels (0, 100, 200, 300). Poultry manure was applied into the soil exactly one week before planting while the NPK fertilizers were applied at two weeks after sowing. Maize seeds were planted at a spacing of 30 cm by 50 cm and at rate of 5-10kg of seeds/ha. The data collected for this study includes fresh weight, dry weight and yield of maize. A study was carried out a study on the effects of application timing on maize production using poultry manure [OKC09]. In their study, low soil fertility was identified as a major factor militating against crop production in many tropical cropping systems where the amount of fertilizers used was low and agricultural residues were not returned to the soil for its rejuvenation. As a result of this, the performance of maize (Zea mays) in response to application of a uniform rate of 30 t/ha of fresh poultry manure was studied on a loamy soil at Ilorin in the southern Guinea savannahof Nigeria to determine the effects of poultry manure application timing on maize production.

2. MATERIALS AND METHODS

This study adopted the statistical model for analysing the effects of Poultry manure and NPK fertilizer applications on the growth and yield of Maize (Zea Mays). The statistical model employed was based on factorial experiment and is given by:

$$Y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \varepsilon_{ijk} \quad (1)$$

where *i= 1,2,3,4;j=1,2,3,4;k=1,2; a=4; b=4; n=2*
Y_{ijk} is the k^{th} observation taken under the i^{th} level of NPK and j^{th} level of poultry manure, μ is the overall mean effect, τ_i is the level of NPK effect, β_j is the effect of the j^{th} rate of manure, $(\tau\beta)_{ij}$ is the effect of interaction between NPK fertilizers and poultry manure and ε_{ijk} is the random error component. The Latin notations given in equation 1 are as defined below:
a= number of levels of NPK effect.
b = number of rates of poultry manure.
n = number of observation at each level
The factorial experimental methodology is preferred to a sequence of experiments investigating the factors separately ([Oeh10]). The principles of this factorial methodology are the main and interaction effects in its model. The secondary data collected from the Institute of Agricultural Research and Training, Moore Plantation, Apata, Ibadan were used in this study. The model assumes that the population is normally and independently distributed with mean μ and variance σ^2, that is, $Y_{ijk} \sim (\mu, \sigma^2)$, the error terms are normally and independently distributed with mean, $\mu = 0$ and variance σ^2 ,that is, $e_{ijk} \sim (0,\sigma^2)$, the NPK effects and poultry manure rates are additive and sum of their effects are equal to zero, that is, $\sum \tau_i = \sum \beta_j = 0$, the interaction effects of NPK and Poultry manure are additive and their sums are also equal to zero and there are abn total observations in the experiment conducted. The Analysis of Variance (ANOVA) was given in Table 1which gave the partitioning of the total sum of squares into recognizable sources of variation.The total corrected sum of squares (SST) is:

$$SST = \sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n}(Y_{ijk} - \bar{Y}_{...})^2$$

$\sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n}[(\bar{Y}_{i..} - \bar{Y}_{...}) + (\bar{Y}_{J.} - \bar{Y}_{...}) + (\bar{Y}_{ij.} - \bar{Y}_{i..} - \bar{Y}_{J.} + Y... + (Yijk - Y...)2]$

$=bn\sum_{i=1}^{a}(\bar{Y}_{i..} - \bar{Y}_{...}) + an\sum_{i=1}^{a}(\bar{Y}_{J.} - \bar{Y}_{...}) + bi=1aj=1bYij.-Y.J.+Y...+i=1aj=1bk=1n(Yijk-Y...)2$ (2)

Then SST is given as:

$$SST = SSN + SSP + SSNP + SSE \quad (3)$$

The number of degree of freedom with each sum of square is also given in Table 1.
where MSE = *SSE /ab(n-1)*
In computations, the sums of squares are defined as:

$$SST = \sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}^2 - \frac{Y_{...}^2}{abn} \quad (4)$$

$$SSN = \sum_{i=1}^{a}\frac{Y_{i..}^2}{bn} - \frac{Y_{...}^2}{abn} \quad (5)$$

$$SSP = \sum_{j=1}^{b}\frac{Y_{.j}^2}{an} - \frac{Y_{...}^2}{abn} \quad (6)$$

The sum of squares between the ab cell totals would be first obtained, and referred to as the sum of squares due to subtotals

$$Subtotals = \sum_{i=1}^{a}\sum_{j=1}^{b}\frac{Y_{ij.}^2}{n} - \frac{Y_{...}^2}{abn} \quad (7)$$

$$SSI = SS_{subtotals} - SSN - SSP \quad (8)$$

$$SSE = SST - SSI - SSP - SSN = SST - SS_{subtotals} \quad (9)$$

The data collected is given in Table 2 showing the poultry manure and the NPK fertilizers measured in kg/ha at varying levels applied on the fresh and dry weight as well as the seed yield of maize. The sums of observations in each level of poultry manure and NPK fertilizer for the fresh weight and dry weight of maize are given Table 3 and Table 4, respectively.

Table 1: Analysis of variance (ANOVA)

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	F_{cal}
NPK	*a -1*	SSN	*A=SSN/(a-1)*	*A/D*
Poultry Manure	*b – 1*	SSP	*B=SSP/(b-1)*	*B/D*
Interaction	*(a – 1) (b –1)*	SSI	*C =SSI/(a-1)(b-1)*	
Error (E)	*ab (n -1)*	SSE	*D = SSE /ab(n-1)*	
Total (T)	*abn – 1*	SST		

Table 2: Observations on fresh weight, dry weight and yield of maize in 2015 and 2016 cropping sessions for poultry manure and NPK fertilizer levels

Poultry Manure (kg/ha)	NPK kg(/ha)	Fresh Weight (g)		Dry Weight (g)		Seed Yield (kg)	
		2015	2016	2015	2016	2015	2016
0	0	673.5	667.5	238.2	272.0	3477	2978
	100	701.3	817.5	246.5	556.7	3764	3228
	200	728.4	891.6	249.9	654.0	4111	3605
	300	756.7	846.7	257.0	700.0	4299	3681
500	0	763.5	920.5	254.8	641.7	4213	3818
	100	803.3	979.5	265.3	687.0	4652	3994
	200	823.7	1020.0	268.6	708.7	5029	4127
	300	857.7	1058.7	275.9	715.3	5354	4358
1000	0	839.0	1018.2	271.9	692.7	5041	3066
	100	883.2	1093.7	282.8	730.0	5352	4584
	200	911.9	1118.0	288.4	737.3	5818	4766
	300	942.3	1140.0	294.1	752.0	5978	4996
1500	0	954.3	1068.3	293.4	725.0	5865	5153
	100	984.1	1135.0	300.0	765.2	6364	5258
	200	1011.7	1152.3	310.0	784.0	6455	5603
	300	1037.8	1186.0	315.3	805.7	6822	5828

Table 3: Sum of observations in each level of the two factors for the fresh weight of maize

Poultry Manure (Kg/ha)	NPK fertilizer (kg/ha) (Fresh Weight in gram)				
	0	**100**	**200**	**300**	**Total**
0	1341	1519	1620	1603	**6083**
500	1684	1783	1844	1916	**7227**
1000	1857	1977	2030	2082	**7946**
1500	2022.6	2119.1	2164	2223.8	**8529.5**
Total	**6904.6**	**7398.1**	**7658**	**7824.8**	**29785.5**

Table 4: Sum of observations in each level of the two factors for the dry weight of maize

Poultry Manure (Kg/ha)	NPK fertilizer (kg/ha) (Dry Weight in gram)				
	0	**100**	**200**	**300**	**Total**
0	510.2	803.2	903.9	957	**3174.3**
500	896.5	952.3	977.3	991.2	**3817.3**
1000	964.6	1012.8	1025.7	1046.1	**4049.2**
1500	1018.4	1065.2	1094	1121	**4298.6**
Total	**3389.7**	**3833.5**	**4000.9**	**4115.3**	**15339.4**

3. STATISTICAL ANALYSIS OF THE DATA AND RESULTS OF THE ANALYSIS

The fixed effect model given in equation 1 was used in the analysis. The sums of squares of the respective factors were estimated and the ANOVA results were presented in tables and decisions as well as conclusion was made based on the results obtained in the study.

$$Corrected\ Factor(CF) = \frac{\left(\sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}\right)^2}{abn}$$

$$CF = \frac{(Y_{...})^2}{abn} = \frac{(29785.50)^2}{4X4X2} = \frac{887176010.80}{32}$$

= 27724250.32g/ha

The sums of squares of Poultry Manure (factor) and NPK fertilizer (factor) are:

$$SS(Poultry\ Manure) = \frac{\sum_i^a Y_{i..}^2}{bn} - CF$$

$$= \frac{6083.20^2 + \cdots + 8529.50^2}{4X2} - 27724250.32$$

$$= \frac{225123704.30}{8} - 27724250.32$$

= 416187.415g/ha

$$SS(NPK) = \frac{\sum_j^b Y_{.j.}^2}{an} - CF$$

$$= \frac{6904.60^2 + \cdots + 7824.80^2}{4X2} - 27724250.32$$

$$= 27784730.48 - 27724250.32$$

$$SS(NPK) = 60480.15625 g/ha$$

The sums of squares of the interaction between Poultry Manure and NPK fertilizer effects, total and error are estimated as:

$$SS(Poultry\ Manure/NPK) = \frac{\sum_i^a \sum_j^b \sum_k^n Y_{ij.}^2}{k} - CF - SS(Poultry) - SS(NPK)$$

$$= \frac{(1341^2 + 1519^2 + \cdots + 2223.80^2}{2} - 27724250.32) - 416212.7113 - 60480.15625$$

= 479883.685-476692.8676

SS(Poultry Manure/NPK)= 3190.81745 g/ha

$$SST = \sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}^{\ 2} - CF$$

$$= 673.5^2 + 667.5^2 \ldots + 1186^2 - 27724250.32$$

$$= 689866.61$$

$$SST = 689866.61 g/ha$$

SSE = SST – SS (PM) – SS (NPK) – SS (Poultry/NPK)

= 689866.61 – 416212.7113 – 60480.15625 – 3190.81745

SSE =209982.925

The estimated results as given above are summarized in Table 5.

Table 5: ANOVA for plant fresh weight of maize

Source of Variation	Degree of freedom	Sum of squares	Mean sum of squares	F_{cal}	F_{tab}
Poultry Manure	3	416212.7113	138737.5704	10.57	$F_{0.05,(3,15)}$ =0.83
NPK	3	60480.15625	20160.05208	1.54	$F_{0.05,(3,15)}$ =0.83
Poultry Manure & NPK	9	3190.81745	354.5353	0.027	$F_{0.05,(9,15)}$ =0.96
Error	16	209982.925	13123.9328		
Total	31	689866.61			

The results presented in Table 6 showed that F_{cal} (10.57) > F_{tab} (0.83), this implies that there is significant difference among the poultry manure levels, and as a result of this, poultry manure has significant contribution to fresh plant weight of maize. The F_{cal} (1.54) > F_{tab} (0.83), implies that there is significant difference among the NPK fertilizer levels and thus, NPK fertilizer levels do affect the fresh plant weights of maize positively for bountiful harvest. The result also showed that F_{cal} (0.027) < F_{tab} (0.96) and therefore the quality of interaction between the levels of Poultry manure and NPK fertilizer has no significant difference.

$$Corrected\ Factor(CF) = \frac{\left(\sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}\right)^2}{abn}$$

$$CF = \frac{(Y_{...})^2}{abn} = \frac{(15339.4)^2}{4X4X2} = \frac{235297192.40}{32}$$

= 7353037.261g/ha

The sums of squares of Poultry Manure (factor) and NPK fertilizer (factor) are:

$$SS(Poultry\ Manure) = \frac{\sum_i^a Y_{i..}^2}{bn} - CF$$

$$= \frac{3174.3^2 + 3817.3^2 + \cdots + 4298.6^2}{4X2} - 7353037.261$$

$$= \frac{59521942.38}{8} - 7353037.261$$

= 87205.5365g/ha

$SS(Poultry\ Manure)$ = 87205.5365g/ha

$$SS(NPK) = \frac{\sum_j^b Y_{.j.}^2}{an} - CF$$

$$= \frac{3389.7^2 + 3833.5^2 \ldots + 4115.3^2}{4X2} - 7353037.261$$

$$= 7391085.405 - 7353037.261$$

$SS(NPK)$ = 38048.144g/ha

The sums of squares of the interaction between Poultry Manure and NPK fertilizer effects, total and error are estimated as:

$$SS(Poultry\ Manure/NPK) = \frac{\sum_i^a \sum_j^b \sum_k^n Y_{ij.}^2}{k} - CF - SS(Poultry) - SS(NPK)$$

$$= \frac{(1341^2 + 1518.80^2 + \cdots + 2223.80^2}{2} - 7353037.261) - 87205.5365 - 38048.144$$

=7507184.03-7353037.261- 87205.5365 – 38048.144

SS(Poultry Manure/NPK)= 28893.0885 g/ha

$$SST = \sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}^{\ 2} - CF$$

$$= 238.2^2 + 272^2 \ldots + 315.3^2 - 7353037.261$$

$$= 1567795.279$$

$$SST = 1567795.279 g/ha$$

SSE = SST – SS (PM) – SS (NPK) – SS (Poultry/NPK)

= = 1567795.279 – 87205.5365 – 38048.144 – 28893.0885

SSE =1413648.51g/ha

The estimated results as given above are summarized in Table 6.

The results presented in Table 6 revealed that F_{cal} (0.308) < F_{tab} (0.83), this implies that there is no significant difference among the poultry manure levels, and as a result of this, poultry manure has no significant contribution to the dry plant weight of maize. The F_{cal} (0.135) < F_{tab} (0.83), implies that there is no significant difference among the NPK fertilizer levels and thus, NPK fertilizer levels do not affect the dry plant weights of maize. The result also showed that F_{cal} (0.034) < F_{tab} (0.96) and therefore the quality of interaction between the levels of Poultry manure and NPK fertilizer has no significant difference. The analysis is also carried out on the seed yied of maize using the poultry manure and NPK fertilizer.

Table 6: ANOVA for plant dry weight of maize

Source of Variation	Degree of freedom	Sum of squares	Mean sum of squares	F_{cal}	F_{tab}
Poultry Manure	3	87205.5365	29068.512	0.308	$F_{0.05,(3,15)}$ =0.83
NPK	3	38048.144	12682.715	0.135	$F_{0.05,(3,15)}$ =0.83
Poultry Manure & NPK	9	28893.0885	3210.343	0.034	$F_{0.05,(9,15)}$ =0.96
Error	15	1413648.51	94243.234		
Total	31	1567795.279			

Table 7: Sum of observations in each level of the factor for the seed yield of maize

Poultry Manure (Kg/ha)	NPK fertilizer (kg/ha) (Seed Yield in kg)				
	0	**100**	**200**	**300**	**Total**
0	6455	6992	7716	7980	**29143**
500	8031	8646	9156	9712	**35545**
1000	8107	9936	10584	10975	**39602**
1500	11018	11622	12058	12650	**47348**
Total	**33611**	**37196**	**39514**	**41317**	**151638**

$$Corrected\ Factor\ (CF) = \frac{\left(\sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}\right)^2}{abn}$$

$$CF = \frac{(Y_{...})^2}{abn} = \frac{(151638)^2}{4X4X2} = \frac{22994083040}{32}$$

CF = 718565095.10 g/ha

The sums of squares of Poultry Manure (factor) and NPK fertilizer (factor) are:

$$SS(Poultry\ Manure) = \frac{\sum_i^a Y_{i..}^2}{bn} - CF$$

$$= \frac{29143^2 + \cdots + 47348^2}{4X2} - 718565095.10$$

$$\frac{5922912982}{8} - 718565095.10$$

$$= 740364122.80 - 718565095.10$$

= 21799027.65g/ha

Finding the Sum of Squares of NPK Fertilizer factor

$$SS(NPK) = \frac{\sum_j^b Y_{.j.}^2}{an} - CF$$

$$= \frac{33611^2 + \cdots + 41317^2}{4X2} - 718565095.10$$

$$= 722711552.80 - 718565095.10$$

$$SS(NPK) = 4146457.65\text{g/ha}$$

The sums of squares of the interaction between Poultry Manure and NPK fertilizer effects, total and error are estimated as:

$$SS(Poultry\ Manure/NPK) = \frac{\sum_i^a \sum_j^b \sum_k^n Y_{ij.}^2}{k} - CF - SS(Poultry) - SS(NPK)$$

$$= \frac{(6455^2 + 6992^2 + \cdots + 12650^2}{2} - 718565095.10) - 21799027.65 - 4146457.65$$

= 744991000 - 718565095.10 – 21799027.65 – 4146457.65

SS(Poultry Manure/NPK)= 480420.35 g/ha

$$SST = \sum_{i=1}^{a}\sum_{j=1}^{b}\sum_{k=1}^{n} Y_{ijk}{}^2 - \text{CF}$$

$$= 238.2^2 + 272^2 \ldots + 315.3^2 - 718565095.10$$

$$= 33214118.90$$

$$SST = 33214118.90 g/ha$$

SSE = SST – SS(PM) – SS (NPK) – SS (Poultry/NPK)

= 33214118.90 – 21799027.65 - 4146457.65 – 480420.35

SSE = 6788213.25 g/ha

The estimated results as given above are also summarized in Table 8.

Table 8: ANOVA for plant seed yield of maize

Source of Variation	Degree of freedom	Sum of squares	Mean sum of squares	F_{cal}	F_{tab}
Poultry Manure	3	21799027.65	7266342.55	16.06	$F_{0.05,(3,15)}$ =0.83
NPK	3	4146457.65	1382152.55	3.05	$F_{0.05,(3,15)}$ =0.83
Poultry Manure & NPK	9	480420.35	53380.03889	0.12	$F_{0.05,(9,15)}$ =0.96
Error	15	6788213.25	452547.55		
Total	31	3321411890			

The results presented in Table 8 revealed that F_{cal} (16.06) > F_{tab} (0.83), this implies that there is significant difference among the poultry manure levels, and as a result of this, poultry manure has significant contribution to the plant seed of maize. The F_{cal} (3.05) > F_{tab} (0.83), implies that there is significant difference among the NPK fertilizer levels and thus, NPK fertilizer levels do affect the plant seed of maize. The result also showed that F_{cal} (0.12) < F_{tab} (0.96) and therefore the quality of interaction between the levels of Poultry manure and NPK fertilizer has no significant difference.

4. DISCUSSION OF RESULTS

This study investigated the effects of Poultry manure and NPK fertilizer levels on fresh weight, dry weight and yield of Maize in 2015 and 2016 Cropping Sessions. The results obtained in this study showed that poultry manure and NPK fertilizers equally contributed significantly to the fresh plant weights of maize for a bumper harvest while the interaction of the two factors did not indicate any significant difference.
In the analysis of dry weight of maize, the contribution of the two factors considered was the same to the quality of dry weight of maize. The results also showed that the two factors contributed greatly to the quality and bumper harvest of maize. However the interaction of the factors gave the expression that poultry manure and NPK fertilizer have equal contributions to the quality and bumper harvest of seed yield of maize.

5. CONCLUSIONS

This study concluded that poultry manure and NPK fertilizers equally contributed significantly to the fresh plant weights of maize for a bumper harvest while the interaction of the two factors did not indicate any significant difference. The contribution of the two factors considered was the same to the quality of dry weight of maize. The two factors, poultry manure and NPK fertilizers, contributed greatly to the quality and bumper harvest of maize but the interaction of the factors gave the expression that poultry manure and NPK fertilizer have equal contributions to the quality and bumper harvest of seed yield of maize. Based on the results of the analysis of this study it is recommended that the Institute should use either poultry manure or NPK fertilizer applications for the quality harvest of seed yield of maize as one of these will be sufficient to have quality harvest of the yield of maize for subsequent cropping sessions. Government could also organise a scheme that would educate the farmers and research institutes on the use of fertilizers on crops and fruits once in a while.

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