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Effect of Cow Dungs Rate and Sasakawa Technology on the Performance of Maize (*Zea mays*) In Meeting The Erratic Climate Change In Mubi Guinea Savannah Of Nigeria

Mohammed D. Toungos (Ph.D.)

Department of Crop Production and Horticulture,
Modibbo Adamawa University Yola, Adamawa State, Nigeria.
Corresponding Author Email: dahiru.toungos@gmail.com; toungosm@mautech.edu.ng

ABSTRACT
This experiment was carried out during 2019 and 2020 cropping seasons to evaluate the effect of cow dung rates and Sasakawa technology on the performance of maize and also determines the efficacy of Sasakawa technology to maize yield improvement during the time of erratic climate change and also to meet the demand of the populace in terms of food crop production at the time of unpredictable weather conditions in Mubi, Northern Guinea Savannah. The research was conducted at Food and Agricultural Organization Tree/Crop production farm Adamawa State University, Mubi. The trial was laid out in Randomized Complete Block Design replicated three times. Data was collected on fifteen characters namely: Number of leaves at 3,6 and 9 weeks after sowing also Plant height at 3,6 and 9 weeks after sowing, Cob length, Number of row per cob, Number of seed per row, Cob diameter, Cob yield, Shelling percentage, Grain weight, Grain yield and 100 Grain weight. Results showed a non-significant difference for all the fifteen (15) traits of maize T1 but T4 have better performance. Also, NL3 and NL6, T3, T4 and T5 out performed in terms of yield, NL3 showed a highly significant positive correlation with NL6, NL9, PH3 and PH6 .Cob yield also has slightly and significantly correlation with NL6, CL and NS/R. The treatments responds to variations in the rates of cow dung application during the trial period. As highly significant and positive correlation was observed for NL3, NL6, NL9, PH3, PH6, and PH9 indicating differences in the treatments applied. The experiment revealed that treatment T1, T4 and T1, T4 for NL3, and NL6 gave highest performance than other treatments, followed by T1 and T4 for NL9 which also did well in that order respectively. Cob yield was observed to performed better in T3, T4 and T5. That translates to very good grain yields in T3 (27kg/ha^{-1}) ,T4 (16.20kg/ha^{-1}) and T5 (20kg/ha^{-1}). This might be due to the rates of cow dung applied on these treatments and good yield of the cultivars.. Hence, it is therefore recommended based on the results of the study to use these range of cow dung in the study area and the cultivar Oba 98 for early maturity in meeting the need of the people during the time of unpredictable weather conditions in the study area.
Keywords: cow dung, Sasakawa, erratic, cob diameter, cob yield, Shelling percentage.

INTRODUCTION
Maize which is popularly known as “Corn” is one of the most versatile emerging cereal cash crops having wider adaptability under variety of climatic conditions. It is called the queen of cereals globally. The crop can be grown throughout the year in Northern Nigeria and more especially in Mubi, the study area, which is the commercial nerve center of Adamawa State, Nigeria. Maize is also one of the three most important cereals grown in Nigeria along with sorghum and millet (FAOSTAT, 2010). It is one of priority crop

under the flagship agricultural programs of the Nigerian government since 2012. Maize is also the most important cereal crop in Sub-Saharan Africa, with rice and wheat; maize, rice and wheat, are one of the three most important cereal crops in the World (FAO, 2007).

Despite the importance and increase in number of farmers to maize production, yield per hectare is still relatively low in the study area due to the unpredictable rains and heavy floods when it occurs as opined by Toungos, 2018. This is in addition to the low organic matter content, low CEC, low water holding capacity and low fertility levels. In order to increase yield during the time of the vagaries of climatic change, coupled with the low yield experienced by the farmers the adaptation of the Sasakawa technology is one of the best options in boosting yield production in Mubi and the environs.

Cow dung are animals waste or faces especially cow ,which are applied and used as fertilizer, it is normally gotten when dried and applied on the farmland. Sasakawa technology uses a system of planting which is 75cm by 20cm where planting is done one seed per hole. It takes into consideration all the agronomic activities involved in maintaining and obtaining higher yield on small area under intensive and prudent management within the shortest possible time.

Climate variability and extremes are already negatively undermining production of major crops in the regions and, without adaptation and practicing the appropriate techniques and technologies, this is expected to worsen as temperatures increase and become more extreme. In many areas, climate extremes have increased in number and intensity, particularly where average temperatures are shifting upwards: very hot days are becoming more frequent and the hottest days are becoming hotter, this leads to lower crop yields and other consequences that undermine food security, FAO (2018). In addition to increasing temperatures and changes in rainfall, the nature of rainy seasons is also changing, specifically the timing of seasonal climate events. The number of extreme climate-related disasters, including extreme heat, droughts, floods and storms, has doubled since the early 1990s, with an average of 213 of these events occurring every year during the period of 1990–2016. This is also prevalent in the Sudano-Sahelian zone, where the study area is located. These harms agricultural productivity contributing to shortfalls in food availability, with knock-on effects causing food price hikes and income losses that reduce people's access to food. (FAO, 2018).

Food security and nutrition indicators can clearly be associated with an extreme climate event, such as a severe drought, that critically challenges agriculture and food production. Timing of sowing and having early maturing variety with proper management can ameliorate the poor yields been experienced by local farmers in Mubi area and the surrounding environments. Of all natural hazards, floods, droughts, herdsmen and storms affect food production the most; especially in Mubi where almost all the trees have been cut down without replacements. Drought, in particular, causes more than 80 percent of the total damage and losses in agriculture, especially for the livestock and crop production subsectors, FAO (2018). If a drought is severe and widespread enough, it can potentially affect national food availability and access, as well as nutrition, thus magnifying the prevalence of undernourishment (PoU) Nationally. The majority of people most vulnerable to climate shocks and natural hazards are the world's 2.5 billion small-scale farmers, herders, fishers and forest-dependent communities, who derive their food and income from renewable natural resources. Climate variability and extremes have the strongest direct impact on food availability, given the sensitivity of agriculture to climate and the primary role of the sector as a source of food and livelihoods for the rural poor.

Hence the use of Sasakawa technology in maize production in order to meet up the demand of the over growing population in the study area becomes necessary.

Climate variability and extremes are undermining all dimensions of food security: food availability (with losses in productivity that undermine food production and increase food imports); food access (causing spikes in food prices and volatility, especially following climate extremes, income loss for those who depend on agriculture); food utilization and food safety (worsened or reduced dietary consumption, reduced quality and safety of food because of crop contamination, outbreaks of pests and diseases because of rainfall intensity or changes in temperature. Climate variability also puts all aspects of food security at risk: the amount of food produced, people's access to it, people's ability to absorb nutrients and the safety of the food itself are all affected. Direct and indirect climate-driven impacts also have a cumulative effect, leading to a downward spiral of increased food insecurity and malnutrition. But with proper technological management, the effects will be brought to the barest minimum.

As stated, an obvious impact is that climate variability and extremes negatively affect agricultural productivity, in terms of changes in crop yields (the amount of agricultural production harvested per unit of land area), cropping areas (area planted or harvested), or cropping intensity (number of crops grown within a year).In addition, climate variability and extremes also affect food imports as countries try to compensate for domestic production losses. The impacts on production will inevitably translate into loss of income for people whose livelihoods depend on agriculture and natural resources, reducing their ability to access food. Another factor is spikes in food prices and volatility follow climate extremes. Climate anomalies, and in particular extreme events, alter agricultural yields, production and stocks. Impact of high food price volatility pose a major threat to food access, especially in low- and middle-income farmers. The impact of price spikes and volatility not only falls heaviest on the urban poor, but also of small-scale food producers, agriculture laborers and the rural poor who are net food buyers.

Climate variability and extremes also lead to income loss for those whose livelihoods depend on agriculture and natural resources, which then negatively impact food access as households have less resources to purchase food. There is also evidence that climate shocks not only affect the level of income, but affect also the variability of incomes, FAO (2018). More erratic rainfall and higher temperatures along with other extreme events affect the quality and safety of food. Changing climate conditions and extremes such as temperature and humidity can lead to increased contamination of water and food. Climate-related disasters create and sustain poverty, contributing to increased food insecurity and malnutrition as well as current and future vulnerability to climate extremes, Sasakawa 2000. They also have impacts on livelihoods and livelihoods assets – especially of the poor – contributing to greater risk of food insecurity and malnutrition. Prolonged or recurrent climate extremes lead to diminished coping capacity, loss of livelihoods, distress migration and destitution.

The aim of the research is to determine the effect of organic manure on yield and growth of maize using cow dung as manure and the Sassakawa technology of planting (*Zea mays L*) in Mubi and the appropriate dose of organic manure to be used for maximum yield during the time of erratic climate change and also to meet the demand of the populace in terms of food crop production at the time of unpredictable weather conditions in Mubi. The followings are the objectives:

i. to determine the effect of organic manure on the growth and yield of maize (*zea mays L.*);
ii. to determine the effect of Sassakawa technology on the growth and yield of Maize (zea mays L)
iii. to determine the best cultivar(s) that can meet the erratic and unpredictable weather conditions of Mubi with higher yield and
iv. to recommend the appropriate dosage of organic manure to the farmers.

Statement of the problem: People over dependence on inorganic fertilizer such as NPK,UREA and Single super phosphate (SSP) and lack of an adequate rate of cow dung (organic), to be put in place, in order to enable a higher and productive yield, has being a major problem to the performance and growth of crops (maize). Some are also losing confidence in farming due to poor harvest due to unpredictable rainfall.

Description: Maize also known as Corn is a monoecious plant with staminate flowers borne on an apical inflorescence (tassel) and with pistilated flowers produced on one or more lateral branches, which develop into grain bearing rachises.(Geraldi 1995) It is a cereal grass widely grown for food and livestock fodder. Maize is a monoecious plant which ranks with wheat and rice as one of the world's chief grain crops.

Morphology: The maize plant has an erect, solid stem, rather than the hollow one of most other grasses. It varies widely in height, some dwarf varieties being little more than 60cm at maturity, whereas other types may reach a height of 6m or more. The average is 2.4 m. The leaves, which grow alternately, are long and narrow. The main stalk terminates in a staminate (male) inflorescence, or tassel. The tassel is made up of many small flowers termed spikelets, and each spikelet bears three small anthers, which produce the pollen grains, or male gametes. The pistillate (female) inflorescence or ear is a unique structure with up to 1,000 seeds borne on a hard core called the cob. The ear is enclosed in modified leaves called husks. The individual silk fibers that protrude from the tip of the ear are the elongated styles, each attached to an individual ovary. Pollen from the tassels is carried by the wind and falls onto the silks, where it germinates and grows down through the silk until it reaches the ovary. Each fertilized ovary grows and develops into a kernel.(Grogan, C.O 1996)

MATERIALS AND METHODS

Description of Study Area: The experiment was conducted under rain fed conditions at the Food and Agricultural Organization/Tree crop plantation (FAO/TCP) Farm of the Faculty of Agriculture, Adamawa state University, Mubi. Mubi lies within Latitude 100 8'N and 10030 N and Longitude 1310'E and 130 25'E at 696m above sea level is located in the Mubi Northern, Guinea savannah zone of Nigeria with annual rainfall ranges from 700mm-1000mm with peak in July to September (Adebayo and Tukur, 1990)

Treatments

T1 = 10kg/ha
T2 = 0kg/ha
T3 = 27kg/ha
T4 = 16.20kg/ha
T5 = 20kg/ha
T6 = 5.40kg/ha
The cow dung was collected in tons and was converted to kg as follows:
0 tons=0kg
5 tons=5.4kg
10 tons=10.80kg
15tons=16.20kg
20 tons=21.60kg
25 tons=27.00kg

DATA ANALYSIS

Data obtained was subjected to analysis of variances and the treatment means were separated using Duncan Multiple Rang Test (SAS, 1993).

Source of Seed: The maize Oba 98 was obtained from Mubi main market in Mubi North Local Government of Adamawa State Nigeria.

Cultural Practice: The land was cleared, ploughed and leveled, using hand hoe. The cow dungs were applied and incorporated on the plot base of the tones of the plot. Then after two (2) weeks, the areas were marked into blocks and plot in a Randomize Complete Block Design.

Sowing and spacing: Sowings were done on 13/07/2019 and 15/07/2020 by dibbling method 2-3 seeds per hole at 75cm within row and 20cm between rows and seedlings were later thinned to one seedling per stand two weeks after emergence.

Weeds control: Three hoe weeding were carried out at three weeks, six weeks and night weeks after emergence respectively which ensured that weed competition where kept under control.

Harvesting: The cobs were harvested by hand picking when they were ripe and dry.

Cob yield weighing: The cob of the net plot were weighed by weighing balance in kg/ha.

Data collection: Data collection started 3 weeks after sowing (WAS). Growth and yield parameters. Recorded at different stages of crop growth and development were, plant height, number of leaves, cob length. Cob diameter, yield per plant, yield per net plot, weight of 100-grain, shelling.

Plant height(cm): This was taken from a sample of five randomly selected maize plants within the net plot of each plot .A meter rule was used in measuring the plant height (cm) from the ground level to the topmost growing leaf at 3,6,&9 weeks after sowing(WAS) the average was taken as mean height

Number of leaves: Visual counting of leave on five randomly selected plants from the net plot was made at 3, 6 and 9 weeks after sowing (WAS) respectively and the number was recorded for each plant. Then the mean value was calculated for each plot.

Cob length (cm): The length of five randomly de-husked maize plant cobs per plot were selected within the net plot was measured with a meter ruler and the average values were recorded.

Cob diameter (mm): This was taken from a sample of five cobs per plot randomly selected from the net plot and measure with a digital venier caliper and the values were recorded

100 Grain weight (g): One hundred grains were counted from each net plot and weighed.

Shelling percentage: The Shelling percentage of Maize in each net plot was calculated as weight of grain after shelling

$$\frac{\text{weight of grain after shelling x 100\%}}{\text{cob weight before shelling}}$$

Cob yield: The weight of cobs from each net plot was taken at harvest and converted to yield per hectare.

$$\frac{10{,}000m^2 \times \text{yield percent plot}}{\text{net plot size } (m^2)} \text{ Kg}$$

Grain yield: The growth yield from each of the treatment was measured in cm were measured and recorded.

Number of row per cob: Five cobs were selected from each plot and numbers of rows per cobs were counted means were determined and recorded.

RESULTS

Mean Values for Fifteen (15) Agronomic Characters of Maize

The mean square value for agronomic characters of maize is presented in table 1. A non- significant difference was recorded for all the characters during the years under study. The average number of leaves and plant height 3, 6 and 9 weeks after sowing (WAS) respectively, cob length, number of row per cob, number of row per cob, number of seed per row, cob diameter, cob yield, shelling percentage, grain weight, grain yield and hundred grain weight. Even though there were no significant difference statistically, but in practical terms there were differences observed in terms of plants height at 3, 6, and 9 weeks after sowing (WAS), number of leaves, number of seeds per row and seed diameter.

Mean Separation for Rates of cow dungs Among Fifteen (15) Characters of Maize

The different rates of cow dungs on fifteen (15) agronomic characters of maize are presented in Table 2. At 3, 6 weeks after sowing (WAS), T4 recorded the highest number of leaves (8.27 and 13.47) followed by T1 (7.47 and 13.00) respectively while T5 recorded the lowest leave number (6.60 and 11.33) respectively. At 9 weeks after sowing (WAS), T1 and T3 recorded the highest number of leaves (20.4) and (20.47) respectively is in agreement with the work of Olayinka, K. 2002 and Lakasi *et al* 2005 on organic resource management in maize.

For plant height at 3 and 6 weeks after sowing T4, gave the tallest plant (27.93 and 93.60) respectively. Followed by T1 (26.93 and 78.18) respectively and the least plant height was recorded by T5 (20.17 and 64.80) respectively. At 9 weeks after sowing, T1 (239.67) recorded the tallest height followed by T4

(224.33) and T6 (212.67) was the least in plant height. The result is in line with Toungos, M.D, 2018 work on effects of Sasakawa Technology on yield of maize.

For cob length character, T1 recorded longest length character, (15.57) followed by T2 (15.50cm) and the shortest length was T6 (11.93cm). Number of row per cob recorded highest rows per cob recorded highest rows by T6 (14.07) treatment effect but the lowest row per cob was recorded by T2 (13.47). For seed number per row, T1 had the highest seeds per row (34.04) followed by T3 (32.13). Cob diameter character, T1 recorded the widest diameter (44.52) and the least was T2 (40.71). For cob yield trait T3 recorded the highest yield (7778 kg). T4 (82.90) had the most shelling percentage while T2 and T5 recorded the least (5833 and 5833) respectively. For grain weight T3 (2.30) gave the highest weight followed by T4 (2.23) and the least was T2 and T6 (1.70 and 1.70) respectively. Grain yield T3 (6389) had the highest grain yield while the least was recorded by T2 and T6 (4722 and 4722) respectively. For cob grain weight, T1 (31.24) recorded highest weight followed by T3 (30.36) and the lowest was recorded by T2 (26.92). Although all the treatment studied are statistically similar.

Table:1 Mean values for 15 Agronomic Characters of Maize

SOURCE	DF	NL3	NL6	NL9	PH3	PH6	PH9	CL	NR/C	NS/R	CD	CY	SP	GW	GY	100G
Treatment	5	1.11^{ns}	2.65^{ns}	0.79^{ns}	27.33^{ns}	306.71^{ns}	649.43^{ns}	4.21^{ns}	0.44^{ns}	24.23^{ns}	7.21^{ns}	2257389.85^{ns}	5.88^{ns}	0.23^{ns}	1691541.50^{ns}	9.31^{ns}
Replication	2	1.14^{ns}	0.09^{ns}	0.14^{ns}	7.55^{ns}	9.56^{ns}	190.17^{ns}	2.37^{ns}	0.17^{ns}	21.35^{ns}	0.74^{ns}	1959031.72^{ns}	12.15^{ns}	0.26^{ns}	1766073.39^{ns}	3.15^{ns}
Error	10	0.95	2.44	2.3`	15.77	405.24	1212.30		8.49	0.53	41.90	10.76	536571.23	5.19	0.49	3849414.13 22.74
Coefficient of Variation		13.59	12.97	7.61	16.70	26.86	16.21	21.21	5.31	21.25	7.75	33.44	2.80	34.19	34.64	16.60
Mean		7.18	12.04	19.97	23.78	74.94	214.83	13.74	13.66	30.46	42.32	6928.97	81.29	2.05	5663.53	28.73

NS= Non-significant, NL3= number of leaves 3WAS, NL6= number of leaves at 6WAS, NL9= number of leaves at 9WAS, PH3= plant height at 3WAS, PH6= plant height at 6WAS, PH9= plant height at 9WAS, CL= cob length, NR/C= `1 number of row/cob, NS/R= number of seed/row, CD= Cob diameter, CY= Cob yield, SP= Shieling percentage, GW= grain weight, GY= grain yield, 100GW= 100 Grain weight.

Table 2: Effect of Cow Dungs Rate among 15 Characters of Maize

Treatment	NL3	NL6	NL9	PH3	PH6	PH9	CL	NR/C	NS/R	CD	CY	SP	GW	GY	100GW
T1 10kg/ha	7.47a	13.00a	20.47a	26.93a	78.13a	239.67a	15.57a	14.00a	34.40a	44.52a	7222a	79.18a	2.17a	5833a	31.24a
T2 0kg/ha	6.80a	11.57a	19.20a	23.17	71.73a	206.67a	15.50a	13.47a	29.00a	40.71a	5833a	80.87a	1.70a	4722a	26.92a
T3 25kg/ha	6.87a	11.47a	20.47a	22.50	72.07a	205.67a	14.23a	13.87a	32.13a	44.00a	7778a	82.10a	2.30a	6389a	30.36a
T4 15kg/ha	8.27a	13.47a	20.27a	27.93a	93.60a	224.33a	13.80a	13.77a	30.60a	41.62a	7500a	82.90a	2.23a	6204a	28.92a
T5 20kg/ha	6.60a	11.33a	19.80a	20.17a	64.80a	200.00a	13.40a	13.50a	30.60a	41.57a	7407a	82.32a	2.20a	6111a	27.37a
T6 5kg/ha	7.07a	11.40a	19.63	21.97a	69.33a	212.67a	11.93a	14.07a	26.00a	41.48a	5833a	80.37a	1.70a	4722a	27.56a

T1= treatment level of cow dung at 10 kg/ha, T2= treatment level of cow dung at 0kg/ha, T3= treatment level of cow dung at 23kg/ha, T4= treatment level of cow dung at 15kg/ha, T5= treatment level of cow dung at 20kg/ha, T6= treatment level of cow dung at 5kg/ha.

NS= Non-significant, NL3= number of leaves 3WAS, NL6= number of leaves at 6WAS, NL9= number of leaves at 9WAS, PH3= plant height at 3WAS, PH6= plant height at 6WAS, PH9= plant height at 9WAS, CL= cob length, NR/C= number of row/cob, NS/R= number of seed/row, CD= Cob diameter, CY= Cob yield, SP= Shieling percentage, GW= grain weight, GY= grain yield, 100GW= 100 Grain weight.

Correlation Coefficient among fifteen (15) agronomic characters of maize

The correlation coefficient among fifteen (15) agronomic characters of maize studied is presented in Table 3. Number of leaves at three weeks after sowing had a highly significant and positive correlation with number of leaves at six (6) weeks after sowing (0.547**) plant height at 3,6 and 9 weeks after sowing (0.6610**, 0.6215**, and 0.6648**) respectively.

For the number of leaves at six (6) weeks after sowing, NL9 (0.6180**), PH3 (0.7929**), PH6 (0.898**), PH9 (0.6945**), NS/R (0.5518**) and CY (0.5487**) had high significant and positive correlation coefficient and a significant difference was recorded. For CL (0.4842*), GN (0.5283*), G1 (0.5297*) and 100 GN (0.4848*). A highly significant and positive correlation was recorded for PH6 (0.5642*) PH9 (0.6213**), CL (0.7570**), NS/R (0.8077**), CD (0.7253**), CY (0.8444**), GW (0.8197**), GY (0.8267**) and 100 GW (0.5441**). A significant and highly significant positive correlation was recorded for CD (0.4543*) and PH6 (0.8456**), PH9 (0.6506**) and 100 GW (0.5711**). Similarly, PH6 had a significant difference with GN (0.5075*), GY (0.5345*) and 100 GW (0.5075*) and a highly significant positive correlation was recorded for PH9 (0.6211**) NS/R (0.5002**) and CY (0.5478**). A highly significant positive correlation coefficient was recorded for CL (0.7665**), NS/R (0.8170**), CD (0.7477**), CY (0.6394**). For CL traits, a significant positive correlation was recorded for NR/C (0.4835**), and NS/R (0.9685*), CD ().9011*) and 100 GW (0.6698**). NR/C had a highly positive significant correlation for CD (0.7219**). A highly significant and positive correlation coefficient was recorded for CD (0.5649**), CY (0.8467**), GW (0.8227**), GY (0.8346**) and 100 GW (0.6334**). In the same vein, CD had a highly significant and positive correlation for CY (0.7435**), GW (0.7004**), GY (0.7158**) and 100 GW (0.7567**). For CY trait a highly positive significant correlation was recorded for GW (0.9933**), GY (0.0074**) and 100 GW (0.5437**). For SP a significant and positive correlation coefficient was recorded for GW had a significant correlation with 100 GW (0.4833*) and GY (0.9971**). For GY trait a significant and positive correlation was recorded for 100 GW (0.5030*).

Table: 3 Correlation Coefficient Among 15 Agronomic Characters of Maize Studied

	NL3	NL6	NL9	PH3	PH6	PH9	CL	NR/C	NS/R	CD	CY	SP	GW	GY	100GW
NL3		0.7001**	0.5475**	0.6610**	0.6215**	0.6648**	0.3120^{ns}	-0.0992^{ns}	0.4262^{ns}	0.2492^{ns}	0.3710^{ns}	-0.601^{ns}	0.3467^{ns}	0.3544^{ns}	0.4233^{ns}
NL6			0.6180**	0.7929**	0.8987**	0.6945**	0.4842*	-0.0409^{ns}	0.5578**	0.3888^{ns}	0.5487**	-0.0105^{ns}	0.5283*	0.5297*	0.4848*
NL9				0.4211^{ns}	0.5642**	0.6213**	0.7570**	0.3931^{ns}	0.8077**	0.7253**	0.8444**	0.1401^{ns}	0.8197**	0.8267**	0.5441**
PH3					0.8456**	0.6506**	0.4178^{ns}	0.1751^{ns}	0.4242^{ns}	0.4543*	0.3654^{ns}	-0.1166^{ns}	0.3526^{ns}	0.3397^{ns}	0.5711**
PH6						0.6211**	0.4306^{ns}	0.0758^{ns}	0.5002**	0.4101^{ns}	0.5474**	0.1375^{ns}	0.5318*	0.5345*	0.5075*
PH9							0.7665**	0.3814^{ns}	0.8170**	0.7477**	0.6178**	-0.1207^{ns}	0.5823	0.5957**	0.6394**
CL								0.4835*	0.9485**	0.9011**	0.7883**	-0.0096^{ns}	0.7510**	0.7652**	0.6698**
NR/C									0.3910^{ns}	0.7219**	0.4255^{ns}	-0.1635^{ns}	0.4082^{ns}	0.3994^{ns}	0.4171^{ns}
NS/R										0.5649**	0.8467**	0.1418^{ns}	0.8227**	0.8346**	0.6334**
CD											0.7435**	-0.0750^{ns}	0.7064**	0.7158**	0.7567**
CY												0.3848^{ns}	0.9933**	0.0074**	0.5437**
SP													0.4615*	0.4470^{ns}	-0.2982^{ns}
GW														0.9971**	0.4833*
GY															0.5030*
100GW															

* and**= significant values, ns= non-significant

NL3= number of leaves 3WAS, NL6= number of leaves at 6WAS, NL9= number of leaves at 9WAS, PH3= plant height at 3WAS, PH6= plant height at 6WAS, PH9= plant height at 9WAS, CL= cob length, NR/C= number of row/cob, NS/R= number of seed/row, CD= Cob diameter, CY= Cob yield, SP= Shieling percentage, GW= grain weight, GY= grain yield, 100GW= 100 Grain weight

DISCUSSIONS

Mean Square Value for Fifteen (15) Agronomic Characters of Maize

A non-significant difference was observed for all the traits evaluated. This agrees to the findings of Adepetu, *et al* 2005 that several organic materials such as cow dung and refuse compost have been recommended to subsistence farmers in West Africa as a soil amendment to increase crop yield.

Mean Separation Rates of Cow Dung Among Fifteen (15) Characters of Maize

The different rates of cow dungs on maize evaluated reveled a similarly for NL3, Nl6 and NL9, although at NL3 and NL9, T4 recorded the highest, (0.27 and 13.47) respectively followed by T1 (7.41 and 13.00) respectively. At NL9 T1 and T3 recorded highest (20.47 and 20.47) respectively. The least was T2 (19.20) the result conformed with Reijntias *et al* (1992) and Adepetu *et al* (2005) remarked that the downward trend in food production should prompt farmers to amend the soil with different materials in order to enhance growth and yield of crops .

Similarly, for PH3 and PH6, T4 recorded the tallest plant (27.93cm and 93.60cm) respectively followed by T1 (26.93cm and 78.18cm) respectively while the shortest plant was recorded by T5 (20.17cm and 64.80cm) respectively. For PH9, T1 was the tallest plant (239.67cm) followed by T4 (224.33cm) while the shortest was T5 (224.33cm) while the shortest was T5 (200.00cm). This result is in line with the findings of Taninu *et al* (2007). Lakasi *et al* (2005) reported that this is advantageous if the organic materials added to the soil mineralize to release nutrients slowly and the rate of nutrient mineralization increase as the plant growth progresses as the plant matured, it is expected that a good soil would have released adequate nutrients for optimum plant growth. For cob length, the result revealed non-significant difference statistically. Although T1(15.57 cm) recorded highest length followed by T2(15.50cm) and the least was T6(11.93cm).A non-significant differences was observed for NR/C, although T6 had the highest NR/C(14.07cm)while the least was T2(13.47cm).For NS/R, T1(34.40cm) had the highest NS/R, followed by T3(32.13cm) and the least was recorded by T6(26 00cm). For cob diameter, T1(44.52cm) had the widest CD and the least was T2(40.71cm). The work agrees with the findings of Olayinka et at 2009 on effects of poultry manure on the performance of maize. Although there is no significant difference statistically among the treatment although T3 (7778kg) gave the highest CY and the least were T2 and T6 (5833kg and 5833kg) respectively. For CP character T4 b (82.90) recorded the highest yield followed by T5 (82.32) and the lowest yield was recorded by T1 (79.18). Grain weight had T3 (2.30) while T4 was followed by T2 and T3 (1.70 and 1.70) respectively. For grain yield T3 had the highest (6389) followed by T4 (6204) while the least was T2 and T6 (4722 and 4722) respectively. 100 Grain weight recorded the highest by Y1 (31.24) owed by T3 (30.36) and the least was T2 (26.92).

Correlation Coefficient among 15 Agronomic Maize

From the results, number of leaves at 3 weeks after sowing highly and significantly correlated positively with Nl6 (0.7001**) NL9 (0.6648**), PH3 (0.6610**), PH6 (0.6215**), PH9 (0.6648**) for NL6 recorded highly significant and positive correlation with NL9 (0.6180**), PH3 (0.7929**) and CY (0.5487**) and a significant difference for CL (0.4842*), GN (0.5283*), GN (0.5297*) and 100 GN (0.4848*). For NL9 a highly significant and positive correlation with PH6 (0.5642**), PH9 ().6213**), CL (0.7570**), NS/R (0.8077*), CD (0.7253**), GY (0.8267**) and 100 GN (0.5441**) that indicates cow dung has a high impact on maize production in the study area even though the rest of the traits recorded non- significant difference. PH3 also recorded a highly and positive significant difference with PH6 (0.8456**), PH9 (0.6506**) and 100 GW (0.577**), and a significant difference and positive correlation with PH9 (0.6211**), NS/R (0.5002**) and CY (0.5474**) and a significant difference was recorded for GN (0.5318*), GY (0.5345*) and 100GN (0.5075*). PH9 also recorded a highly significant and positive correlation with CL (0.7665**), NS/R (0.8170**), CD (0.7477**), CY (0.6178**), GY (0.5957**) and 100 GW (0.6394**), GL trait recorded positive and highly significant correlation with NS/R (0.9485**), CD (0.9011**), CY (0.7883**) GW (0.75110**), GY (0.7652**) and 100 GW (0.6698**). A negative non-significant difference was recorded for SP (-0.1635^{ns}) but a highly significant positive correlation was recorded with CD (0.7219**) CY (0.8467**), GW (0.8227**), GY (0.8346**) and 100 GW (0.6334**). CD had highly significant and positive correlation 2with CY (0.7435**), GW

(0.7064**), GY (0.7158**) and 100 GW (0.7561**). For CY character, a highly significant and positive correlation with GW (0.9933**), GY (0.0074**) and 100 GW (0.5437**). SP also had a significant and positive correlation with GW (0.4615**) GW recorded a highly positive significant correlation with GY (0.9971**) and a significant difference with 100 GW (0.4833*). For GY trait a significant difference was recorded for 100 GW (0.5030*).

Summary

An experiment was conducted during the raining seasons of 2019 and 2020 on effect of cow dung rates and Sasakawa technology on performance of maize and also determines the efficacy of Sasakawa technology to maize yield improvement during the time of erratic climate change and also to meet the demand of the populace in terms of food crop production at the time of unpredictable weather conditions in Mubi, Northern Guinea Savannah Zone of Nigeria. The research was conducted at Food and Agricultural Organization Tree/crop Production Farm (FAO/TCP) Adamawa State University, Mubi. Fifteen (15) agronomical traits were studied , NL3, NL6, NL9, PH3, PH6, PH9, CL, NR/C, NS/R, CD, CY, SP, GW, and 100 GW. The results were subjected to analysis of variance and mean were obtained using Duncan's Multiple Range Test. Results reveled the effect of cow dung rates at different treatments at T1, T4, and T1, T4 at NL3, NLC, and NL6 outperformed other treatments during the trail. Even though, T3, T4, and T5 have better cob yield than the outperformed ones. In the same vein, T3, T4, and T5 had better performance and also highly significant and positive correlation was recorded for NL3 with NL6, NL9, PH3, PH6 and PH9 during the period under study. This might not be unconnected with the rates of cow dung applied on the different treatments that outperformed in terms of cob yield which translate into total yield per area and the early maturing cultivar of Oba 98.

CONCLUSION

Even though the results indicated non-significant difference for all the characters studied, but differences were observed in terms of cob weight and yield on the treatments. The treatments also responds to variations in the rates of cow dung application during the trial period. As highly significant and positive correlation was observed for NL3, NL6, NL9, PH3, PH6, and PH9 indicating differences in the treatments applied. Climate variability and extremes are undermining all dimensions of food security: food availability. Climate variability also puts all aspects of food security at risk: the amount of food produced, people's access to it, people's ability to absorb nutrients and the safety of the food itself are all affected. Direct and indirect climate-driven impacts also have a cumulative effect, leading to a downward spiral of increased food insecurity and malnutrition. But with proper technological management, such as the Sasakwa Technology and early maturing cultivars such as Oba 98, the effects will be brought to the barest minimum.

RECOMMENDATION

The experiment revealed that treatment T1, T4 and T1, T4 for NL3, and NL6 gave highest performance than other treatments, followed by T1 and T4 for NL9 which also did well in that order respectively. Cob yield was observed to performed better in T3, T4 and T5. That translates to very good grain yields in T3 (27kg/ha^{-1}) ,T4 (16.20kg/ha^{-1}) and T5 (20kg/ha^{-1}). This might be due to the rates of cow dung applied on these treatments. Hence, it is therefore recommended based on the results of the study to use these range of cow dung in the study area and cultivar Oba 98 for early maturity. Further research is also recommended to be done in this area for adoption by farmers and adopting more cultivars for early maturity in meeting the need of the people during the time of unpredictable weather conditions in the study area.

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