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# Effect of Fertilization on Weed and Yield of Sugarcane (*Saccharum Officinarum* L.) at Badeggi, Nigeria

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**Abstract** Field trials were conducted in 2004-2007 wet and dry seasons at the National Cereals Research Institute Farm, Badeggi (lat. 9 45 N long.0.6 07 E, 70.5 metres above sea level) in the Southern Guinea Savannah ecological zone of Nigeria to study the effect of fertility rates on weed and yield of chewing sugarcane. Randomized complete block design was adopted for the study in which seven fertility rates evaluated were -: $F_0$ = Control (no cattle manure no inorganic fertilizer), $F_1$ = 120kgN/ha - 26kgP/ha - 37kgK/ha (NCRI recommended rate for sole chewing sugarcane), $F_2$ = 10 t/ha of cattle manure alone (NCRI recommended rate for sole chewing sugarcane), $F_3$ = 10 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha, $F_4$ = 10 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha, $F_5$ = 5 t/ha of cattle manure +120kgN/ha - 26kgP/ha - 37kgK/ha and $F_6$ = 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha The results showed that the combined cattle manure10 t/ha + 120kgN/ha - 26kgP/ha - 37kgK/ha, 10 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha, 5 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha and 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha consistently resulted significantly in better weed performance , stalk girth and stalk yield than the separate application of cattle manure at 10 t/ha and 120kgN/ha - 26kgP/ha - 37kgK/ha. Among the combined rates, the effect of lowest combined rate of 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha on stalk girth and stalk yield was significantly similar compared with higher combined rates but volume of weed obtained from the lowest combined fertilizer was significantly lower than the remaining combined rates.

**Keywords:** Combined fertilizer rates, cattle dung, inorganic fertilizer and chewing sugarcane

## Introduction

Sugarcane (*Saccharum officinarum* L.) is a perennial crop and one of the world's economically most important cultivated plants (Rehim and Espig, 1988). It is the chief source of centrifugal sugar in the world and contributes 1, 254, 857mt or about 60 percent of the world sugar out put (Gupta *et al*., 2004).

In Nigeria next to rice in term of utilization of Inland Valley Swamps (IVS) is chewing sugarcane and it is grown on about 30,000ha, which

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represents less than 0.6% of the areas of inland valley swamps available for crop production (Busari, 2004). The combined production of both industrial and chewing sugarcane rose from 607,000tonnes in 1972 to 920,000 tonnes in 1992, of which chewing cane accounted for between 55-65% (Busari *et al*., 1995; Busari, 2004).Chewing sugarcane is grown by local farmers across Nigeria on the alluvial soils of Ogun, Ondo, Cross River and Oyo states, and in rain fed low areas of Niger, Katsina, Kaduna, Jigawa, Kwara, Sokoto and Adamawa states (Ojehomon *et al*., 1996; Busari *et al*., 2000).

Sugarcane is an important cash crop, which is used for the production of sugar, molasses for livestock feeds and alcohol production, bagasses as organic fertilizer (Akobundu, 1987). In Brazil, sugarcane is used for ethanol fuel production for automobile (Fauconnier, 1993). Chewing sugarcane is normally chewed as a readymade source of energy (sucrose) or made into local products such as *mazarkwaila* and *alewa*for drinking *akamu* and *gari* (Busari *et al*., 1995).

In Nigeria, the production of this crop is presently in the hands of local farmers with low average yield of between 20-60 t/ha compared to over 100 t/ha obtained in the United States and Cuba (Fadayomi, 1996). According to Rao and Sharma (1981), poor yield of sugarcane is mostly due to poor soil nutrition and weed control.

In sandy soils, especially in upland ecologies where soil is over-mined, loss of nutrients, water and herbicides through leaching is very high thereby making the soil unproductive.

Cattle manure increased the efficiency of mineral fertilizers by improving properties of the soil (Vanlauwe *at al*., 2001). Cattle manure applied with inorganic nitrogen (N), increased soil pH and ameliorated acidity produced as a result of nitrification which added (Olayinka and Ailenubhi, 2001). Application of cattle manure with urea increased the soil organic content from 0.346% to 0.363% and in further cane cropping, the organic content decreased when urea was without organic N (Mokwunye, 1981). The continuous application of cattle manure versus inorganic fertilizer for ten years on sugarcane field slight the superiority of application of 60 t/ha of cattle manure over annual rate of 120N - $60P_2O_5$ - $90K_2O$kg/ha alone (Belay *et al*., 1997). They associated this to increased soil organic carbon, organic nitrogen and exchangeable calcium thereby resulting in significant increase of sugarcane yield. Combined application of cattle manure at 20 and 10 t/ha with 50kgN/ha minimized production in yield from successive cane cropping (Yadev and Prasad, 1992).

Weeds are very detrimental to sugarcane as they compete for nutrients, water and sunshine. These adversely affect tillering and initial growth of

sugarcane. Heavy weed growth in the early life of the crop tends to reduce cane yield through reduced cane weight, high fibre content and low juice quality (Allison and Haslam, 1985).

It is therefore imperative that sound soil and crop management practices that are environmentally friendly be adopted to improve soil fertility for effective weed control and improve sugarcane production. The present investigation is an attempt in this direction.

## Materials and methods

Field trials were conducted in 2004/2005, 2005/2006 and 2006/2007 wet and dry seasons at the upland sugarcane experimental farm of the National Cereals Research Institute, Badeggi (lat. 9 45 N long.0.6 07 E, 70.5m above sea level) to evaluate the effect of fertility rates on weed and yield of chewing sugarcane. Soil samples at the experimental site were randomly collected before the establishment of the first experiment in 2004 and analysed for physico-chemical properties. This is presented in table1.The nutrients contents of cattle manure is presented in Table2.

The treatments tested consist of seven fertility rates

. The fertility treatments therefore were:-

$F_0$ = Control (no cattle manure no inorganic fertilizer).

$F_1$ = 120kgN/ha - 26kgP/ha - 37kgK/ha (NCRI recommended rate for sole chewing sugarcane).

$F_2$ = 10 t/ha of cattle manure alone (NCRI recommended rate for sole chewing sugarcane).

$F_3$ = 10 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha.

$F_4$ = 10 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha.

$F_5$ = 5 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha.

$F_6$ = 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha.

Each treatment was accommodated in a gross plot size of $15m^2$ (5 x 3m) and a net plot of $9m^2$(3x3) in a randomized complete block design with three replications. The alley way between plots was 1.0m and between replications was 1.5m and inter-row spacing of 1.0m. The same field and plots were maintained throughout the period of experiment following the practice of the local farmers (no ratoon).

In the first year 2004, the experimental field was cleared, ploughed, harrowed and manually levelled. In subsequent years 2005 and 2006, as the same field was maintained, the field was only cleared and manually levelled.

Bida local variety or Ajax obtained from the National Cereals Research Institute Bida was used at the seed rate of 7 t/ha. It is popularly grown by farmers. It is more robust, softer and less drought resistant compared with the

industrial sugarcane. It is purple in colour and can attain a stalk length of 2-3m and takes 10 months to mature. It has a potential yield of 150 t/ha stalk yield (Fauconnier, 1993).

Cattle manure was incorporated into the soil manually using short handle hoe a month before establishing the first trial and subsequently after harvesting each trial. The inorganic fertilizer was applied split at planting broadcast on the setts (N - P - K basal application) and at 6 MAP during ear thing up the remaining half N - P - K was applied through band placement method. Nitrogen (N) was supplied by urea, phosphorus (P) was supplied by single super phosphate (SSP), while muriate of potash (MOP) supplied the potassium (K)

Healthy tender young (6 months old) stalks were cut into setts each contained three eye buds were used as planting material for the first year trial in 2004/2005; while for the subsequent two years( 2005/2006 and 2006/2007) stalks obtained from each preceding year were used as planting material. The stalks were cut into setts, each sett contained three eye buds. The cane setts were laid (planted) end to end horizontally along the row and covered with soil. The hoe-weeding was carried out at 1, 2, 3, 4, 5, 6 and 9MAP using short handle hoe. Ear thing up was carried out at 6MAP. This involved scooping the soil round the stools of standing sugarcane to give a strong support to sugarcane against storm.

Harvesting was done at 10MAP using cutlass to cut the stalk from the base .Stalks from the net plot were tied into bundles and weighed on 50kg Salter scale balance. The stalk yield for each plot was expressed in tonnes per hectare

Observation taken includes weed dry matter determined at 3, 6 and 9MAP from 1.0$m^2$ area in each net plot. The weed samples were cleaned free of soil and oven dried at 70 C to a constant weight and weighed using a sensitive electronic balance, Plant height (cm) at 3MAP and stalk length at 6 and 9MAP were taken from the net - plots using a graduated meter rule from the base (ground level) of the plant to the tip of the last unfolded leaf for plant height or to the last node at the top for stalk length.

Sugarcane stalks with internodes that can be chewed were counted from the net plot at 6, 8 and 10MAP.Stalk girth was taken using the veneer calliper an instrument for measuring diameter was used at 6, 8 & 10MAP. It is graduated in centimetre. Five sugarcane stalks tagged in the net plot were measured each at the centre. The sugarcane stalks harvested at 10MAP from the net plot were tied into bundles and weighed on a 50kg balance to determine the stalk yield.

All the data that were collected from the experiments were subjected to statistical analysis of variance(ANOVA) to test for the significance of treatment effects using 'F' test as described by Snedecor and Cochran (1967).Where the 'F 'test showed significance, means were then separated using the Duncan Multiple Range Test (DMRT) (Ducan, 1955).

## Results

The application of combined fertility rates at 3, 6 & 9MAP in the three trials produced significantly higher weed dry matter production than separate application of organic and inorganic fertilizer and the control treatments (Table 3). The highest weed dry matter among the combined fertility was obtained from the application of 10 t/ha and 5 t/ha of manure each being combined with 120kgN/ha - 26kgP/ha - 37kgK/ha.

Uniform chewing sugarcane height was obtained from application of combined rates of cattle manure and inorganic fertilizer; however, they were significantly taller than at separate application of organic, inorganic and the control treatments at 3, 6 & 9MAP in all the trials (Table 4). The untreated control had the least number of chewable stalks per plot. Application of the combined fertility rates produced higher number of chewable stalks than their sole applications at 6, 8 & 10MAP in the three trials. In 2004/2005 and 2005/2006 at 6 & 8MAP among the combined fertility rates, application of 10 t/ha and 5 t/ha of cattle manure each combined with 120kgN/ha - 26kgP/ha - 37kgK/ha gave higher number of chewable stalks per plot; however, at 10MAP in the three trials, there was no significant difference between the number of chewable stalks obtained from the application of combined fertility rates (Table 5). Application of 10 t/ha and 5 t/ha each combined with 120kgN/ha - 26kgP/ha - 37kgK/ha at 6 & 8MAP gave significantly higher number of chewable stalks per plot than the remaining fertility rates from the combined analysis.

The application of fertility rates on stalk girth at 6, 8 & 10MAP in 2004/2005, 2005/2006 and 2006/2007 was significant with smallest stalk girth been produced in the untreated than at other fertility rates. However, at 8 and 10MAP and in the combined analysis, application of combined fertility rates produced canes with uniform stalk girth but significantly bigger than at separate application of cattle manure and inorganic. While at 6MAP in the three trials, application of 10 t/ha of cattle manure combined with either rate of inorganic fertilizer 120kgN/ha - 26kgP/ha - 37kgK/ha and 60kgN/ha - 13kgP/ha - 18.7kgK/ha produced significantly fatter stalks than the remaining combined fertility. Sole application of both organic and inorganic resulted in similar stalk

girth but significantly thicker than stalks of cane in the untreated control (Table 6).

Statistical uniform stalks yields were obtained from the application of combined fertility rates in the three trials and in the combined of 2005/2006 - 2006/2007; however, these yields were significantly higher than at separate application of cattle manure and inorganic fertilizer (Table 7).

In 2006/2007 application of combined fertility rates produced uniform stalk yields but significantly fatter than at separate application of cattle manure and inorganic fertilizer.

## Discussion

In this study, the maximum stalk yield of 70.63 t/ha in 2004/2005 72.64 t/ha in 2005/2006 and 76.23 t/ha in 2006/2007 obtained from the fertility treatments in the three trials were higher than between 20 - 60 t/ha earlier reported at farmers field for the crop (Busari *et al*., 2000). These differences in stalk yield in the three trials was probably due to incorporated cattle manure at various rates which might have improved the sandy soil structure of the upland, thereby increased the efficiency of mineral fertilizer applied in combination with it for sugarcane. Vanlauwe *et al*. (2001) had earlier reported cattle manure applied with inorganic fertilizer increased the soil fertility and thus productivity of crops especially when applied over time.

Better performance of weeds, crop growth and yield obtained in the plots treated with cattle manure combined with inorganic fertilizer at various rates than at separate application of cattle manure 10 t/ha and 120kgN/ha - 26kgP/ha - 37kgK/ha may be attributed to enough nutrients derived from both cattle manure and inorganic fertilizer applied. Cattle dung also having a characteristic of binding soil particles together to improve the poor sandy soil structure of the experimental site thereby, reducing the rate of leaching of applied inorganic fertilizer for better growth of sugarcane. According to Gana (2010), in sandy soils, especially in upland ecologies where soil is over-mined, loss of nutrients, water and herbicides through leaching is very high thereby making the soil unproductive. Cattle manure increased the efficiency of mineral fertilizers by improving properties of the soil. Cattle manure applied with inorganic nitrogen (N), increased soil pH and ameliorated acidity produced as a result of nitrification which added $NH_4^{2+}$. Application of cattle manure with urea increased the soil organic content from 0.346% to 0.363% and in further cane cropping, the organic content decreased when urea was without organic N. Delipathy *et al*. (1994) earlier reported that soil with high level of fertility influences the severity of weeds than soil with low nutrient level. Similarly

Rhoadesre (1994) reported that difference in performance of weed and crop growth of sugarcane was based on the rates of nutrients released (mineralized) into the soil and taken by the crop. The most effective weed control obtained by the lowest combined fertility rate of 5 t/ha of cattle manure 60kgN/ha - 13kgP/ha - 18.7kgK/ha over the remaining combined rates is in line with the result obtained by Gibberd (1995) who in his experiment obtained efficiency portion of manure when applied in small amounts with inorganic fertilizer and more often. The fatter sugarcane stalks obtained with the combined fertility rates over the separate application of cattle manure and inorganic fertilizer, authors like Aliyu (2000) and Ayoola and Agboola (2004) had earlier reported that in spite of the favourable effect of manure in soil physical and chemical properties, it doesn't supply sustainable amount of nutrients to crop. For application of the lowest combined fertility rate of 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha having significantly similar sizes with the higher combined rates could be as a result of stabilization equilibrium of soil nutrients over time. This result is in conformity with the result obtained by Rayer (1986) who in his long term manuring experiment on a permanent plot at India observed from soil depth of 0 - 15cm and 15 - 30cm less variation in the levels of organic carbon, total nitrogen, available phosphorus, exchangeable potassium and magnesium indicating some sort of stabilization in the equilibrium. Application of high rates of 10 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha and 5 t/ha of cattle manure + 120kgN/ha - 26kgP/ha - 37kgK/ha being outstanding on their positive influence on yield and yield quality agreed with the result obtained by Singh *et al*. (2001) who obtained fatter sizes of cane and yield of 85 t/ha from application of 10 t/ha of cattle manure+150N+75$P_2O_5$ +45$K_2O$kg/ha.

**Table 1.** Physico-chemical characteristics of soil taken from experimental Site before the establishment of the trial

| Soil properties 0 - 25cm depth | Badeggi 2004 |
|---|---|
| Physical properties | |
| Sand (%) | 91.00 |
| Silt (%) | 8.00 |
| Clay (%) | 1.00 |
| Textural class | Sandy |
| Chemical properties | |
| pH in water | 6.2 |
| Organic carbon (%) | 0.50 |
| Organic matter (%) | 0.56 |
| Total nitrogen (%) | 0.039 |
| Available phosphorus (ppm) | 8.95 |
| Exchangeable bases (cmol / $kg^{-1}$) | |
| K | 0.35 |

| | |
|---|---|
| Mg | 0.29 |
| Ca | 1.00 |
| Na | 0.16 |
| CEC (cmol / $kg^{-1}$) | 5.85 |

**Table 2.** Laboratory analyses of cattle manure component

| | Percent (%) |
|---|---|
| | 2004 – 2007 |
| Nitrogen | 0.215 |
| Phosphorus | 0.26 |
| Potassium | 0.35 |
| Organic | 16 |

Source: Cattle manure was obtained from the cattle market behind Gwadebe New Market, Bida

**Table 3.** Effect of fertility rates on Weed dry matter production (t / ha) in chewing sugarcane at Badeggi, 2004/2005, 2005/2006 and 2006/2007 wet and dry seasons

| **Treatment** | **3MAP[1]** | | | **6MAP** | | | **9MAP** | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 |
| Fertility rate (F) | | | | | | | | | |
| 0kg/ha (Control, no cattle manure and inorganic fertilizers) | 1.10d[4] | 1.05d | 0.65e | 1.44e | 1.23e | 1.20e | 1.75e | 1.22e | 1.10e |
| 120kgN/ha-26kgP/ha-37kgK/ha (NCRI recommended rate) | 1.80c | 1.85c | 1.90c | 1.76d | 1.78d | 1.81d | 2.10d | 2.30d | 2.40d |
| 10t/ha of cattle manure(NCRI recommended rate) | 1.63c | 1.74c | 1.87c | 2.28c | 2.30c | 2.40c | 2.93c | 2.88c | 3.00c |
| 10t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 3.41a | 3.71a | 3.85a | 3.99a | 4.01a | 4.51a | 4.85a | 4.94a | 5.12a |
| 10t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 2.31b | 2.55b | 2.71b | 2.78b | 2.93b | 3.10b | 3.72b | 3.91b | 4.05b |
| 5t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 3.36a | 3.70a | 3.82a | 3.96a | 3.99a | 4.40a | 4.88a | 4.92a | 5.10a |
| 5 t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 2.30b | 2.50b | 2.69b | 2.74b | 2.91b | 3.11b | 3.70b | 3.88b | 4.02b |
| SE(±) | 0.150 | 0.071 | 0.070 | 0.052 | 0.056 | 0.061 | 0.112 | 0.113 | 0.190 |

1) MAP Months after planting 2) Means followed by the same letter(s) within the same column and treatment are not significantly different at 5% level of probability using DMRT.

**Table 4.** Effect of fertility rates on plant height and stalk length of chewing sugarcane at Badeggi, 2004/2005, 2005/2006 and 2006/2007 wet and dry seasons

| | Plant height (cm) | | | Stalk length (cm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3MAP[1] | | | 6MAP | | | 9MAP | | |
| Fertility rate (F) | 2004/2005 | 2005/2006 | 2006/2007 | 2004/2005 | 2005/2006 | 2006 2007 | 2004/2005 | 2005/2006 | 2006/2007 |
| 0kg/ha (Control no cattle manure and inorganic fertilizers) | 64.21c[6] | 59.69d | 57.87e | 30.06d | 27.64c | 22.81c | 80.59d | 74.41d | 67.69d |
| 120kgN/ha-26kgP/ha-37kgK/ha (NCRI recommended rate) | 70.30b | 89.59c | 91.75c | 59.33b | 60.88b | 62.67b | 115.75b | 135.94b | 137.18b |
| 10t/ha of cattle manure(NCRI recommended rate) | 70.60b | 85.01b | 86.19d | 46.83c | 60.18b | 63.31b | 107.19c | 118.94c | 128.13c |
| 10t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 85.41a | 94.61a | 98.90a | 64.89a | 75.63a | 78.06a | 140.13a | 153.69a | 163.51a |
| 10t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 85.23a | 94.61a | 97.99a | 64.54a | 71.63a | 78.75a | 139.19a | 152.00a | 161.53a |
| 5t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 86.70a | 94.19a | 97.99a | 64.10a | 73.44a | 76.83a | 137.49a | 152.00a | 162.91a |
| 5 t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 85.28a | 92.69a | 97.98a | 63.24a | 71.71a | 76.72a | 136.63a | 154.00a | 161.92a |
| SE(±) | 0.772 | 0.633 | 0.472 | 0.910 | 1.210 | 1.420 | 1.452 | 0.653 | 0.812 |

MAP Months after planting 2) Means followed by the same letter(s) in both columns are not significantly different at 5% level of probability using DMRT.

**Table 5.** Effect of fertility rates on number of chewable stalks / 9m$^2$ of chewing sugarcane at Badeggi, 2004/2005, 2005/2006 and 2006/2007, wet and dry seasons

| Treatment | 6MAP[1] | | | 8MAP | | | | 10MAP | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 | 2004 / 2005 | 2005 / 2006 | 2006/ 2007 | | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 |
| Fertility rate (F) | | | | | | | | | | |
| 0kg/ha (Control no cattle manure and inorganic fertilizers) | 6.18d[6] | 8.44e | 8.63f | 13.62e | 13.86e | 11.87 e | 11.87 e | 18.00c | 13.61c | 12.41 c |
| 120kgN/ha-26kgP/h-a37kgK/ha (NCRI recommended rate) | 10.47c | 14.44d | 26.06e | 24.81c | 28.38d | 29.87 d | 29.87 d | 27.81b | 35.94b | 40.31 b |
| 10t/ha of cattle manure(NCRI recommended rate) | 10.71c | 18.81c | 22.88d | 19.56d | 34.44c | 34..4 4c | 34.91 c | 24.93b | 35.92b | 38.42 b |
| 10t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 24.68a | 34.50a | 38.81a | 52.00a | 65.94a | 67.31 a | 2006 / 2007 | 68.06a | 70.44a | 84.43 a |
| 10t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 16.00b | 29.31b | 35.25b | 45.41b | 55.38b | 61.7b | | 66.37a | 69.94a | 82.98 a |
| 5t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 22.25a | 33.69a | 38.06a | 50.87a | 64.69a | 66.31 a | 66.31 a | 66.93a | 69.93a | 83.76 a |
| 5 t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 15.75b | 29.00b | 31.00c | 44.07b | 55.94b | 61.10 b | 61.10 b | 66.07a | 69.51a | 82.03 a |
| SE(±) | 1.301 | 1.212 | 0.973 | 0.990 | 0.430 | 0.612 | 0.612 | 0.942 | 0.413 | 0.923 |

MAP Months after planting 2) Means followed by the same letter(s) in both column are not significantly different at 5% level of probability using DMRT.

**Table 6.** Effect of fertility rates on stalk girth (cm) of chewing sugarcane at Badeggi, 2004-2005, 2005-2006 and 2006-2007wet and dry seasons

| Treatment | 6MAP[1] | | | 8MAP | | | 10MAP | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 | 2004 / 2005 | 2005 / 2006 | 2006 / 2007 |
| Fertility rate (F) | | | | | | | | | |
| 0kg/ha (Control no cattle manure and inorganic fertilizers) | 1.70d[6] | 1.66c | 1.60c | 2.17c | 1.81c | 1.57c | 2.20c | 1.83cc | 1.51c |
| 120kgN/ha-26kgP/h-37kgK/ha (NCRI recommended rate) | 2.13c | 2.60b | 2.81b | 2.78b | 2.49b | 2.54b | 2.60b | 2.78b | 2.88b |
| 10t/ha of cattle manure(NCRI recommended rate) | 2.15c | 2.59b | 2.75b | 2.68b | 2.69b | 2.71b | 2.72b | 2.87b | 2.94b |
| 10t/ha of cattle manure+120kgN/ha-26kgP/h-37kgK/ha | 3.43a | 3.62a | 3.71a | 3.78a | 3.80a | 3.91a | 3.95a | 3.97a | 3.99a |
| 10t/ha of cattle manure+60kgN/ha-13kgP/h-18.7kgK/ha | 3.41a | 3.51a | 3.66a | 3.65a | 3.68a | 3.89a | 3.92a | 3.95a | 3.98a |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5t/ha of cattle manure+120kgN/ha-26kgP/h-37kgK/ha | 2.99b | 2.83b | 2.87b | 3.78a | 3.79a | 3.88a | 3.93a | 3.96a | 3.98a |
| 5 t/ha of cattle manure+60kgN/ha-13kgP/h-18.7kgK/ha | 2.92b | 2.81b | 2.86b | 3.66a | 3.70a | 3.87a | 3.91a | 3.94a | 3.96a |
| SE(±) | 0.050 | 0.051 | 0.022 | 0.040 | 0.090 | 0.032 | 0.081 | 0.001 | 0.041 |

MAP Months after planting 2) Means followed by the same letter(s) in both column are not significantly different at 5% level of probability using DMRT.

**Table 7.** Effect of fertility rates on stalk yield (t/ha) of chewing sugarcane at Badeggi, 2004/2005, 2005/2006 and 2006/2007 wet and dry seasons

| Treatment | Years | | | |
|---|---|---|---|---|
| | 2004 / 2005 | 2005 / 2006 | 2006-2007 | 2006 / 2007 |
| Fertility rate (F) | | | | |
| 0kg/ha (Control no cattle manure and inorganic fertilizers) | 14.82d[6] | 10.70e | 8.25d | 8.25d |
| 120kgN/ha-26kgP/ha-37kgK/ha (NCRI recommended rate) | 27.86b | 36.75c | 41.00b | 41.00b |
| 10t/ha of cattle manure(NCRI recommended rate) | 18.83c | 28.19d | 31.21c | 31.21c |
| 10t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 70.63a | 72.64a | 76.23a | 76.23a |
| 10t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 68.63a | 70.81a | 74.40a | 74.40a |
| 5t/ha of cattle manure+120kgN/ha-26kgP/ha-37kgK/ha | 68.78a | 71.82a | 75.90a | 75.90a |
| 5 t/ha of cattle manure+60kgN/ha-13kgP/ha-18.7kgK/ha | 68.61a | 70.00a | 74.98a | 74.98a |
| SE(±) | 0.901 | 1.190 | 1.011 | 1.011 |

MAP Months after planting ) Means followed by the same letter(s) in both columns are not significantly different at 5% level of probability using DMRT.

## Conclusion

The results obtained from this study showed that application of combined fertility rates resulted significantly in higher stalk girth and stalk yield over cattle manure and inorganic fertilizer applied separately. However, there was no significant difference between the effects of lowest rate of 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 37kgK/ha and higher combined rates on stalk and stalk yield.

In conclusion, the results obtained indicated that application of cattle manure as source of fertilizer should be supplemented with inorganic fertilizer especially for long duration crop like sugarcane and also for ecology like an over mined sandy upland sugarcane experimental field. The application of the lowest combined fertility rate of 5 t/ha of cattle manure + 60kgN/ha - 13kgP/ha - 18.7kgK/ha may be recommended.

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