International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 8, Issue 61, 2016, pp.-3428-3433.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

# EFFECT OF LAND CONFIGURATION, PLANT POPULATION AND NITROGEN MANAGEMENT ON PRODUCTIVITY OF SWEET CORN IN VERTISOL

**NAGDEOTE V.G.[1], GHANBAHADUR MANGALA[2], MHASKE A.R.[3]*, BALPANDE S.S.[4] AND GHODPAGE R.M.[5]**

[1]Department of Agronomy, College of Agriculture, Nagpur, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra 444104
[2]AICRP on FSR, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra 444104
[3]Agricultural Engineering Section, College of Agriculture, Nagpur, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra 444104
[4,5]Department of Soil Science, College of Agriculture, Nagpur, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra 444104
*Corresponding Author: Email-mhaskear@gmail.com

Received: November 17, 2016; Revised: December 12, 2016; Accepted: December 13, 2016; Published: December 18, 2016

**Abstract-** A research trial was conducted at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Agronomy farm on "Effect of land configuration, plant population and nitrogen management on productivity of sweet corn" during *Kharif* season of 2010-11 and 2011-12. The experimental site has semi-arid tropical climate and Vertisol soil. The growth, yield attributes, yield, quality and economics of the sweet corn were significantly superior with the sowing of sweet corn on ridges and furrow with plant population of 55556 plants ha$^{-1}$ (60 x 30 cm$^2$) along with 100 percent N through inorganic fertilizers to sweet corn. The highest GMR, NMR, B:C ratio was recorded with 100 percent N through inorganic fertilizers over flat bed sowing, 45 x30 cm spacing (74074 plants per hectare) and integrated nitrogen management at 75% N through inorganic fertilizer+ 25% N through vermicompost, 50% N through inorganic fertilizer + 50% N through vermicompost and vermicompost @ 2.5 t per hectare. The same trend was reported about total nitrogen uptake during both the years.

**Keywords**- Flat bed, Net returns, Ridges and furrow, Sweet corn, Quality, Yield.

**Citation:** Nagdeote V.G., et al., (2016) Effect of Land Configuration, Plant Population and Nitrogen Management on Productivity of Sweet Corn in Vertisol. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 8, Issue 61, pp.-3428-3433.



**Academic Editor / Reviewer:** Dr Benukar Biswas

## Introduction

Maize (Zea mays L.) is one of the promising cereals cultivated in India and has great significance as human food, animal feed and raw material for large number of industrial product. About 50 to 55 percent of total maize production is consumed as a food, 30 to 35 percent goes for poultry, piggery and fish meal industry and 10 to 12 percent to wet milling industry. The green cob of maize is consumed directly as food in and around cities. In india, it is grown over an area of 8.3 Mha. with total production of about 18 million tones and average yield per ha 2.17 tones [1].

The sweet corn (*Zea mays* L. Sacharata) is one of the type of maize also called as Indian corn, sugar corn, pole corn used for its high sugar content and preferred as a vegetable and human food in the soft dough stage with succulent grain. Sweet corn contains about 13 to 15 percent sugar in grains. The higher content of water soluble polysaccharide in the Kernel adds texture and quality in addition to sweetness [12]. Land configuration and plant population plays a important role due to erratic pattern of rainfall in the Vertisol of semiarid climatic situations. Maize, being an exhauster nature needing higher amount of nitrogen, and productivity more dependent on efficient management of nitrogen possibly by maintaining soil moisture through land configuration and plant population. N management through organic source has benefit of moisture conservation through providing stability of soil structure. During present investigation an attempt was made to study the effect of moisture conservation practices *viz.* ridges and furrow, plant population and integrated nitrogen management on growth, yield, quality and economics of sweet corn under vertisols of semi arid climatic conditions.

## Material and Methods

The research trial of sweet corn (c.v. Sugar-75) was conducted on typic haplustert at the farm of department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during *Kharif*) season of 2010-2011 and 2011-2012. Soil of experimental site was dominant in clay. Soil showed slightly alkaline reaction (pH 7.8). Organic carbon content in experimental soil was observed medium whereas available nitrogen and available phosphorus was low. Soil was rich in available potassium. The field experiment "Effect of land treatment, plant density and nitrogen management on productivity of sweet corn" was framed in split plot design. Gross size of the plot was 5.40x4.80 m while net plot size was 4.20x3.60 m. Treatments consisted of two land configuration practices *viz.* sowing on flat bed ($L_1$), sowing on ridges and furrow ($L_2$), two plant population treatments *viz.* plant population at the spacing 40 x 30 cm ($S_1$ – 74074 plants ha$^{-1}$), 60 x 30 cm ($S_2$ – 55556 plants ha$^{-1}$) as main plot treatments and four nitrogen management practices *viz.* 100 percent N through inorganic fertilizer ($N_1$), 75 percent N through inorganic fertilizer + 25 percent N through vermicompost ($N_2$), 50 percent N through inorganic fertilizer + 50 percent N through vermicompost ($N_3$), application of vermicompost @ 2.5 t per hectare as sub plot treatments . Thus there were 16 treatment combinations.

The sowing of sweet corn was done on 30$^{th}$ June and 1$^{st}$ July 2010 and 2011, respectively. The land configuration i.e. sowing of sweet corn on flat bed and ridges and furrow was done as per treatments. The plant population was also kept as per treatments. The nitrogen through vermi compost and nitrogen through inorganic fertilizer were given as per treatments. Azatobactor and PSB seed inoculation was done commonly to all treatments. The 50 % dose of N to be given and full dose of $P_2O_5$ and $K_2O$ were applied at the time of sowing and remaining

50% dose of N was applied in two equal split doses. The vermicompost was well mixed in the entire plots before sowing. The recommended dose of fertilizer was applied @ 120:60:30 NPK/ha. All the agronomic practices were followed as per requirements during the life cycle of the crop. A total of 737.3 mm rainfall received in 32 rainy days during the crop growth period of 30 June to 15 September, 2010. In 2011 total of 434.3 mm rainfall received in 34 rainy days during crop growth period.

Periodical growth observations on plant height, number of leaves per plant, leaf area and dry matter accumulation /plant were recorded at 15 days interval. The dry matter accumulation at the time of harvest was recorded separately in five plant parts i.e. stem, leaves, tassel and cob. The harvest index was worked out by dividing the seed yield by biological yield obtained from net area and multiplied by 100 to express in percent [11]. Plant samples were washed thoroughly dried at $60^0$ C, finely pulverized and digested in a diacid mixture of $HNO_3$ and $HClO_4$ in 3:1 ratio, Nitrogen content was determined by modified micro Kjeldahl method. [6]. The uptake of major nutrients was studied separately in fodder and grain at the harvest.

## Results and Discussion

### Yield attributes

The growth and yield attributes of sweet corn were significantly influenced by land configuration, plant population anf nitrogen management in both the years [Table-1]. Sweet corn crop recorded higher plant height, no. of leaves, cob length and girth and no of kernels in cob in ridges and furrow treatment. Plant spacing 60x30 cm (plant population 55556 plants $ha^{-1)}$ showed significantly higher plant height; no. of leaves .cob length, cob girth and no. of kernels in cob in both the year. Ridges and furrow treatment with plant spacing 60x30 cm might have uses better soil moisture and more photosynthesis rate. In subplot treatments, 120 kg N(100 percent) through inorganic fertilizers observed better for all the growth and yield attributes than integrated nitrogen management and vermi compost alone in both the year 2010-11 and 2011-12. This might be due to high available mineral N during the critical growth stages maintained with inorganic fertilizer. These results were also in agreement with [2, 3]. Interaction effect of these treatment was observed non significant. The total dry matter accumulation in stem, leaves, tassel and cob [Fig-1 and 2] at harvests showed significant improvement with sowing of sweet corn on ridges and furrow and spacing 60x30 cm( population 55556 plants $ha^{-1}$ ) along with 120 kg N through fertilizers during both the years [Fig-3.]. The Harvest index (50.36 %, 49.44 %) was maximum with 100% N through fertilizers during both the years [Table-2]. These results were in agreement with Kamble *et al.* (2013) and karthika and Vageesh (2014).

**Table-1** *Effect of land configuration, plant population and integrated nitrogen management on growth and yield attributes of sweet corn during 2010-11 & 2011-12*

| Treatments | 2010-11 | | | | | 2011-12 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Plant height (cm) | No. of leaves/plant | Cob length (cm) | Cob Girth (cm) | No. of kernels per cob | Plant height (cm) | No. of leaves /plant | Cob length ( cm) | Cob Girth (cm) | No. of kernels per cob |
| **I. Main plot treatments:** | | | | | | | | | | |
| **A. Land Configuration** | | | | | | | | | | |
| $L_1$ - Flat bed | 165.49 | 13.24 | 19.30 | 14.62 | 476.73 | 160.96 | 10.01 | 17.14 | 13.89 | 457.79 |
| $L_2$ - Ridges and furrow | 170.04 | 14.07 | 21.02 | 16.66 | 503.82 | 165.98 | 12.69 | 18.70 | 15.43 | 487.76 |
| SE(m)± | 0.49 | 0.10 | 0.53 | 0.28 | 5.90 | 1.01 | 0.10 | 0.23 | 0.099 | 6.04 |
| CD at 5% | 1.56 | 0.30 | 1.69 | 0.90 | 18.77 | 3.19 | 0.32 | 0.70 | 0.32 | 19.22 |
| **B. Plant population** | | | | | | | | | | |
| $S_1$ – 45x30 cm (74074 plants $ha^{-1}$) | 162.62 | 12.99 | 18.89 | 13.99 | 447.48 | 159.65 | 10.54 | 16.43 | 13.14 | 436.08 |
| $S_2$ – 60x30 cm (55556 plants $ha^{-1}$) | 172.91 | 14.32 | 21.44 | 17.29 | 533.07 | 167.29 | 12.16 | 19.42 | 16.18 | 509.47 |
| SE(m)± | 0.35 | 0.10 | 0.38 | 0.20 | 4.17 | 0.71 | 0.072 | 0.16 | 0.07 | 4.27 |
| CD at 5% | 1.56 | 0.30 | 1.69 | 0.90 | 18.77 | 3.19 | 0.32 | 0.70 | 0.32 | 19.22 |
| **II. Sub plot : Integrated nitrogen management** | | | | | | | | | | |
| $N_1$ – 100 % N through inorganic fertilizers | 175.98 | 14.80 | 22.64 | 16.28 | 529.83 | 170.67 | 12.80 | 19.94 | 15.53 | 506.39 |
| $N_2$ – 75% % N through inorganic fertilizers+25% N through vermicompost | 171.06 | 14.27 | 20.26 | 15.74 | 503.76 | 165.94 | 12.56 | 18.32 | 14.88 | 496.89 |
| $N_3$ - 50% N through inorganic fertilizers + 50 % N through vermicompost | 169.63 | 13.19 | 19.80 | 15.63 | 475.76 | 164.75 | 10.91 | 16.94 | 14.57 | 453.57 |
| $N_4$ – Vermicompost @ 2.5 tone $ha^{-1}$ | 154.40 | 12.36 | 17.94 | 14.91 | 451.75 | 152.53 | 9.13 | 16.49 | 13.67 | 434.25 |
| SE(m)± | 0.72 | 0.12 | 0.61 | 0.25 | 5.59 | 1.98 | 0.27 | 0.35 | 0.26 | 5.068 |
| CD at 5% | 2.11 | 0.35 | 1.73688 | 0.71 | 15.96 | 5.68 | 0.77 | 1.02 | 0.75 | 15.068 |
| **Interaction** | | | | | | | | | | |
| **LxS** | | | | | | | | | | |
| SE(m)± | 0.49 | 0.09 | 0.58 | 0.28 | 5.89 | .1.01 | 0.10 | 0.22 | 0.10 | 6.04 |
| CD at 5% | NS. | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **LxN** | | | | | | | | | | |
| SE(m)± | 1.02 | 0.17 | 0.86 | 0.35 | 7.90 | 2.81 | 0.38 | 0.50 | 0.37 | 7.17 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **SxN** | | | | | | | | | | |
| SE(m)± | 1.02 | .17 | 0.86 | 0.35 | 7.90 | 2.81 | 0.38 | 0.50 | 0.37 | 7.17 |
| CD at 5% | NS | NS | NS | NS | 22.84 | NS | NS | NS | NS | 22.21 |
| **LxSxN** | | | | | | | | | | |
| SE(m)± | 1.45 | 0.25 | 1.22 | 0.50 | 11.18 | 3.98 | 0.54 | 0.70 | 0.52 | 10.13 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **G. M.** | 167.77 | 13.65 | 20.16 | 15.64 | 31.92 | 163.47 | 11.35 | 17.92 | 14.66 | NS |

**Table-2** *Effect of land configuration, plant population and integrated nutrient management on yield attributes of sweet corn during 2010-11 & 2011-12*

| Treatments | 2010-11 | | | | 2011-12 | | | | Pooled Green cob yield (q ha$^{-1}$) | Pooled fodder yield (q ha$^{-1}$) | Pooled Number of cobs ha$^{-1}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Kernel Rows per cob | No of cobs per plant) | Length of cob without Husk (cm) | Harvest index (%)[1] | No. of Kernel Rows per cob | No of cobs per plant) | Length of cob without Husk (cm) | Harvest index (%)[1] | | | |
| **I. Main plot treatments:** | | | | | | | | | | | |
| **A. Land Configuration** | | | | | | | | | | | |
| $L_1$ - Flat bed | 14.42 | 1.04 | 18.12 | 47.28 | 13.95 | 1.01 | 16.58 | 46.29 | 137.63 | 121.85 | 63772.81 |
| $L_2$ - Ridges and furrow | 15.36 | 1.16 | 19.89 | 47.50 | 14.92 | 1.12 | 18.14 | 47.78 | 159.99 | 134.04 | 70538.56 |
| SE(m)± | 0.14 | 0.030 | 0.53 | 0.857 | 0.15 | 0.03 | 0.41 | 0.817 | 4.37 | 1.49 | 1557.50 |
| CD at 5% | 0.44 | 0.09 | 1.70 | NS | 0.47 | 0.09 | 1.31 | NS | 13.89 | 4.74 | 4955.95 |
| **B. Plant population** | | | | | | | | | 12.74 | 10.66 | 11.27 |
| $S_1$ – 45x30 cm (74074 plants ha$^{-1}$) | 13.88 | 1.03 | 17.94 | 48.47 | 13.51 | 1.01 | 15.40 | 48.12 | | | |
| $S_2$ – 60x30 cm (55556 plants ha$^{-1}$) | 15.89 | 1.17 | 20.07 | 46.42 | 15.36 | 1.12 | 19.33 | 45.95 | 130.69 | 111.05 | 72734.38 |
| SE(m)± | 0.10 | 0.021 | 0.38 | 0.606 | 0.10 | 0.021 | 0.29 | 0.578 | 166.93 | 144.84 | 61577.00 |
| CD at 5% | 0.45 | 0.096 | 1.70 | NS | 0.47 | 0.09 | 1.31 | NS | 3.09 | 1.05 | 1101.48 |
| **II. Sub plot : Integrated nitrogen management** | | | | | | | | | | | |
| $N_1$ – 100 % N through inorganic fertilizers | 16.08 | 1.38 | 20.89 | 50.36 | 15.20 | 1.27 | 18.63 | 49.44 | 197.00 | 153.34 | 81501.72 |
| $N_2$ – 75% % N through inorganic fertilizers+25% N through vermicompost | 15.64 | 1.22 | 19.26 | 48.05 | 14.71 | 1.26 | 17.94 | 47.87 | 163.41 | 139.67 | 73327.59 |
| $N_3$ - 50% N through inorganic fertilizers + 50 % N through vermicompost | 14.30 | 1.06 | 18.93 | 48.99 | 14.32 | 1.07 | 16.63 | 48.98 | 139.75 | 113.23 | 66440.03 |
| $N_4$ – Vermicompost @ 2.5 tone ha$^{-1}$ | 13.54 | 0.79 | 16.94 | 42.16 | 13.54 | 0.76 | 16.24 | 41.84 | 95.08 | 105.56 | 47353.41 |
| SE(m)± | 0.19 | 0.06 | 0.54 | 0.841 | 0.28 | 0.043 | 0.42 | 0.940 | 3.95 | 2.74 | 1411.96 |
| CD at 5% | 0.55 | 0.17 | 1.55 | NS | 0.79 | 0.13 | 1.197 | NS | 11.29 | 7.82 | 4032.96 |
| **Interaction** | | | | | | | | | | | |
| **LxS** | | | | | | | | | | | |
| SE(m)± | 0.14 | 0.03 | 0.53 | 0.86 | 0.15 | 0.04 | 0.41 | 0.82 | 4.37 | 1.49 | 1557.73 |
| CD at 5% | NS | NS | NS | 0.86 | NS | NS | NS | NS | NS | NS | NS |
| **LxN** | | | | NS | | | | | | | |
| SE(m)± | 0.78 | 0.02 | 0.77 | | 0.39 | 0.03 | 0.59 | 1.19 | 5.59 | 3.87 | 1996.82 |
| CD at 5% | NS | NS | NS | 1.19 | NS | NS | NS | NS | 15.82 | NS | NS |
| **SxN** | | | | NS | | | | | | | |
| SE(m)± | 0.78 | 0.02 | 0.77 | | 0.39 | 0.03 | 0.59 | 1.19 | 5.59 | 3.87 | 1996.82 |
| CD at 5% | 2.24 | NS | NS | 1.19 | NS | NS | NS | NS | 16.51 | NS | 5998.44 |
| **LxSxN** | | | | NS | | | | | | | |
| SE(m)± | 0.38 | 0.03 | 1.09 | | 0.56 | 0.02 | 0.84 | 1.68 | 7.91 | NS | 2823.92 |
| CD at 5% | NS | NS | NS | 1.68 | NS | NS | NS | NS | NS | 5.47 | NS |
| **G. M.** | 14.88 | 1.36 | 19.01 | 48.57 | 14.43 | 1.29 | 17.36 | 47.04 | 148.81 | 127.37 | 67155.69 |

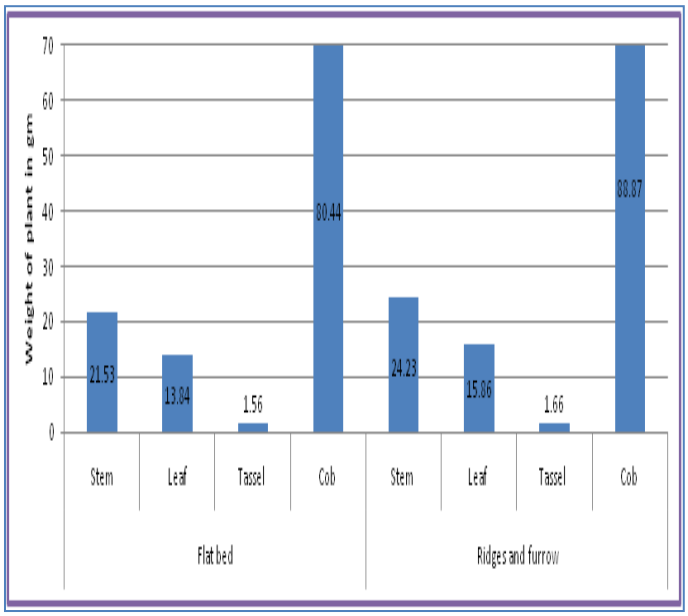


**Fig-1 Effect of land configuration on dry matter partition of sweet corn**

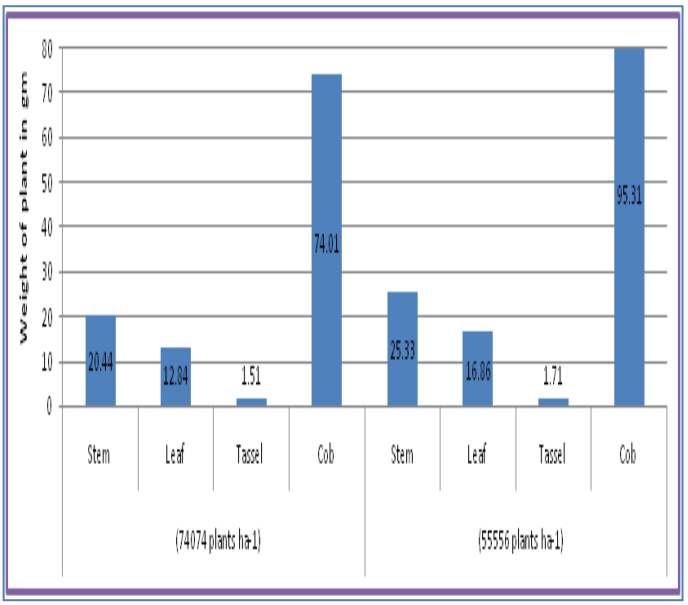


**Fig-2 Effect of plant population on dry matter partition of sweet corn**

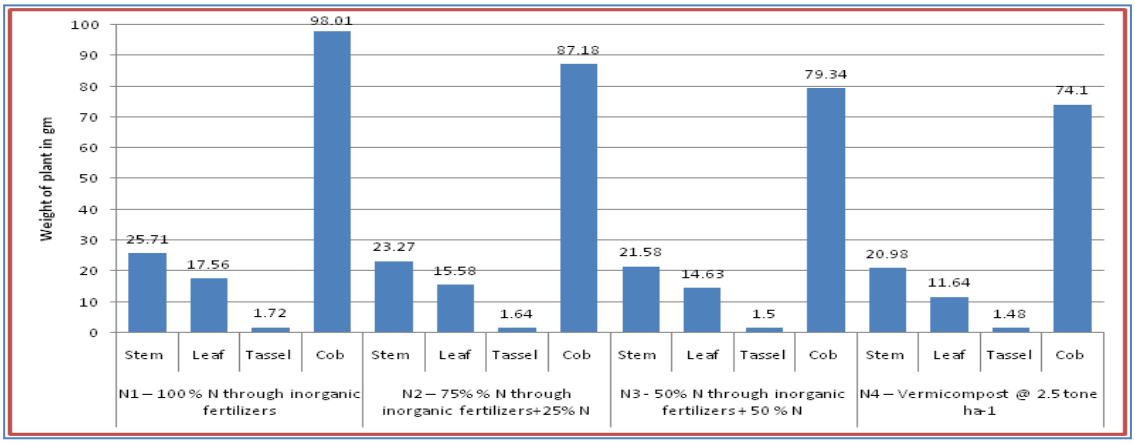


**Fig-3 Effect of integrated nitrogen management on dry matter partition of sweet corn**

**Yield**

Pooled data depicted in [Table-2] indicated that green cob yield, number of cobs per hectare and fodder yield significantly influenced by ridges and furrow with plant population 55556 plants ha$^{-1}$ along with 120 kg N through inorganic fertilizer. This suggests more moisture and nutrient availability with better photosynthase in this treatment. An interaction effect of plant population x integrated nitrogen management on number of grains per cob, green cob yield and number of cobs per hectare during both years was found significant. The number of grains per cob, green cob yield and number of cobs per hectare was recorded maximum with $S_2$ $N_1$ (i.e. 55556 plant per hectare with 100% N through fertilizer), which was significantly superior over rest of the treatment combinations.

**Quality Parameters**

The protein content [Table-3] in the grains showed maximum value 14.85%, 15.10% and 15.60% With sowing of sweet corn on ridges and furrow with plant population 55556 plants ha$^{-1}$ along with 120 kg N through fertilizers in the year 2010-11 and 2011-12. It was significantly superior over flat bed, 45 x30 cm (74074 plants per hectare) and integrated nitrogen management at 75% N through inorganic fertilizer+ 25% N through vermicompost, 50% N through inorganic fertilizer + 50% N through vermicompost and vermicompost @ 2.5 t per hectare. The same trend was reported regarding reducing sugar content in the grain of sweet corn. Improvement in quality might be due to higher uptake of micronutrients in these treatments. The data [Table-4] on nitrogen uptake (kg/ha) reveals that maximum total uptake was recorded (152.64, 163.7 and 172.2 and 149.2, 162.4 and 165.2 N kg/ha) by the treatments sowing of sweet corn on ridges and furrow with plant population 55556 plants ha$^{-1}$ along with 120 kg N through inorganic fertilizers during both the years by grain and fodder. [4] reported crude protein content in the maize grain ranged between 9.95 to 10.04 per cent. Similar results were recorded by Gupta and Surajbhan (1997) and Spandana Bhatt (2012).

**Table-3** *Effect of land configuration, plant population and integrated nutrient management on quality parameters of sweet corn during 2010-11 & 2011-12*

| Treatments | 2010-11 | | 2011-12 | |
|---|---|---|---|---|
| | Protein content (%) | Total sugar (%) | Protein content (%) | Total sugar (%) |
| **I. Main plot treatments:** | | | | |
| **A. Land Configuration** | | | | |
| $L_1$ - Flat bed | 13.98 | 11.45 | 13.77 | 11.36 |
| $L_2$ - Ridges and furrow | 14.85 | 11.90 | 14.76 | 11.87 |
| SE(m)± | 0.254 | 0.128 | 0.200 | 0.130 |
| CD at 5% | 0.807 | 0.408 | 0.636 | 0.412 |
| **B. Plant population** | | | | |
| $S_1$ – 45x30 cm (74074 plants ha$^{-1}$) | 13.73 | 11.17 | 13.42 | 11.00 |
| $S_2$ – 60x30 cm (55556 plants ha$^{-1}$) | 15.10 | 12.18 | 15.10 | 12.22 |
| SE(m)± | 0.179 | 0.091 | 0.141 | 0.092 |
| CD at 5% | 0.807 | 0.408 | 0.636 | 0.412 |
| **II. Sub plot : Integrated nitrogen management** | | | | |
| $N_1$ – 100 % N through inorganic fertilizers | 15.60 | 13.47 | 15.35 | 13.26 |
| $N_2$ – 75% % N through inorganic fertilizers+25% N through vermicompost | 14.27 | 12.63 | 14.16 | 12.44 |
| $N_3$ - 50% N through inorganic fertilizers + 50 % N through vermicompost | 14.00 | 11.45 | 13.88 | 11.35 |
| $N_4$ – Vermicompost @ 2.5 tone ha$^{-1}$ | 13.80 | 9.15 | 13.67 | 9.40 |
| SE(m)± | 0.218 | 0.150 | 0.228 | 0.137 |
| CD at 5% | 0.622 | 0.429 | 0.651 | 0.391 |
| **Interaction** | | | | |
| **LxS** | | | | |
| SE(m)± | 0.25 | 0.13 | 0.20 | 0.13 |
| CD at 5% | NS | NS | NS | NS |
| **LxN** | | | | |
| SE(m)± | 0.31 | 0.22 | 0.32 | 0.19 |
| CD at 5% | NS | NS | NS | NS |
| **SxN** | | | | |
| SE(m)± | 0.31 | 0.22 | 0.32 | 0.19 |
| CD at 5% | NS | NS | NS | NS |
| **LxSxN** | | | | |
| SE(m)± | 0.44 | 0.30 | 0.46 | 0.25 |
| CD at 5% | NS | NS | NS | NS |
| **G. M.** | 14.42 | 11.68 | 14.26 | 11.61 |

**Table-4** *Uptake of nitrogen by sweet corn crop (kg ha$^{-1}$) as influenced by different treatments during 2010-11 and 2011-12*

| Treatments | Nitrogen (kg ha$^{-1}$) | | | | | |
|---|---|---|---|---|---|---|
| | 2010-11 | | | 2011-12 | | |
| | Grain | fodder | Total | Grain | fodder | Total |
| **I. Main plot treatments:** | | | | | | |
| **A. Land Configuration** | | | | | | |
| $L_1$ - Flat bed | 53.82 | 74.06 | 127.88 | 54.28 | 73.94 | 128.21 |
| $L_2$ - Ridges and furrow | 67.86 | 84.78 | 152.64 | 65.67 | 83.54 | 149.21 |
| SE(m)± | 2.082 | 1.46 | 3.54 | 1.35 | 1.09 | 2.44 |
| CD at 5% | 6.624 | 4.66 | 11.2 | 4.28 | 3.49 | 7.78 |
| **B. Plant population** | | | | | | |
| $S_1$ – 45x30 cm (74074 plants ha$^{-1}$) | 50.07 | 66.78 | 116.85 | 48.86 | 66.19 | 115.05 |
| $S_2$ – 60x30 cm (55556 plants ha$^{-1}$) | 71.61 | 92.07 | 163.67 | 71.09 | 91.29 | 162.37 |
| SE(m)± | 1.47 | 1.03 | 2.50 | 0.95 | 0.78 | 1.73 |
| CD at 5% | 6.62 | 4.66 | 11.29 | 4.28 | 3.49 | 7.78 |
| **II. Sub plot : Integrated nitrogen management** | | | | | | |
| $N_1$ – 100 % N through inorganic fertilizers | 70.84 | 101.30 | 172.15 | 69.15 | 96.08 | 165.23 |
| $N_2$ – 75% % N through inorganic fertilizers+25% N through vermicompost | 65.31 | 88.14 | 153.45 | 64.39 | 87.64 | 152.03 |
| $N_3$ - 50% N through inorganic fertilizers + 50 % N through vermicompost | 59.40 | 66.54 | 125.94 | 59.19 | 69.25 | 128.44 |
| $N_4$ – Vermicompost @ 2.5 tone ha$^{-1}$ | 47.79 | 61.71 | 109.50 | 47.16 | 61.98 | 109.15 |
| SE(m)± | 1.78 | 2.00 | 3.78 | 1.84 | 1.97 | 3.81 |
| CD at 5% | 5.08 | 5.72 | 10.80 | 5.26 | 5.62 | 10.87 |
| **Interaction** | | | | | | |
| **LxS** | | | | | | |
| SE(m)± | 2.082 | 1.467 | 3.549 | 1.346 | 1.098 | 2.444 |
| CD at 5% | NS | NS | NS | NS | NS | NS |
| **LxN** | | | | | | |
| SE(m)± | 2.516 | 2.834 | 5.35 | 2.604 | 2.780 | 5.384 |
| CD at 5% | NS | NS | NS | NS | NS | NS |
| **SxN** | | | | | | |
| SE(m)± | 2.516 | 2.834 | 5.35 | 2.604 | 2.780 | 5.384 |
| CD at 5% | NS | NS | NS | NS | NS | NS |
| **LxSxN** | | | | | | |
| SE(m)± | 3.558 | 4.008 | 7.566 | 3.683 | 3.932 | 7.615 |
| CD at 5% | NS | NS | NS | NS | NS | NS |
| **G. M.** | 60.84 | 79.42 | 140.26 | 59.97 | 78.74 | 138.71 |

**Table-5** *Gross Monetary Return (Rs. ha$^{-1}$), Net Monetary Return (Rs. ha$^{-1}$) and B:C ratio of sweet corn as influenced by different treatments during 2010-11 and 2011-12*

| Treatments | Gross Monetary Return (Rs.ha$^{-1}$) | | | Net Monetary Return (Rs. ha$^{-1}$) | | | B:C Ratio | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010-11 | 2011-12 | Pooled | 2010-11 | 2011-12 | Pooled | 2010-11 | 2011-12 | Pooled |
| **I. Main plot treatments:** | | | | | | | | | |
| **A. Land Configuration** | | | | | | | | | |
| $L_1$ - Flat bed | 168634 | 160619 | 164627 | 103189 | 92826 | 98008 | 2.65 | 2.42 | 2.53 |
| $L_2$ - Ridges and furrow | 184899 | 178747 | 181823 | 118939 | 110580 | 114759 | 2.88 | 2.70 | 2.79 |
| SE(m)± | 4430 | 5534 | 4002 | 4429 | 5534 | 4002 | 0.069 | 0.086 | 0.06 |
| CD at 5% | 14095 | 17610 | 12733 | 14095 | 17610 | 12733 | 0.219 | 0.274 | 0.20 |
| CV (%) | 11.02 | 13.06 | 10.24 | 15.95 | 20.07 | 15.04 | 10.97 | 13.47 | 10.44 |
| **B. Plant population** | | | | | | | | | |
| $S_1$ – 45x30 cm (74074 plants ha$^{-1}$) | 156720 | 149681 | 153200 | 88452 | 78941 | 83696 | 2.35 | 2.14 | 2.25 |
| $S_2$ – 60x30 cm (55556 plants ha$^{-1}$) | 196813 | 189685 | 193249 | 133625 | 124465 | 129070 | 3.18 | 2.98 | 3.08 |
| SE(m)± | 3133 | 3914 | 2830 | 3133 | 3914 | 2830 | 0.049 | 0.061 | 0.04 |
| CD at 5% | 14095 | 17610 | 12733 | 14095 | 17610 | 12733 | 0.219 | 0.274 | 0.20 |
| **II. Sub plot : Integrated nitrogen management** | | | | | | | | | |
| $N_1$ – 100 % N through inorganic fertilizers | 219535 | 204207 | 211872 | 163446 | 146047 | 154746 | 3.94 | 3.55 | 3.74 |
| $N_2$ – 75% % N through inorganic fertilizers+25% N through vermicompost | 196157 | 190321 | 193239 | 129396 | 121229 | 125313 | 2.96 | 2.78 | 2.87 |
| $N_3$ - 50% N through inorganic fertilizers + 50 % N through vermicompost | 171038 | 165519 | 168279 | 93667 | 85768 | 89718 | 2.22 | 2.08 | 2.15 |
| $N_4$ – Vermicompost @ 2.5 tone ha$^{-1}$ | 120334 | 118684 | 119509 | 57746 | 53766 | 55756 | 1.93 | 1.83 | 1.88 |
| SE(m)± | 4595 | 4482 | 3761 | 4595 | 4482 | 3761 | 0.073 | 0.071 | 0.06 |
| CD at 5% | 13123 | 12803 | 10742 | 13128 | 12803 | 10742 | 0.209 | 0.203 | 0.17 |
| **Interaction** | | | | | | | | | |
| **LxS** | | | | | | | | | |
| SE(m)± | 4430 | 5535 | 4002 | 4430 | 5535 | 4002 | 0.07 | 0.08 | 0.06 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **LxN** | | | | | | | | | |
| SE(m)± | 6498 | 6339 | 5318 | 6498 | 6339 | 5318 | 0.10 | 0.10 | 0.09 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **SxN** | | | | | | | | | |
| SE(m)± | 6498 | 6339 | 5318 | 6498 | 6339 | 5318 | 0.10 | 0.10 | 0.09 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **LxSxN** | | | | | | | | | |
| SE(m)± | 9189 | 8965 | 7521 | 9189 | 8965 | 7521 | 0.15 | 0.14 | 0.12 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| CV (%) | 11.39 | 10.96 | 9.68 | 15.54 | 17.62 | 15.14 | 11.61 | 12.08 | 11.14 |
| **G. M.** | 176767 | 169689 | 173225 | 111064 | 101703 | 106383 | 2.76 | 2.56 | 2.66 |

**Economics**

The gross returns [Table-5] in terms of rupees per hectare were worked out on the basis of green cob yield and dry fodder yield of each treatment, taking in to account prevailing market prices. The net returns obtained by deducting the cost of cultivation from the gross returns. The benefit cost ratio was calculated by dividing the gross returns by the total cost of cultivation of each treatment.

The highest gross, net returns and B: C ratio was recorded with sowing of sweet corn on ridges and furrow and population 55556 plants $ha^{-1}$ during both the years. In case of integrated nitrogen management, the treatment 120 kg N through inorganic fertilizers recorded maximum gross ,net returns and B:C ratio of 181823, 193249 and 211872 , 114759, 129070 and 154746 Rs per hectare and B:C ratio of 2.78, 3.09 and 3.74. The gross, net returns and B:C ratio were unsatisfactory due to the treatment sowing of sweet corn on flat bed, with plant population 74074 plants per hectare and integrated nitrogen management through vermicompost @ 2.5 t per hectare.

**Conclusion**

Sweet corn green cob yield, number of cobs per hectare and fodder yield were found highest by ridges and furrow with plant population 55556 plants $ha^{-1}$ along with 120 kg N through inorganic fertilizer suggesting more moisture and nutrient availability with better photosynthase in this treatment. Similarly the protein content in the grains of sweet corn, gross, net returns and B:C ratio were maximum

**Acknowledgement**

Experiment was conducted at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola farm. Therefore author is thankfully acknowledged the help and guidance of Director, Central Research Farm and Head, Agronomy Department, Dr. PDKV, Akola.

**Author Contributions**

We have contributed as team to conduct this experiment. Being the person of soil water conservation engineering, I have tested the effect of land treatment.

**Abbreviations**

N-Nitrogen
Mha.- Million hectare
B: C-Benefit cost
t- Tonne
@- At the rate
$^0$ C- degree centigrade

**Conflict of Interest: None declared**

**References**

[1] Anonymous (2008) Corn area, yield and production- http://www.fas.usda.gov/ pseuonline/ psdhom.aspx.
[2] Arulkumar P., Shinde V. S., Solunke P. S. and Kadam V. D. (2005) *P.K.V. Res. J.,* 29(2), 237-238.
[3] Bhatt Spandana (2012) *African journal of Agriculture Res.,* 7(46), 6158-6166.
[4] Ghodpage R.M., Balpande S.S., Raut M.M. and Sarika Pongde (2014) *Green Farming,* 5(3), 395-394.
[5] Gupta and Surajbhan (1997) *J. Soil Cons.,* 25(2), 133-135.
[6] Jackson M.L. (1973) Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd. New delhi, India.
[7] Kamble A.S., Ghanahadur M. and Sonawane R.K. (2013) *Green Farming,* 4(1), 43-45.
[8] Kar P.P., Barik K.C., Mahapatra P.K., Garnayak L.M., Rath B.S., Bastia D.K. and Khanda C.M. (2006) *Indian J. Agron.,* 51(1), 43-45.
[9] Karthika, K.S. and Vageesh T.S. (2014) *Green Farming,* 5(2), 210-213.
[10] Sakthivel N., Balsubraminian A., Radhamani S. and Subbiah P. (2003) *Madras Agric. J.,* 90(7-9), 411-415.
[11] Singh I.D. and Stoskof N.C. (1971) *Agrom. J.,* 63, 224-226.
[12] Venketraman N. S. (2007) Need of corn revolution in India. Kisan World. 22-23.