Response of Sweet Corn (*Zea mays* var. *rugosa*) to Drip Fertigation in Varying Levels of Nitrogen

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Abstract

The yield performance of sweet corn applied with varying levels of nitrogen fertilizer using drip fertigation and band method of fertilizer placement was evaluated using Split Plot with three replications. The number of days to tasseling, silking and leaves of sweet corn were not affected with the application of varying levels of nitrogen, the nitrogen fertilizer placement and their interaction. In contrary, plant height, ear height, length of leaves, length of ear and the green yield of sweet corn were significantly affected with the treatments. Application of 90 kg N/ha significantly gave the highest yield of 14.86 tons/ha. The yield of sweet corn was comparably higher using drip fertigation as fertilizer placement as compared to the band method. Highest return on investment was attained when applying 90 kg N/ha. Using drip fertigation as fertilizer placement method likewise gave higher ROI. Generally, the yield of sweet corn was increased when applied with 90 kg N/ha using drip fertigation. The plant height, ear height, length of leaves, and the green yield of sweet corn differ significantly with the application of nitrogen using drip fertigation over band method. Application of 90 kg N/ha gave the optimum utilization of nitrogen where it gave a maximum yield of 14.86 tons/ha. The varying levels of nitrogen can be applied in both drip fertigation or band method. Application of 90 kg N/ha is best recommended in sweet corn where it gave a maximum yield of 14.86 tons/ha.

Keywords: yield performance, sweetcorn, drip fertigation, band method, fertilizer placement

1. Introduction

Sweet corn (*Zea mays* var. *rugosa*) is a variety of maize with a high sugar content. Unlike field corn varieties, which are harvested when the kernels are dry and fully mature (dent stage), sweet corn is picked when immature (milk stage) and eaten as a vegetable, rather than a grain. It is known for its sweet

and juicy taste with nutritious contents. Cooked sweet corn has significant antioxidant activity, which can substantially reduce the chance of heart disease and cancer. Cooked sweet corn also releases increased levels of ferulic acid, which provides health benefits, such as battling cancer. Sweet corn is usually shorter than field-corn varieties.

Nitrogen (N) is especially important in sweet corn production, not only for plant growth but also for the production of amino acids that influence flavor and nutrition. Research showed that 6 percent of the total nitrogen is taken up between germination and the sixth leaf stage, 25 percent from seventh leaf to tassel, 25 percent from tassel to silk and 39 percent during ear development (Diver, *et al.,* 2008). In a study conducted by M. Sanmaneechai, et. al. (nd) on varying nitrogen fertilizer applied to sweet corn, its yield increased to 23 kg/ha with increasing N rates up to 135kg/ha, and then leveled off, whereas N uptake increased up to180 kg N/ha. Residual effects from N applied for previous crops increased yield and N uptake of sweet corn. Another study conducted by Olaniyan, *et al.* (nd) on the effect of different sources and rates of nitrogen fertilizer on growth and yield of sweet corn, the result favored production of sweet corn at 120kg N/ha. Highest total dry matter was obtained at 120kg N/ha. The fresh cob weight of 13.97 tonnes and 17.35 tonnes/ha were obtained from 80kg and 120kg N/ha respectively.

Fertigation supplies nutrients in the form of fertilizers, although it can also be used to deliver soil amendments and a variety of other materials, including agricultural chemicals to cope with crop pests and plant diseases. Goyal *et al.,* (1985) as cited by Hegde, DM (nd), reported that fertigated pepper, tomato and eggplant receiving 9, 18 or 30 g urea/plant all had higher yields than plants receiving a side application of urea (15 + 15 g/plant at planting and first harvest).One distinct disadvantage of fertigation is that it does not allow farmers and gardeners to deliver solid soil amendments such as compost, humus, and similar materials. This can lead to imbalances in the soil quality, especially if fertigation is used for an extended period of time to manage crops.

Sweet corn production in Claveria particularly in Banban is not a usual practice. Only few farmers engaged in sweet corn production. At present, about 10 to 15 farmers are planting sweet corn, and three of these are in Banban.

Farmers in Claveria are practicing fertigation in vegetables like tomato and sweet pepper but not in drip. Their usual practice was dissolving granular fertilizers in water and applied it to the plants as what they termed as "hinubig". Drip fertigation is not yet practiced in the place especially in sweet corn. Information on this technology is limited thus this study will be conducted.

The main objective of the study was to compare the performance of sweet corn using varying levels of Nitrogen fertilizer with drip fertigation and band method of fertilizer placement. Specifically, it aimed to:

1. Determine the optimum amount of N requirement in sweet corn that will give maximum yield

2. Determine which among the fertilizer placement method used is suitable for optimum N fertilization

3. Compare the growth and yield performance of sweet corn using drip fertigation and band method as fertilizer placement in varying levels of N fertilizer

4. Compare the profitability of sweet corn using the two methods of fertilizer placement in varying levels of N

2. Methodology

The experiment was conducted at Sitio Banban, Ane-i, Claveria, Misamis Oriental during the dry season of 2010. Table 1 shows the description of the study area.

Table 1. General description of the study area

Parameters	Description
Climate (Type)	Type III
Soil Type	Jasaan Clay
Topography	Slightly sloping (0-8%)
Altitude	600 masl
NPK content (based on soil analysis taken August 2010)	90-60-20 (kg N/ha)

2.1 Experimental Design

The study was laid out using Split-plot Design replicated three times.

Main Plot.Levels of N	Sub-plot. Fertilizer Placement
MP_1- 60 kg/ha N	SP_1- Drip Fertigation
MP_2- 90 kg/ha	SP_2- Band method N
MP_3- 120 kg/ha N	

Three levels of Nitrogen Fertilizer (60 kg, 90 kg & 120 kg N per hectare) were applied in sweet corn using two methods of Fertilizer Placement (drip fertigation and band method (Figures 1 & 2). Phosphorus and potassium components were applied uniformly in all experimental plots except for Nitrogen which was applied in four different levels. Treatment combinations are as follows:

Treatment 1 – application of 60 kg N/ha in drip fertigation

Treatment 2 - application of 60 kg N/ha in band method

Treatment 3 - application of 90 kg N/ha in drip fertigation

Treatment 4 – application of 90 kg N/ha in band method

Treatment 5 - application of 120 kg N/ha in drip fertigation

Treatment 6 - application of 120 kg N/ha in drip fertigation

2.2 Lay-outing of the Field

A total land area of 1,380 m^2 was used in the study and was divided into three blocks as replications. Each block was divided into three plots to accommodate the main plots (N levels: 60 N kg/ha, 90 kg N/ha & 120 kg N/ha). The main plot was further subdivided into two plots that represent the sub-plots (Nitrogen Fertilizer Placement Methods: Drip Fertigation & Band Method). The sub-plot measuring 5.0 m in width and 10 m in length accommodated six (6) rows at 0.75 cm apart. Furrows were made to a depth of about 4 cm. An alleyway of 1 m between the treatments and 1.5 m

between replication was provided for convenience in carrying out operations like harvesting and placing labels on individual plots. Also, during the rainy season, shallow drainage canals were laid out on these alleyways to prevent water logging.

Figure 1. Drip installation in the area

Figure 2. 1st sidedress using band method of N application

2.3 Cultural Management

The land was thoroughly prepared. Early plowing was done to allow enough time between plowings and harrowings to obtain good land preparation and control of weeds. Soil analysis was done to determine the nutrient requirement for sweet corn especially on Nitrogen.

Sweet corn seeds were sown at one (1) inch deep along the furrows at a distance of 30 cm between hills and 75 cm between furrows at one seed per hill. Replanting was done for non-germinating seeds.

Thinning was done 7 days after seedling emergence leaving only one seed per hill. Drip irrigation was installed in the area for treatments that require drip fertigation.

Fertilizers were also applied based on the treatments using both drip fertigation and band method of fertilizer placement. The recommended nitrogen was applied in split amount, one-half at first side-dress 15 days after sowing and the other one-half was sidedressed 30 days later. All of the recommended P_2O_5 and K_2O and Calphos were applied as basal at planting.

Pesticides and insecticides were applied as required and hand weeding was done to completely control the weeds. Shallow hilling-up was also done 30 days immediately after sidedressing.

Sweet corn was harvested when it reached 80 days after seed emergence. It was harvested as young corn.

2.4 Data Gathering

2.4.1 Agronomic data

The number of days to tasseling was recorded as the number of days from seedling emergence to a time when 50% of the plants of a given entry have tasseled. While the number of days to silking is the number of days from seedling emergence to a time when 50% of the plants of a given entry have tasseled.

Plant height (cm) is the average height of 20 random plants, measured from ground level to the base of the tassel.

The average ear height of 20 random plants was also measured from ground level to the node bearing the lower ear. Ear Length (cm) – recorded as the average of 20 ears harvested at random from each plot.

Length of leaves was recorded as the average length of leaves per plant of 20 random plants, measured during reproductive stage. Number of leaves was also recorded as the average number of leaves per plant of 20 random plants, measured during reproductive stage.

2.5 Yield Determination

Green yield was obtained by weighing all the corn ears in the plot and computed using the formula below:

$$\text{Yield (kg/ha)} = \text{fresh ear weight per plot} \times \frac{\text{1 ha area (10,000 m}^2\text{)}}{\text{Area per plot (50 m}^2\text{)}}$$

2.6 Cost and Return Analysis

The cost and return per hectare was estimated based on the prevailing market price of sweet corn in the area (nearest market is CDO). The computed cost of production per hectare was deducted from the gross return to obtain the net return per hectare.

2.7 Data Analysis

Results of the study were analyzed using SPSS software. The software provides analysis of Variance in Split-plot design for the data analysis and significance between treatment means were compared using Bonferroni Test.

3. Results and Discussion

3.1 Climatic Data

Total rainfall (Figure 3) during the conduct of the study was moderately high with an average rainfall of 263.56 mm. Highest rainfall was noted in the month of September with a total of 312.50 mm and the lowest rainfall recorded was in December with only 206.25 mm. Likewise the average maximum temperature experienced by the area was 28.03 ^{o}C and the minimum temperature was 20.26 ^{o}C (Figure 4).

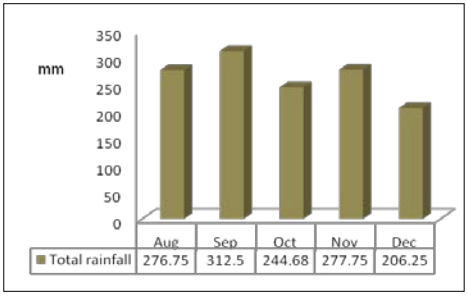

Figure 3. Total rainfall experienced by the area from August to December 2010

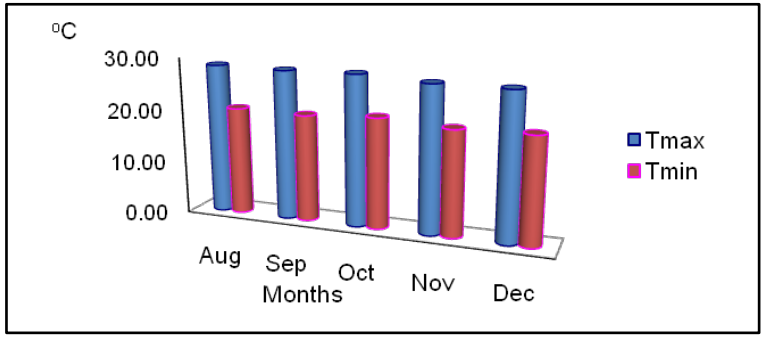

Figure 4. Maximum and minimum temperature experienced by the area from August to December 2010

3.2 Agronomic Data

3.2.1 Number of Days to Tasseling

The number of days to tasseling was recorded as the number of days from seedling emergence to a time when 50% of the corn plants have tasseled. Statistical analysis revealed that varying levels of nitrogen and the methods of Nitrogen Fertilizer Placement as well as their interaction did not affect the number of days to tasseling.

Table 2. Number of days to tasseling of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean^{ns}
	Drip Fertigation	Band Method	
60 kg/ha	58.33	58.00	58.16
90 kg/ha	58.00	59.00	58.50
120 kg/ha	58.33	58.33	58.33
Mean^{ns}	58.22	58.44	

MP- main plot^{ns} ; SB – Sub plot^{ns} MP x SP^{ns}
cv (a) = 0.78% cv (b) = 1.56%

Table 2 represents the number of days to tasseling of sweet corn applied with Nitrogen in varying levels using different methods for fertilizer placement. The earliest to develop tassel was sweet corn plant applied with nitrogen at 60 kg/ha at an average of 58.16 days and the latest was those applied with

nitrogen at 90 kg /ha at 58.5 days. Application of nitrogen using drip fertigation gave an average of 58.22 days while sweet corn applied with nitrogen using band method developed tassel at 58.44 days. The interaction of the two factors gave 58 to 59 days of sweet corn to develop tassel.

3.2.2 Number of Days to Silking

The number of days to silking was recorded as the number of days from seedling emergence to a time when 50% of the sweet corn have developed silk.

Based on statistics, the number of days for sweet corn to develop silk was not affected by the application of varying levels of Nitrogen, different methods of Nitrogen Fertilizer Placement as well as their interaction.

Table 3. Number of days to silking of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean^{ns}
	Drip Fertigation	Band Method	
60 kg/ha	63	62	63
90 kg/ha	61	63	62
120 kg/ha	62	63	63
Mean^{ns}	62	63	

MP- main plot^{ns} ; SB – Sub plot^{ns} MP x SB^{ns}

cv (a) = 0.60% cv (b) = 1.61%

As shown in Table 3, sweet corn applied with nitrogen at 90 kg/ha developed silk at 62 days after seedling emergence while those applied with 60 kg N/ha and 120 kg N/ha developed silk at 63 days. Drip fertigated sweet corn developed silk earlier compared to those applied with nitrogen using band method at 62 days and 63 days, respectively. The interaction of the two factors gave 61 to 63 days for sweet corn to develop silk.

3.2.3 Plant Height (cm)

The average plant height was taken from 20 random plants, measured from ground level to the base of the tassel. Table 4 shows the plant height of sweet

corn applied with Nitrogen in varying levels using two different methods of fertilizer placement.

Table 4. Plant height of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean*
	Drip Fertigation	Band Method	
60 kg/ha	194.93	195.13	195.03[b]
90 kg/ha	202.73	202.33	202.53[a]
120 kg/ha	209.00	195.07	202.04[ab]
Mean*	202.22[a]	197.51[b]	

Means in a column with the same letter are not significantly different with each other.
MP- main plot* ; SB – Sub plot* MP x SP*
cv (a) = 2.82% cv (b) = 1.91%

Application of nitrogen in varying levels (60 kg N/ha; 90 kg N/ha; 120 kg n/ha) showed a significant effect on the plant height of sweet corn. The application of 90 kg N per hectare gave the tallest plant height of 202.53 cm which was significantly taller with those applied only with 60 kg N/ha with plant height of 195.03 cm, followed by sweet corn applied with 120 kg N/ha of 202.04 cm. Nitrogen is an important component of many important structural, genetic and metabolic compounds in plant cells. It is especially important in sweet corn production for its plant growth (Eckert, 2010).

Application of nitrogen in different fertilizer placement (Drip and Band methods) also gave a significant difference between their treatment means where sweet corn applied with nitrogen in drip method has taller plant height of 202.22 cm which is significantly taller with those applied with nitrogen in band method with average plant height of 197.51 cm. Sweet corn responds very well to fertigation.

The interaction of the two factors (Table 4) likewise showed a significant difference in the plant height of sweet corn based on statistical analysis. Tallest plant height was obtained in sweet corn applied with 90 kg N/ha in drip method with average plant height of 202. 73 cm which was significantly taller compared in all treatments based on Bonferroni. Shortest plant height was obtained in sweet corn applied with 60 kg N/ha in drip method.

3.2.4 Ear Height (cm)

The ear height of the sweet corn was recorded as the average ear height of 20 random plants measured from ground level to the node bearing the lower ear. Table 5 shows the average ear height of sweet corn applied with varying levels of nitrogen using two different methods of fertilizer placement.

Table 5. Ear height of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean*
	Drip Fertigation	Band Method	
60 kg/ha	59.20	57.73	58.46[b]
90 kg/ha	66.00	57.90	61.95[ab]
120 kg/ha	69.47	58.53	64.00[a]
Mean*	64.89[a]	58.05[b]	

Means in a column with the same letter are not significantly different (Bonferroni)).
MP- main plot* ; SB – Sub plot* MP x SP**
cv (a) = 3.57% cv (b) = 4.18%

Sweet corn applied with 120 kg N/ha obtained the tallest ear height of 64 cm which is significantly higher to sweet corn applied with 60 kg N/ha of 58.46 cm followed by sweet corn applied with 90 kg N/ ha with ear height of 61.95 cm. Analysis of Variance revealed that the ear height of sweet corn was significantly affected with the application of varying levels of nitrogen. This result could be attributed to the significant effect of nitrogen fertilization in the ear height of sweet corn. Nitrogen is an important component of many important structural, genetic and metabolic compounds in plant cells. It is especially important in sweet corn production for its plant growth (Eckert, 2010).

Results also showed that sweet corn applied with nitrogen in drip method significantly gave taller ear height of 64.89 cm as compared to those applied with nitrogen using band method of fertilizer placement with average ear height of 58.05 cm. Drip fertigation permits precise timing and placement of plant nutrients and increases the efficiency of fertilizer use.

Likewise, the interaction of the two factors showed a highly significant difference in their treatment means (Table 5). Sweet corn applied with 120

kg N/ha in drip method gave the tallest ear height of 64.47 cm followed by sweet corn applied with 90 kg N/ha in drip method of 66.47 cm; 60 kg N/ha in drip with ear height of 59.20 cm; 120 kg N/ha in band method; 90 kg N/ha in band method and the shortest ear height was obtained by sweet corn applied with 60 kg N/ha in band method with ear height of 58.46 cm.

3.2.5 Length of Leaves

The length of leaves was recorded as the average length of leaves per plant of 20 random plants measured during reproductive stage.

Table 6. Average length of leaves of sweet corn fertigated in varying levels of Nitrogen using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean^{ns}
	Drip Fertigation	Band Method	
60 kg/ha	80.55	79.35	79.95^{a}
90 kg/ha	82.35	81.89	82.12^{b}
120 kg/ha	78.98	80.53	79.76^{a}
Mean*	80.63	80.59	

Means in a column of the same letter are not significantly different with each other.
MP- main plot* ; SB – Sub plot^{ns} MP x SP^{ns}
cv (a) = 1.28%; cv (b) = 1.25%

The average length of leaves of sweet corn applied with varying levels of nitrogen using two methods of fertilizer placement is shown in Table 6. Results revealed that application of nitrogen in varying levels slightly affected the length of leaves of sweet corn. Application of 90 kg N/ha obtained the longest leaves of 82.12 cm which was significantly longer compared to sweet corn applied with 60 kg N/ha with length of leaves of 79.95 cm and sweet corn applied with 120 kg N/ha with length of leaves of 79.76 cm.

However, the different methods of nitrogen fertilizer placement have no significant effect on the length of leaves of sweet corn. The longer leaves was obtained in sweet corn applied with nitrogen using drip method of 80.63 cm while those applied with nitrogen in band method obtained the length of leaves of 80.59 cm.

Likewise, the interaction of the two factors has no significant effect on the length of leaves of sweet corn. Longest leaves was obtained in sweet corn applied with 90 kg N/ha in drip method of 82.35 cm while the shortest leaves was obtained in sweet corn applied with 120 kg N/ha in drip method with length of leaves of 78.98 cm.

3.2.6 Number of Leaves per Plant

The number of leaves was recorded as the average number of leaves per plant of 20 random plants measured during reproductive stage.Table 7 shows the number of leaves of sweet corn applied with varying levels of nitrogen using two different methods of fertilizer placement. The use of different levels of nitrogen has no significant effect on the number of leaves of sweet corn based on statistical analysis. Likely, using either drip fertigation or in band method in nitrogen application has no significant differences in their treatment means. Likewise, the interaction of the two factors resembled no significant differences on the number of leaves. The number of leaves of sweet corn in the study produced an average of 10 and 11.

Table 7. Number of leaves of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean^{ns}
	Drip Fertigation	Band Method	
60 kg/ha	10	10	10
90 kg/ha	11	10	11
120 kg/ha	11	10	11
Mean^{ns}	11	10	

MP- main plot^{ns} ; SB – Sub plot^{ns} MP x SP^{ns}
cv (a) = 4.34% cv (b) = 4.12%

3.2.7 Length of Ear (cm)

Ear length of the experimental plants was recorded as the average of 20 ears harvested at random from each plot.

Nitrogen is a constituent of amino acids, proteins, coenzymes, nucleic acids and chlorophyll. Results of the study showed that application of nitrogen in varying levels affected the length of ears of sweet corn. The length of ear follows the increasing level of nitrogen applied. Thus, highest level of nitrogen which was 120 kg/ha gave the longest ear length of 21.95 cm (Figure 6) while the least nitrogen level (60 kg N/ha) gave the shortest ear length of 20.56 cm.

Table 8. Length of ears of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement

Levels of N Fertilizer ((MP)	Nitrogen Fertilizer Placement (SP)		Mean^{ns}
	Drip Fertigation	Band Method	
60 kg/ha	20.69	20.44	20.56^{b}
90 kg/ha	21.07	21.33	21.20^{a}
120 kg/ha	22.53	21.37	21.95^{a}
Mean*	21.43	21.05	

Means in a column with the same letter are not significantly different with each other.
MP- main plot^{ns} ; SB – Sub plot* MP x SP^{ns}
cv (a) = 3.01% cv (b) = 3.43%

Presented in Table 8 is the length of ears of sweet corn applied with Nitrogen in varying levels using different methods of fertilizer placement. The methods of nitrogen fertilizer placement (NFT) showed no significant differences between their treatment means. Longest ear was obtained by sweet corn applied with nitrogen in drip fertigation of 21.43 cm while those applied with nitrogen in band method had an ear length of 21.05 cm.

Likewise, the interaction of the two factors did not influence the length of ears of sweet corn. The length of ears ranges from 20.44 cm to 22.53 cm with sweet corn applied with 120 kg N/ha in drip fertigation had the longest ear length and sweet corn applied with 60 kg N/ha in band having the shortest ear length.

3.3 Yield Determination

The green yield of sweet corn was obtained by weighing all the corn ears in the plot and was converted into tons per hectare.

Nitrogen is a key essential element affecting plant growth and crop yields. Application of varying levels of nitrogen in sweet corn showed a highly significant difference between treatment means based on the analysis of variance. Result of the study revealed that 90 kg N/ha was the optimum amount of nitrogen required by sweet corn on that particular area where it gave the highest yield of 14.86 tons/ha which is significantly higher compared to sweet corn applied with 120 kg N/ha having a yield of 14.32 tons/ha and sweet corn applied with 60 kg N/ha having yield of 13.76 tons/ha. The yield of sweet corn followed the recommended rate of nitrogen based on soil analysis at 90-60-20.

The average yield of sweet corn per hectare applied with Nitrogen in varying levels using different methods of fertilizer placement was shown in Figure 5. Green yield was greatly affected by the methods of nitrogen fertilizer placement. Sweet corn applied with nitrogen in drip fertigation method significantly gave higher yield of 14.82 tons/ha compared to those sweet corn applied with nitrogen using the band method of application with yield of 13.80 tons/ha. The advantage of using drip fertigation lies in the utilization of fertilizer especially nitrogen which is very volatile. Drip fertigation permits precise timing and placement of plant nutrients, can increase the efficiency of fertilizer use, and may improve yield, quality, and profits. Fertigation also can reduce the potential for nutrient leaching and runoff (ag.ohio-state).

Nevertheless, the interaction of the two factors (varying levels of nitrogen and the method of fertilizer placement) had no significant effect on the green yield of sweet corn. However, the yield ranges from 13.32 tons/ha to 15.39 tons/ha with sweet corn applied with 90 kg N/ha in drip fertigation method having the highest yield of 15.39 tons/ha while sweet corn applied with 120 kg N/ha in band method having the lowest green yield of 13.32 tons/ha.

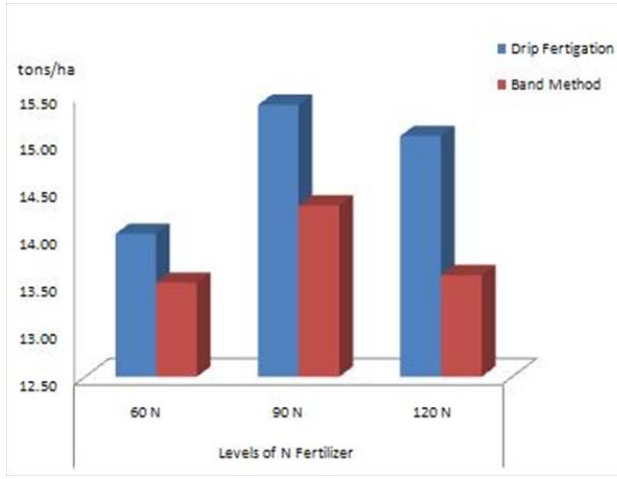

Figure 5. Green yield of sweet corn applied with varying levels of nitrogen using two different methods of fertilizer placement

Figure 6. Sweet corn applied with 120 kg N/ha using drip fertigation (T_5) has longer ears (a) and heavier ear weight (b) compared to those applied with the same level of N using band method (T_6).

3.4 Cost and Return Analysis

The cost and return per hectare of sweet corn was computed based on the prevailing market price of sweet corn in the area (nearest market is CDO). The computed cost of production per hectare was deducted from the gross return to obtain the net return per hectare.

The prevailing price of sweet corn during the conduct of the study was P20.00 per kg at Cagayan de Oro City. Figure 8 shows the mean gross income, total cost of production, net income and ROI of sweet corn applied with varying levels of nitrogen using two different methods of fertilizer placement.

Applying nitrogen at 90 kg/ha gave the highest gross income of P297,100.00; net income of P229,996 and a return of investment of 342.66%. The high gross income was attributed to the high yield obtained which was 14.86 tons/ha. Highest total cost of production was obtained by applying 120 kg N/ha of P68,146.00. This was mainly attributed to the amount of nitrogen applied to sweet corn. Lowest gross income, total cost of production and net income was obtained by sweet corn applied with 60 kg N/ha of P275,200.00, P65,017, and P210,183.00, respectively. Lowest ROI was obtained in sweet corn plants applied with nitrogen at 120 kg/ha of 316.07%, this is mainly attributed to the high cost of production incurred due to the large amount of nitrogen applied.

Results also showed that application of nitrogen using drip fertigation method gave higher gross income; total cost of production; net income and ROI of P296,466.67; P68,718.67; P227,748.00 and 331.31%, respectively. Whereas, using band method as fertilizer placement gave a gross income; total cost of production; net income and ROI of P274,266.67; P64,792.67; P209,474.00 and 323.42%, respectively. The drip irrigation material attributes the higher cost of production. Nevertheless, using drip fertigation gave higher yield compared to band application, thus giving it higher gross income, net income and ROI.

However, applying nitrogen at 90 kg N/ha in drip fertigation gave the highest gross income of P307,800.00; net income of P238,745; and an ROI of 345.73%. Highest total cost of production was obtained by applying nitrogen at 120 kg/ha in drip fertigation of P70,298.00. Sweet corn applied with 120 kg N/ha using band method got the lowest gross income of

P266,400.00; net income of P200,406.00; and ROI of 303.67%. Lowest total cost of production was obtained in sweet corn applied with 60 kg N/ha using band method of fertilizer placement of P63,231.00.

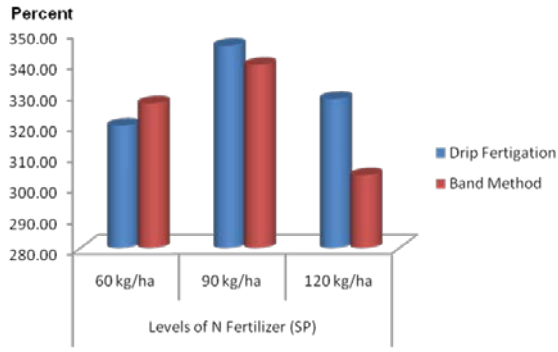

Figure 8. Return on investment of sweet corn applied with varying levels of nitrogen using two different methods of fertilizer placement.

4. Conclusions

On the basis of the aforementioned results, the following conclusions are made:

1. Generally, the yield of sweet corn was increased when applied with 90 kg N/ha using drip fertigation.

2. The plant height, ear height, length of leaves, and the green yield of sweet corn differed significantly with the application of nitrogen using drip fertigation over band method.

3. Application of 90 kg N/ha gave the optimum utilization of nitrogen where it gave a maximum yield of 14.86 tons/ha.

4. Application of 90 kg N/ha using drip fertigation gave the highest return on investment.

5. References

Diver, S., Kuepper, G., and Sullivan, P., (2008). Sweet Corn: Organic Production. ATTRA Sustainable Agriculture. from http://attra.ncat.org/attra-pub/sweetcorn.html

Eckert, Don. nd. (2010). Role of Nitrogen in plants. Retrieved from; http://www.rainbowplantfood.com/agronomics/efu/nitrogen.pdf

Hegde, DM. nd. Nutrient Requirements of Solanaceous Vegetable Crops. Food and Fertilizer Technology Center from http://www.agnet.org/library.php?func=view&id=20110801133428

Sanmaneechai, M., Koehler, F.E., and Roberts, S., (1984). Nitrogen Fertilization Practices for Sequential Cropping of Wheat, Turnips, and Sweet corn. Soil Science Society of America Journal. 48(1).

Olaniyan, A.B., Akintoye, H.A., Balogun M.A., (2004). Effect of different sources and rates of nitrogen fertilizer on growth and yield of sweet corn, from http://www.tropentag.de/2004/abstracts/full/146.pdf