# On-farm Comparison of Fertility Treatments on Sweet Corn

Mark Douglass, Craig Altemose, Tom Butzler and Brooks Way

An on-farm comparison of fertility treatments to one Sweet Corn variety planted and harvested at two different times during the season was carried out at the Way Fruit Farm in Centre County, Pennsylvania. This was an evaluation of which treatment was most economical, had the best sugar content, and nutrient utilization. The treatments consisted of:

1) 50 pounds of nitrogen applied just prior to planting as a broadcast and incorporated
2) a nitrogen recommendation based on Pre-Sidedress Nitrate Soil Test (PSNT) taken when the corn was 8 to 12 inches tall,
3. a foliar treatment with Fertileader & Fertileader BMO

Two replicated trials consisting of these three treatments replicated four times in each trial were planted, one in early May and the second in early June, 2003. All treatments were applied after each trial was soil sampled and brought up to recommended soil test levels for P and K.

PSNT recommendations were made if the test level was less than 25 ppm nitrate. The recommendations were based on a yield goal of 120 bushels of dry shell corn per acre. We used this goal based on field corn because Penn State has no yield goal for sweet corn. Both trials were sprayed with the herbicides: Prowl 3 EC at 1 quart & Bicep Lite II, Magnum at 2 quarts per acre pre-emergence to control weeds. The planting rate was 18,000 seeds/acre.

Harvests were taken August 18 & August 25, 2003 in Trials1 and 2 respectively. Measurements were based on the number and weight of marketable ears from the middle 20 feet of rows 4, 8, 12, and 16 out of each plot. Yields were interpolated to one acre. A Brix test was performed for sugar content of 1 ear selected at random from each row sample harvested in each plot. The 2003 year was a record setting year for rainfall. Irrigation was only needed once to help incorporate the side dress Nitrogen fertilizer recommended in the PSNT treatments. Wire cone traps with appropriate lures were used to trap and monitor Corn Earworm and European Corn Borer. A bucket trap was used to monitor Fall Armyworm. The results of this monitoring did not show a need for increased insecticide spraying.

The cost for treatment 1 was $540.62 per acre, treatment 2 was $550.37 per acre, and treatment 3 was $558.55 per acre. Net return to management for treatment 1 was $2419.16 per acre, treatment 2 was $3085.94 per acre, and treatment 3 was $2416.07 per acre. The results of the Brix test for sugar content were 22.1 for treatment 1, 21.9 for treatment 2, and 22.9 for treatment 3.

Brooks Way plans to use a PSNT test on all sweet corn grown in 2004.

Project participants were Brooks Way of Way Fruit Farm, Thomas Butzler, Craig Altemose, and Mark Douglass, Penn State Cooperative Extension. Responsibilities included experimental design, implementation, data collection, analysis, outreach efforts, and summary report.

# Project Title: Continuation of an on-farm comparison of fertility treatments on one Sweet Corn variety planted and harvested at two different times during the season. This is an evaluation of which treatments are most economical, show the best sugar content, and nutrient utilization. FNE02-446

Project Leader: Brooks Way, Way Fruit Farm
Address: 926 Smith Road
Matilda, Pa 16870
Telephone: 814-692-5211 Best time to call: Day Time

This project was conducted to determine the effect:

1. 50 pounds of nitrogen applied just prior to planting as a broadcast and incorporated
2. of the use of a Pre-Sidedres Nitrate Soil Test (PSNT) to measure nitrate available to the crop when the crop is 8 to 12 inches tall. A recommendation for nitrogen is made if the test is less than 25 ppm nitrate.
3. of a foliar treatment with Fertileader & Fertileader BMO,

I (Brooks Way, owner of Ways Fruit Farm), farm over 200 acres in fruit and vegetable production, grown mostly on land owned. My crop mix consists of 100 acres of apples, 20 acres of peaches, 12 acres of strawberries, 2 acres of tart cherries, 1 acre of sweet cherries, 15 acres of pumpkins, 25 acres of sweet corn, and 35 acres of agronomic crops. I was involved in the experimental design and provided farm labor and equipment to carry out field implementation of trials. I also was involved in writing the summary report. Thomas M. Butzler, IPM/Horticulture-PSU Coop. Extension, Craig Altemose, Centre County CED/Agronomy-PSU Coop. Extension, and Mark Douglass, Farm

Financial Management PSU-Coop. Extension were involved in experimental design, implementation, data collection, analysis, outreach efforts, and summary report.

## Way Research Methods 2003

We picked a site with minimal soil variability. The soil type was Murrill Channery Silt Loam, 3-8% slope. Two Trials were planted one in early May and one in early June. Plots were 60 feet X 60 feet. Each trial was 60 feet wide x 720 feet long . Attached as appendix 2 are diagrams of test plots and treatments. Treatments in each strip trial consisted of foliar treatment with Fertileader & Fertileader BMO, PSNT to 25 ppm or the rate needed to produce 120 bushels of dry shell corn per acre (based on field crop recommendations since Penn State does not have a recommendation for sweet corn) and preplant incorporate 50 pounds of nitrogen per acre. To take into account any variability, treatments were replicated four times in each trial. All treatments were applied after each trial was brought up to recommended soil test levels.

We soil sampled both trial area's and applied fertilizer to the soil test recommendation (50-30-0/acre) to all plots. Trial 1: 50-30-0 rate/acre was applied and incorporated right away on 5/1/03. Plots 1, 5, 8, and 10 received 50 nitrogen/acre that was incorporated right away on 5/1/03. All 12 plots in trial #1 were planted on 5/3/03 with the sweet corn variety Incredible. The planting rate was 18,000 seeds/acre. Plant populations across the plots ranged from 12,000 to 18,000 plants/acre in both trials. Herbicide Prowl 3 EC at 1 qt./A & Bicep Lite II, Magnum at 2 qt./A was applied on May, 04, 2003 pre-emergence to control weeds. European corn borer (ECB), corn earworm (CEW), & fall armyworm (FAW) were monitored through traps placed at the two trial sites at planting. A Pre-Sidedress Nitrate Soil Test sample (PSNT) was taken when the corn was 8 inches tall in

both trials. Plots 2, 4, 9 and 12 in trial 1 were sampled on 6/17/03. Plots having a test > 25 ppm nitrate received a zero recommendation. Plots with < 25 ppm nitrate received a nitrogen recommendation based on 120 bu. per acre dry shell corn. Nitrogen was recommended and applied to plots 2, 4, and 12 at a rate of 114/acre, 120/acre, and 115/acre respectively. Plot 9 had a zero recommendation. This was applied as a sidedress and incorporated on 6/20/03. Irrigation was applied on 7/3/03. Fertileader at 2.5 pts./acre was applied to plots 3, 6, 7, and 11 on 7/1/03 while BMO at 2.5 pts./acre and Larvin Insecticide were applied 7/30/03. Warrior Insecticide at 3 oz./acre was applied to both trials on 8/13/03. Trial 2 was planted on 6/1/03 with the sweet corn variety Incredible. Herbicide Prowl 3 EC at 1 Qt./A & Bicep Lite II, Magnum at 2 Qt./A was applied was applied on June, 02, 2003 pre-emergence to control weeds. Again all plots received 50-30-0 fertilizer that was incorporated on 6/1/03. Plots 1, 5, 9, and 12 received 50 N/ acre that was incorporated 6/1/03. Plots 2, 6, 8, and 10 received a PSNT on 6/23/03. Plots 2 and 6 had a recommendation of 118 lbs. and 123 lbs N/acre respectively that was applied as a sidedress and incorporated on July 18. Plots 8 and 10 had a zero recommendation. Fertileader at 2.5 pts. /acre was applied to plots 3, 4, 7, and 11 on 7/21/03 while BMO at 2.5 pts./acre and Larvin Insecticide at 50 oz./acre was applied 8/8/03. Foliar samples were taken in each plot of both trials at random using a zig zag pattern. They were taken from the base of the ear prior to harvest (24 samples total). We harvested, counted, and weighed marketable ears from rows 4, 8, 12, and 16 out of each plot. Yields were interpolated to one acre based on a 34 inch row spacing and our 20-feet sample length in the middle of each 60 foot corn row. Harvests were taken August 18 & August 25, 2003. Trial 1 and 2 respectively. A Brix test was performed for sugar content of 1 ear selected at random from each row sample harvested in each plot. The 2003 year was a record setting year for rainfall; irrigation was only needed once to help incorporate the side dress

fertilizer. Cost were lower for 2003 compared to 2002 due to not having to use irrigation more then once.

Wire cone traps with appropriate lures were used to trap and monitor corn earworm and European corn borer while a bucket trap was used to monitor fall armyworm (Appendix 3)

## Results

The cost for the 3 treatments were Treatment 1 – Prepalnt Inc 50 lbs N/Acre $540.62 Treatment 2 – Sidedress PSNT $550 and Treatment 3 – Foliar Fertileader and BMO $558.55. The difference in cost was due to the different cost of Fertilizer, testing and application methods. The fertilizer cost was Pre-plant $40.75, Side-dress nitrogen after PSNT $50.50 and Foliar Fertileader and BMO $58.68 per acre. Net return to management was Preplant $2416.07, Sidedress after PSNT $3085.94 and Foliar Fertileader and BMO $2419.16 per acre. The results of the Brix test where an average of 22.22 for the 50 Preplant plots, 21.94 for the PSNT plots and 22.78 for the plots that were foliar sprayed. The Plan for 2004 is to use a PSNT test on all sweet corn grown and tested when the sweet corn is 8 inches tall and fertilize to a level necessary to produce 120 of dry shelled corn per acre. Attached as appendix 1 is a summary of the financial data.

## Outreach

As part of the outreach effort, a field day was held for the Appalachian Fruit Growers Association on August 12, ten growers attended. The field day was held at the sweet corn fertility strip trials followed by a tour of the Way Farm facilities and direct market operation. On August 13 a group of forty growers from Alabama visited the farm and toured the sweet corn fertility trials.

A poster was developed and will be upgraded to be displayed at the Central Pennsylvania Vegetable Conference and North Central Pennsylvania Vegetable Conference in February 2004 and four pesticide recertification meetings and crops meetings in Clinton and Centre Counties. Results will be published in the 2004 January issue of the North Central Region Agriculture and Natural Resources Newsletter.

Project Leader: Brooks Way, Way Fruit Farm
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Matilda, Pa 16870
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**Appendix 1**

# Result for Way Sweet Corn Economic Data on a per Acre Basis 2003

| | 50 Nitrogen | PSNT | Foliar |
|---|---|---|---|
| Yield Dozen | 844.77 | 1,038.95 | 850.77 |
| Price Per Dozen | 3.50 | 3.50 | 3.50 |
| **Total Income** | 2,956.69 | 3,636.31 | 2,977.71 |
| | | | |
| **Variable costs** | $0.00 | $0.00 | $0.00 |
| Broadcast 50-30-0 | $20.57 | $20.57 | $20.57 |
| Spreading | $6.15 | $6.15 | $6.15 |
| Broadcast 50 N | $7.88 | $0.00 | $0.00 |
| Spreading | $6.15 | $0.00 | $0.00 |
| BMO + Fertleader | $0.00 | $0.00 | $24.06 |
| Foliar Spray | $0.00 | $0.00 | $7.90 |
| PSNT Test | $0.00 | $6.00 | $0.00 |
| Sidedress | $0.00 | $11.63 | $0.00 |
| Sidedressing | $0.00 | $6.15 | $0.00 |
| **Total variable costs** | $40.75 | $50.50 | $58.68 |
| | | | |
| **Fixed costs** | | | |
| Herbicides | $23.00 | $23.00 | $23.00 |
| Spray | $7.60 | $7.60 | $7.60 |
| Insecticides | $22.89 | $22.89 | $22.89 |
| Spray | $23.70 | $23.70 | $23.70 |
| Soil test | $6.00 | $6.00 | $6.00 |
| Plow | $14.30 | $14.30 | $14.30 |
| Disk | $27.60 | $27.60 | $27.60 |
| Plant | $13.60 | $13.60 | $13.60 |
| Irrigation Set Up | $50.00 | $50.00 | $50.00 |
| Irrigation | $102.00 | $102.00 | $102.00 |
| Labor | $70.00 | $70.00 | $70.00 |
| Seed | $48.38 | $48.38 | $48.38 |
| Lime | $40.80 | $40.80 | $40.80 |
| Land | $50.00 | $50.00 | $50.00 |
| **Total fixed costs** | $499.87 | $499.87 | $499.87 |
| **Total costs** | $540.62 | $550.37 | $558.55 |
| **Net returns to mgt.** | $2,416.07 | $3,085.94 | $2,419.16 |

**Appendix 2**
Sweet Corn Fertility Trial at Brooks Way
SARE Grant Trial #1

| |
|---|
| Block 1<br>Treatment 1 |
| Block 1<br>Treatment 2 |
| Block 1<br>Treatment 3 |
| Block 2<br>Treatment 2 |
| Block 2<br>Treatment 1 |
| Block 2<br>Treatment 3 |
| Block 3<br>Treatment 3 |
| Block 3<br>Treatment 1 |
| Block 3<br>Treatment 2 |
| Block 4<br>Treatment 1 |
| Block 4<br>Treatment 3 |
| Block 4<br>Treatment 2 |

Treatment 1 – Prepalnt Inc 50 lbs N/Acre

Treatment 2 – Sidedress PSNT

Treatment 3 – Foliar Fertileader and BMO

Sweet Corn Fertility Trial at Brooks Way
SARE Grant Trial # 2

| |
|---|
| Block 1<br>Treatment 1 |
| Block 1<br>Treatment 2 |
| Block 1<br>Treatment 3 |
| Block 2<br>Treatment 3 |
| Block 2<br>Treatment 1 |
| Block 2<br>Treatment 2 |
| Block 3<br>Treatment 3 |
| Block 3<br>Treatment 2 |
| Block 3<br>Treatment 1 |
| Block 4<br>Treatment 2 |
| Block 4<br>Treatment 3 |
| Block 4<br>Treatment 1 |

Treatment 1 – Prepalnt Inc 50 lbs N/Acre

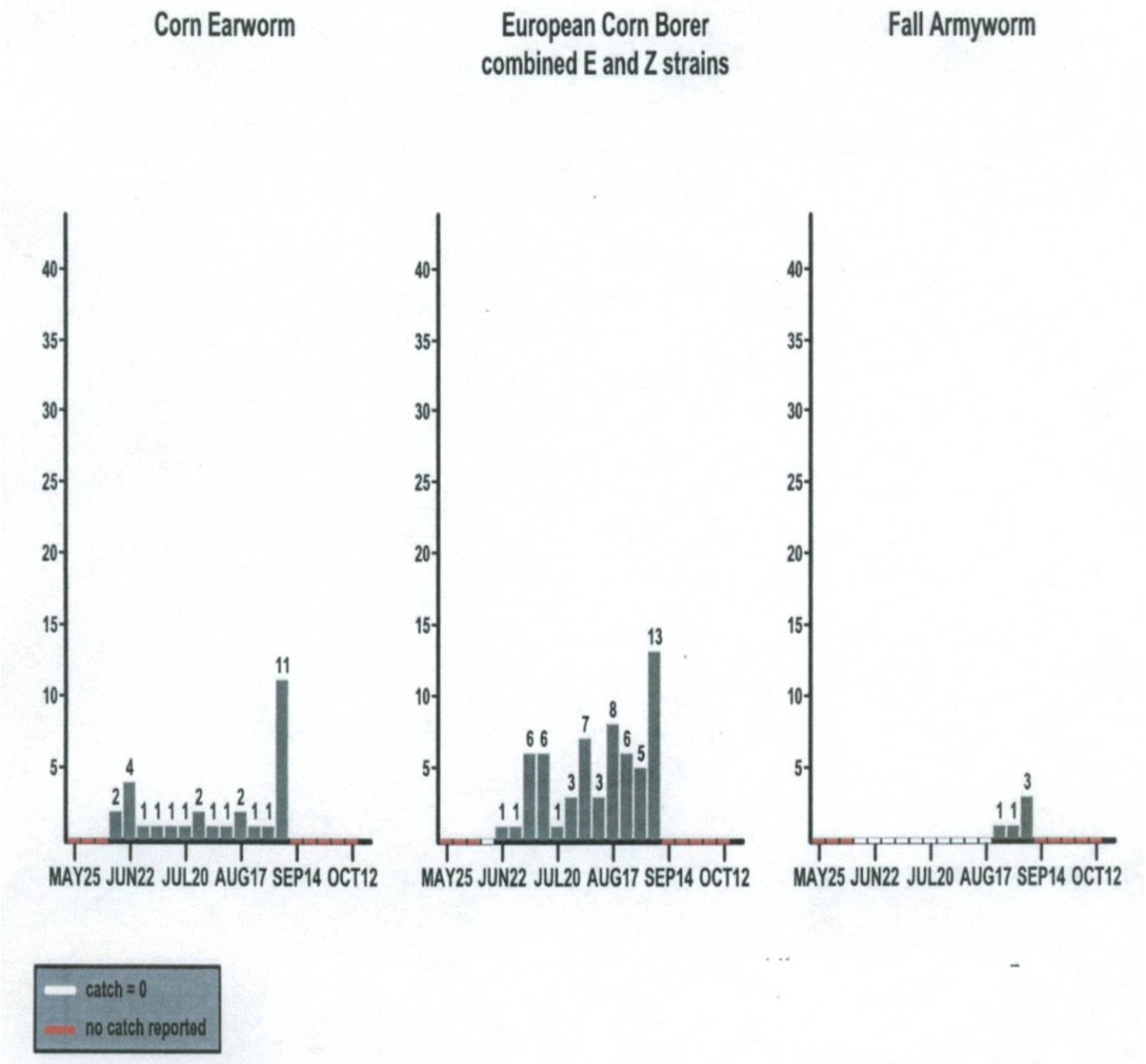
Treatment 2 – Sidedress PSNT

Treatment 3 – Foliar Fertileader and BMO

**Appendix 3**

# Average Daily Trap Catch Summaries, 2003

## Brooks Way, Centre County, PA



# Way Sweet Corn Fertility Trial in Cooperation with Penn State Cooperative Extension

Brooks Way, Owner of Ways Fruit Farm
Thomas M. Butzler, IPM/Horticulture-PSU Coop. Extension
Craig Altemose, Centre County CED/Agronomy-PSU Coop. Extension
Mark Douglass, Farm Financial Management PSU-Coop. Extension

Funded by USDA Northeast Sustainable Agriculture Research and Education (NESARE) Farmer Grant

**Figure 1. Fidel Castillo (on the left) and Brooks Way harvest marketable ears of sweet corn in test plots.**

# History & Treatments

Brooks read an article in the October 13, 2001 issue of **Lancaster Farming** titled "*Is It Wise To Use Starter Fertilizer For Corn?*" This led him to theorize the elimination of certain fertilization procedures and the incorporation of foliar feeding.

Brooks thought that the foliar fertilizer would give the plant a boost right when it was needed (applied when corn silking) and improve the sugar content. In addition, foliar feeding was convenient in the sense that it could be mixed with insecticide applications. Brooks tried foliar feeding in 2001 and thought he saw some visual difference in a plot where the foliar feed was not reaching the middle rows. This led him to question the effect of various fertilization practices on marketable yield.

This project was conducted to determine the effect:

1. of a foliar treatment with Fertileader & Fertileader BMO
2. of the use of a Pre-Sidedress Nitrate Soil Test (PSNT) to measure nitrate available to the crop when the crop is 8 to 12 inches tall. A recommendation for nitrogen is made if the test is less than 25 ppm nitrate.
3. of preplant incorporate 50 pounds of nitrogen per acre.

The PSNT is a soil sample taken at one foot of depth when the corn plants are eight inches to one foot high to determine the amount of nitrogen available to the plant at the time when it is green and growing and able to take up the nitrogen.

**Abstract**

# On-farm Comparison of Fertility Treatments on Sweet Corn

Mark Douglass, Craig Altemose, Tom Butzler and Brooks Way

An on-farm comparison of fertility treatments to one Sweet Corn variety planted and harvested at two different times during the season was carried out at the Way Fruit Farm in Centre County, Pennsylvania. This was an evaluation of which treatment was most economical, had the best sugar content, and nutrient utilization. The treatments consisted of: 1) 50 pounds of nitrogen applied just prior to planting as a broadcast and incorporated 2) a nitrogen recommendation based on Pre-Sidedress Nitrate Soil Test (PSNT) taken when the corn was 8 to 12 inches tall, and 3). a foliar treatment with Fertileader & Fertileader BMO.

Two replicated trials consisting of these three treatments replicated four times in each trial were planted, one in early May and the second in early June, 2003. All treatments were applied after each trial was soil sampled and brought up to recommended soil test levels for P and K.

PSNT recommendations were made if the test level was less than 25 ppm nitrate. The recommendations were based on a yield goal of 120 bushels of dry shell corn per acre. We used this goal based on field corn because Penn State has no yield goal for sweet corn. Both trials were sprayed with the herbicides: Prowl 3 EC at 1 quart & Bicep Lite II, Magnum at 2 quarts per acre pre-emergence to control weeds. The planting rate was 18,000 seeds/acre.

Harvests were taken August 18 & August 25, 2003 in Trials1 and 2 respectively. Measurements were based on the number and weight of marketable ears from the middle 20 feet of rows 4, 8, 12, and 16 out of each plot. Yields were interpolated to one acre. A Brix test was performed for sugar content of 1 ear selected at random from each row sample harvested in each plot. The 2003 year was a record setting year for rainfall. Irrigation was only needed once to help incorporate the side dress Nitrogen fertilizer recommended in the PSNT treatments. Wire cone traps with appropriate lures were used to trap and monitor Corn Earworm and European Corn Borer. A bucket trap was used to monitor Fall Armyworm. The results of this monitoring did not show a need for increased insecticide spraying.

The cost for treatment 1 was $558.55 per acre, treatment 2 was $548.10 per acre, and treatment 3 was $540.62 per acre. Net return to management for treatment 1 was $2419.16 per acre, treatment 2 was $3088.21 per acre, and treatment 3 was $2416.07 per acre. The results of the Brix test for sugar content were 22.78 for treatment 1, 21.94 for treatment 2, and 22.22 for treatment 3.

Brooks Way plans to use a PSNT test on all sweet corn grown in 2004.

Project participants were Brooks Way of Way Fruit Farm, Thomas Butzler, Craig Altemose, and Mark Douglass, Penn State Cooperative Extension. Responsibilities included experimental design, implementation, data collection, analysis, outreach efforts, and summary report.

# Plot plan showing fertility treatments in both trials carried out in 2003

.

Sweet Corn Fertility
Trial at Brooks Way
SARE Grant Trial # 1

| |
|---|
| Block 1<br>Treatment 1 |
| Block 1<br>Treatment 2 |
| Block 1<br>Treatment 3 |
| Block 2<br>Treatment 2 |
| Block 2<br>Treatment 1 |
| Block 2<br>Treatment 3 |
| Block 3<br>Treatment 3 |
| Block 3<br>Treatment 1 |
| Block 3<br>Treatment 2 |
| Block 4<br>Treatment 1 |
| Block 4<br>Treatment 3 |
| Block 4<br>Treatment 2 |

Sweet Corn Fertility
Trial at Brooks Way
SARE Grant Trial # 2

| |
|---|
| Block 1<br>Treatment 1 |
| Block 1<br>Treatment 2 |
| Block 1<br>Treatment 3 |
| Block 2<br>Treatment 3 |
| Block 2<br>Treatment 1 |
| Block 2<br>Treatment 2 |
| Block 3<br>Treatment 3 |
| Block 3<br>Treatment 2 |
| Block 3<br>Treatment 1 |
| Block 4<br>Treatment 2 |
| Block 4<br>Treatment 3 |
| Block 4<br>Treatment 1 |

Treatment 1 – Preplant Inc 50 lbs N/Acre

Treatment 2 – Sidedress PSNT

Treatment 3 – Foliar Fertileader and BMO

# Result for Way Sweet Corn Economic Data on a Per Acre Basis Across Both Trials in 2003

| | 50 Nitrogen | PSNT | Foliar |
|---|---|---|---|
| Yield Dozen | 844.77 | 1,038.95 | 850.77 |
| Price Per Dozen | 3.50 | 3.50 | 3.50 |
| **Total Income** | $2,956.69 | $3,636.31 | $2,977.71 |
| **Variable costs** | | | |
| Broadcast 50-30-0 | $20.57 | $20.57 | $20.57 |
| Spreading | $6.15 | $6.15 | $6.15 |
| Broadcast 50 N | $7.88 | $0.00 | $0.00 |
| Spreading | $6.15 | $0.00 | $0.00 |
| BMO + Fertleader | $0.00 | $0.00 | $24.06 |
| Foliar Spray | $0.00 | $0.00 | $7.90 |
| PSNT Test | $0.00 | $6.00 | $0.00 |
| Sidedress N | $0.00 | $11.63 | $0.00 |
| Sidedressing | $0.00 | $6.15 | $0.00 |
| **Total variable costs** | $40.75 | $50.50 | $58.68 |
| **Fixed costs** | | | |
| Herbicides | $23.00 | $23.00 | $23.00 |
| Spray | $7.60 | $7.60 | $7.60 |
| Insecticides | $22.89 | $22.89 | $22.89 |
| Spray | $23.70 | $23.70 | $23.70 |
| Soil test | $6.00 | $6.00 | $6.00 |
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| Disk | $27.60 | $27.60 | $27.60 |
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| Irrigation | $102.00 | $102.00 | $102.00 |
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| Seed | $48.38 | $48.38 | $48.38 |
| Lime | $40.80 | $40.80 | $40.80 |
| Land | $50.00 | $50.00 | $50.00 |
| **Total fixed costs** | $499.87 | $499.87 | $499.87 |
| **Total costs** | $540.62 | $550.37 | $558.55 |
| **Net Returns to Managment.** | $2,416.07 | $3,085.94 | $2,419.16 |

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| **Total fixed costs** | $499.87 | $499.87 | $499.87 |
| **Total costs** | $540.62 | $550.37 | $558.55 |
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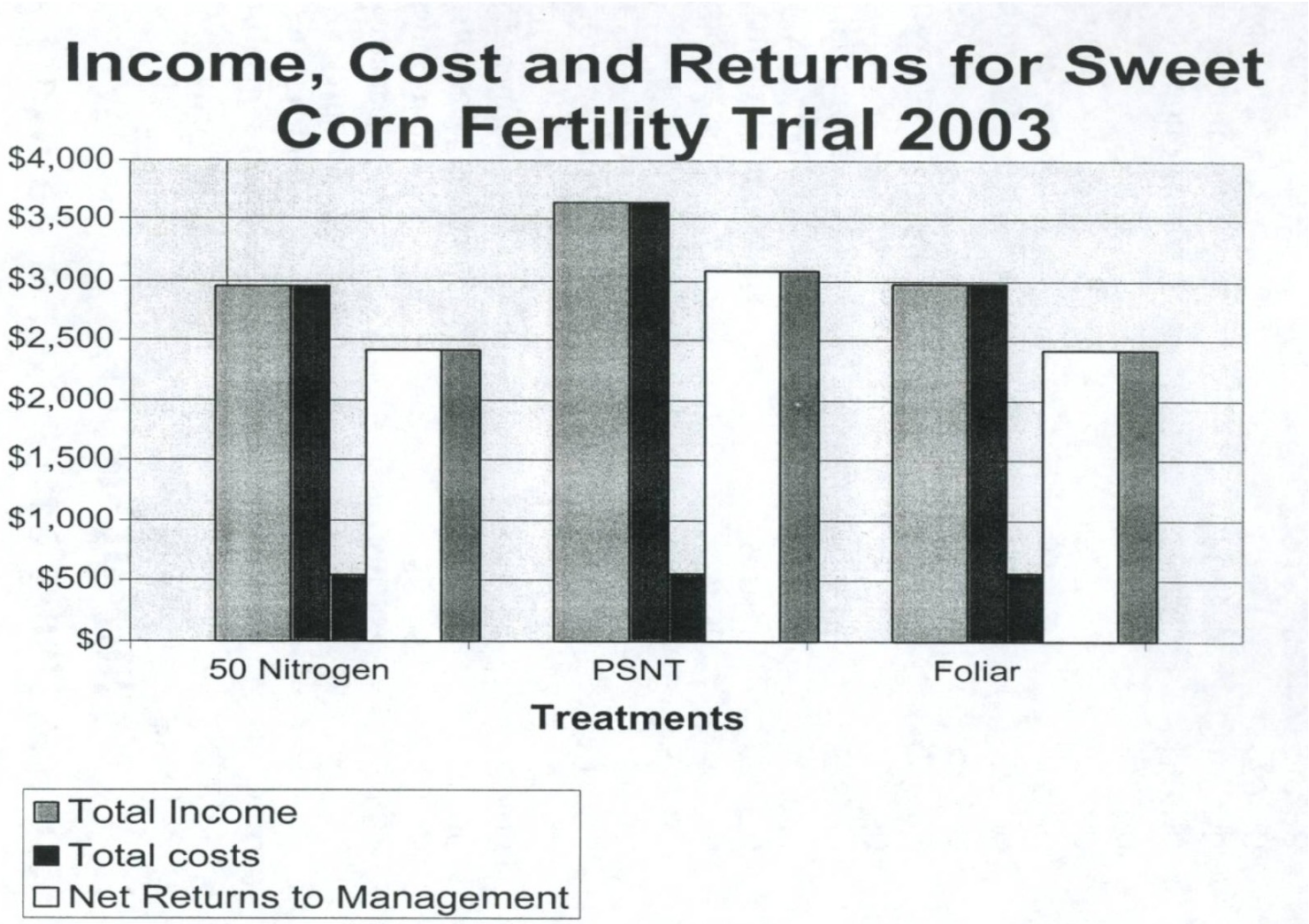


Figure 4. Income and Expenses on Marketable Ears on Both Trials in 2003.

# Mother Nature at Work

The project was conducted in 2002 and was adversely affected by the drought, out of 12 plots only 3 plots yielded marketable ears. The data that was collected increased our interest in continuing this research study in 2003. With additional funding received from NESARE we were able to continue our research effort in 2003.


**Figure 2. Local newspaper articles from 2002 describing drought conditions throughout central Pennsylvania**