

Peppers



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Experiment: Fertilizer Effects on Bell Pepper Production
Year: 2004 (04-33)
Date of Planting/Harvest: transplant 5-12-04/ 7-04 thru 9-04
Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)

pH ~ 6.4 P1 ~ 52
 CEC ~ 5 K ~ 121
 OM ~ 1.5% (6.2% K)

**Chart 1. Fertilizer Effects on Bell Pepper Production and Quality
 North Central Research Station - 2004**

Fertilizer Treatment	Count peppers/A	Weight ton/A	Avg lbs/pepper
ACLF	62726	13.1	0.41
ACLF + Foliar	64469	13.0	0.40
Conventional	62146	12.2	0.39
Untreated	37752	7.7	0.41
<i>LSD (0.2)</i>	<i>14170.4</i>	<i>4.3</i>	<i>0.038</i>

- ACLF: 7 gal/A High NRG-N + 6 gal/A 9-24-3 + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 6 gal/A High NRG-N (sidedress x 2)
- ACLF + Foliar: 7 gal/A High NRG-N + 6 gal/A 9-24-3 + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 6 gal/A High NRG-N (sidedress x 2); 2 gal/A Sure-K + 1 gal/A Nutritional Foliar (biweekly foliar)
- Conventional: 235 lbs/A 0-0-60 + 290 lbs/A 18-46-0 (preplant incorporated); 9 gal/A 28% UAN (sidedress x 2)
- Band applications were made after transplanting in a band next to the row. Sidedress applications were made June 21st and July 1st in a band along the irrigation line and watered in. Foliar applications were made biweekly with a pressurized backpack beginning on July 13th.
- Harvest was completed by hand from July 20th thru September 23rd. Peppers were counted and weighed to calculate yield. All fertilizer treatments significantly increased bell pepper production over the untreated check.
- Agro-Culture Liquid Fertilizer programs produced higher yielding and larger bell peppers than the conventional fertilizer program.
- Highest yield was achieved with the Agro-Culture Liquid Fertilizers program with the addition of foliar applications during harvest. By applying additional nutrition during the harvest season when there is a high demand of fruit production, productivity was greatly increased producing higher quality bell peppers increasing both size and quantity.

Experiment: Two-Year Fertility Programs on Bell Peppers

Year: 2004 (04-33); 2005 (05-33)

Date of Planting/Harvest: transplant 5-12-04/ 7-04 thru 9-04
transplant 5-9-05 / 7-05 thru 9-05

Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)

pH ~ 6.4 P1 ~ 52
CEC ~ 5 K ~ 121
OM ~ 1.5% (6.2% K)

Soil Test Levels (ppm)

pH ~ 7.3 P1 ~ 61
CEC ~ 6.3 K ~ 87
OM ~ 1.8% (3.5% K)

2004 Fertilizer Programs

- **ACLF:** 7 gal/A High NRG-N + 6 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 6 gal/A High NRG-N (sidedress x 2)
- **ACLF + Foliar:** 7 gal/A High NRG-N + 6 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 6 gal/A High NRG-N (sidedress x 2); 2 gal/A Sure-K + 1 gal/A Nutritional Foliar (foliar x 7)
- **Conventional:** 235 lbs/A 0-0-60 + 290 lbs/A 18-46-0 (preplant incorporated); 9 gal/A 28% UAN (sidedress x 2)

2005 Fertilizer Programs

- **ACLF:** 2 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 18 gal/A High NRG-N (sidedress)
- **ACLF + Foliar:** 2 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500 (band); 18 gal/A High NRG-N (sidedress); 2 gal/A Sure-K + 1 gal/A Nutritional Foliar (foliar x 7)
- **Conventional:** 140 lbs/A 0-0-60 + 50 lbs/A 18-46-0 (preplant incorporated); 30 gal/A 28% UAN (sidedress)

In the fall of 2004 Michigan State University developed a new Vegetable Crop Fertility Guide. There were slight differences for certain crops and nutrients in the new guide compared to the one previously used. Bell Peppers were one of the crops where changes were made. Also a soil test taken in the spring of 2005, after 40-ton/A manure application, showed differences in Phosphorus and Potassium levels. For both growing seasons, a complete Agro-Culture Liquid Fertilizers program was compared to an equal conventional program. Although these programs are different between the two years, comparisons between years are the same. (Programs listed above)

- Band fertilizer applications were made after transplanting in a band next to the row. Sidedress nitrogen was applied on June 23 in a band along the side of the plants. Overhead irrigation was applied to water in the nitrogen.
- Dry fertilizer was broadcast incorporated prior to transplanting.
- Foliar applications were made every other week, with a pressurized backpack sprayer. A total spray volume of 15 gal/A was used.
- Harvest was completed by hand from July 21st thru September 29th. Peppers were counted and weighed to calculate yield.

Fertilizer Effects on Bell Pepper Production and Quality

North Central Research Station: 2004 - 2005

Fertilizer Treatment	2004 Yield ton/A	2005 Yield ton/A	Avg. Yield ton/A	2004 Size oz/pepper	2005 Size oz/pepper	Avg. Yield oz/pepper
ACLF	13.1	14.6	13.8	6.6	6.1	6.3
ACLF + Foliar	13.0	16.6	14.8	6.4	6.6	6.5
Conventional	12.2	14.2	13.2	6.2	6.3	6.3
Untreated	7.7	13.5	10.6	6.6	6.5	6.5
LSD (0.2)	4.3	3.7	2.2	0.61	0.46	0.33

Results:

- All fertilizer programs increased bell peppers yields over the untreated check.
- There was no significant difference in bell pepper size.
- Agro-Culture Liquid Fertilizer programs produced higher yielding peppers than the conventional fertilizer program.
- Highest yield was achieved with the Agro-Culture Liquid Fertilizers program with the addition of foliar applications during harvest. By applying additional nutrition during the harvest season when there is a high demand of fruit production, productivity was greatly increased producing higher quality bell peppers increasing both size and quantity.
- Although soil test values varied for one year to the next, changing the fertilizer program to meet the soils needs proved to be efficient as yields were similar for both years.

Experiment: Protrastim (PTS) Use on Bell Peppers
Year: 2005 (05-33)
Date of Planting/Harvest: transplant 5-9-05 / 7-05 thru 9-05
Plot Size: 5 plants x 5 ft

Soil Test Levels (ppm)

pH ~ 7.3 P1 ~ 61
 CEC ~ 6.3 K ~ 87
 OM ~ 1.8% (3.5% K)

**Foliar Fertilizer Effects on
 Bell Pepper Production and Quality**

North Central Research Station: 2005

Fertilizer Treatment	Weight ton/A	Avg lbs/pepper
ACLF + Foliar	15.1	6.4
ACLF + Foliar PTS	16.6	6.6
Untreated	13.5	6.5
LSD (0.1)	2.8	0.6

- Protrastim (PTS) is a protein cell carrier with a tri-alcohol growth stimulant that boosts the crops ability to store energy for the photosynthetic process.
- Both fertilizer programs had the same band and sidedress fertilizers.
- Band fertilizer: 2 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500 (applied after planting, next to row on 5/9/05)
- Sidedress fertilizers: 18 gal/A High NRG-N (applied on 5/23)
- Foliar applications were done with a pressurized backpack with a total spray volume of 15 gal/A. Applications were biweekly from July 13th thru August 24th.
- Eight foliar applications were made. Treatments were:
- Foliar: 2 gal/A Sure-K + 1 gal/A Nutritional Foliar
- Foliar + PTS: 2 gal/A Sure-K + 1 gal/A Nutritional Foliar + 2 oz/A PTS

Results:

- Fertilizer plots yielded higher than the untreated check.
- There was no significant difference in pepper size amongst the treatments.
- Addition of PTS to the foliar program proved to be beneficial, increasing the yield by 1.5 tons/A and slightly increasing the fruit size.

Experiment: Garden Fertilizer Comparison
Year: 2003 (03-34&35)
Date of Planting/Harvest: May / July-September
Plot Size: 5' x 5'

Table 1. Tomato Fertility Programs

North Central Research Station - 2002-03

Product applied 2x month	2002 Yield Tomatoes/plant	2003 Yield Tomatoes/plant	Average Yield Tomatoes/plant	Avg. Fruit Size lb/tomato
Garden Grow	25.3	22.5	23.9	0.31
Miracle Gro	21.1	20.0	20.6	0.28
Untreated	21.0	14.8	17.9	0.28

Table 2. Bell Pepper Fertility Programs

North Central Research Station - 2002-03

Product applied 2x month	2002 Yield Peppers/plant	2003 Yield Peppers/plant	Yield/Plant Peppers/plant	Avg. Fruit Size lb/tomato
Garden Grow	5.9	9.3	7.6	0.27
Miracle Gro	5.0	8.0	6.5	0.23
Untreated	3.1	5.0	4.1	0.23

- This experiment was complete to determine the best fertilizer source for home garden vegetables. Comparisons were made between Agro-Culture Liquid Fertilizers' Garden Grow and the conventional fertilizer Miracle Gro.
- Garden Grow was mixed at a rate of 1 oz per gallon of water and Miracle Gro was mixed at 1 tsb. per gallon of water. Each plant was watered bi-weekly with 4 oz of fertilizer solution.
- Plants were transplanted in mid-May and harvest was done by hand from early July thru a killing frost in September. Fruit was sorted, weighed, and counted to calculate yield.
- In both 2002 and 2003 tomato and bell pepper yields were increased with either fertilizer application as compared to the untreated check.
- Amongst the two years, highest yield was achieved with applications of Agro-Culture Liquid Fertilizers Garden Grow for both the tomatoes and bell peppers.
- Garden Grow significantly increased the fruit size of both bell peppers and tomatoes in both 2002 and 2003.

Experiment: Bell Peppers
Year (Experiment Number): 2006 (06-203)
Date of Planting/Harvest: May 23 / July-Mid Sept
Hybrid: Boynton
Plot Size (replications): 5' x 5', 4 reps

Soil Test Levels (ppm)	
pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

This trial was established to compare various Agro-culture Liquid Fertilizer fertility programs on the yield of bell peppers. Additionally, a comparison with conventional dry fertilizer program was made. Bell Pepper consumption in the U.S. has doubled since 1986. Greater demand for fresh market peppers is the main driving force behind this increase. Off-season greenhouse production has continued to supply fresh peppers to the US consumers all year, thus maintaining demand beyond the historically seasonal supply. It is very likely this market segment will continue to grow into the near future.



- “Boynton” variety peppers were transplanted into the research plot area on May 23, 2006. Each plant was approximately 5-6” tall at this time. The plots were 5' x 5' with a single row of five plants down the center with 12” in-row spacing.
- The entire plot area received the equivalent of 20 tons/Acre of dairy manure prior to being plowed to a depth of 6” during fall tillage. In the spring, a tractor mounted rotor-tiller was used to prepare the plots for planting.
- Products for the dry fertilizer treatment were broadcast across selected plots and incorporated prior to planting. The Agro-culture Liquid Fertilizer products were banded with a fertilizer knife so that the products were placed two inches below and just to the side of the transplants. The same applicator was used for side dressing all nitrogen products on June 13th. However, these applications were placed about 3-4 inches to the side of the planted row.

Table BP1. Bell Pepper Fertility programs for 2006.

Treatment		Rate/A	Method of Application
1	Pro-Germ + Sure-K + Micro 500 High NRG-N	2 + 7 + 2 qt 18	Band Sidedress
2	Pro-Germ + Sure-K + Micro 500 High NRG-N Sure-K + Nutr. Foliar	2 + 7 + 2 qt 18 2 + 1	Band Sidedress Weekly
3	Pro-Germ + Sure-K + Micro 500 High NRG-N Sure-K + Nutr. Foliar + PTS	2 + 7 + 2 qt 18 2 + 1 + 2 oz	Band Sidedress Weekly
4	Pro-Germ + Sure-K + Micro 500 High NRG-N Experimental Foliar #1	2 + 7 + 2 qt 18 3	Band Sidedress Weekly
5	0-0-60 18-46-0 28% UAN	140# 50# 30	Broadcast Broadcast Sidedress
6	Untreated Control	(none)	

- The foliar fertilizer applications started on July 7th with initial fruit set of the peppers. Treatments were reapplied every 7-10 days until September 5th when the last

application was made. A total of eight applications for each foliar treatment were made during the growing season. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. These fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. Fungicides and insecticides were applied separately, but in a similar manner as needed through out the season.

- PTS in treatment #3 is Protrastim, a protein cell carrier with a tri-alcohol growth stimulant that boosts the crops ability to store energy for the photosynthetic process.
- Peppers were harvested every 7-10 days beginning on July 19th and ending on Sept 11th. All peppers were hand harvested, counted and weighted as they matured.

RESULTS:

- Pepper yields for all Agro-culture Liquid Fertilizer treatments were numerically greater than the plots that received no fertilizer. Pepper production for the Conventional program was similar to the Agro-culture Liquid Fertilizer soil only program, but less than all Agro-culture Liquid Fertilizer programs that utilized foliar treatments (Table BP2).
- All peppers were hand harvested based on size, therefore, the average size of the harvested peppers should have been very similar. However, picking was based on a minimum size and some peppers grew faster than others. Therefore statistical differences were noticed between several of the treatments ($P \leq 0.15$). All fertility programs except treatment #3 produced statistically larger peppers than the untreated control program. Peppers treated with the Experimental Foliar program average 1.6 oz per pepper larger than the Untreated and 1.2 oz/pepper larger than the conventional fertility program average over the entire season. Average peppers size for all Agro-Culture Liquid fertility programs (trt 1-4) were statistically similar to the conventional fertility program. Still, if a producer could realize a premium for larger sized peppers, the experimental foliar program may provide greater value per acre even with yields similar to the other fertility programs.
- Yield of the peppers on individual harvest dates were statistically similar for all treatments over the entire season. Still, there was a noticeable increase in the early yields. More marketable peppers were produced with the ACLF programs during the two initial harvests compared to the conventional fertilizer and the untreated.
- The use of PTS (trt. #3) promoted early ripening and approximately 46% of the total production from the first three of eight harvests was produced by this treatment program. (Table BP3). Yield for most other fertility programs was only about ~38% of their total production for this same time.
- Weekly applications of Agro-culture Liquid Fertilizer Nutritional Foliar and Sure-K resulted in a yield increase of over 1.3 tons/Acre compared to the conventional fertilizer program utilized in this trial. Because the pepper size was similar for these two treatments, the yield increase occurred due to greater fruit set with the foliar fertilizer applications. The two year average for this Agro-culture Liquid Fertilizer was a yield increase of nearly 1.4 tons /Acre. Despite any statistically difference, these treatment differences have been consistently in favor of this fertility program.



Table BP2. Yield and average size of bell peppers produced over eight harvests during 2006.

Treatment		Harvest 1	Harvest 2	Harvest 3	Harvests 4-8 (cumulative)	Total Yield*	Avg. Wt* (oz./pepper)
		Yield (tons / Acre)					
1	Plant/SD	3.98	2.58	1.81	14.0	22.4 ab	6.2 bc
2	Plant/SD/Foliar	4.47	3.15	2.77	17.1	27.5 b	5.6 bc
3	Plant/SD/Foliar & PTS	4.46	3.64	2.24	11.9	22.2 ab	5.4 ab
4	Plant/SD/Exp Foliar #1	4.43	2.98	2.31	16.1	25.8 ab	6.9 c
5	Conventional Program	3.46	3.61	3.06	16.1	26.2 ab	5.7 bc
6	Untreated Control	3.42	1.84	3.34	11.2	19.8 a	5.3 a

* Treatments with the same letter are statistically similar according to Duncan's Multiple Range Test (P<0.20)

Table BP3. Effect of Fertility Program on yield distribution by harvest for peppers.

Treatment		Harvest 1	Harvest 2	Harvest 3	Harvests 4-8 (total)
		Percentage of total yield by harvest			
1	Plant/SD	17.8%	11.5%	8.1%	62.5%
2	Plant/SD/Foliar	16.3%	11.5%	10.1%	62.2%
3	Plant/SD/Foliar & PTS	20.1%	16.4%	10.1%	53.6%
4	Plant/SD/Exp Foliar #1	17.2%	11.6%	9.0%	62.4%
5	Conventional Program	13.2%	13.8%	11.7%	61.5%
6	Untreated Control	17.3%	9.3%	16.9%	56.6%

Conclusions:

The addition of foliar fertilizers to the basic liquid fertility program promoted yield and size of the treated peppers. Additionally, the foliar fertilizers promoted maturity and therefore, yields from the earliest harvests were increased.

Conventional fertilizers were applied according to published guidelines from Michigan State University's Nutrient Recommendations for Vegetable Crops in Michigan. Ext Bulletin E2934, 2004



Experiment: Three-Year Summary - Fertility Programs on Bell Peppers**Year:** 2004 (04-33); 2005 (05-33); 2006 (06-203)**Date of Planting/Harvest:** transplant 5-12-04/ 7-04 thru 9-04

transplant 5-9-05 / 7-05 thru 9-05

transplant 5-23-06 / 7-06 thru 9-06

Plot Size: 5 ft. x 5 ft.**2004****Soil Test Levels (ppm)**

pH ~ 6.4 P1 ~ 52
 CEC ~ 5 K ~ 121
 OM ~ 1.5% (6.2% K)

2005 & 2006**Soil Test Levels (ppm)**

pH ~ 7.3 P1 ~ 61
 CEC ~ 6.3 K ~ 87
 OM ~ 1.8% (3.5% K)

These trials were established to compare various Agro-culture Liquid Fertilizer fertility programs with conventional dry fertilizer program on the yield and quality of bell peppers.

Table BP1. Bell Pepper Fertility programs for 2004, 2005 & 2006.

Treatment		2004 Rate/A	2005 & 2006 Rate/A	Method of Application
1	High NRG-N Pro-Germ + Sure-K + Micro 500 High NRG-N	7+ 6 + 7 + 2 qt 6 + 6	0 + 2 + 7 + 2qt 18	Band Sidedress
2	Pro-Germ + Sure-K + Micro 500 High NRG-N Sure-K + Nutr. Foliar	7+ 6 + 7 + 2 qt 6 + 6 2 + 1	2 + 7 + 2 qt 18 2 + 1	Band Sidedress Weekly
3	Pro-Germ + Sure-K + Micro 500 High NRG-N Sure-K + Nutr. Foliar + PTS	7+ 6 + 7 + 2 qt 6 + 6 2 + 1 + 2oz	2 + 7 + 2 qt 18 2 + 1 + 2 oz	Band Sidedress Weekly
4	Pro-Germ + Sure-K + Micro 500 High NRG-N Experimental Foliar #1	NA	2 + 7 + 2 qt 18 3	Band Sidedress Weekly
5	0-0-60 18-46-0 28% UAN	235 290 9 + 9	140# 50# 30	Broadcast Broadcast Sidedress
6	Untreated Control	(none)	none	

In the fall of 2004 Michigan State University developed a new Vegetable Crop Fertility Guide. Bell Peppers were one of the many crops where noticeable changes in nutrient recommendations were made. For all growing seasons, a complete Agro-Culture Liquid Fertilizers program was compared to an equal conventional fertility program. Although these programs are different between 2004 and the two other years, comparisons between years are the same. (Fertility Programs listed above)

- Band fertilizer applications were made after transplanting in a band next to the row. Sidedress nitrogen was applied on in mid-June in a band along the side of the plants. All plots were irrigated as needed, see irrigation logs for specific details.
- Dry fertilizer was broadcast and lightly incorporated prior to transplanting.
- Foliar applications were made every 7-10 days, with a pressurized backpack sprayer. A total spray volume of 15 gal/A was used.
- Harvest was completed by hand from mid-July thru late September most years. Mature peppers were hand harvested, counted and weighed to calculate yield.

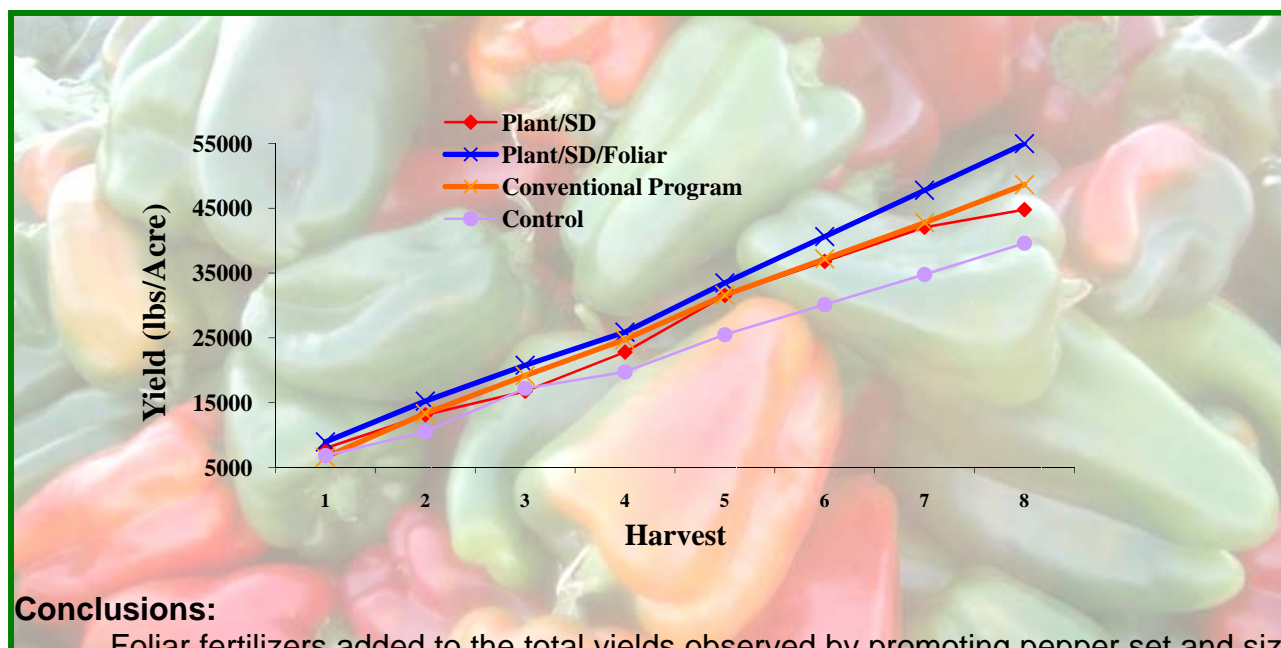
Fertilizer Effects on Bell Pepper Production and Quality. North Central Research Station 2004-2006								
Fertility Program	Total Yield (tons/Acre)				Pepper Size (oz/pepper)			
	2004	2005	2006	Avg. Yield	2004	2005	2006	Avg. Size
ACLF	13.1	14.6	22.4	16.7	6.6	6.1	6.2	6.3
ACLF & Foliar	13.0	16.6	27.5	19.0	6.4	6.6	5.6	6.2
Conventional Fertility	12.2	14.2	22.3	16.2	6.2	6.3	5.7	6.1
LSD* ($P \leq 0.20$)	4.3	3.7	0.7		0.61	0.46	1.6	

*LSD is specific to individual yield criteria by year (within column) of evaluation only.

Results:

- All Agro-Culture Liquid Fertilizer programs increased bell peppers yields over Conventional Fertilizer Program.
- There was no significant difference in bell pepper size when averaged over three years. Since peppers were hand harvested based on size, this was expected.
- Agro-Culture Liquid Fertilizer programs produced higher pepper yields than the conventional fertilizer program.
- Highest yield was achieved with the Agro-Culture Liquid Fertilizers program with the addition of foliar applications during harvest. By applying additional nutrition during the harvest season when there is a high demand of fruit production, productivity was greatly increased producing greater fruit set better quality bell peppers.
- Although soil test values varied for one year to the next, changing the fertilizer program to meet the soils needs proved to be efficient as yields were similar for both years.

Figure P1. Effect of harvest date on the yield of Bell peppers, 2006.



Conclusions:

Foliar fertilizers added to the total yields observed by promoting pepper set and size on the treated plants. Yields were established and maintained at higher levels when foliar fertilizers were used.

Experiment: Bell Peppers – Foliar Fertility**Year (Experiment Number):** 2007 (07-110)**Date of Planting/Harvest:** May 16 / Late July-Early Sept**Hybrid:** Alliance**Plot Size (replications):** 15' x 5', 3 reps**Soil Test Levels (ppm)**

pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

Bell Pepper consumption in the U.S. continues to increase and therefore, the demand for this crop continues to increase. Off-season greenhouse production and imports have continued to supply fresh peppers to the US consumers all year, thus maintaining demand beyond the historically seasonal supply. This trial was established primarily to compare various Agro-culture Liquid foliar fertility programs on the yield of bell peppers. Additionally, a comparison of ACLF products with a conventional dry fertilizer program was made.



- The entire plot area was planted to soybeans in the season prior to this trial. The stubble was lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 10 tons/acre was used with Michigan State University's Vegetable Fertility Guide (E2934) to develop the basic fertility levels.

Table P1. Soil and Foliar Fertility Programs for Bell Peppers in 2007.

Treatment	(Yield goal = 10 tons/Acre)	Fertility Rate/A (gal/A)	Method of Application
1	Untreated Control (Water only for transplant)	0	Na
2	0-0-60+Mn+Zn+10-34-0 28% UAN +10-34-0	145#, 5#, 4# (6) 31+10	PPI/Transplant Band
3	PG + SK + Micro 500+ Mn HN	4.6, 6.7, 2.3 qt, 1 pt 22	Transplant PPI / Band
4	PG + SK + Micro 500+Mn 28% w/ eNhance	4.6, 6.7, 2.3 qt, 1 pt 29.6	Transplant Band
5	PG + SK + Micro 500+ Mn HN Sure K + Nut. Foliar + Prem Ca	4.6, 4.7, 2.3 qt, 1 pt 22 2+1+1qt	Transplant Band Foliar
6	PG + SK + Micro 500+ Mn HN Sure K + Nut. Foliar + Prem Ca + PTS	4.6, 4.7, 2.3 qt, 1 pt 22 2+1+1 qt+2 oz	Transplant Band Foliar
7	HN + PG + SK + Micro 500+ Mn HN Sure K + G07	4.6, 4.7, 2.3 qt, 1 pt 22 2+1 qt	Transplant Band Foliar
8	HN + PG + SK + Micro 500+ Mn HN Sure K + G07	4.6, 4.7, 2.3 qt, 1 pt 22 2+2 qt	Transplant Band Foliar
9	HN + PG + SK + Micro 500+ Mn HN Sure-K + Green & Grow Write Prof.	4.6, 6.7, 2.3 qt, 1 pt 22 2+2 qt	Transplant Band Foliar
10	HN + PG + SK + Micro 500+ Mn HN Sure-K + Woody Plants & Trees	4.6, 6.7, 2.3 qt, 1 pt 22 2+2 qt	Transplant Band Foliar

- The dry fertilizers were broadcast then lightly incorporated, liquid fertilizer materials were banded on the soil surface in the center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Forming the bed placed the liquid fertilizers approximately 3"-4" below the top-center of each bed.
- On May 16, 2007, "Alliance" variety bell peppers were transplanted into the plot area. Each plot was 15' long consisted of ten pepper plants with 18" spacing between plants. A transplant solution and/or approximately 400 GPA of water were used to aid in the establishment of these plants, exact products and rates described above (Table P1).
- Admire and Ridomil pesticides were also applied separately as a soil drench at the labeled rates of application during transplant. Additional fungicides and insecticides were applied as necessary through out the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by the pesticides.
- Foliar fertilizer applications started on July 2nd at the time of initial fruit set on the peppers. Treatments were reapplied every 7-10 days until August 20th when the last application was made. A total of eight applications were made during the growing season. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. The fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre.
- Beginning on July 23rd, peppers weighting approximately 4 oz or larger were hand harvested, counted and weighted every week until Sept 10th. Deformed or diseased peppers were picked and discarded as noticed through-out the season. No evaluations were made to quantify these peppers unmarketable peppers.

RESULTS:

- As a general rule, the use of various foliar fertilizers did not significantly enhance green peppers yields beyond the base ACLF fertility program (Trt. #4) this season. Still, some foliar fertilizer programs did improve yields (Chart BP1), positively impacted pepper size (Chart BP2) and therefore enhance pepper quality/value.

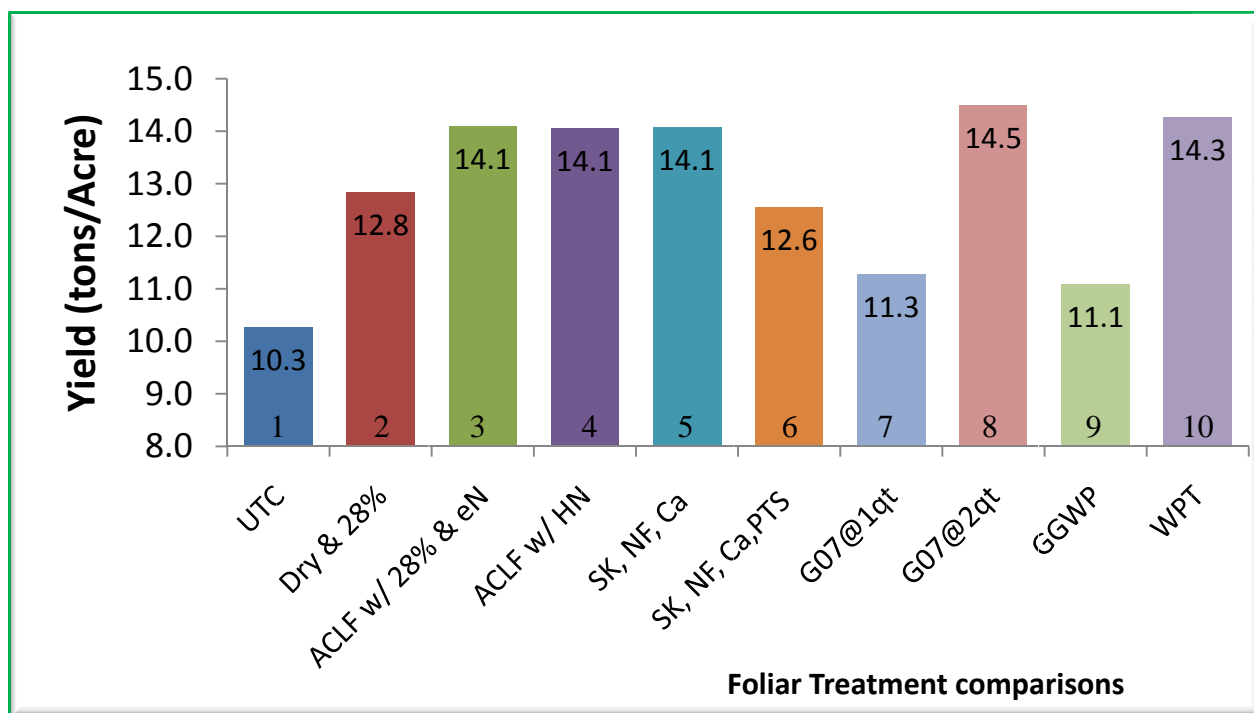


Chart BP1. Yield response of Bell Peppers to various soil and/or foliar fertilizer programs in 2007.

- The base ACLF programs of Sure-K, Pro-Germinator and Micro 500 at transplant with High NRG-N or eNanced 28% UAN (Trt #3 & #4) produced yields among the highest in this trial. Both programs out yielded the conventional dry fertilizer with 28% UAN program (Trt. #2) by 1.3 tons per acre over the season.
- The observed bell pepper yields for the entire season were best for regular applications of the Experimental Foliar G07 at 2 qt./A (Trt. 8) or Woody Plants and Trees (WPT), 14.5 and 14.3 tons/Acre, respectively. Yields for the other foliar fertilizer programs were lower, but not statistically different from the conventional fertilizer program.

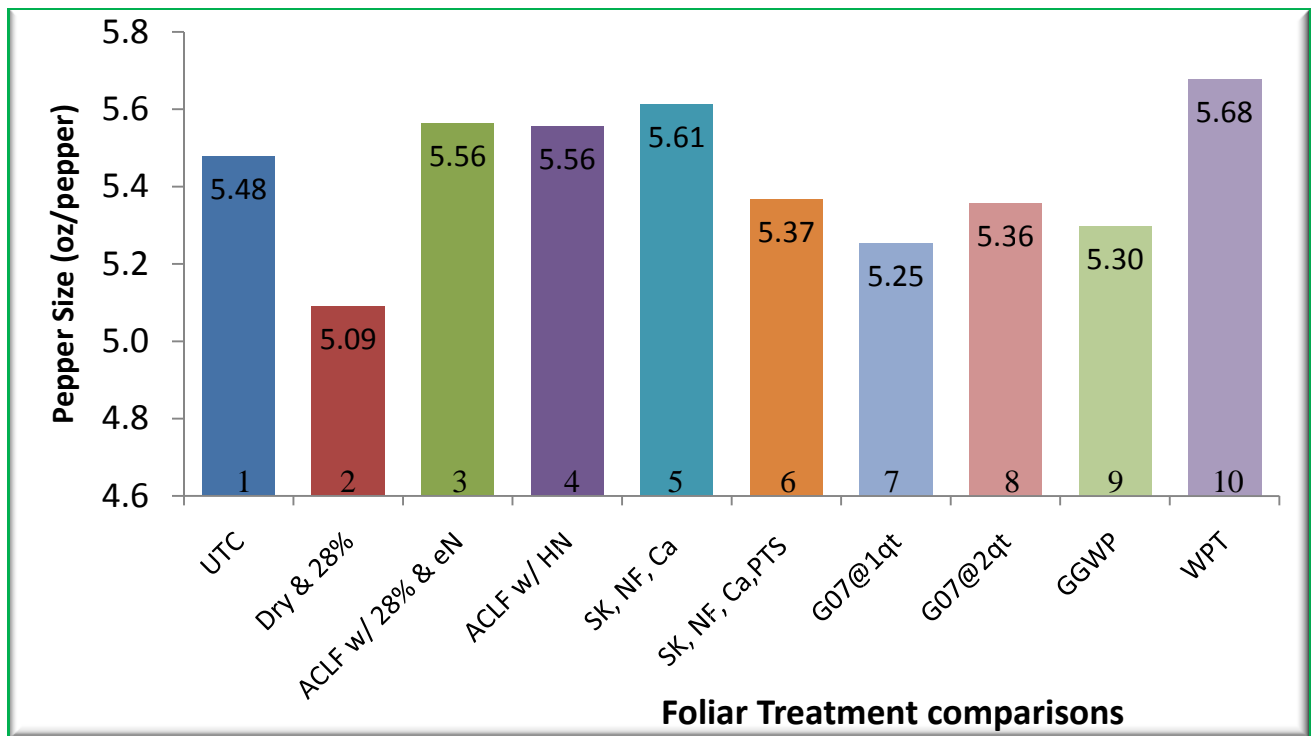
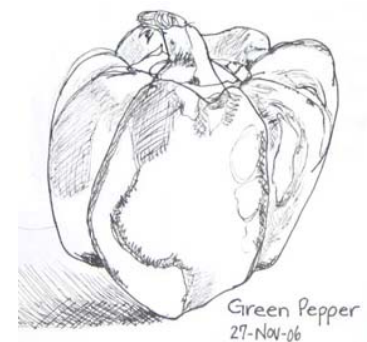


Chart BP2. Average Bell Pepper Size by fertility program during the 2007 season.

- The conventional dry fertilizer with 28% UAN program produced the lowest average for pepper size of any treatment in the trial, approximately 5.1 oz./pepper. Peppers from the ACLF base programs with High NRG-N or eNanced 28% UAN averaged nearly 0.5 oz per pepper larger across the entire season (Chart BP2).
- Regular use of Woody Plants and Trees resulted in the production of the heaviest peppers, 5.68 oz/pepper average. Foliar applications of Sure-K, Nutritional Foliar & Premium Calcium also enhanced pepper size slightly.
- The experimental foliar G07 had the highest yields with a slight reduction in average peppers size. Therefore, the observed positive yield response was from more peppers produced than an increased pepper size.



Experiment: Peppers – Drip Fertility

Year (Experiment Number): 2007 (07-108)

Date of Planting/Harvest: May 16 / late July-early Sept

Hybrid: Alliance / Diablo Chili Peppers

Plot Size (replications): 30' x 5' (2@15' x 5'), 3 reps

Soil Test Levels (ppm)

pH ~ 7.3 P1 ~ 61
CEC ~ 6.3 K ~ 87
OM ~ 1.8% (3.5% K)

Pepper consumption in the U.S. continues to increase and therefore, the demand for this crop continues to increase. Off-season greenhouse production has continued to supply fresh peppers to the US consumers all year, thus maintaining demand beyond the historically seasonal supply. Pepper research trials at the North Central Research Station have previously only utilized pre-plant, side dress, and foliar fertilizer applications. The objective for this trial was to expand these successful fertility programs and utilize drip-irrigation applications of Agro-Culture Liquid Fertilizers for pepper production. Additionally, a comparison with conventional fertilizer products over two types of peppers was made.

- The entire plot area was planted to soybeans in the season prior to this trial. The stubble was lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 10 tons/acre was used with Michigan State University's Vegetable Fertility Guide (E2934) to develop the basic fertility levels.
- The dry fertilizers were broadcast then lightly incorporated into the soil. All plots were then formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Liquid fertilizers were then applied with the transplanting operations or via the drip irrigation tape placed below the plastic mulch at the time of bedding.



Table DP1. Drip Irrigation Fertility Programs for Peppers in 2007.

Treatment	(Yield goal = 10 tons/Acre)	Rate/A (gal/A)	Method of Application
1	18-46-0, 0-0-60, Mn, Zn 28% UAN via water	131#, 145#, 5#, 4# 3.6	PPI Drip
2	0-0-60+18-46-0+Mn + Zn+10-34-0 28% UAN + Sure K	145#,63#, 5#, 4#, 8 3.6+ 0.7	PPI/trans Drip
3	PG + SK + Micro 500 + Mn HN + Sure K	4.6, 4.7, 2 qt, 1qt 2.8+1qt	Transplant Drip
4	PG + SK + Micro 500 + Mn 28% w/ eNhance + Sure K	4.6, 4.7, 2 qt, 1qt 3.6.+1 qt	Transplant Drip
5	PG + SK + Micro 500 + Mn NR + Sure K	4.6, 4.7, 2 qt, 1qt 3.5+1 qt	transplant Drip

Yield Goal = 10 tons per acre – Fertility rate recommendations based on Michigan State University Vegetable fertility guide for 2007

SK = Sure-K, PG=Pro-Germinator, HN = High HRG-N, NR= High NRG-NR

- On May 16, 2007, "Alliance" bell peppers and "Diablo" New Mexico type Chili peppers were both transplanted into 15' of each plot. Ten pepper plants of each variety were planted into ½ of the 30' plot area, utilizing 18" between plants on alternating sides of the drip tape. A

transplant solution and/or water at approximately 400 GPA was applied to aid in the establishment of these plants, exact products and rates described.

- Admire and Ridomil pesticides were applied separately as a soil drench treatment at the labeled rates of application during transplant. Additional fungicides and insecticides were applied as necessary throughout the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides.
- Drip irrigation fertilizer applications started on June 12th (8-10" tall plants) and continued on a regular basis until two weeks prior to the last anticipated harvest date. The drip lines for each plot were equipped with a valve at the header line. This allowed water/fertilizer to be directed to selected plots during application. The fertilizer treatments were diluted into a total volume of 15 gallons of water. Fifteen additional gallons of additional water was used to flush the header lines and drip lines between treatments. Finally, all plots were irrigated for at least 4 additional hours following any fertilizer application to distribute the fertilizer within each plot.
- Starting on July 23rd and weekly thereafter, all Bell peppers that were approximately 4 oz or larger were hand harvested weekly until Oct. 10th. Rotten, miss-shaped and/or damaged peppers were removed as noticed, but none were included in any harvest evaluations.
- The "Diablo" Chili peppers were hand harvested on three separate dates during the growing season and all remaining peppers were stripped from the plants at the conclusion of this trial. Any Rotten and/or damaged peppers were picked as they were noticed, but none were included in any harvest evaluations.

Drip irrigation Applications



RESULTS:

The main treatments / applications in this trial were the form/type of Nitrogen (Table DP1) and pepper variety/type. The decision was made to include Sure-K with four of the five nitrogen treatments. While the fertility treatments were the same for both pepper types, they were harvested differently due to differences in the end use for each type of peppers. Therefore, data are presented separately for each pepper type.

Bell peppers showed a small yield response (0.5 to 2.4 tons per acre) from the various ACLF nitrogen and **Sure-K** product combinations utilized in this trial (Chart DP1). However, applying **Sure-K** with 28% UAN solutions didn't promote yields or pepper size compared to 28% UAN only. Despite a yield advantage of 2.25 tons per acre or more from the use of **High NRG-N** or **High NRG-NR** programs over the 28% UAN & **Sure-K** fertility program, total season yields were statistically similar.

Chili Pepper yields did show some subtle differences between treatments at the second harvest (Chart DP2). However, total yields as well as individual harvest yields were found to be statistically similar among all treatments.

The quantity of peppers harvested at the conclusion of the growing season did show an advantage from the addition of Sure-K to the 28% UAN (Trt. #2 vs. Trt. #1), as show in Chart P3. Still, individual plot yields were variable and yield averages from the final harvest was statistically similar across all treatments.

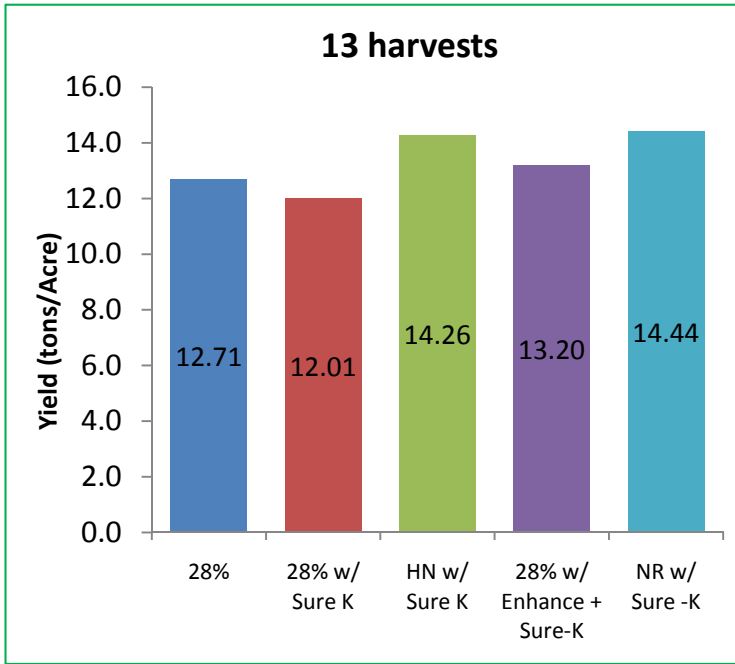


Chart DP1. Total season yield response of Bell Peppers to various drip irrigation / nitrogen fertility programs

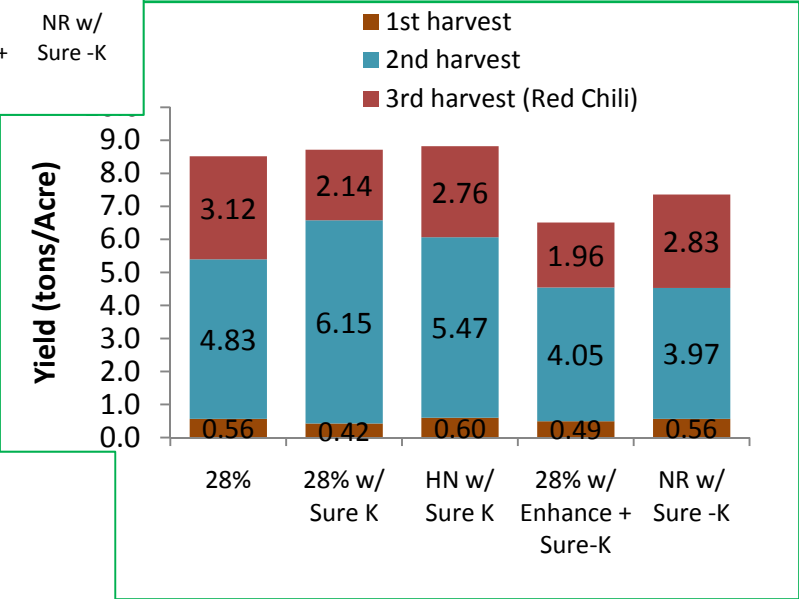


Chart DP2. Initial yield values for Chili Pepper harvests from various nitrogen fertility programs.

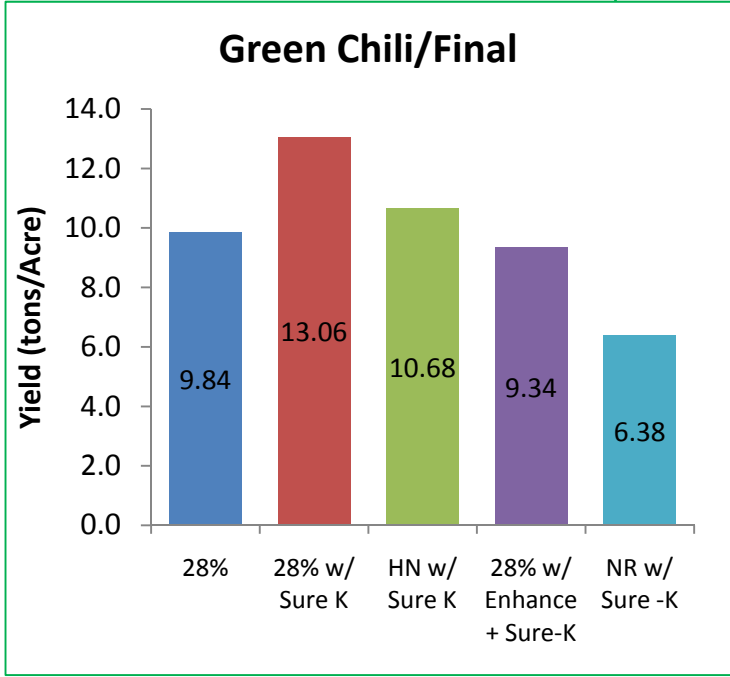


Chart DP3. Final yield of green chili peppers following a season with various nitrogen fertility programs.

Experiment: Bell Peppers – Soil and Foliar Fertility
Year (Experiment Number): 2008 (08-108)
Date of Planting/Harvest: May 16 / Late July-Early Sept
Hybrid: Alliance
Plot Size (replications): 30' x 5', 3 reps

Soil Test Levels (ppm)	
pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

Bell pepper is a cultivar group of the species *Capsicum annuum*. Cultivars of these plants produce peppercorns which develop into fruits of many different colors, including red, yellow, green and orange. Bell peppers are sometimes grouped with less pungent pepper varieties as "sweet peppers". This trial was established to compare various Agro-Culture Liquid foliar fertility programs on the yield and quality of bell peppers as well as comparisons with a conventional fertilizer program.

The entire plot area was planted to carrots in the season prior to this trial. The residue was chisel plowed in the fall and lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 200 cwt. (10 tons) /acre was used with Michigan State University's Vegetable Fertility Guide (E2934) to develop the basic fertility levels. The base N: P₂O₅: K₂O rates used for all plots were 167, 60 and 115 pounds per acre respectively.



Table BP1. Soil and Foliar Fertility Programs for Bell Peppers in 2008.

Treatment	Rate/A (gal/Acre)	Application
untreated Control		
0-60+Mn+Zn % UAN +10-34-0 -34-0 (Conventional Program)	2#+ 5#+ 4# .4+10.4	Pre-plant and transplant
PG + SK + Micro 500+ Mn PG + SK (ACLF Base)	PG+2+4 qt+1 pt + 6.9	Pre-plant and/PPI
PGK + SK + Micro 500+ Mn PG + SK	PG + 2+4 qt+1 pt + 6.9	Pre-plant and/PPI
PG + SK + Micro 500+ Mn PG + SK Pre K + Nut. Foliar + Premium Ca	PG+2+4 qt+1 pt + 6.9 1+1qt	Pre-plant and/PPI Foliar
PG + SK + Micro 500+ Mn PG + SK G07	PG+2+4 qt+1 pt + 6.9	Pre-plant and/PPI Foliar
PG + SK + Micro 500+ Mn PG + SK Pre K + G-07	PG+2+4 qt+1 pt + 6.9 2 qt	Pre-plant and/PPI Foliar

SK = Sure-K™, PG=Pro-Germinator™, HN = High NRG-N™, G07 & F07 were Experimental Foliar Materials. PGK was an alternative formulation of Pro-Germinator evaluated this season.

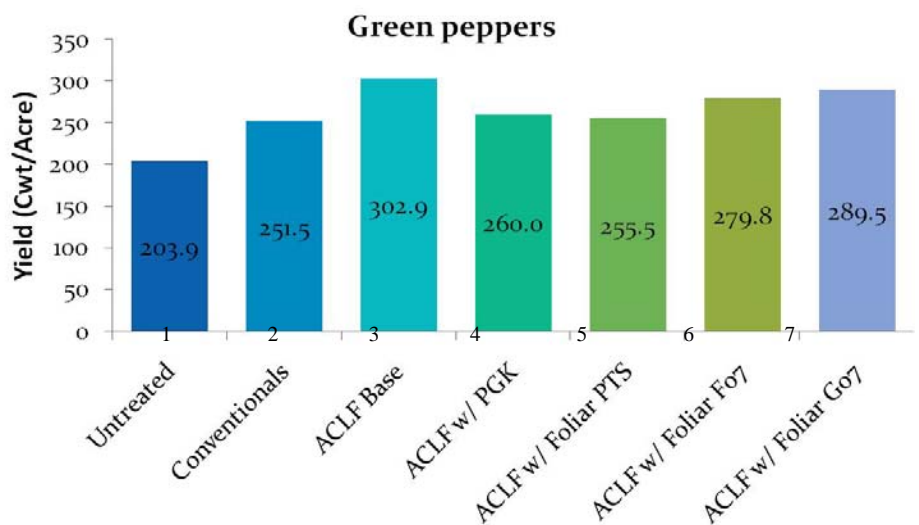
- The dry fertilizers were broadcast then lightly incorporated, liquid fertilizer materials were banded on the soil surface in the center of selected plot areas and then all plots were formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Forming the bed placed the liquid fertilizers approximately 3"-4" below the top-center of each bed.
- On May 20, 2008, "Alliance" variety bell peppers were transplanted into the plot area. Each plot was 30' long consisted of thirty pepper plants with 12" spacing between plants. A transplant solution and/or approximately 400 GPA (5.9 oz/plant) of water were used to aid

in the establishment of these plants, exact products and rates described above (Table BP1).

- Admire® and Ridomil® pesticides were also applied separately as a soil drench at the labeled rates of application during transplant. Additional fungicides (14 day interval) and insecticides (as necessary) were applied throughout the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides.
- Foliar fertilizer applications started on July 2nd at the time of initial fruit set on the peppers. Treatments were reapplied every 14 days until August 20th when the last application was made. A total of five applications were made during the growing season. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. The fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. While these treatments could have been applied with the pesticide applications, they were separated by at least one day to prevent dilution or off-target applications
- Beginning on July 23rd, peppers weighting approximately 4 oz or larger were hand harvested, counted and weighted every week until Sept 10th. Deformed or diseased peppers were picked and discarded as noticed through-out the season. No evaluations were made to quantify these unmarketable peppers.

RESULTS:

- As a general rule, the use of various foliar fertilizers did not enhance the yield or size of pepper harvested above the ACLF base fertility program this past season. The base ACLF fertility program was the best fertility treatment evaluated in this trial (Trt. 3, Figure BP1). This fertility program produced the greatest yields

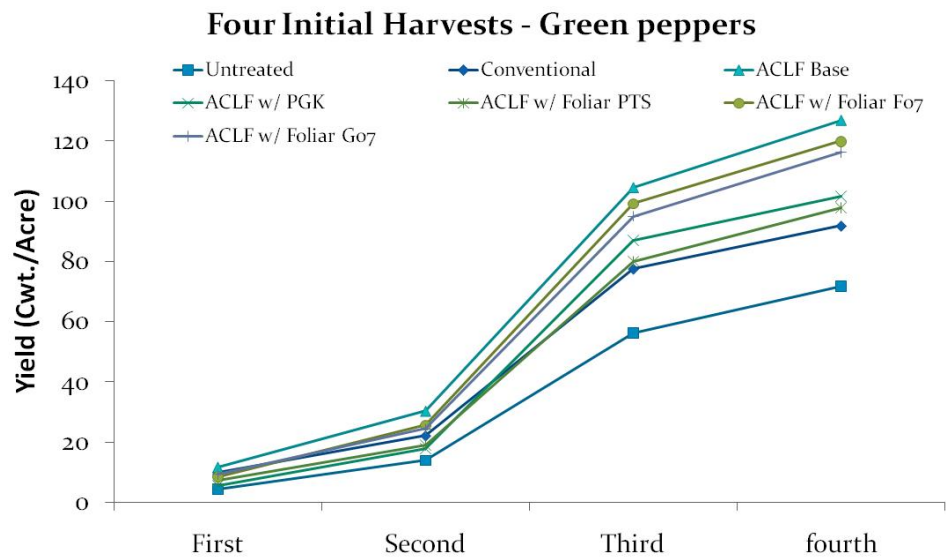


Columns with different letters are significantly different for total yield - Duncan's MRT $P \leq 0.10$

Figure BP1. Total Yield of Green Peppers in Response to Multiple Fertility Programs in 2009

- in the initial four weeks of this trial (Figure BP2) as well as the best total yield in this trial (Figure BP1). This treatment program was significantly greater than the un-fertilized peppers, but all fertility programs in this trial were statistically similar to each other.
- While the yields for the ACLF foliar fertilizer treatments (Trt. 5-7) were numerically above the conventional program, but below the ACLF base program. Total fruit counts for these foliar fertilizer applications and the ACLF Base fertility programs were nearly identical. The numerically lower yields were therefore a result of harvesting slightly smaller peppers (0.3 to 0.4 oz/pepper) over the entire season. A grower selling his peppers based on counts would have theoretically received the same payments for all these ACLF fertility programs.
- The pepper size for each program was statistically similar among all treatments, averaging 6.4 oz per pepper over the entire season's harvest.

- The experimental formulation of Pro-Germinator named PGK didn't improve on the Pro-Germinator results. Total season yields were above the conventional program, but not up to the high level of Pro-Germinator.



CONCLUSIONS:

- There exists uncertainty if the extended application interval used for this year's foliar fertility program, moving from 7 days to 14 day interval, resulted in the lower performance observed this year compared to prior trials.
- By the third harvest, the pepper yields for the ACLF Base fertility program were positively differentiated from yields of the Conventional fertility program. The later harvests continued with greater separation and higher total season yields observed for the ACLF programs.
- The ACLF Base fertility program provided the best early season and total season green pepper yield in 2008.

Figure BP2. Green Pepper Yields During the First Month of Harvest in 2008.



Experiment: Bell Peppers – Drip Fertility
Year (Experiment Number): 2008 (08-108)
Date of Planting/Harvest: May 16 / late July-early Sept
Hybrid: Alliance & Tequila Bell Peppers
Plot Size (replications): 5' x 30' (3x10'), 3 reps per variety

Soil Test Levels (ppm)	
pH ~ 7.3	P1 ~ 61
CEC ~ 6.3	K ~ 87
OM ~ 1.8%	(3.5% K)

Pepper consumption in the U.S. continues to increase and therefore, the demand for this crop continues to increase. The variety of colors and shapes that are available now also have increased the appeal of using peppers as part of a meal/snack. Last season's research trials at the North Central Research Station began evaluations of drip applied fertilizer. The main objective for this trial was to utilize the same basic drip-irrigation applications of Agro-Culture Liquid Fertilizers for pepper production, but use larger plots for potentially greater uniformity in the results. A secondary objective was comparison of fertilizer products over two varieties of peppers.

The entire plot area was planted to carrots in the season prior to this trial. The residue was chisel plowed in the fall and lightly worked in the spring with a field cultivator to prepare for establishment of the plots. A yield goal of 300 cwt / acre was used with Michigan State University's Vegetable Fertility Guide (E2934) to develop the basic fertility levels. The base N: P₂O₅: K₂O rates used for all plots were 167, 60 and 115 pounds per acre respectively.



The dry fertilizers were broadcast then lightly incorporated into the soil. All plots were then formed into beds (4" tall x 24" wide) with plastic mulch covering the center of each plot. Liquid fertilizers were then applied with the transplanting operations or via the drip irrigation tape placed below the plastic mulch at the time of bedding.

Table DP1. Drip Irrigation Fertility Programs for Peppers in 2008.

Treatment	Fertilizer (gallons/Acre)	Application
untreated Control		
0-60+Mn+Zn % UAN +10-34-0 -34-0 (Conventional Program)	2# + 5# + 4# .4 + 10.4	1 and transplant
§ + SK + Micro 500+ Mn ¶ + SK (ACLF Base)	§+2+4 qt+1 pt + 6.9	transplant and/PPI
¶ + SK + 0-0-60 + 18-46-0 -34-0 % UAN (2X Fertilizer)	+ 6.9 +192# +88#	1 transplant p/Week
§ + SK + Micro 500+ Mn ¶ + Sure K	§ + 2 + 4 qt + 1 pt +1	transplant p/Week
§ + SK + Micro 500+ Mn ¶ + SK	§ + 2 + 4 qt + 1 pt 2+1	transplant p/Week
§ + SK + Micro 500+ Mn ¶ + SK+ PG	§ + 2 + 4 qt + 1 pt + 2 + 0.5	transplant p/Week

SK = Sure-K™, PG=Pro-Germinator™, HN = High NRG-N™, NR= High NRG-NR

- On May 12, 2008, "Tequila" bell peppers were transplanted into 10' of each plot. On May 19, the "Alliance" bell peppers were planted into the remaining area for each plot, utilizing 12" between plants on alternating sides of the drip tape. A transplant solution and/or water were applied at ~5.9 oz/plant or approximately 400 GPA. The exact products and rates are described previously (Table DP1).

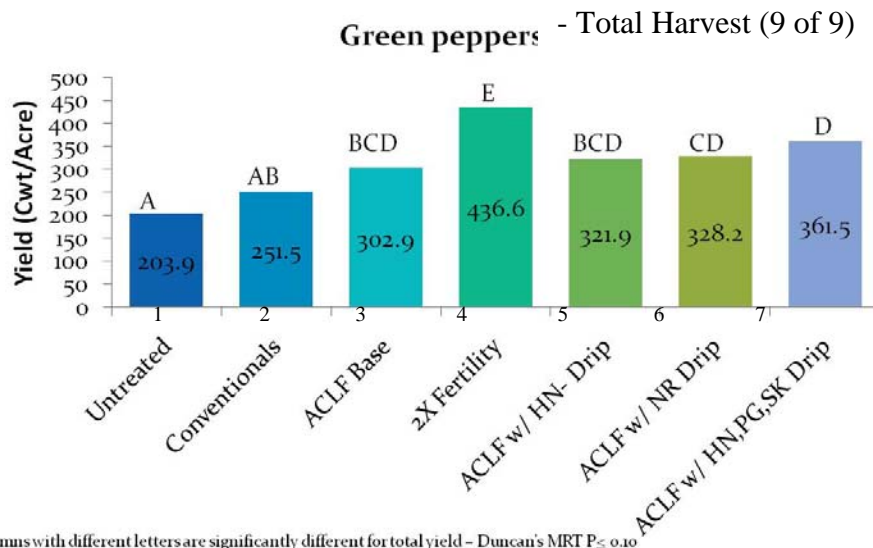
Drip irrigation Applications

- Admire® and Ridomil® pesticides were applied separately as a soil drench treatment at the labeled rates of application during transplant. Additional fungicides (14 day interval) and insecticides (as necessary) were applied throughout the growing season with an air-blast backpack sprayer operated at 10 gallons per acre, ensuring through coverage by these pesticides.
- The fertility program in Treatment #4 is a combination of conventional materials and ACLF products. The N & K fertility were 2X the recommended levels ($\frac{1}{2}$ ACLF & $\frac{1}{2}$ Conventional products) and the P is only 1X (conventional) the recommended levels for the planned yield goal for these peppers. The High-NRG-N was applied in the spring prior to planting and the conventional 28% UAN was applied in season via drip irrigation.
- Drip irrigation fertilizer applications started on June 16th (8-10" tall plants) and continued on a regular basis until the last application on August 18. The drip lines for each plot were equipped with a valve at the header line. This allowed water/fertilizer to be directed to selected plots during application. The fertilizer treatments were diluted into a total volume of 15 gallons of water. Fifteen additional gallons of additional water was used to flush the header lines and drip lines between treatments. Finally, all plots were irrigated for at least 4 additional hours following any fertilizer application to distribute the fertilizer within each plot.
- Starting on July 23rd and weekly thereafter, all peppers that were approximately 4 oz or larger were hand harvested, counted and weighted. Rotten, miss-shaped and/or damaged peppers were removed as noticed, but none were included in any recorded evaluations.



RESULTS:

- The over application of potassium and nitrogen in treatment #4 yielded some interesting results (Figure DP1). A band application of High NRG-N and Sure-K applied over the plots also fertilized with potash and DAP had the highest total yield of the green peppers,

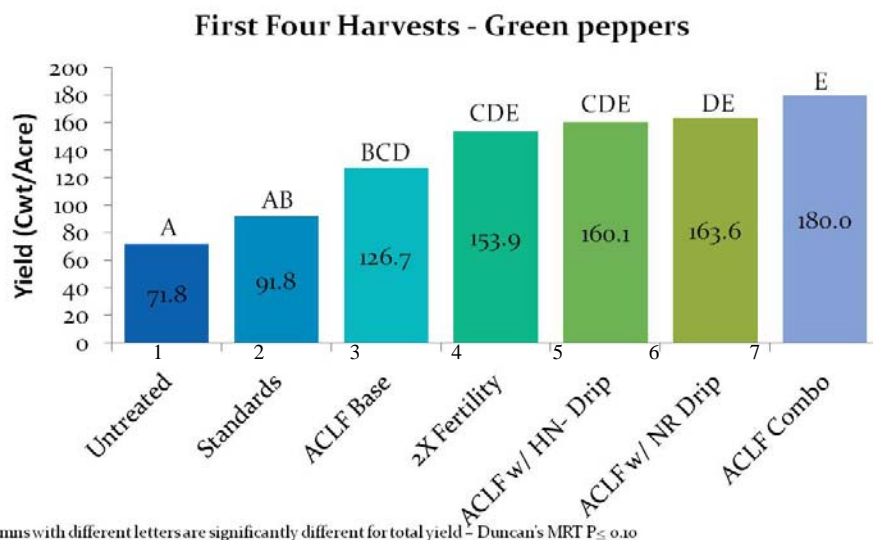


Columns with different letters are significantly different for total yield - Duncan's MRT $P \leq 0.10$

Figure DP1. Total Yield from Nine Harvests of Green Peppers Based on the Seven Fertily Programs in 2008.

producing nearly 437 cwt/A or 146% of the 1X fertility yield goal. This yield was significantly greater than any other fertility program for total yield. The value of peppers would have likely made this an economical application, despite the high rates of fertilizer. Interestingly, the yield bump from this fertility program occurred in the latter half of the growing season (Figure DP2 & DP3).

- The highest yield after the four initial harvests was the ACLF Combo (Trt#7) where a portion of the Pro-Germinator and Sure-K were combined with the High NRG-N and applied by drip irrigation several weeks during the growing season. The other drip irrigation applications for the ACLF programs also out yielded the 2X fertility treatment during the initial harvests (Figure DP2). All drip irrigation application also out yielded the 100% pre-plant applications of conventional fertilizers and the ACLF Base program. During the last four weeks of this trial (Figure DP3), the 2X fertility treatment had significantly greater yields than the other fertility programs. Still, it should be noted that the ACLF drip irrigation applications (Trt. 5-7) were discontinued three weeks prior to the last harvest. The noticeable lower productivity in the late season for the ACLF drip treatments (Figure DP3) may be related to stopping the fertilizer applications. So that treatments 3, 5, 6 and 7 all received the same relative amounts of fertilizer over the

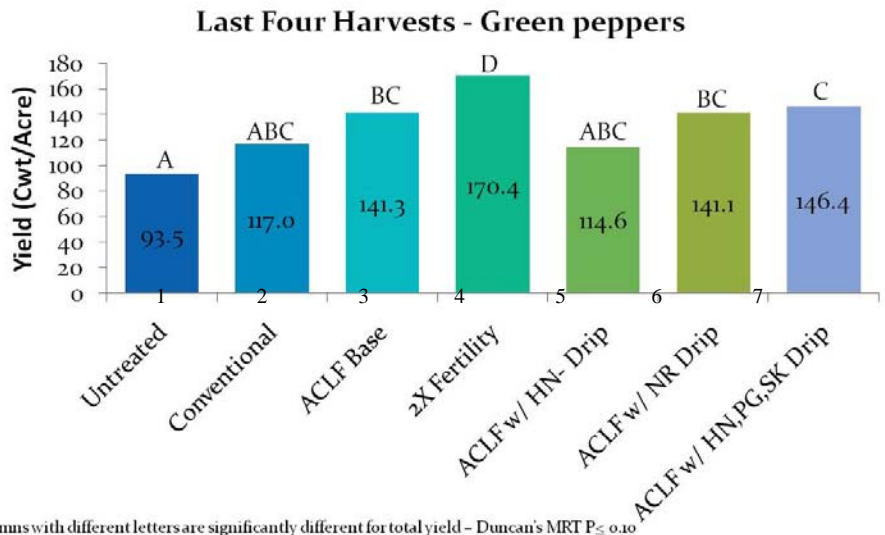


Columns with different letters are significantly different for total yield - Duncan's MRT $P \leq 0.10$

Figure DP2. Initial Yield Response to Fertility Placement and Fertilizer Type by Green Peppers, Total From the First Four Harvests.

growing season. Only the form of nitrogen and/or the timing of fertilizer application were varied for these programs. Among these treatments, the green peppers yielded the best with the continuous feeding of N, P & K offered by the ACLF combo (Trt #7) program.

- The 2X fertility program and the lower productivity during the later harvests for the ACLF drip irrigation applications shows that the peppers grown for this trial were able to utilize greater amounts of fertilizer than anticipated for this trials yield goal of 300 cwt / Acre.



Columns with different letters are significantly different for total yield - Duncan's MRT $P \leq 0.10$

TEQUILA VARIETY:

- The Tequila variety peppers were only planted in a portion of each drip irrigated plot, so not all comparisons made for the green peppers are possible for this variety. Figure DP4 show the yields from the four drip irrigation treatments stacked by harvest. For this pepper variety, there was no significant difference between the four fertility programs for total yield. Numerically the program utilizing the High NRG-NR (Trt #6) had the best total yield. It also had a greater proportion of it yield in the later harvests than did the other fertility programs. It was not until after the sixth harvest that this programs yield exceeded the others. It should also be noted that this variety of pepper didn't utilize the excess fertilizer available in the 2X fertility program like the green peppers previously discussed.

Additionally, the ACLF Combo that was very effective for the green peppers was similar to the other programs for this variety. While treatments on this pepper variety didn't show any statistical differences among fertility programs, they did show a dramatic difference among

Figure DP3. Pepper Yields from the Last Four Harvests Based on Fertility Programs in 2008.

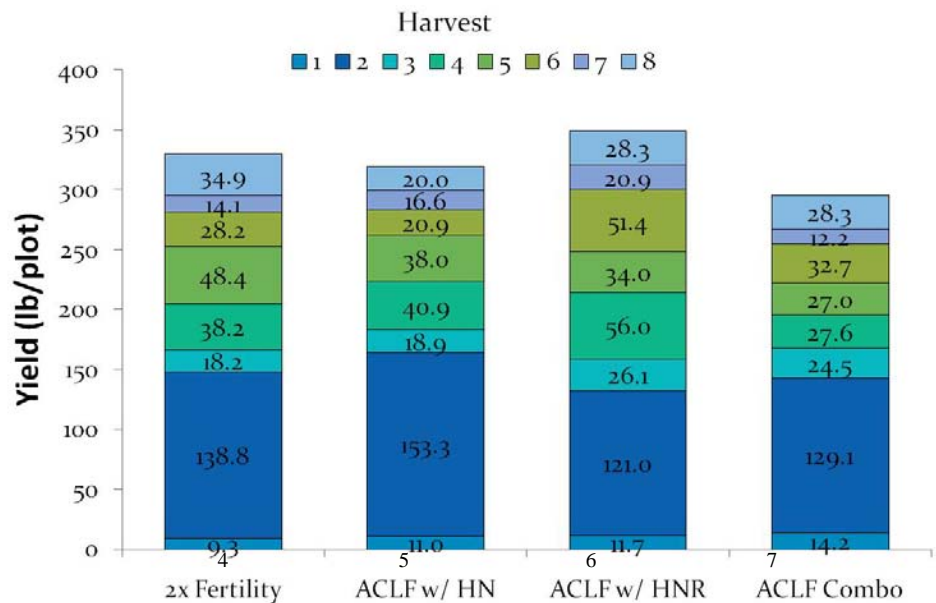


Figure DP4. Cumulative Yield by Harvest for Tequila Peppers from Four Different Fertility Treatments.

the two pepper varieties ability to respond to fertility. Providing nearly double the levels of nitrogen and potassium to this pepper variety didn't enhance yields. All fertility programs were able to meet or exceed the yield goal for these peppers.

CONCLUSIONS:

The two pepper varieties evaluated had very different responses to the fertility programs utilized. One variety was very responsive, even to rates in excess of what would appear reasonable. While the second variety essentially yielded the same for all fertility programs evaluated, even excessive fertility. Drip irrigation applications of a combination of N-P-K applied in season resulted in higher yields than when 100% of the same products and rates of fertility were applied pre-plant for one variety. The use of ACLF fertility products resulted in greater pepper yields than similar rates of conventional fertilizer materials.

Matching the plants ability to utilize fertilizer with the fertility programs will optimize yields and prevent over application of fertilizer for varieties which can't utilize it.





Experiment 09-103: Bell Peppers, drip irrigation applied fertility program comparisons, 2009.

Planted: 11/11/09	Variety: Alliance/Tequila	Population: 8700 (12"x5')
Plot Size: 5'x30'(15'split)	Replications: Three	Harvested: Multiple
Fertigation: Weekly	Foliar: None	

Soil Test Values (ppm):													
pH	CEC	% OM	P1	K	S	% K	% Mg	% Ca	% H	% Na	Zn	Mn	B
7.2	4.5	0.7	59	57	9	3.2	23.5	72.0	-	1.3	1.0	5.0	0.4

Objectives: Compare 100% pre-plant fertility program with split-applications, does applying 60% of the nutrients via drip irrigation in-season impact yield. Determine the best in-season nitrogen fertility product/combination for bell pepper production and if two different pepper varieties respond similarly to changes in fertility.

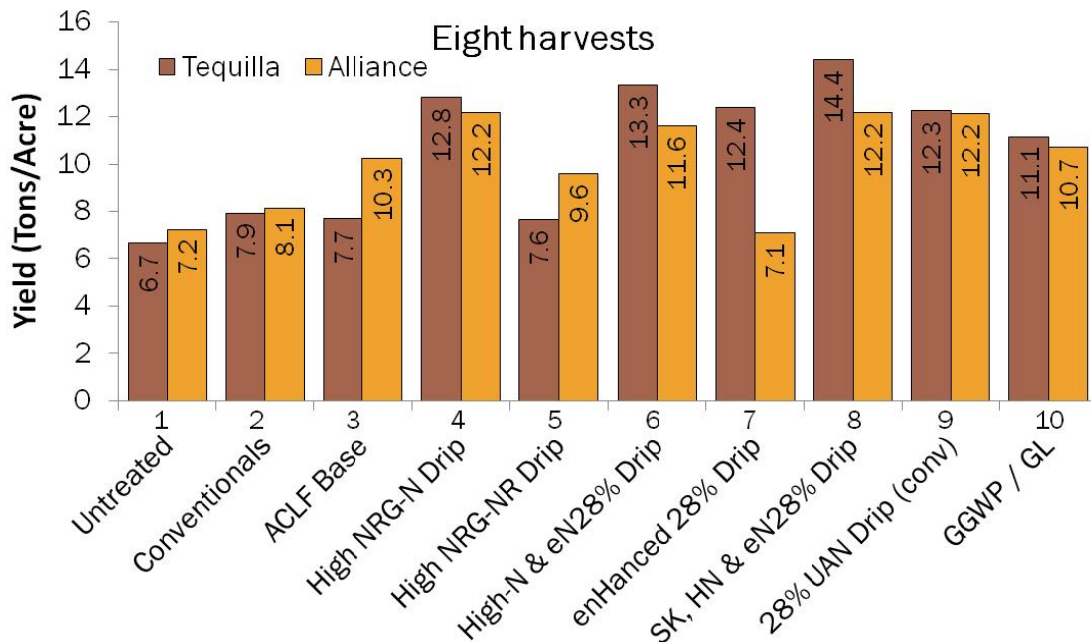


Figure BP1. Total season yields from various fertility programs in 2009. Bars are paired by treatment, but separated by bell pepper variety within each treatment.

Conclusions:

- Splitting the nitrogen delivery into multiple applications significantly increased bell pepper production without utilizing any additional fertilizer for the growing season.
- The Alliance variety bell pepper yields were generally equal or greater than the Tequila variety yields within the same fertility program. Still, the two pepper varieties typically responded the same manner to each fertility program.
- Multiple drip irrigation applications of High NRG-N nitrogen, especially in combination with Sure-K resulted in the best early season yields as well as total yields for both pepper varieties (Trt. 4,8).
- Peppers fertilized according to the "garden fertility" guidelines (Trt. 10) out yielded both base fertility programs (Trt. #2 & #3). Therefore, applying nutrients to bell peppers as an in-season root drench can be an effective method of fertilizer application on a small scale.

*See *Product Descriptions* in the introduction for more information on ACLF products used.

Table BP1. Bell pepper fertility programs utilizing various products and timing of applications to impact growth and yield, 2009.

	Treatment	Rate/#A (gal/A)	Method of Application	Nutr. App	NUE [#]
1	Untreated Control	0	na		
2	0-0-60+18-46-0, 46-0-0+Mn 10-34-0	192#, 87#,362#, 5# 5	PPI Transplant	362.9	77.2
3	PG + SK + Micro 500+Mn HN + SK	4.6, 2, 4 qt, 1 pt 33 + 7	Transplant PPI/band	121.3	271.1
4	PG + SK + Micro 500+Mn HN + SK HN	4.6, 2, 4 qt, 1 pt 13.5 + 7 2.5	Transplant PPI/band Drip x 8	116.3	318.7
5	PG + SK + Micro 500+Mn HN + SK HNR	4.6, 2, 4 qt, 1 pt 13.5 + 7 3.1	Transplant PPI/band Drip x 8	123.3	266.3
6	PG + SK + Micro 500+Mn HN + eN28% + SK HN + eN28%	4.6, 2, 4 qt, 1 pt 6.75 + 9 + 7 1.25 + 1.75	Transplant PPI/band Drip x 8	116.3	344.9
7	PG + SK + Micro 500+Mn eN28% + SK eN28%	4.6, 2, 4 qt, 1 pt 18 + 7 3.4	Transplant PPI/band Drip x 8	161.4	204.6
8	PG + SK + Micro 500+Mn HN + eN28% + SK	4.6, 2, 4 qt, 1 pt 2.1 + 2.75 + 1	Transplant Drip x 8	141.3	300.8
9	10-34-0 28% UAN +10-34-0+0-0-60 28% UAN	5 22 +10.4 + 192# 4.2	Transplant band/ Drip x 8	360.5	106.5
10	Green Grow Wright Professional Green Lawn (See Garden Hand-out)	Garden Handout	transplant Side dress	95.6	300.5

#Nutrient Use Efficiency – (Lb. Yield / Total Lb. Nutrient as Fertilizer Applied)

Materials & Methods:

The beds for the peppers were prepared and covered with plastic mulch on May XX, 2009. All plants were then transplanted and transplant water (4.5 oz/plant) was completed on May XX, 2009. The first 15' for each plot was planted to the Alliance variety and the remainder was planted to Tequila variety. Over the next few days some transplants didn't survive and they were replaced with extra transplants of the same variety to ensure 100% stand for harvest. The dead plants were removed and the new plant was placed in the same hole with only a small amount of water applied with these replacements.

During the growing season, drip irrigation applications were started on June 16th and applied weekly for the next 8 weeks. These treatments were applied and the remaining water necessary to fully saturate the soil profile for the week was applied. After the last fertility application, only water was applied. The first peppers reached a marketable size on July 30th and were harvested regularly (8 weeks) until a killing frost. The weights and counts from each pepper variety in each plot were recorded for every regular harvest.



*See *Product Descriptions* in the introduction for more information on ACLF products used.