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Introduction

**Intern's picture year in review
Report**

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**Picture year in review
Report**

Welcome to the 2011 Research Report for the North Central Research Station (NCRS). The NCRS was started in 1994 to expand product knowledge and to enable better testing of new products and programs. In this report you will find research results from the numerous plots of experiments conducted this past growing season. In addition to results from the NCRS field and specialty crops, there are also results from experiments conducted at various test sites around the country. Simply click on the types of research that you wish to visit.

First you will notice that the 2011 report is using a new layout format. After so many years, we thought it was time for a make-over. This will not only look sharper, but gives some consistency to the reporting.

The theme for the NCRS this year seemed to be "Growing for the Future". This year the NCRS was on nine farms for a total of 536 acres with 444 tillable acres. To keep pace with this growth, additional buildings and improvements were needed. In January a building was started on Farm 3 that would become indoor fertilizer and chemical storage, complete with a liner under the cement and sumped containment in case of any spills. Next to that was an equipment storage barn for the increasing amount of research and farm equipment. However, it was noted that no matter how big you build a barn, you will fill every inch. In the pictures are the buildings in early March.



In the fall construction was started on a greenhouse for Specialty Crop research and transplant propagation. In the picture we see Tim and Brian taking survey grades next to the completed fertilizer and equipment storage buildings.

Also this year we hired intern students from Michigan State University to assist in the field crop research, although they did spend time with the Specialty Crop team too. They were Amanda Goffnett and Jeff Brown, both of which are majoring in Crop and Soil Sciences. They were a great help and are included in the group picture on the cover.



Another building project was the expansion of the shop in Barn 1, where we also have our offices. This is to enable additional space for the equipment work over the winter as well as to enable work on the delivery vans and tankers, which is conducted by the NCRS field staff. The picture shows the expansion and the accompanying concrete aprons. A new water line was dug for delivery of water to the new buildings.



And as long as the concrete trucks were there, the parking area was paved and drainage installed. This ended up being a tremendous improvement especially during times of rain when the lot would become a muddy lake.

Another improvement was the installation of a new fuel storage system. The diesel and gasoline for farm use is in tanks that are within a system that also enables containment in case of a tank leak. This is an important part of our commitment to environmental stewardship as well as being a good neighbor.



We are proud to show all of these improvements along with the research plots on one of the several research tours at the NCRS each year. The NCRS will offer even more opportunities to visit in the 2012 growing season.

Again, all of these improvements are done to support the growth of Agro-Culture Liquid Fertilizers, and the research that is behind that growth. The staff of the NCRS hopes that you find the research report helpful and educational. And plans are already underway for the continuation of research in 2012.



Jerry L. Wilhm, Ph.D.
Senior Research Manager

NCRS Personnel:

Doug Summer – NCRS Manager
Stephanie Zelinko – Field Agronomy Research Manager
Brian Levene – Specialty Crops Research Manager
Phil Dush – NCRS Supervisor
Dan Janzen – Agronomy Supervisor
Tim Brussel – NCRS Assistant
Ron Davis – NCRS Assistant

Pro-Germinator™ A high-quality, dual form phosphate fertilizer with multi-form nitrogen for immediate uptake and superior usability well into the growing season. (9-24-3-0.1Fe)

Sure-K™ A versatile, chloride- and hydroxide-free potassium fertilizer for extremely efficient results in all cropping environments. (2-1-6)

High NRG-N™ A multi-form nitrogen fertilizer with one percent sulfur for effective, season-long nitrogen availability for more efficient applications. (27-0-0-1S)

Micro 500™ A proprietary formulation of zinc, manganese, iron, copper and boron to maximize micro-nutrient efficiency. (1.8%Zn, 1.2%Mn, 0.37%Fe, 0.25%Cu, 0.02B) (Additionally, individual secondary and micronutrients are produced using proprietary chelation chemistry.)

eNhance™ The only nitrogen supplement formulated to work within the plant to produce greater nitrogen availability and reduce input costs. (Note: eNhance is added to UAN solutions at a rate of 2 gallons per ton of 28% and 2.25 gallons per ton of 32%). (8.7% S, 0.07% zinc, 0.07% manganese)

LiberateCa™ For precision placement of usable calcium and improved availability in conservation tillage environments. (3% Ca)

ferti-Rain™ Combines proprietary new technology and proven chemistry to simulate rapid nutrient uptake and plant development through foliar application. (12-3-3-1.5S-0.1Fe-0.05Mn-0.1Zn) (ferti-Rain™ was formerly known as F-07 during development.)

NResponse™ Stabilized liquid urea-based nitrogen plus sulfur. (20% urea, 2% ammoniacal, 2% nitrate nitrogen, 1% sulfur). Used primarily as a foliar application.

access™ This is the newest crop nutrition product introduced in late 2010. It is a Sulfur fertilizer supplemented with micronutrients, with an analysis of 17% sulfur and 0.25% each of iron and manganese. It is used in two ways: added to UAN solutions (20 gal per ton of 28%) or as a sulfur additive to planter (NOT in the seed furrow) and sidedress applications where additional sulfur is needed.

LN-07 is an experimental additive for UAN solutions. Like HN-07, it is mixed with 28% at a rate of 20 gal per ton. It is being targeted for soils with low pH.

Objective:

As with every year, 2011 had its challenges when it came to crop production. A very cold and wet April and early May delayed spring planting. Most corn plots were able to get planted in the one week of good weather the first week of May before another huge rainfall event. The rest of the corn and almost all the soybeans finally all got planted by June 1st. The rest of the summer had near average rainfall and temperatures, but due to the late planting, corn reaching black layer was questionable. Luckily above average October temperatures and a late frost enabled corn to reach black layer.

2011 Weather Summary North Central Research Station

Month	High Temp.	Date	Low Temp.	Date	Avg. Temp
April	84.0	10	22.6	1	44.8
May	89.6	31	32.0	5	59.1
June	94.7	7	47.6	2	68.3
July	96.5	21	50.6	14	76.2
August	89.2	1	48.7	22	69.4
September	92.0	1	33.5	16	60.3
October	83.7	9	24.4	28	50.7

Month	GGD	NCRS Avg GGD	Rainfall	NCRS Avg Rainfall	Rain Days
April	65.7	131.9	5.4	2.9	1
May	314.7	294.5	5.8	4.4	15
June	542.9	538.2	2.1	3.0	16
July	794.9	666.3	3.0	3.7	9
August	599.9	604.5	4.1	3.3	9
September	335.3	387.4	1.6	2.9	10
October	151.6	118.6	2.8	2.4	9
Total	2805	2741.4	24.7	22.6	69
Total (thru Sept.)	2653.4	2622.8	22.0	20.2	

Objective:

The North Central Research Station has overhead irrigation on two of its nine farms. Our goal is to have at least 1 inch of water per week either from natural rainfall or irrigation. With the extremely wet spring we experienced at the NCRS, irrigation was not started until July. This is the first time in the history of irrigation at the NCRS that supplemental water was not needed in June. For the most part, the summer of 2011 had great rainfall events, therefore little irrigation was needed. Dates and water amounts for experiments on farm 3 and 5 are listed below.

2011 Irrigation Report
North Central Research Station

Farm 3		Farm 5	
7/2	2 inches	7/2	1 inch
7/9	3.5 inches	7/9	1 inch
7/16	1 inch	7/16	1 inch
7/23	1 inch	7/23	1 inch
8/27	1.3 inches	8/27	1.5 inches
Total	8.8 inches	Total	5.5 inches

Field Crop Research at the North Central Research Station:

The NCRS is all about research. Whether the experiment is comparing ACLF's high usability rates against those of conventional fertilizers or testing new experimental products, accuracy of experimental methods is the key to success. The North Central Research Station has been conducting field research on crop nutrition since its beginning in 1994. We have come a long way in terms of research equipment since then. It is felt that there is no finer research farm in the country in the evaluations of fertility for field crops. Let's take a look at how experiments are run at the NCRS.



The NCRS has used the GreenStar GPS guidance and mapping system since 2010. All experimental areas are already laid out. So now it is a matter of selecting what experiments will be conducted where, and filling in the plot plans. Care is taken to keep track of previous plot history, so all treatments utilizing, say, dry fertilizers are kept in the same plots. Same for the no fertilizer "check" plots. The treatments are assigned in different tracks in the field, so it is a matter of following the monitor in the planter tractor to apply the treatments in the correct track. Each treatment is usually replicated four times, so the planter makes four passes in the experiment for each treatment.



Similar tactics are used when planting soybeans or wheat with the drill. For planting soybeans in 15 inch rows, every other seed tube is blocked.

Research plots at the NCRS are quite large. Plots are usually at least 250 feet long by 15 feet wide. This is 6 rows wide for 30 inch row spacing.



To haul fertilizer out to the field for plots, a fertilizer wagon, or "war wagon" as it is called was made just for this purpose.





Various dry fertilizers are used in the conventional comparison plots. To enable accurate application of dry fertilizers, NCRS Manager Doug Summer built this “blower” applicator. It acts like an air flow machine and uses a PTO driven turbine for the blowing air, and a Gandy metered dry applicator. Calibration trials developed the different rate settings for the different fertilizers. Even though it is for dry fertilizer, it is quite an impressive machine.

Since the planter is using a GPS monitor to locate the plots, care is taken to make sure the planter is in the ground and fertilizer pumps running when it crosses the line on the monitor. So there are rows extending unevenly out into the alley. How do you even up the plot borders? Well in the old days when the farm was smaller, we laid down a steel tape and used hoes. But who wants to do that? With all of the technology around, there has to be a better way. Fortunately there is.



This system was built by Ron Davis and does a great job of evening up the plot borders. It has a set of S-tines that make a cultivated strip along the border. When a field cultivator is used to take out the extra plants from the alley, following the outside of the marked border.

Now GPS systems aren’t made to accurately measure distances in feet at right angles down the field. But Stephanie Zelinko developed a system of using a second perpendicular A-B line in the experiment to enable distance measurement to tell where the plot should end. Setting the auto-track makes for a perfectly straight line as seen in the picture. The track on the left is the edge of the plot.





Then it is easy to keep the plots looking nice and even the rest of the season. Plus you are assured that they are the correct length for harvest and yield determination later.

When it is time for application of sidedressed nitrogen, the tractor again follows the GPS monitor and applies the correct treatment to the correct plot.



Foliar applications are a part of many of the experiments at the NCRS. As with the other operations, the sprayer follows the GPS monitor for guidance to the correct plot. This sprayer uses a Raven flow controller and satellite tracking for speed input. This is a great system for getting a lot of foliar applications made accurately.

And before you know it, it's time for harvest. For beans, as in the picture of Navy Bean harvest, a Wind Reel system is used to ensure all of the cut stalks, and any loose beans, are blown into the feeder house. We used to have a problem with the stalks at the end of the plot not being fed into the harvester since there was nothing to push them in, and the reel would not get them as they were just lying on the cutter bar. This was especially a problem with the field beans. But now that we have had the Wind Reel for several years, harvest is a breeze





Before harvesting with the combine, the experiment being harvested is entered into the GPS monitor of the combine. This way the combine operator, like Phil here, can hand communicate with whoever is in the grain cart recording plot yield data, and make sure the combine is harvesting the plot that is being recorded in the cart. It is a great system and prevents errors.

Whatever the crop being harvested, the edge rows are border rows and are not harvested for yield data. Here in this 6-row plot, the middle four rows are the ones that are measured. This eliminates any effect of treatment in the adjacent plots that might affect the border row.



Someone rides up in the grain cart to record the plot yield. Samples are retained for measurement of test weight and moisture on our Dickey-John desktop tester back in the office.

Of course not all crops are harvested with a combine. But like the grain crops, only the middle four rows of sugarbeets are topped and harvested for yield data.

For harvest measurements, the beets are dumped into this wagon with a load bar and scale.



So regardless of the crop being tested, the North Central Research Station has the right equipment and researchers qualified for accurate implementation, harvest and data interpretation to provide the research needed to guide Agro-Culture Liquid Fertilizers into the future with confidence.



2011 Summer Internship

Jeff Brown



GPS mapping, data logging and auto steer provide precise seed and fertilizer placement.



AGRO-CULTURE

LIQUID

FERTILIZERS



Monitors and flow controls ensure accurate fertilizer application to research test plots.



Multiple modes of nutrient application: planter- applied, foliar, sidedress, strip-till and fertigation.



Research Driven  **Farmer Trusted**

2011 LIQUID Internship

Amanda Goffnett



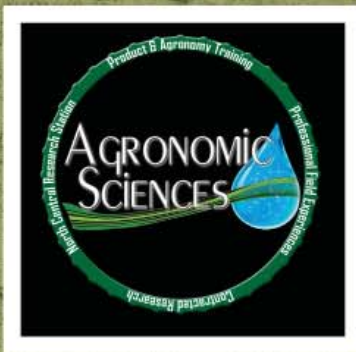
Plots are planted using auto-steer for accuracy and documentation, along with monitors for precise liquid applications.



During harvest, grain from each plot is unloaded, weighed and sampled.



Foliar applications are made to plots at certain growth stages.



Stand counts are taken to determine treatment effects on plant population.



Fertilizer is accurately measured, mixed and pumped into tanks for application.



Scouting crops for insects, disease and nutrient deficiencies.

NCRS

Corn:

- Nutri-Till fertilizer applications in corn (11-310)
- Comparison of accesS and ATS on corn (11-502)
- Corn planter fertilizer placement (11-504)
- Nitrogen source comparison on corn – Nitrogen Sources (11-709)
- Nitrogen source comparison on corn – High NRG-N additives (11-709)
- Nitrogen source comparison on corn – 28% UAN additives (11-709)
- Nitrogen rate and source comparison in corn (11-710)
- Sulfur additions to corn fertilizer programs (11-711)
- Nitrogen rate comparison on corn (11-712)
- Corn fertilizer programs in a permanent plot rotation (11-715)
 - Effect of ACLF program components.
 - Nitrogen Program Comparisons.
 - Fertilizer Program Comparison (“It’s Nutrients, not Numbers!”)
 - It’s Nutrients not Numbers, Part 2
- Foliar applications on corn (11-716)
- Split nitrogen applications on corn (11-717)

Soybeans:

- Fertilizer application comparisons in No-Till Soybeans (11-307)
- Fertilizer and method of application comparison on soybeans (11-309)
- Comparison of split foliar applications on soybeans (11-508)
- Foliar ferti-Rain rate comparisons on 15” row soybeans (11-702)
- Fertilizer program additives in 15”-row soybeans (11-703)
- Fertilizer placement comparison on 30”-row soybeans (11-704)
- Soybean fertilizer programs in a permanent plot rotation (11-714)
- Soybean yield response to foliar applied Sure-K and micronutrients (11-719)

Navy Beans:

- Navy bean fertility program comparison (11-306)
- Foliar fertilizer comparison on navy beans (11-306)

Sugarbeets:

Fertilizer program comparisons in sugarbeets (11-707)

Sugarbeet foliar program comparisons (11-707)

Small Grains:

Late foliar applications to winter wheat (11-311)

Application options for winter wheat fertilizers (11-503)

Planter fertilizer response and nitrogen comparison in oats (11-705)

Contract Research

Sulfur Fertilizer Applications for Canola (North Dakota)

Fertilizer Comparison in 1st Year Sugarcane (Louisiana)

Foliar Fertilizer Applications to Soybeans That Were Flooded (Louisiana)

Fertilizer Program Comparisons in Rice (Louisiana)

Fertilization of Winter Wheat (Maryland)

Corn Fertilizer Study (Maryland)

Fertilization of Strip-Till Soybeans (Colorado)

Fertilization of Strip-Till Sugarbeets (Colorado)

Experiment Info:

Fall NT:	10/29/2010
Spring NT:	5/2/2011
Planted:	5/2/2011
Variety:	DeKalb 48-12
Population:	36,000
Previous Crop:	Winter wheat
Plot Size:	15'x180'/210'/130'
Replications:	5
Sidedress:	6/8/2011
Harvest:	10/25/2011

**Soil Test Values
(ppm):**

pH:	7.4
CEC:	6.0
% OM:	1.6
Bicarb:	11
K:	63
S:	10
% K:	2.7
% Mg:	16.4
% Ca:	79.8
% H:	0
% Na:	1.1
Zn:	0.9
Mn:	3
B:	0.6

Objective:

Evaluate different Liquid fertilizer placement and timing options in Strip Till, or as we call the dual placement program: Nutri-Till.

The benefits of strip tillage are well known. A combination of residue conservation plus seed zone preparation is a hit with many growers. While there have been a number of advancements in various aspects of the strip-till equipment, there is still a missing link as far as optimal placement of the crop nutrition. Application of dry and liquid fertilizers is usually limited to rather deep placement at the bottom of the shank. This is good for N and possibly K, but the best placement for early access of P and low-rates of N would be in the seed zone. Previous research from the North Central Research Station has shown the advantages of such placement, and this experiment was designed to expand on the dual placement aspects of Nutri-Till. The custom-built Nutri-Till applicator consists of Yetter coulters and hillers, and an anhydrous shank. Deep placement of liquid is through a tube to the base of the shank. Shallow seed-zone placement is through a stream jet solid stream nozzle that is between the two side coulters in the rear. This puts the band of fertilizer about 1 to 2 inches below the soil surface, or in the zone where the seed will be placed with the planter. So it does require separate tanks for the dual-placed products. We have used Nutri-Till for many years at the NCRS with very favorable results in corn, soybeans and sugarbeets. Below is a picture of the Nutri-Till applicator in the raised position. Tubes lead to the the bottom of the front shank for deep placement and to shallow seed-zone placement in the rear.

This past season we conducted an experiment in corn following winter wheat to compare timing and placement of nutrients. First application was in the fall of 2010 where Pro-Germinator + Sure-K + Micro 500 were placed in the upper or Shallow placement. For comparison, since there is no Shallow seed zone placement on commercially available equipment (yet), these same nutrients were applied in the Deep placement, which is some 8 inches below the soil surface. These same placement treatments were also applied in the spring of 2011 for comparison. There was also a Deep application of Sure-K in the fall of 2010 in combination with a planter (of the Pro-Germinator + Micro 500) application in the spring. One treatment applied all of the fertilizer in the spring Nutri-Till application where the P&K was with Shallow Placement and the N was with the Deep Placement. All of these Nutri-Till applications were compared to a planter application of the same nutrients following spring strip till with no nutrient application. The following pictures show the fall Nutri-Till application and planting in the spring on the Nutri-Till strips made in the previous fall.





The spring Nutri-Till application was on May 2 and the experiment was planted on May 4. It began raining on May 10 and by May 29 we had received 5.82 inches of rain. So this undoubtedly slowed emergence and early growth. Then it turned hot and dry in July during pollination, and that may have affected yield, as the resulting yields were lower than previous year's production. But treatment comparisons should still be valid. Yields are shown in the Table below.

Table 1. Effect of fertilizer placement and timing in strip-till corn.
North Central Research Station, St. Johns, MI - 2011

Effect of Drill-Applied Fertilizer and Foliar Applications
on Winter Wheat Yield.

North Central Research Station. 2010-2011

P,K,Micros: 3 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500

Nitrogen: 42 gal/A High NRG-N applied either sidedress or Nutri-Till

Nutri-Till placement: Shallow (seed zone) or Deep (bottom of shank)

Planter placement: In-furrow.

	P,K,Micros	Timing	Placement	Nitrogen	Yield (Bu/A)
1.	none	--	--	sidedress	146.6
2.	P,K,Micros	Fall	Deep	sidedress	155.0
3.	P,K,Micros	Fall	Shallow	sidedress	164.3
4.	P,K,Micros	Spring	Shallow	sidedress	161.5
5.	K P,Micros	Fall Planter	Deep	sidedress	162.7
6.	P,K,Micros	Spring	Shallow	Deep	175.1
7.	P,K,Micros	Planter	In-Furrow	sidedress	168.0

LSD(0.1): 8.7; (0.2): 6.7. CV: 6.2%

Conclusions:

- Not applying P,K & micros had the lowest yield (trt. 1)
- Deep placement of P&K in the fall (trt 2) was significantly lower in yield than Shallow placement (trt 3), proving that having those nutrients in the seed zone is best for yield.
- Shallow placement of P&K in either the fall (trt 3) or spring (trt 4) resulted in similar yields. This shows the stability of these nutrients.
- Deep placement in fall of Sure-K (trt 5) produced a yield that was similar to that of other placements. This may have relevance to regular strip till equipment.
- Planter application of all of the P, K & micros (trt 7) had a yield that was slightly higher, but not significant statistically, than that of the Nutri-Till applications. This may enable faster planting without sacrificing yield.
- However, the highest yielding treatment was where all of the applied fertilizer was through the Nutri-Till in the spring (trt 6). That would be shallow placement of the Pro-Germinator + Sure-K + Micro 500; and deep placement of the high NRG-N nitrogen. Even with the heavy rainfall after planting, the High NRG-N did not have leaching problems. It stayed beneath the roots for later access.
- (Note: we do not recommend fall applications of UAN based N fertilizers like High NRG-N. We have done this and there was N loss over the winter. So don't do it in areas of substantial rain and snow.)

Experiment Info:

Planted:	5/7/2011
Variety:	DeKalb 48-12
Population:	36,000
Previous Crop:	soybeans
Plot Size:	15' x 200'
Replications:	4
Sidedress:	6/9/2011
Harvested:	10/26/2011

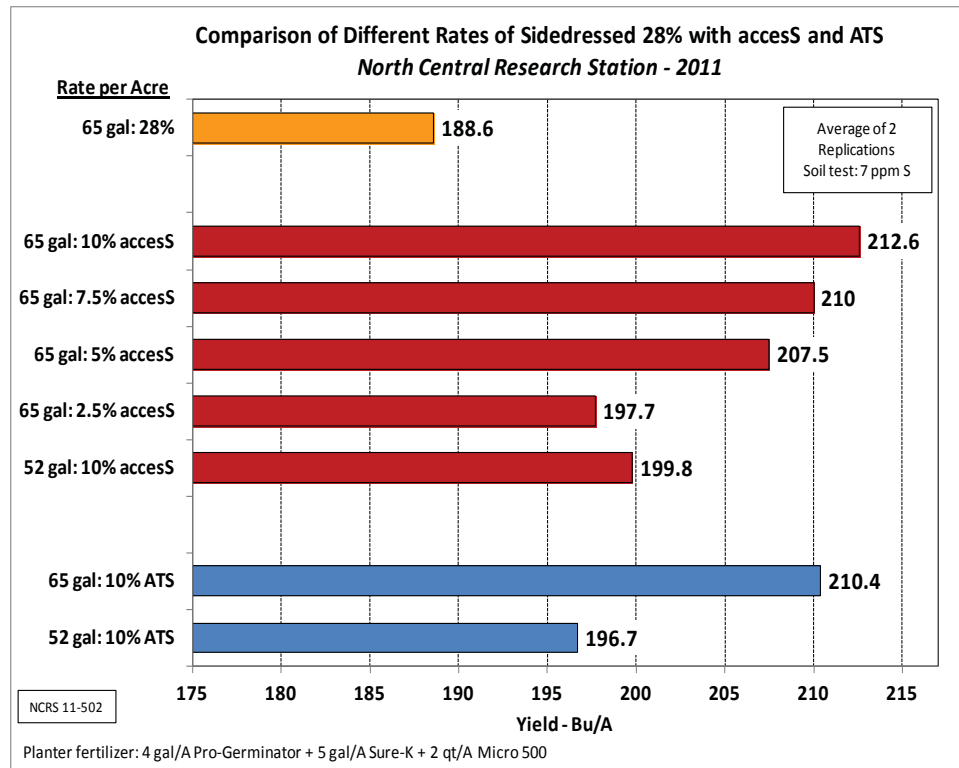
Soil Test Values (ppm):

pH:	7.0
CEC:	11.1
% OM:	3.1
Bicarb:	10
K:	52
S:	7
% K:	1.2
% Mg:	22.4
% Ca:	75.3
% H:	0
% Na:	1.1
Zn:	1.1
Mn:	2
B:	0.7

Objective:

Compare different rates of the sulfur fertilizer additives accesS and ammonium thio-sulfate (ATS) for effects on yield of corn growing in low-sulfur soil.

The yield-increasing benefits of accesS have been previously demonstrated in testing at the NCRS. Those tests usually had the accesS being applied at a set rate per acre, such 3 gal/A vs 6 gal/A of ATS. In this experiment, the accesS, and ATS, are being applied as different % mix rates with 28% UAN. So even though the same volume per acre of fertilizer is applied, there would actually be different rates of both the access and the 28% UAN. This research would determine the effects of different % mixes applied at a constant volume. Yield results appear in the following chart.



LSD (0.1): 15.9; (0.2): 11.8; CV: 10.0%

Conclusions:

- Addition of sulfur to 28% UAN did increase corn yield at all concentrations
- Corn yield increased with increased rate of accesS per acre, even at the expense of N rate.
- With the reduced application rate of 52 gal/A of a 10% accesS or ATS concentration, the yield was lower than that with the 65 gal/A rate. But the yield with that lower rate was still higher than the yield of the 65 gal/A rate of 28% UAN with no sulfur.

Experiment Info:

Planted: 5/9/2011
 Variety: Pioneer 9807
 Population: 36,000
 Previous Crop: soybeans
 Plot Size: 15' x 115'
 Replications: 4
 Sidedress: 6/8/2011
 Harvested: 10/25/2011

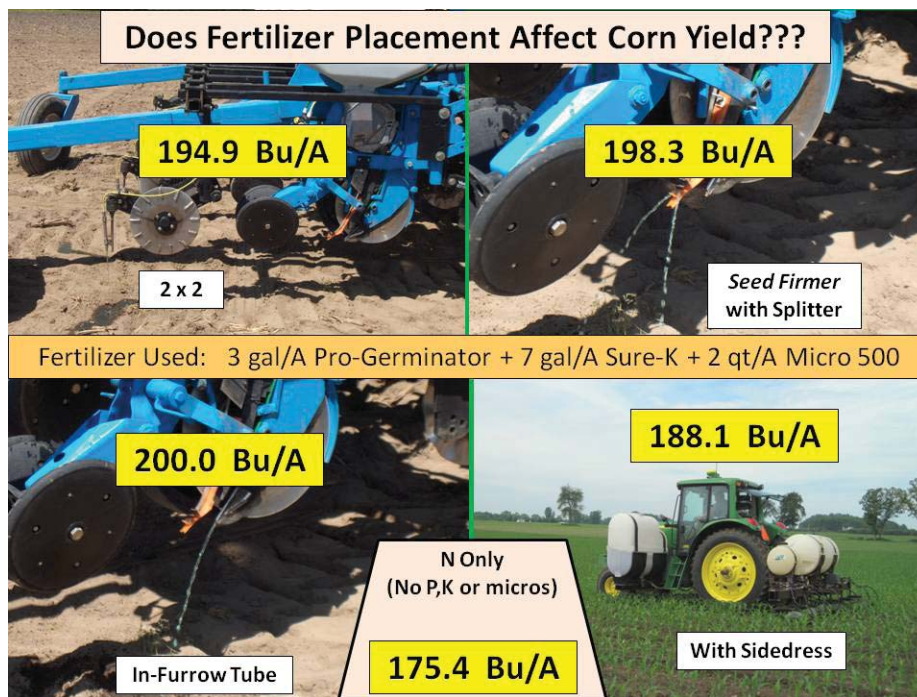
Soil Test Values (ppm):

pH: 7.0
 CEC: 7.5
 % OM: 1.6
 Bicarb: 18
 K: 71
 S: 6
 % K: 2.4
 % Mg: 24.8
 % Ca: 71.8
 % H: 0
 % Na: 1.0
 Zn: 1.5
 Mn: 8
 B: 0.6

Objective:

Compare different placements of Liquid fertilizer (3 gal/A Pro-Germinator + 7 gal/A Sure-K + 2 qt/A Micro 500) for effects on corn yield.

There are various placement options for liquid fertilizers such as (1) 2x2 placement and in-furrow placement. In-furrow also presents some options, such as on a (2) seed firmer/cover with the fertilizer tube split into a Y at the end (3) an in-furrow tube that places the fertilizer in the bottom of the furrow prior to seed drop. An issue that can arise in wet spring conditions like this year is that some growers get concerned about just finishing planting before more rain occurs and don't bother putting on any planter fertilizer. Then after emergence they become concerned about lack of fertilizer and wonder if they should put some on at sidedress (4), or just do nothing (5). An experiment was conducted to evaluate these five different placement options. (Note: sidedress fertilizer for all was 21 gal/A High NRG-N + 28 gal/A 28% + eNhance.) Pictures of fertilizer placement and average placement yield appear in the following picture.



LSD (0.1):7.4. CV: 5.4% LSD (01.):9.9; (0.2): 7.7; CV:5.8%

Conclusions:

- All fertilizer applications resulted in a yield increase over no P and K fertilizer.
- The highest yield was with the tube and the seed firmer.
- The application with sidedress was lower than the planter-time applications, but was much better than forgoing application due to it being 30 days after planting.

Some of the planter-applied treatments from 2011 were also applied in a similar experiment in 2010 (10-710a). The two-year average would suggest an advantage for the tube in-furrow placement. But both the tube and the seed firmer resulted in a better overall yield than that of the 2x2 placement, likely due to the earlier access to the row-placed crop nutrition.

Planter fertilizer placement effects on corn yield 2010 - 2011. North Central Research Station.

Placement	2010	2011	Avg.
In-furrow tube	196.7	200.0	198.4
Rebounder	190.0	198.3	194.2
2x2	185.5	194.9	190.2

Experiment Info:

Planted:	5/9/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	corn
Plot Size:	15' x 255'
Replications:	4
Sidedres:	6/15/2011
Harvested:	10/31/2011

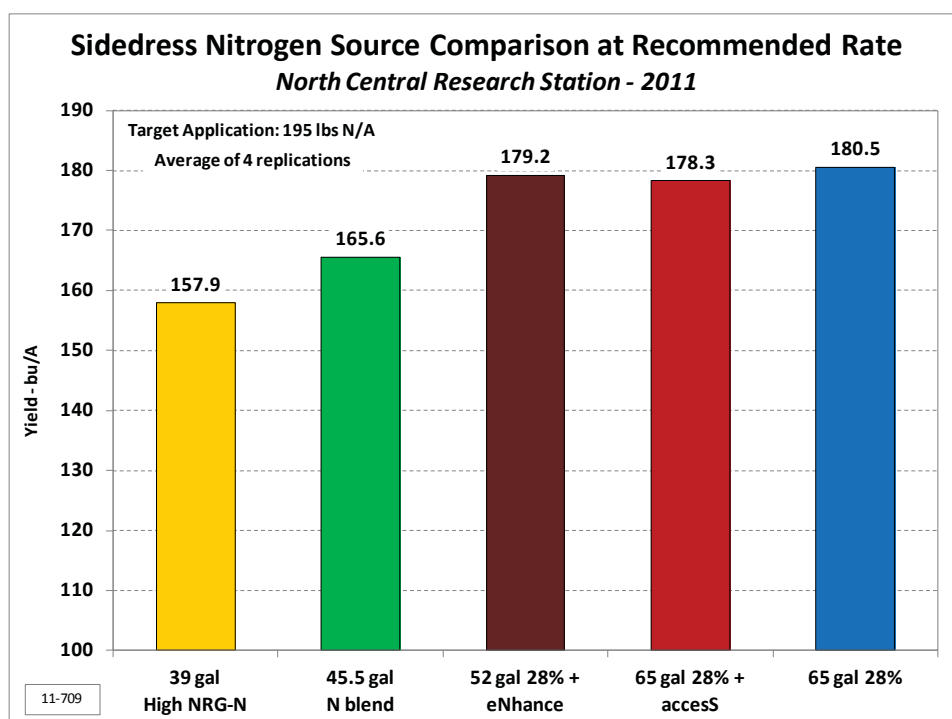
Soil Test Values (ppm):

pH:	5.9
CEC:	9.8
% OM:	2.2
P1:	18
K:	131
S:	6
% K:	3.4
% Mg:	14.1
% Ca:	64.6
% H:	17.6
% Na:	0.3
Zn:	1.3
Mn:	6
B:	0.4

This experiment evaluated different nitrogen sources, rates and combinations of products for effect on corn yield. Nitrogen treatments were applied sidedress, 37 days after planting when the corn was in the V7 growth stage. A yield goal of 165 bu/A corn was set. Because the experiment site was previously corn, an additional 30 pounds/A of nitrogen was added making the target rate 195 lbs N/A.

Objective:

A Five different nitrogen sources were compared for yield effect: High NRG-N, 28% + eNhance, 28% + accesS, N blend (43%/57% v/v blend of High NRG-N and 28% + eNhance by equivalent pounds), and 28% UAN. Each product was applied at the recommended equivalent rate to provide 195 lbs N/A. Applied rates by product on resulting yields are in the chart below.



LSD (0.1): 12.1 CV:10.5%

Conclusions:

- The additives eNhance and accesS for 28% UAN, provided equal yields to the 28% UAN alone. With eNhance, a 20% lower rate was applied saving on nitrogen cost while providing equal yield. The additional of accesS did not show an additional yield increase in the study. However, past data has shown better yield with the addition of accesS. More work will be done on this in the future.
- High NRG-N at the recommended 60% N rate, yielded significantly lower than other treatments. It should be noted that due to the weather, the sidedress was 37 days after planting which likely was too late for slow release N product like High NRG-N. Thus, the lower rate of High NRG-N did not have the extra nitrogen available to exceed the yield goal in corn on corn.
- Yielding half way between the 28% + eNhance and the High NRG-N was the N blend treatment. This treatment was 43% High NRG-N and 57% 28% + eNhance, provided some of the time release benefits of each product.
- The N blend also did not appear to provide enough nitrogen for this corn on corn experiment compared to the higher rates of the other products. But application was also likely too low.

Experiment Info:

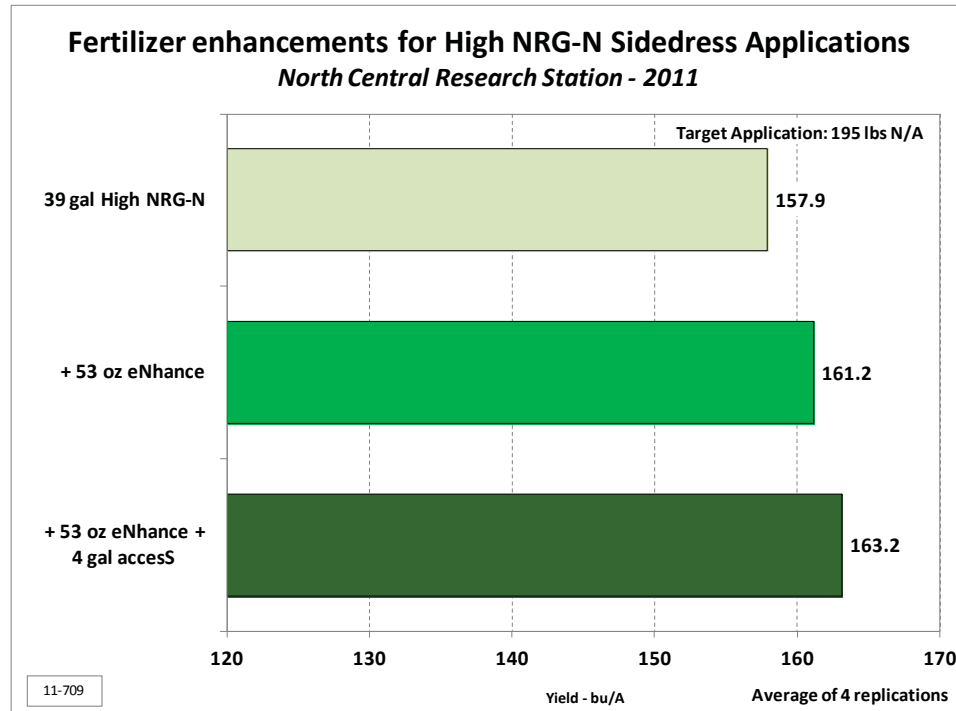
Planted:	5/9/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	corn
Plot Size:	15' x 255'
Replications:	4
Sidedress:	6/15/2011
Harvested:	10/31/2011

**Soil Test Values
 (ppm):**

pH:	5.9
CEC:	9.8
% OM:	2.1
P1:	18
K:	131
S:	6
% K:	3.4
% Mg:	14.1
% Ca:	64.6
% H:	17.6
% Na:	0.3
Zn:	1.3
Mn:	6
B:	0.4

Objective:

With the better yield potential from improved corn genetics, some of the increased efficiency benefits of High NRG-N are less effective than in the past. This depends heavily on soil type, temperature and location in the country. In high yielding areas, that High NRG-N's efficiency benefits apparently are not as effective. Additives such as eNhanse and accesS are being evaluated at to determine if they can provide additional support. The additives eNhanse and accesS were applied at recommended rates. (eNhanse - 2 gal/ton of High NRG-N and accesS - 10% of the total application rate).



Conclusions:

- The addition of eNhanse increased corn yield over the recommended rate of High NRG-N by only 3 bu/A.
- Furthermore, there was an additional 2 bu/A yield increase when accesS was added to High NRG-N with eNhanse.
- Although neither of the additives statistically increased corn yield over the High NRG-N only, they both show promise as a way to enhance High NRG-N in grower areas where additional fertility is needed. More testing will be done next year, to look for a solution.

Experiment Info:

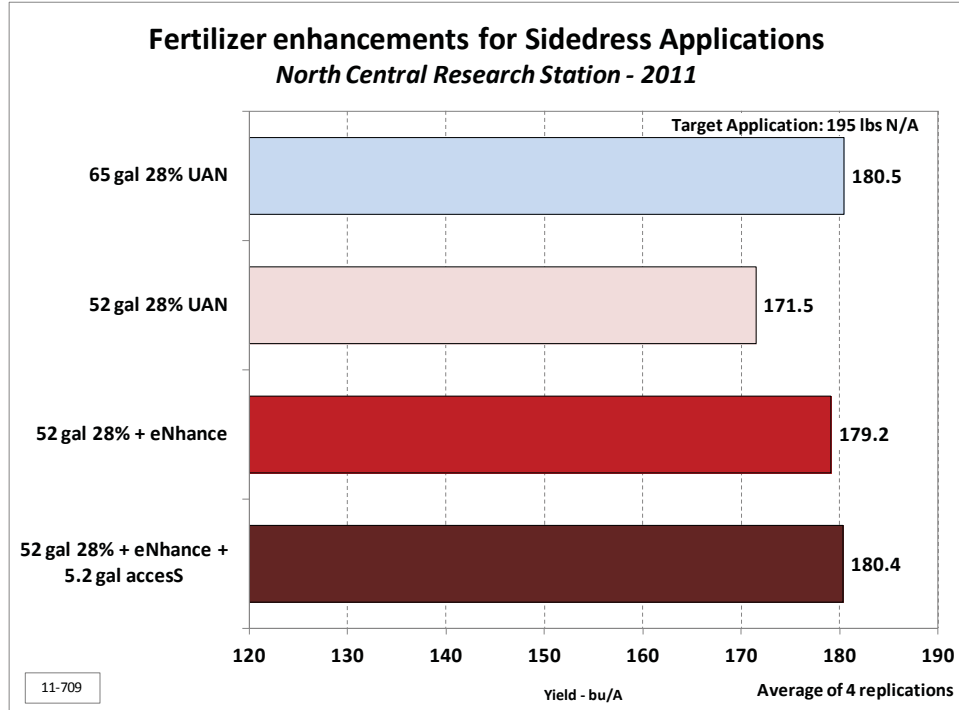
Planted: 5/9/2011
 Variety: DeKalb 53-78
 Population: 32,000
 Previous Crop: corn
 Plot Size: 15' x 255'
 Replications: 4
 Sidedress: 6/15/2011
 Harvested: 10/31/2011

Soil Test Values (ppm):

pH: 5.9
 CEC: 9.8
 % OM: 2.2
 P1: 18
 K: 131
 S: 6
 % K: 3.4
 % Mg: 14.1
 % Ca: 64.6
 % H: 17.6
 % Na: 0.3
 Zn: 1.3
 Mn: 6
 B: 0.4

Objective:

The final objective in this sidedress nitrogen comparison is evaluating rates and additives for 28% UAN. To provide 195 lbs N/A, a rate of 65 gal/A was used as the standard program. When adding eNhance to UAN solutions, the recommended rate can be lowered by 20% to 52 gal/A/ Another treatment evaluated the addition of eNhance and AccessS. These additives were compared to the 28% at the reduced ate of 52 gal/A with no additive.



LSD (0.1): 12.1 CV:10.5%

Conclusions:

- Lowering the rate of 28% UAN from 65 gal to 52 gal/A lowered corn yield by 9 bu/A.
- The addition of eNhance at 2 gal/ ton of 28% UAN and lowering the application rate by 20%, provided nearly an 8 bu/A yield increase over the equal rate of 28% above and yielded the same as the higher rate or 28% UAN. This is consistent with previous research results.
- Adding 5.2 gal of accessS to the 28% + eNhance nitrogen program did not further increase corn yield for some reason

Experiment Info:

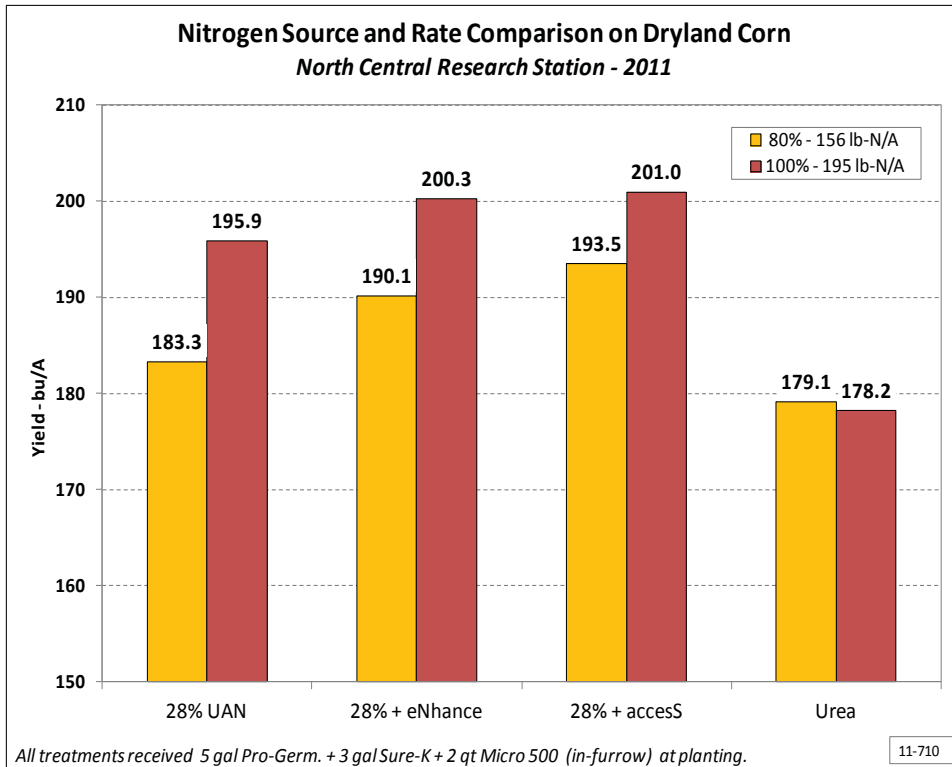
Planted: 5/10/2011
 Variety: DeKalb 53-78
 Population: 32,000
 Previous Crop: corn
 Plot Size: 15' x 255'
 Replications: 4
 Sidedress: 6/17/2011
 Harvested: 10/31/2011

Soil Test Values (ppm):

pH: 5.9
 CEC: 9.8
 % OM: 2.2
 P1: 18
 K: 131
 S: 6
 % K: 3.4
 % Mg: 14.1
 % Ca: 64.6
 % H: 17.6
 % Na: 0.3
 Zn: 1.3
 Mn: 6
 B: 0.4

Objective:

Evaluate different four different sources and rates of nitrogen for effect on yield of corn. This was corn following corn, so an N rate of 195 lb/A was established for a yield goal of 165 bu/A. The N rates tested were 156 lb/A (80%) and 195 lb/A (100%). The four sources were: 28% UAN at 57 and 65 gal/A; 28% UAN + eNhance (2 gal/Ton of 28%) also at 57 and 65 gal/A; 28% UAN + accesS (20 gal/Ton of 28%) at 57 and 65 gal/A; and urea at 339 lb/A (80% N) and 424 lb/A (100% N). The N solutions were sidedress applied and the urea was applied preplant broadcast and incorporated. Yield results are in the following table.



LSD (0.1) :8.7; (0.2): 6.7. CV: 7.0%

Conclusions:

- Despite the lateness of the sidedress applications (due to rain that pushed back many NCRS duties), the corn yield for all treatments far exceeded the established yield goal.
- The yields with the sidedressed solution N significantly out-yielded that of the urea. This is likely due to the urea being applied pre-plant and the nearly 6 inches of rain that followed in May.
- The yield of the 100% N rate exceeded that of the 80% rate for the solution N, but not with urea.
- Addition of eNhance and accesS to 28% did increase yield over the same rate of 28%.
- The addition of accesS and eNhance resulted in a significant yield increases at the 80% rate. The yield with the 80% rate of 28% with both accesS and eNhance was not significantly different from the 100% rate of 28% alone. This shows that N efficiency can be increased with these additives.

Experiment Info:

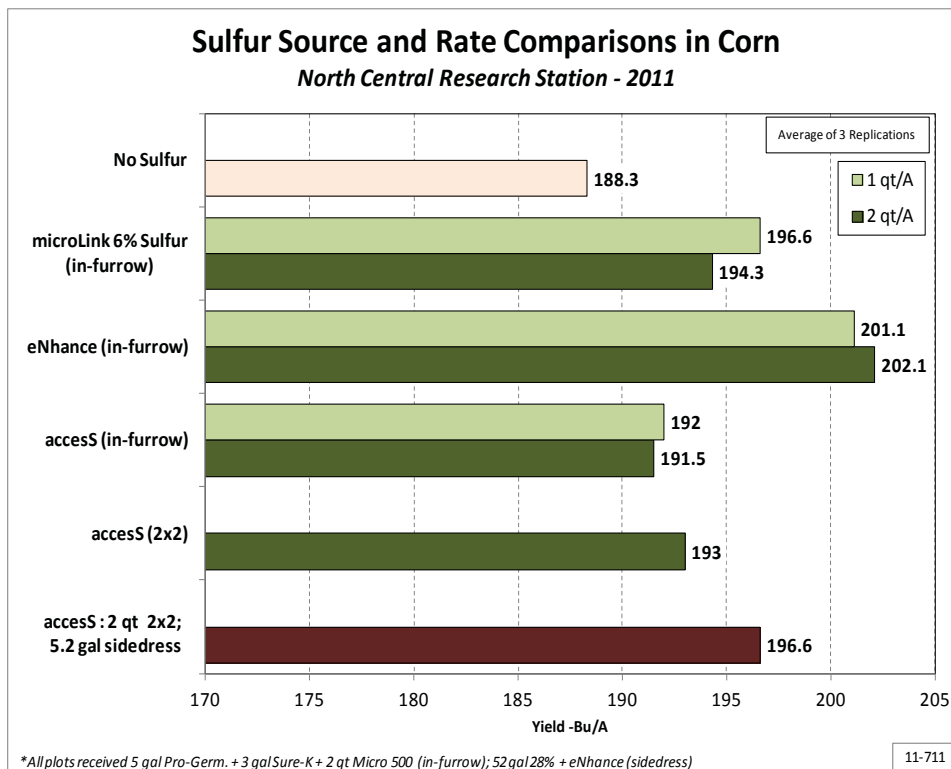
Planted: 6/1/2011
 Variety: DeKalb 46-07
 Population: 32,000
 Previous Crop: corn
 Plot Size: 15' x 225'
 Replications: 4
 Sidedress: 6/14/2011
 Harvested: 11/2/2011

Soil Test Values (ppm):

pH: 7.1
 CEC: 16.5
 % OM: 4.7
 Bicarb: 11
 K: 132
 S: 8
 % K: 2.1
 % Mg: 20.1
 % Ca: 77.6
 % H: 0
 % Na: 0.2
 Zn: 1.4
 Mn: 2
 B: 0.6

Objective:

Determine the effects of three different ACLF sulfur fertilizers on yield of corn. Agro-Culture Liquid Fertilizers currently offers three different sulfur fertilizer formulations: microLink 6% Sulfur, eNhance (8.9% sulfur) and accesS (17% sulfur). The microLink Sulfur was primarily designed as a sulfur source for application with planter-time fertilizers. The eNhance was developed as a UAN fertilizer additive for the purpose of enhanced N activity. The accesS is a new product that can be applied as an additive with UAN, but more as a sulfur source. This experiment was conducted to compare these fertilizers as an in-furrow planter-time application, plus accesS as both in furrow and sidedress. (accesS is not currently recommended for in-furrow applications.) This corn was planted very late due to spring rains, but it did reach black layer.



Conclusions:

- Highest yield was with the eNhance in-furrow applications. Next was microLink Sulfur and then accesS. This confirms that accesS should not be applied in-furrow, even though we did not observe stand loss.
- accesS at any of the applications did not produce corn yield as high as that with eNhance, even though in other experiments it was as good as or better than ATS as a sulfur source.
- eNhance has been proven as a very good in-furrow sulfur additive for corn for several years at the NCRS.
- It was interesting to note that even though the soil sulfur level was low (8 ppm), there was no rate effect as the yields with either 1 or 2 qt/A of any of the products were similar. These results and others like it make research a challenge.

Experiment Info:

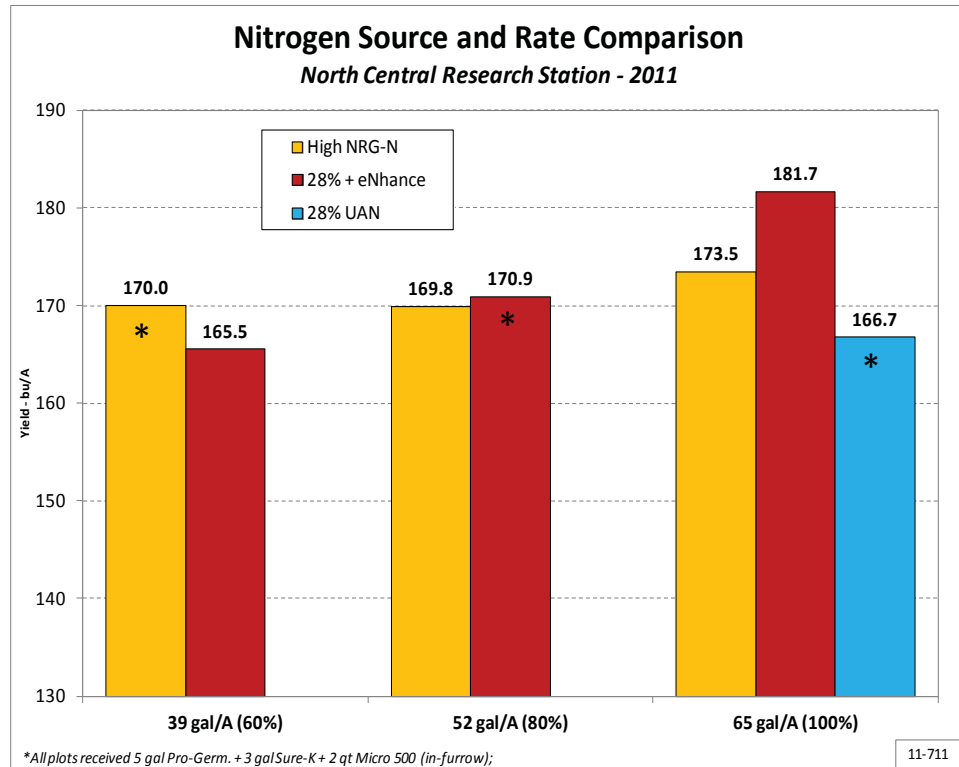
Planted: 5/10/2011
 Variety: DeKalb 53-78
 Population: 32,000
 Previous Crop: corn
 Plot Size: 15' x 255'
 Replications: 4
 Sidedress: 6/14/2011
 Harvested: 10/31/2011

Soil Test Values (ppm):

pH: 7.1
 CEC: 16.2
 % OM: 4.7
 Bicarb: 11
 K: 132
 S: 8
 % K: 2.1
 % Mg: 20.1
 % Ca: 77.6
 % H: 0
 % Na: 0.2
 Zn: 1.4
 Mn: 2
 B: 0.6

Objective:

This experiment evaluated sidedress comparisons of a total nitrogen rate of 195 lbs/A using Agro-Culture Liquid Fertilizers two nitrogen sources, High NRG-N and 28% with eNhance (2 gal/ton). Following usual recommendations, 28% + eNhance can be applied at an 80% use rate (52 gal/A) and High NRG-N is recommended at 60% use rate (39 gal/A). A conventional rate of 65 gal/A 28% was used in the comparison. High NRG-N and 28% + eNhance were each applied at all 3 rates to evaluate performance at reduced rates of application of the products. The asterisk (*) on the bars below indicate the recommend rate of each product. Nitrogen was sidedressed 35 days after planting on V5 corn. Yields appear on the chart below.



Conclusions:

- Each product at its recommended rate, produced similar yield.
- As shown in past data, keeping the full nitrogen rate (65 gal/A) while adding eNhance, increased the yield over the recommended rate.

Experiment Info:

Planted:	5/10/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	soybeans
Plot Size:	15' x 210'
Replications:	4
Dry Broadcast:	5/10/2011
Sidedress:	6/15/2011
Harvested:	10/31/2011

Soil Test Values (ppm):

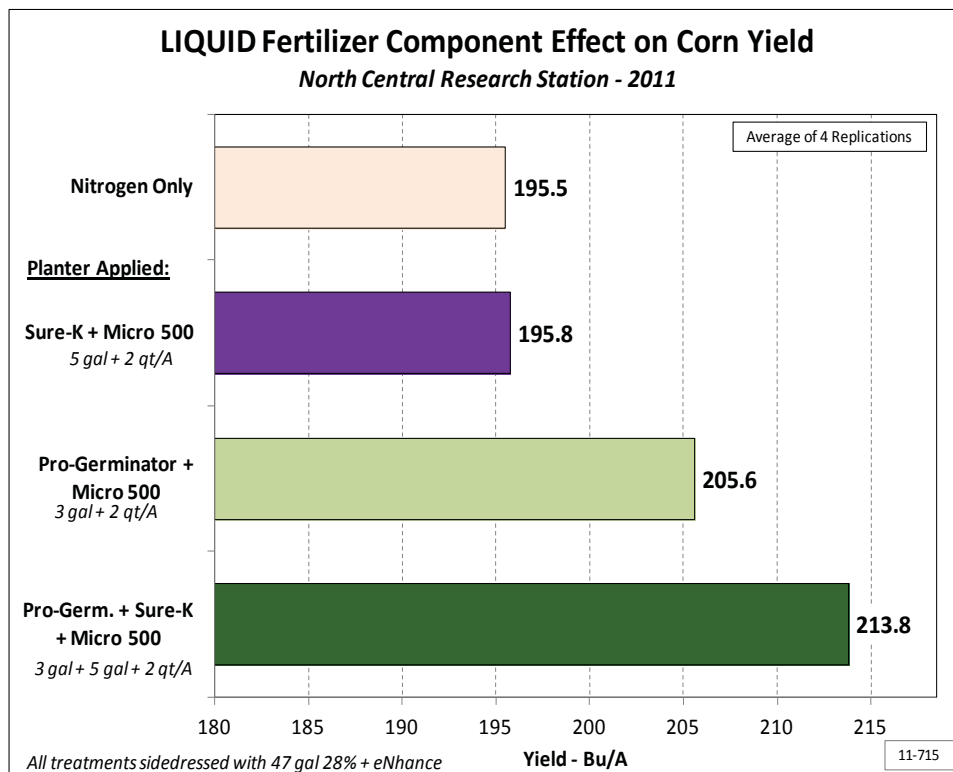
pH:	7.0
CEC:	12.4
% OM:	3.4
Bicarb:	17
K:	111
S:	5
% K:	2.3
% Mg:	21.4
% Ca:	75.9
% H:	0
% Na:	0.4
Zn:	1.5
Mn:	4
B:	0.7

Objective:

Evaluate different corn fertilizer programs based on soil test for effect on yield. (This is the first year of an anticipated long-term experiment in a corn-soybean rotation.)

This so-called “permanent plot” fertilizer experiment will be similar to one conducted on Farm 4 from 1996 to 2005 where fertilizer programs are maintained over time to measure effects on yield of corn and soybeans grown in rotation. This is important to determine the long-term effects of the “low rate” approach of Agro-Culture Liquid Fertilizers high usability nutrition in comparison to higher rates with conventional fertilizers.

One part of this experiment is to measure the effects of the individual program components of the Agro-Culture Liquid Fertilizers. Based on soil test, an in-furrow planter program of 3 gal/A of Pro-Germinator + 5 gal/A of Sure-K + 2 qt/A of Micro 500 was planter-applied, followed by a sidedress application of 47 gal/A of 28% + eNhance. So treatments consisted of no planter fertilizer, Sure-K + Micro 500 only, Pro-Germinator + Micro 500 only, and the complete program. All treatments were sidedressed with 47 gal/A of 28% + eNhance. Results are in the table below.



LSD (0.1.): 9.2; LSD (0.2): 7.1. CV: 5.3%

Conclusions:

- Surprisingly, the application of Sure-K + Micro 500 alone did not yield higher than the Nitrogen-only treatment. This is likely due to the lack of applied phosphorus as from Pro-Germinator which made the Sure-K + Micro 500 treatment ineffective, following Liebig's Law that is the basis for ACLF.
- The application of Pro-Germinator + Micro 500 only did have a significant yield increase, despite seemingly adequate soil P.
- The complete program had the highest yield where the nutrients were effective in non-limiting conditions.

Experiment Info:

Planted:	5/10/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	soybeans
Plot Size:	15' x 210'
Replications:	4
Dry Broadcast:	5/10/2011
Sidedress:	6/15/2011
Harvested:	10/31/2011

Soil Test Values (ppm):

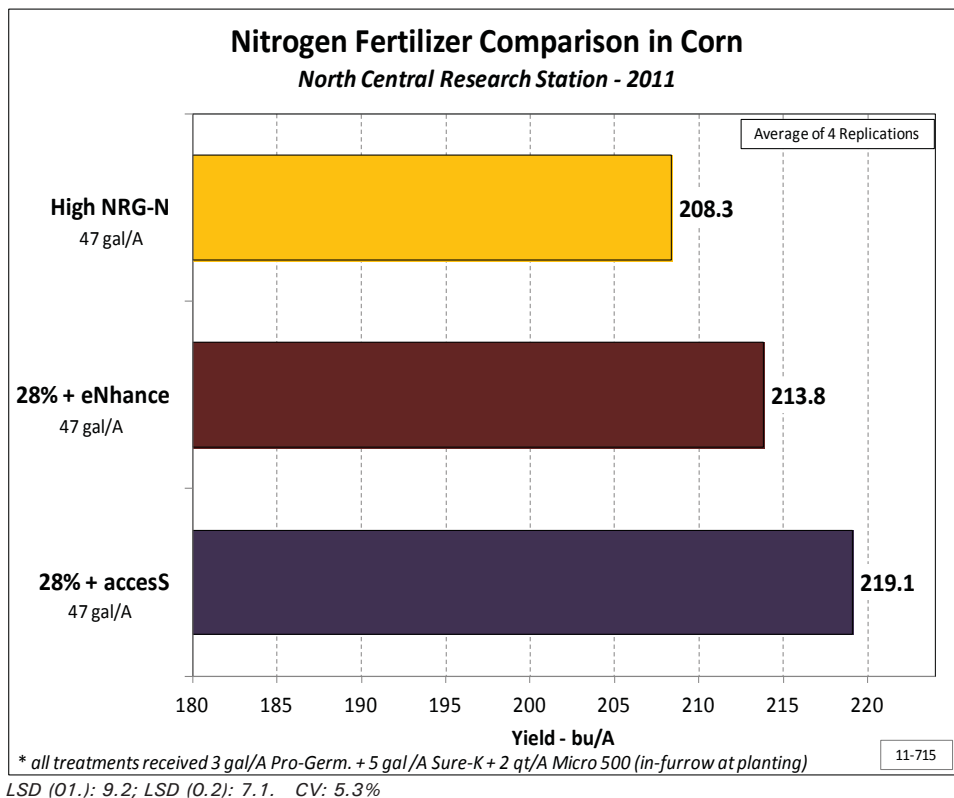
pH:	7.0
CEC:	12.4
% OM:	3.4
Bicarb:	17
K:	111
S:	5
% K:	2.3
% Mg:	21.4
% Ca:	75.9
% H:	0
% Na:	0.4
Zn:	1.5
Mn:	4
B:	0.7

Objective:

Evaluate different corn fertilizer programs based on soil test for effect on yield. (This is the first year of an anticipated long-term experiment in a corn-soybean rotation.)

This so-called "permanent plot" fertilizer experiment will be similar to one conducted on Farm 4 from 1996 to 2005 where fertilizer programs are maintained over time to measure effects on yield of corn and soybeans grown in rotation. This is important to determine the long-term effects of the "low rate" approach of Agro-Culture Liquid Fertilizers high usability nutrition in comparison to higher rates with conventional fertilizers.

Three different nitrogen sidedress applications were compared. These were 47 gal/A each of High NRG-N, 28% + eNhance (eNhance rate of 2 gal/Ton) and 28% + accesS (accesS rate is 10% of volume, so 4.7 gal/A with 42.3 gal/A of the 28% UAN, in a 47 gal/A total application). The 47 gal/A rates apply approximately 136 lb-N/A with the High NRG-N, 141 lb-N/A with the 28% + eNhance, and 127 lb-N/A with the 28% + accesS. (We did not have a 28% UAN only in this experiment due to space, but this comparison is in the other N comparison experiments.) Results appear in the following table.



Conclusions:

- Highest yield was with the 28% + accesS sidedress treatment, despite having the lowest rate of applied nitrogen.
- All of these treatments contain sulfur. The soil test sulfur is only 5 ppm, indicating that there should be a yield benefit from applied sulfur. The 28% + accesS treatment applied an equivalent of 23.5 lb-S/A (actual 8.5 lb-S/A), which may explain why that treatment had the highest yield.

Experiment Info:

Planted:	5/10/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	soybeans
Plot Size:	15' x 210'
Replications:	4
Dry Broadcast:	5/10/2011
Sidedress:	6/15/2011
Harvested:	10/31/2011

Soil Test Values (ppm):

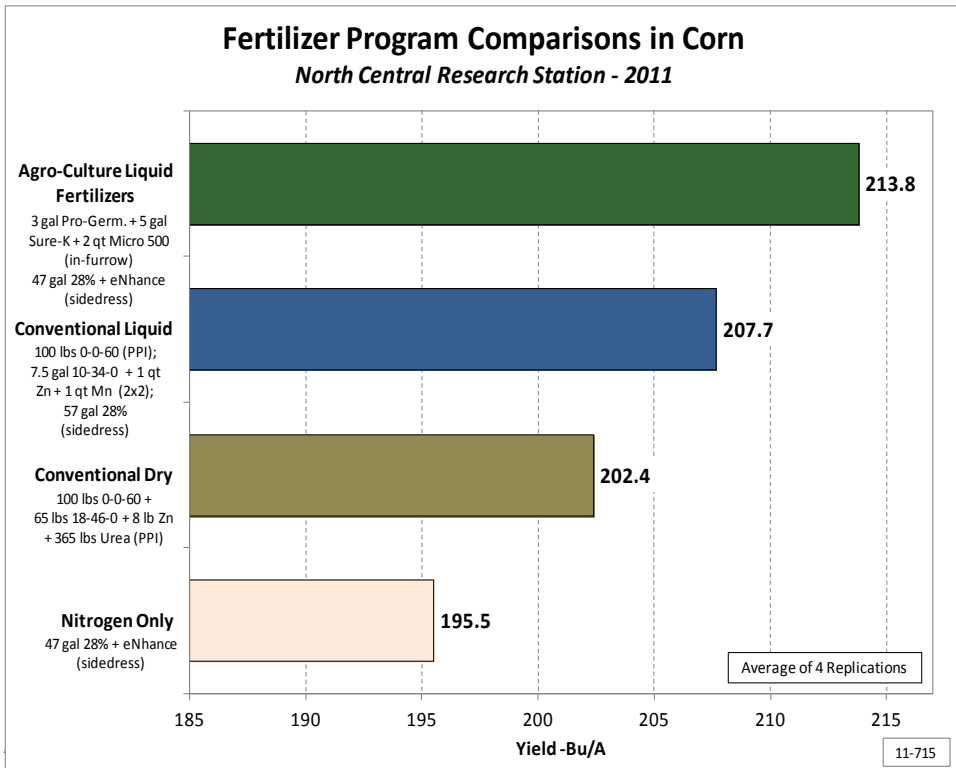
pH:	7.0
CEC:	12.4
% OM:	3.4
Bicarb:	17
K:	111
S:	5
% K:	2.3
% Mg:	21.4
% Ca:	75.9
% H:	0
% Na:	0.4
Zn:	1.5
Mn:	4
B:	0.7

Objective:

Evaluate different corn fertilizer programs based on soil test for effect on yield. (This is the first year of an anticipated long-term experiment in a corn-soybean rotation.)

This so-called "permanent plot" fertilizer experiment will be similar to one conducted on Farm 4 from 1996 to 2005 where fertilizer programs are maintained over time to measure effects on yield of corn and soybeans grown in rotation. This is important to determine the long-term effects of the "low rate" approach of Agro-Culture Liquid Fertilizers high usability nutrition in comparison to higher rates with conventional fertilizers.

Based on soil test, a recommendation of 175-30-60-2Zn was followed for a yield goal of 180 Bu/A. Actually the calculated N recommendation was 218 lb/A. But we thought this was excessive and adjusted it down to 175 lb/A. So three different fertilizer programs were developed to meet this recommendation. One was the ACLF recommendation of 3 gal/A Pro-Germ + 5 gal/A Sure-K + 2 qt/A Micro 500 applied in furrow with the planter and then sidedressed with 47 gal/A of 28% + eNhanche. This actually applied 145-9-4 vs the 175-30-60 that was recommended. Another program was with a pre-plant application of 100 lb/A of 0-0-60; 7.5 gal/A of 10-34-0 + 1 qt/A 9% zinc + 1 qt/A 9% Mn applied 2x2 with the planter and 57 gal/A of 28% applied at sidedress. The third conventional treatment was all dry fertilizer applied preplant incorporated. This was 100 lb/A 0-0-60 + 65 lb/A 18-46-0 + 8 lb/A zinc oxy sulfate (2 lb/A zinc) + 365 lb/A urea. Again, these two conventional rate treatments applied 265 lb/A of primary nutrients vs. 158 lb/A from the Liquid program. A final treatment of nitrogen only for comparison was applied sidedress as 47 gal/a of 28% + eNhanche. Results appear below.

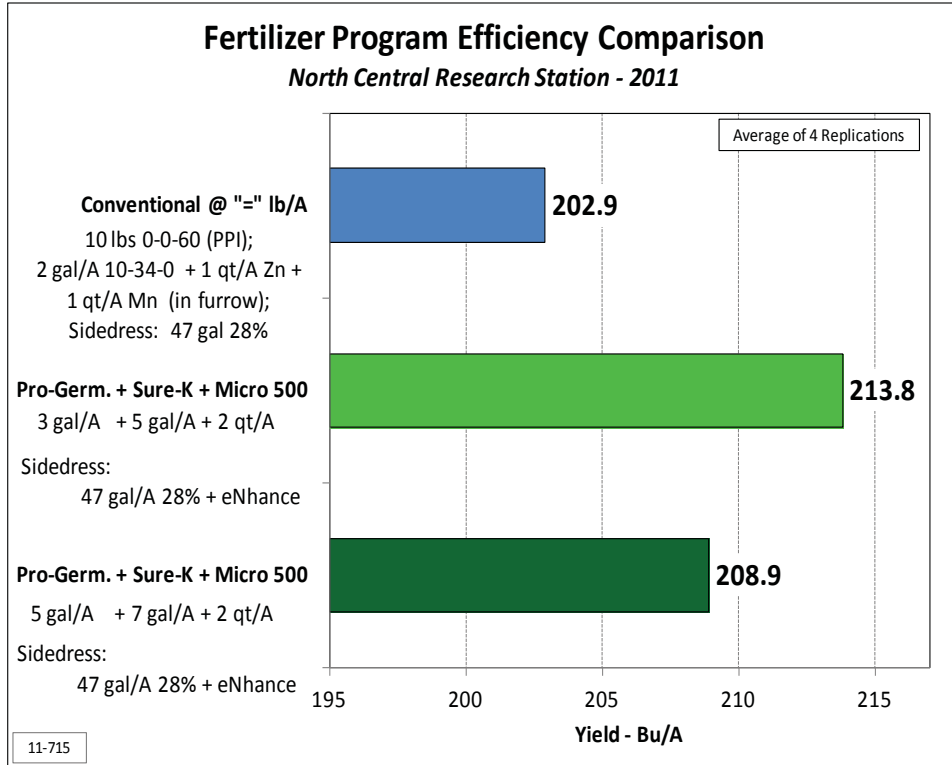


Conclusions:

- Despite applying 40% less primary nutrients per acre, the Agro-Culture Liquid Fertilizers treatment had the highest yield. It was significantly higher than that of the N only and the Dry treatment.
- The Conventional Liquid treatment produced a yield that was significantly higher than that of the N only treatment, but was not significantly higher than that of the Dry.
- The Dry treatment yield was not significantly different than that of the N only treatment. This shows that precision placement is better than broadcast.

It's Nutrients not Numbers, Part 2.

Research has proven over and over the effectiveness of reduced application rates of Agro-Culture Liquid Fertilizers. Well what if you just lowered the rates of conventional fertilizers to match that of ACLF? Do you think ACLF is just lucky? To find out, a treatment of potash, 10-34-0 and 28% was applied to match the 145-9-4 application of ACLF. The conventional micronutrient rates were kept at 1 qt/A of 9% zinc and manganese. Additionally, to answer the question of are ACLF rates too low, a planter (in-furrow) treatment where the Pro-Germinator + Sure-K rates were increased 50% from a total of 8 gal/A to 12 gal/A was applied. Results appear in the following chart.



LSD (01.): 9.2; LSD (0.2): 7.1. CV: 5.3%

Conclusions:

- When nutrients are applied at the same rates with conventional and Agro-Culture Liquid Fertilizers, the ACLF program significantly out-yielded the conventional program. This would indicate higher efficiency with ACLF nutrition.
- Increasing the rates of P and K fertilizers did not result in higher yield, indicating that the recommended rate was accurate. Although stand reduction was not seen with the higher in-furrow application, this rate did exceed the maximum recommendation of 10 gal/A, so this may have been a factor.

Experiment Info:

Planted: 5/10/2011
 Variety: DeKalb 53-78
 Population: 32,000
 Previous Crop: corn
 Plot Size: 15' x 210'
 Replications: 4
 Sidedress: 6/15/2011
 Foliar (V7): 6/17/2011
 Harvested: 11/2/2011

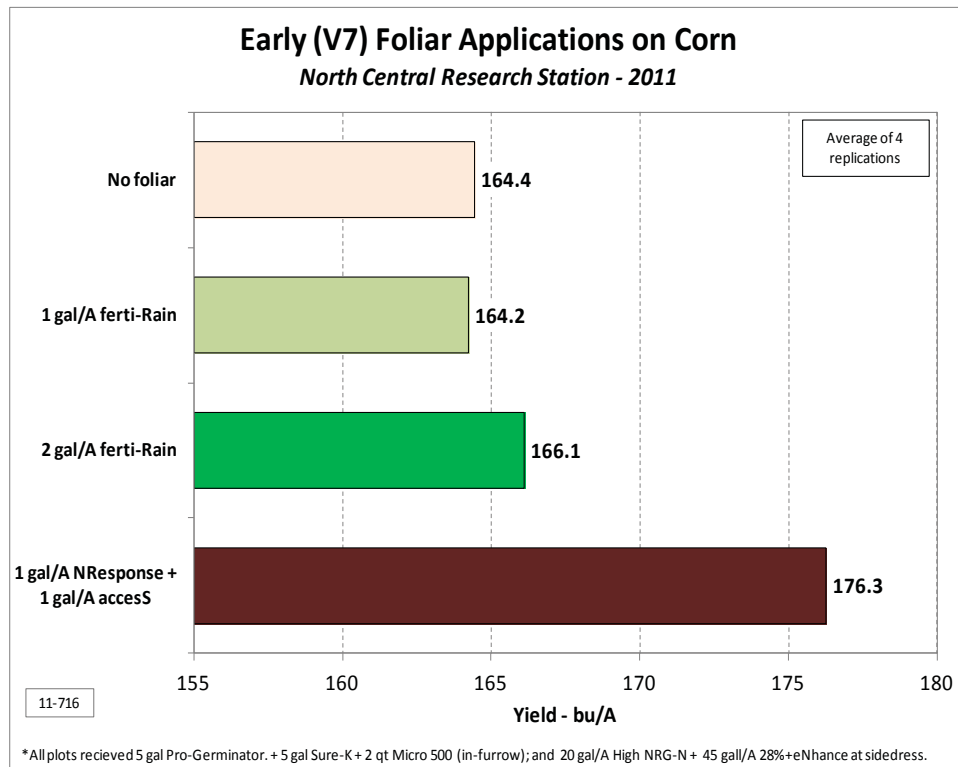
Soil Test Values (ppm):

pH: 7.4
 CEC: 13.8
 % OM: 2.7
 Bicarb: 12
 K: 113
 S: 7
 % K: 2.1
 % Mg: 24.0
 % Ca: 73.7
 % H: 0
 % Na: 0.2
 Zn: 1.0
 Mn: 2
 B: 0.7

Objective:

Evaluate foliar applications of ferti-Rain and accesS + NResponse on corn in the V7 growth stage for effect on yield.

Foliar applications on crops such as soybeans have been proven to be effective in most cases. But this may be because foliar only applications on soybeans have been effective in the absence of soil-applied fertilizer. Foliar applications have not been shown to replace applications of fertilizer to the soil. But research continues to find foliar treatments that can be effective additives to soil fertilizer programs. Success in this quest has been inconsistent. None the less, this year we applied some reduced rates of ferti-Rain (1 and 2 gal/A) and a new treatment, 1 gal/A each of accesS and NResponse. All foliars were applied in a total spray volume of 10 gal/A.



LSD (0.01):7.2; CV:3.5%

Conclusions:

- In spite of the damage to the sprayed leaves, the only treatment to result in a yield increase was the one with NResponse + accesS. We should have taken tissue samples to see what plant nutrients were affected.
- The above treatment had no effect on subsequent growth, just on the sprayed leaves. NResponse has been sprayed on corn with no damage for years, but this is the first time to make foliar applications with the accesS, which must be the culprit for burn here. Perhaps next year we will apply accesS alone. It is unlikely that growers will accept such damage. But we will investigate further.
- The ferti-Rain did not have an effect on yield, which has been our experience with well-fertilized corn.



Experiment Info:

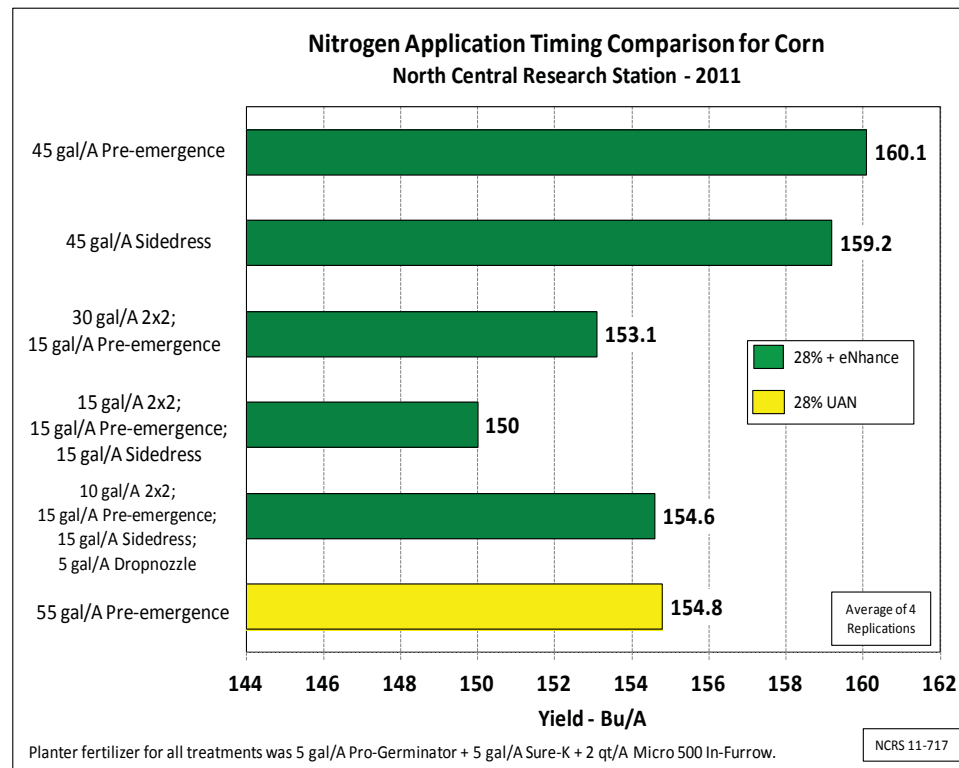
Planted:	5/11/2011
Variety:	DeKalb 53-78
Population:	32,000
Previous Crop:	corn
Plot Size:	15' x 210'
Replications:	4
N Broadcast:	5/13/2011
Sidedress:	6/15/2011
Drop Nozzel:	6/30/2011
Harvested:	10/31/2011

Soil Test Values (ppm):

pH:	7.4
CEC:	13.8
% OM:	2.7
Bicarb:	12
K:	113
S:	7
% K:	2.1
% Mg:	24.0
% Ca:	73.7
% H:	0
% Na:	0.2
Zn:	1.0
Mn:	2
B:	0.7

Objective:

Evaluate single vs. split applications of 28% UAN + eNhanse for effect on corn yield. Previous testing at the NCRS with application timing of nitrogen on corn has surprisingly shown similar yields regardless of method of application. However such testing was with High NRG-N and has not been thoroughly tested with 28% UAN + eNhanse. (Recall that eNhanse is added to 28% UAN at a rate of 2 gallons per ton.) This experiment compared five different application timings for 45 gal/A of 28% + eNhanse to corn following corn: 1) all Broadcast Pre-emergence (after planting); 2) all Sidedress; 3) 15 gal/A 2x2 (with planter) and 30 gal/A Pre-emergence; 4) 15 gal/A 2x2; 15 gal/A Pre-emergence; 15 gal/A Sidedress; and 5) 15 gal/A 2x2; 10 gal/A Pre-emergence; 15 gal/A Sidedress; 5 gal/A through Drop nozzles. A comparison treatment of 55 gal/A 28% UAN applied Pre-emergence was also applied. Yield results appear in the following chart.



Conclusions:

- These results were somewhat unexpected as it shows that single applications are better than multiple applications.
- This was corn after corn and there was residue, but the N did not get tied up from the single surface application. However, the 45 gal/A of 28% with eNhanse did out yield the 55 gal/A rate of 28% without it.
- Despite the apparent yield differences, the yields were not statistically different at the (0.1) level, which does confirm earlier findings that different methods of application result in similar yield.

Experiment Info:

Planted:	5/13/2011
Variety:	Pioneer 92Y53
Population:	150,000
Previous Crop:	corn
Plot Size:	15'x180'/210'/130'
Replications:	5
Foliar R1:	7/12/2011
Foliar R3:	7/25/2011
Foliar R4:	8/1/2011
Harvested:	10/18/2011

Soil Test Values (ppm):

pH:	7.4
CEC:	6.6
% OM:	1.4
Bicarb:	8
K:	56
S:	6
% K:	2.2
% Mg:	17.4
% Ca:	79.5
% H:	0
% Na:	0.9
Zn:	1.1
Mn:	5
B:	0.6

Objective:

The best way to apply fertilizer for a soybean crop is often discussed. Many planters and drills are not set up for liquid fertilizer applications on soybeans. This experiment looks at the yield response to a row applied fertilizer program based on soil test compared to a standard foliar program of Sure-K + Micro nutrients. The foliar Sure-K is at a lower rate of 3 gal/A. In addition to the row-applied fertilizer program, two treatments included additional foliar applications of wither 1 gal/A NResponse or 3 gal/A Sure-K + 1 qt/A Mn. This second application would be combining both the row applied and foliar application. Soybean yield appear in the table below.

Fertilizer Programs in 15" row soybeans (307)

North Central Research Station - 2011

No Fertilizer	51.3
<u>Drill:</u>	
Pro-Germ + Sure-K + Micro 500*	55.1
+ 1 gal/A NResponse	55.1
+ Sure-K + Mn foliar**	56.0
Foliar only**	55.2

* - 2 gal + 6 gal + 2 qt/A

** - 3 gal + 1 qt at R2

Planted on May 13

Foliar on July 12. R2 stage.

LSD (0.2):3.4 CV:10.7%

Conclusions:

- Each fertilizer application significantly increased soybean yield over the no fertilizer check.
- Equal yields were achieved with the row-applied fertilizer program and the foliar program, even though the foliar applied half the rate of Sure-K. This is similar to what has been shown in past data. This allows growers to use either program that fits their operation without fear of potential yield loss due to method of application.
- No further yield increase was seen with the addition of NResponse to the row applied fertilizer program.
- Numerically there was around a 1 bu/A yield increase to doing both a row and foliar fertilizer program, but this would not be cost effective. This again proves that either a single row or foliar application will perform similar without fear of yield loss.
- As has been found with previous testing of soybean fertility, there was a yield increase with soil applied and foliar applied applications, but no further yield increase with the combination of these.

Experiment Info:

Planted:	5/13/2011
Variety:	Pioneer 92Y53
Population:	150,000
Plot Size:	15'x180'/210'/130'
Replications:	5
Previous Crop:	corn
Dry Broadcast:	5/13/2011
Foliar R1:	7/12/2011
Foliar R3:	7/25/2011
Foliar R4:	8/1/2011
Harvested:	10/18/2011

Soil Test Values (ppm):

pH:	7.3
CEC:	6.5
% OM:	1.8
Bicarb:	13
K:	56
S:	9
% K:	2.3
% Mg:	17.3
% Ca:	79.1
% H:	0
% Na:	1.0
Zn:	1.0
Mn:	4
B:	0.6

Objective:

Many times, fertilizer programs are overlooked for soybeans. This experiment compares different fertility programs for a soybean crop grown in 15-inch rows. A dry application of 100 pounds of 0-0-62 was applied in the spring before planting, compared to an Agro-Culture Liquid Fertilizers planter-applied and foliar program. Usually there is no further yield increase with foliar applications following planter applications of fertilizer. So this experiment evaluated some new approaches to this. In addition to the planter applied programs, foliar applications including the fungicide Headline®, NResponse and a mix containing 40% Pro-Germinator, 40% NResponse, 10% eNhance and 10% Micro 500 were used. Yields appear in the table below.

**More Soybean Programs in 15" Row Soybeans
 North Central Research Station - 2011 (309)**

	Bu/A
No Fertilizer	55.1
100 lb 0-0-62	58.9
Drill:	
5 gal/S Sure-K + 2 qt/A Micro 500	57.1
+ Foliar: 2 gal/A NResponse	59.4
+ Foliar 2 gal NResp + Headline	61.5
+ Foliar mix: 2 qt/A at R1, R3, R4	58.9
Foliar only*:	
3 gal/A Sure-K + 1 qt/A Manganese	59.8
Planted on 5/13.	
* - applied at R1 on 7/13.	

LSD (0.1):3.7 CV:7.7%

Conclusions:

- All fertilizer treatments increased soybean yields over the untreated check by at least 2 bu/A.
- The conventional program of 0-0-62 yielded similar to the planter only program containing 5 gal/A Sure-K and 2 qt/A Micro 500.
- As shown in past data, a foliar program containing 3 gal/A Sure-K and 1 qt/A Manganese produced yields similar to higher rates of planter applied fertility.
- The addition of NResponse as a foliar application in the flowering growth stage increased soybean yield by over 2 bu/A.
- The mix of products containing Pro-Germinator, NResponse, eNhance and Micro 500 added nearly a 2 bu/A yield increase. However, the cost of three applications even with the low use rate, may exceed the yield benefit.
- Highest yield was seen with the addition of Headline® Fungicide to the NResponse foliar application, with a significant yield increase of 6.4 bu/A over the untreated check.

Experiment Info:

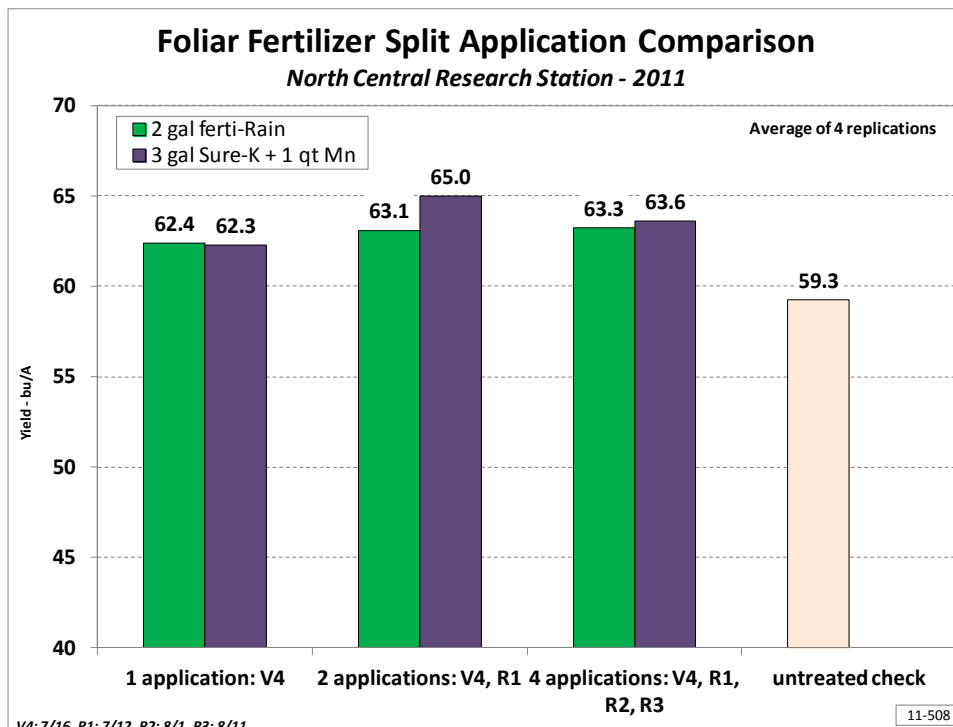
Planted:	6/2/2011
Variety:	Stine 1932
Population:	150,000
Plot Size:	15' x 300'
Replications:	4
Previous Crop:	corn
Foliar V3:	7/6/2011
Foliar R1:	7/12/2011
Foliar R3:	8/1/2011
Harvested:	10/11/2011

Soil Test Values (ppm):

pH:	6.8
CEC:	8.0
% OM:	1.8
P1:	46
K:	70
S:	8
% K:	2.2
% Mg:	19.1
% Ca:	77.4
% H:	0
% Na:	1.3
Zn:	1.8
Mn:	8
B:	0.7

Objective:

Agro-Culture Liquid Fertilizers has two main foliar program options for soybeans. Depending on soil test levels, either a program of 3 gal/A Sure-K with 1 qt/A MicroLink Manganese or 2 gal/A fert-Rain are commonly used. For this experiment location, soil levels were medium to low on potassium with 70 ppm and 2.2% base saturation. In cases where potassium levels are medium, a foliar program including Sure-K would be a better option. In cases with higher potassium soils, ferti-Rain tends to work better. This experiment compared these two foliar programs applied at 3 different timings, keeping the *total fertilizer rate for each product per acre for the season the same*. Timings included (1) 1 application at V4, (2) 2 applications at V4 and R1 or (3) 4 applications at V4, R1, R2, and R3. (V4- 4 trifoliolate, R1-beginning flower, R2-full flower, R3-beginning pod)



Foliar applications are made with a Hagie Sprayer specially designed for plot applications. Multiple small tanks allow for different product mixes to be taken to the field. Fertilizer is mixed with water and applied at a total spray volume of 10 gal/A at 40 psi, with flat fan nozzles on 15 inch spacing.

Conclusions:

- All foliar applications increased soybean yields over the untreated check by at least 3 bu/A.
- With the soils in the experiment having medium potassium levels, there was no significant difference between the two foliar programs. However, at most timings, there was a slight advantage to the Sure-K with MicroLink Manganese application.
- There was no statistically significant difference in soybean yield between the 3 timings of application. This shows, that a grower can apply a full rate in a single application or split the rate and “spoon feed” the crop if they are making multiple pesticide applications. It is a good practice to apply small amounts of nutrition when making any postemergence application.

Experiment Info:

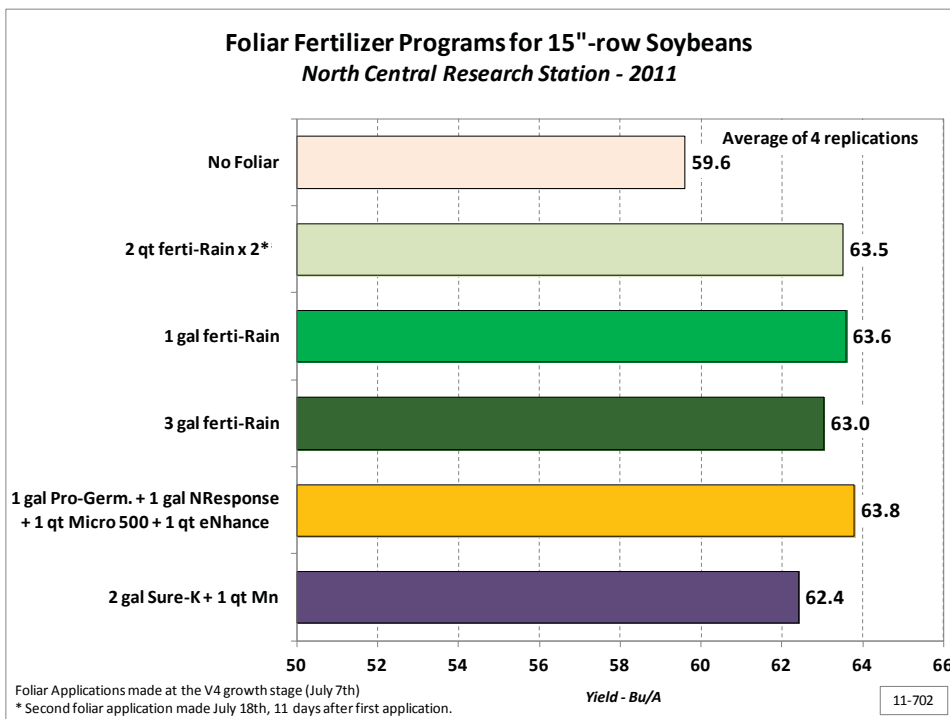
Planted:	6/1/2011
Variety:	Stine 24RA02
Population:	150,000
Plot Size:	15' x 265'
Replications:	4
Previous Crop:	soybean
Foliar V4:	7/7/2011
Harvest:	10/8/2011

Soil Test Values (ppm):

pH:	6.7
CEC:	12.3
% OM:	3.3
P1:	20
K:	203
S:	9
% K:	4.2
% Mg:	13.7
% Ca:	67.4
% H:	14.1
% Na:	0.6
Zn:	2
Mn:	14
B:	0.5

Objective:

Knowing your soil nutrient levels, is the best way to determine which of Agro-Culture Liquid Fertilizes' foliar programs should be used. This experiment location at the North Central Research Station, has lower phosphorus and higher potassium levels than other areas of the farm. Knowing this, ferti-Rain would be the best product for foliar treatments. This experiment compared different rates of ferti-Rain along with multiple applications of lower rates. Along with ferti-Rain a combination of products including 40% Pro-Germinator, 40% NResponse, 10% Micro 500 and 10% eNhance and a treatment containing 2 gal/A Sure-K with 1 qt Manganese was also evaluated. Applications were made at the V4 growth stage in 15-inch row soybeans. Yields appear on the chart below.



LSD (0.1):3.1 CV: 4.8%

Conclusions:

- All fertilizer treatments significantly increased soybean yield over the no foliar check.
- There was no difference in yield between the 3 different application rates of ferti-Rain.
- Highest numerical yield was achieved with the blend of products that focused more heavily on phosphorus.
- The program containing Sure-K and Manganese did not yield as well as those with higher rates of phosphorus, as the soil test indicated a sufficient K levels.

Experiment Info:

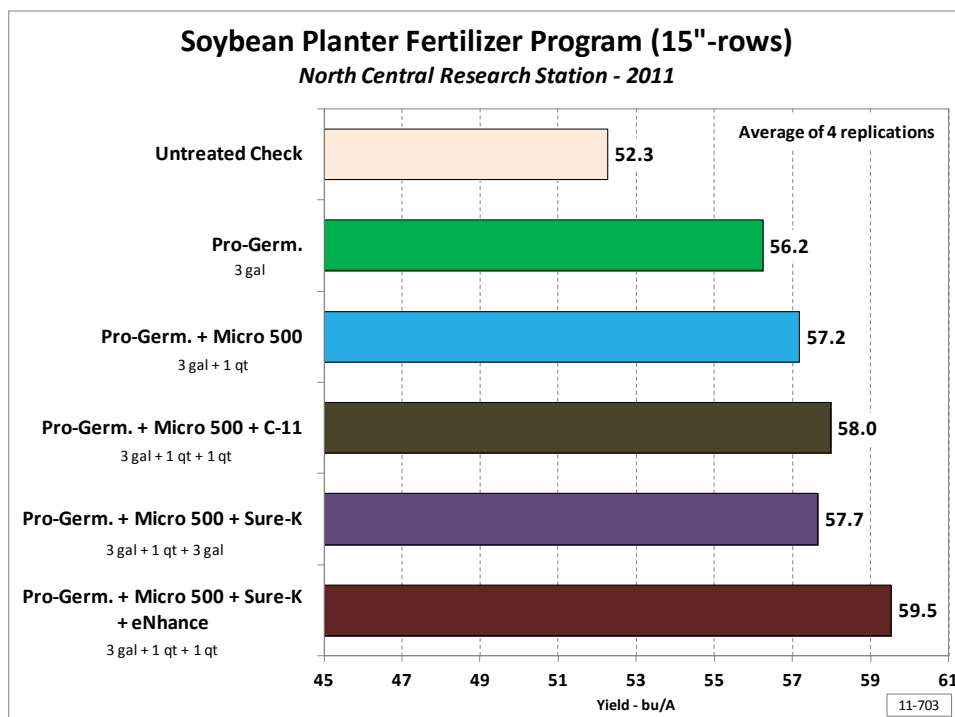
Planted:	6/1/2011
Variety:	Stine 24RA02
Population:	150,000
Plot Size:	15' x 265'
Previous Crop:	soybean
Replications:	4
Foliar V4:	7/7/2011
Harvested:	10/7/2011

Soil Test Values (ppm):

pH:	6.2
CEC:	12.4
% OM:	2.7
Bicarb:	16
K:	151
S:	8
% K:	3.1
% Mg:	16.2
% Ca:	68.4
% H:	12.0
% Na:	0.3
Zn:	2.3
Mn:	8
B:	0.5

Objective:

This experiment compares different row placed fertilizer programs and additives for soybeans. According to a soil test recommendations, 3 gal/A Pro-Germinator and 1 qt Micro 500 was applied. Additives to this program included Sure-K, eNhance and C-11. C-11 is a carbon based experimental product. Soybean yields appear in the chart below.



LSD (0.1):3.1 CV: 4.8%

Conclusions:

- Applications of Pro-Germinator and Micro 500 (according to soil test) resulted in nearly a 5 bu/A yield increase.
- A 1 bu/A yield increase was seen with the addition of 1 qt/A Micro 500 to the Pro-Germinator program.
- The experimental additive C-11, had a slight, but non-significant, yield increase.
- Sure-K did not increase soybean yield, most likely due to the adequate levels found in the soil.
- Highest yield was achieved with the addition of both Sure-K and eNhance to the program, yielding 7 bu/A higher than the untreated check and 2.3 bu/A higher than Pro-Germinator and Micro 500 alone.

Experiment Info:

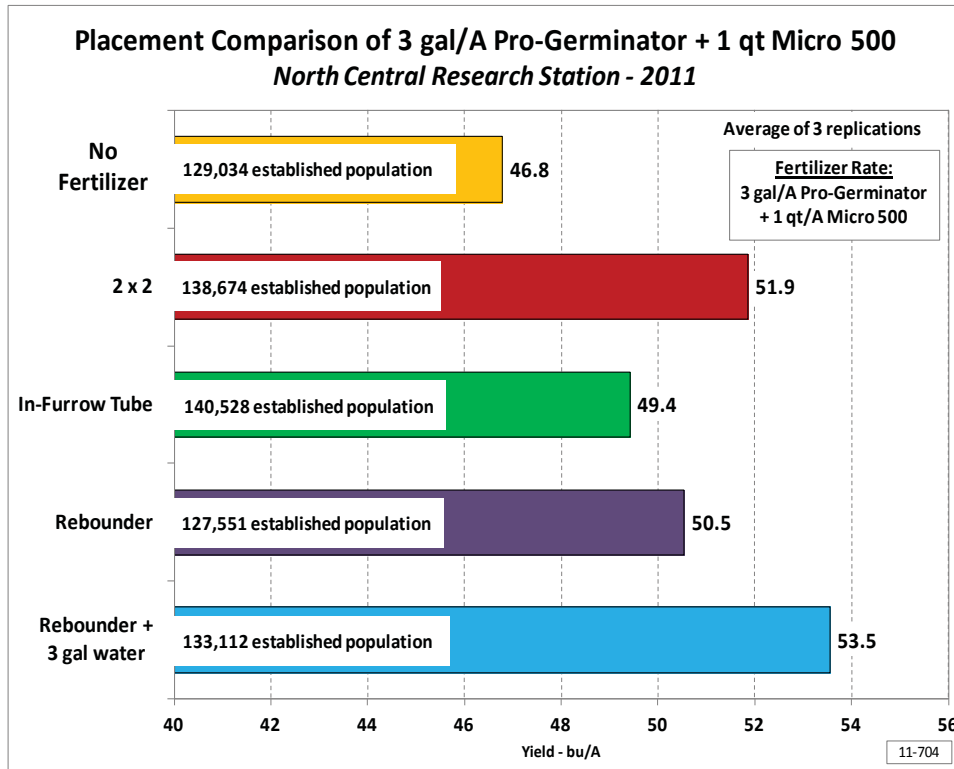
Planted:	6/3/2011
Variety:	Stine 19RA02
Population:	140,000
Previous Crop:	soybean
Plot Size:	15' x 265'
Replications:	4
Foliar:	7/18/2011
Harvested:	10/7/2011

Soil Test Values (ppm):

pH:	6.2
CEC:	12.4
% OM:	2.7
P1:	16
K:	151
S:	8
% K:	3.1
% Mg:	16.2
% Ca:	68.4
% H:	12.0
% Na:	0.3
Zn:	2.3
Mn:	8
B:	0.5

Objective:

Soybean seed is more susceptible to fertilizer injury than is corn seed. In sandy soils or areas with low moisture content, stand reduction can occur with in-furrow placement. This fertilizer placement experiment was established on slightly heavy ground with a CEC of 12.4. Fertilizer was placed in 3 different locations with a Monosem 30-inch row planter. Placements are shown in the pictures on the lower right and included 2 x 2, In-Furrow Tube (at bottom of furrow before seed drop), and with Rebounder where fertilizer stream is split above the seed placement. A fertilizer rate of 3 gal/A Pro-Germinator with 1 qt/A Micro 500 was used. In addition the Rebounder treatment was all tested where of 3 gal/A water plus 3 gal/A Pro-Germinator to check for increased seed safety. Stand counts were done 10 days after planting to determine injury from fertilizer. These numbers appear within the bars on the yield char below.



Conclusions:

- Fertilizer placement had no significant effect soybean population. It can be concluded that in this heavier soil with good moisture low rates (less than 4 gal/A) of fertilizer can be placed in contact with the seed without fear of injury to stand.
- All fertilizer treatments significantly increased soybean yield over the untreated check.
- Of the 3 placements, the 2x2 produced the highest yield.
- When water was added to the fertilizer mix, highest yield was achieved at 53.5 bu/A. With no difference in stand, the yield increase may be due to increased fertilizer volume which enabled better distribution.

Experiment Info:

Planted:	6/1/2011
Variety:	Stine 24RA02
Population:	150,000
Previous Crop:	soybeans
Plot Size:	15' x 210'
Replications:	4
Foliar (V4):	6/1/2011
Harvested:	10/12/2011

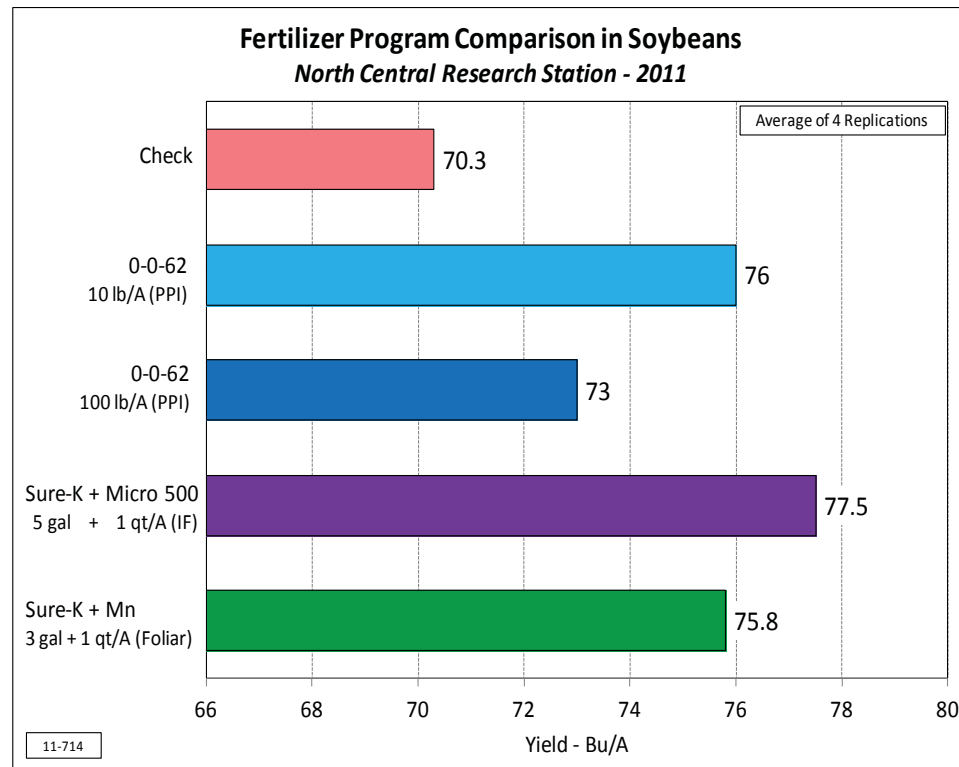
Soil Test Values (ppm):

pH:	7.0
CEC:	12.4
% OM:	3.4
Bicarb:	17
K:	111
S:	5
% K:	2.3
% Mg:	21.4
% Ca:	75.9
% H:	0
% Na:	0.4
Zn:	1.5
Mn:	4
B:	0.7

Objective:

Evaluate different soybean fertilizer programs based on soil test for effect on yield. (This is the first year of an anticipated long-term experiment in a corn-soybean rotation.) This so-called "permanent plot" fertilizer experiment will be similar to one conducted on Farm 4 from 1996 to 2005 where fertilizer programs are maintained over time to measure effects on yield of corn and soybeans grown in rotation. This is important to determine the long-term effects of the "low rate" approach of Agro-Culture Liquid Fertilizers high usability nutrition in comparison to higher rates with conventional fertilizers.

In this rotation, it was determined to make dry potash (0-0-62) applications in the fall after soybean harvest. But it was decided to put on some potash here in the spring so as to get some for the soybean crop. Two rates of potash were applied pre-plant incorporated (PPI): 100 lb/A and 10 lb/A. The low rate is part of a rotation where a near equal amount of K2O to that of 5 gal/A of Sure-K would be applied. Plots were planted with a drill, and Liquid fertilizer was applied in the seed furrow through a tube behind the seed wheel. Foliar application was at the R4 stage of growth. Yields appear in the following chart.



LSD(0.1): 6.5; (0.2): 5; CV: 7.6%

Conclusions:

- The highest yield was with the planter-applied Sure-K. There was no significant difference between that yield and the foliar treatment.
- The low rate of potash yielded higher than the high rate of potash, although the difference was not significant. But it suggests the potential harm of potash chloride.
- The yield with the high rate of potash was not significantly different than no fertilizer.

Experiment Info:

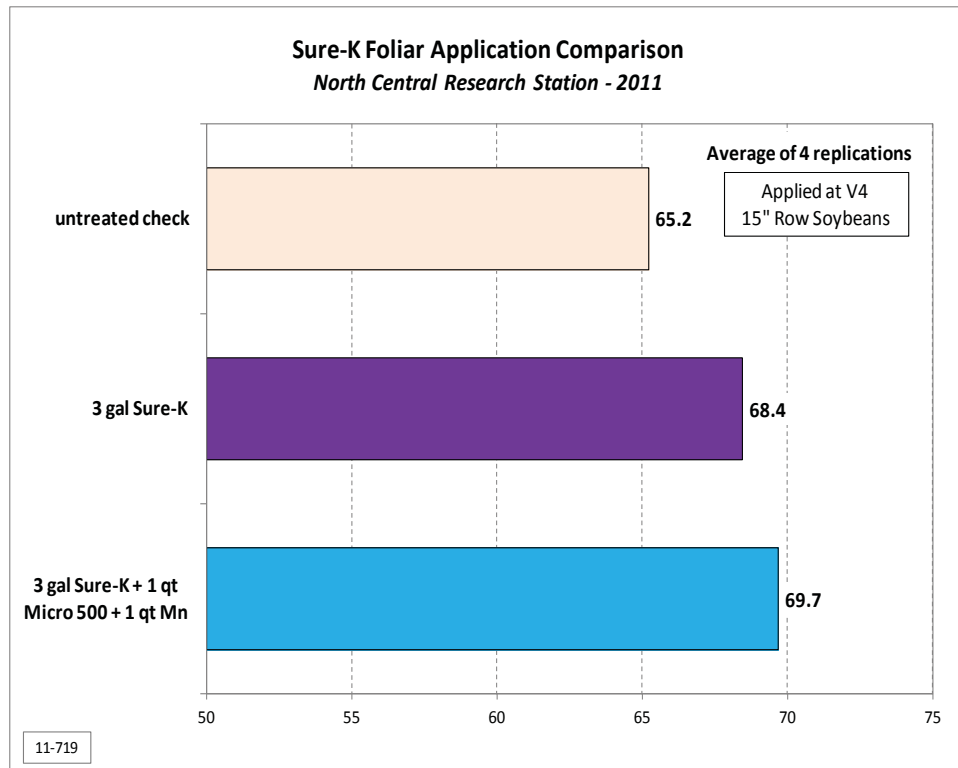
Planted:	6/1/2011
Variety:	Stine 24RA02
Population:	150,000
Previous Crop:	corn
Plot Size:	15' x 255'
Replications:	4
Foliar (V4):	7/7/2011
Foliar (V4+10d):	7/18/2011
Harvested:	10/31/2011

Soil Test Values (ppm):

pH:	6.8
CEC:	12.2
% OM:	3.0
P1:	20
K:	121
S:	16
% K:	2.5
% Mg:	21.7
% Ca:	75.5
% H:	0
% Na:	0.3
Zn:	1.3
Mn:	2
B:	0.6

Objective:

This experiment evaluates the benefits of adding micronutrients into a soybean foliar program when soil tests are low for micronutrients. This location has an extremely low soil level on manganese at 2 ppm. In addition to the 3 gal/A Sure-K, 1 qt of Micro 500 and 1 qt of MicroLink Manganese were added to the application. Applications were made to 15" row soybeans that were 9-inches tall in the V4 growth stage.



Conclusions:

- Both foliar programs with and without micronutrients significantly increased soybean yield over the untreated check.
- The addition of 1 qt/A of Micro 500 and 1 qt/A MicroLink Manganese increased soybean yield 1.3 bu/A over the Sure-K only foliar program.

Experiment Info:

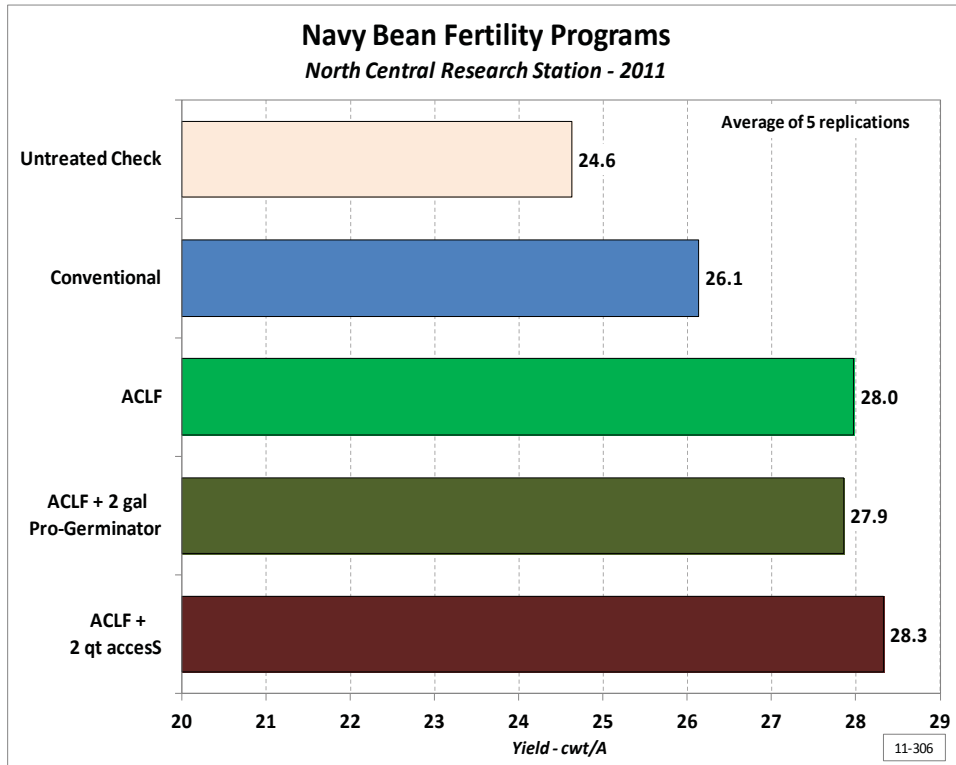
Planted: 6/21/2011
 Variety: Vista
 Population: 140,000
 Previous Crop: soybean
 Plot Size: 15'x180'/210'/130'
 Replications: 5
 Foliar V4: 6/20/2011
 Harvested: 10/3/2011

Soil Test Values (ppm):

pH: 7.2
 CEC: 5.8
 % OM: 1.2
 Bicarb: 12
 K: 53
 S: 6
 % K: 2.3
 % Mg: 16.5
 % Ca: 80.2
 % H: 0
 % Na: 1.0
 Zn: 0.6
 Mn: 2
 B: 0.4

Objective:

This years navy bean experiment compared yield response to a conventional fertilizer program. A soil test recommendation called for 40-0-110. To follow this program the conventional treatment consisted of 185 lbs/A 0-0-62 with 2 lb/A Zinc and 2 lbs/A Manganese (preplant incorporated) with 13 gal/A 28% UAN (planting 2x2) to a complete Agro-Culture Liquid Fertilizer (ACLF) program of 7.5 gal/A Sure-K + 2 qt/A Micro 500 + 8 gal/A High NRG-N (planting 2x2). Also evaluated was the addition of 2 gal/A Pro-Germinator or 2 qt/A accesS to the complete ACLF program. Yield results appear on the chart below.



LSD (0.1):3.3 CV:14.5%

Conclusions:

- All Agro-Culture Liquid Fertilizer treatments significantly increased navy bean yield over the untreated check.
- The Agro-Culture Liquid Fertilizer treatment yielded almost 200 pounds higher than the conventional program.
- The addition of 2 gal/A Pro-Germinator to the planter applied program did not provide additional yield in the high phosphorus soils.
- The addition of 2 qt/A accesS provided a small yield increase of 30 pounds/A. This was the highest yielding treatment at 28.3 cwt/A. It was observed that plants in plots wit this treatment were visually larger than other plots, but this did not result in higher yield.

Experiment Info:

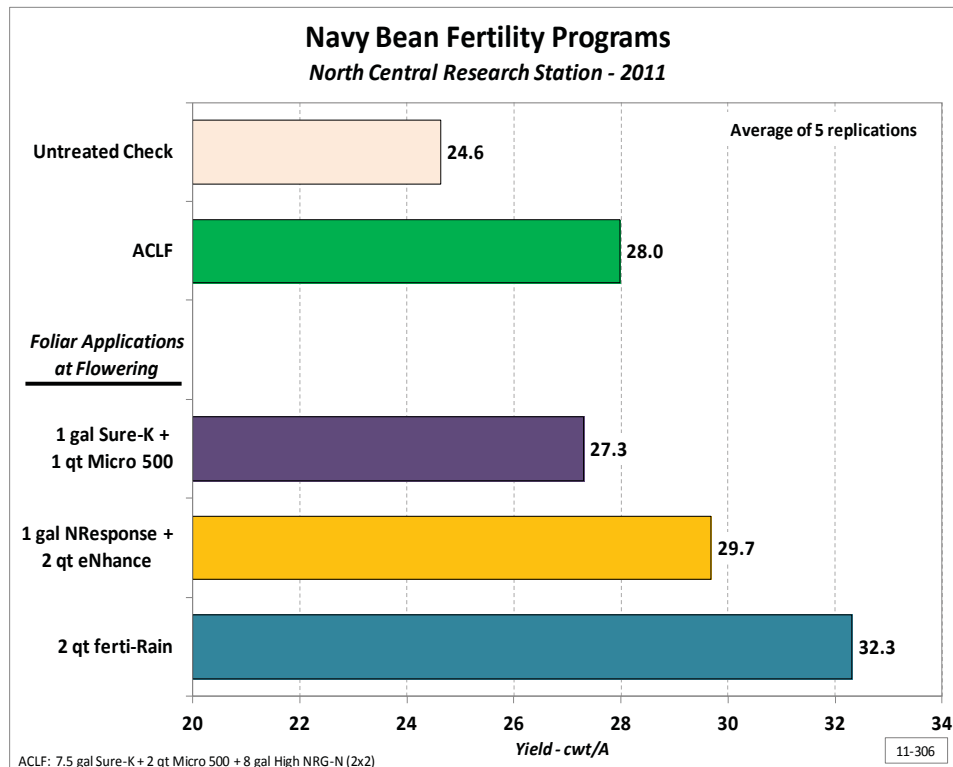
Planted: 6/21/2011
 Variety: Vista
 Population: 140,000
 Previous Crop: soybean
 Plot Size: 15'x180'/210'/130'
 Replications: 5
 Dry Broadcast: 6/20/2011
 Foliar: 6/20/2011
 Harvested: 10/3/2011

Soil Test Values (ppm):

pH: 7.2
 CEC: 5.8
 % OM: 1.2
 Bicarb: 12
 K: 53
 S: 6
 % K: 2.3
 % Mg: 16.5
 % Ca: 80.2
 % H: 0
 % Na: 1.0
 Zn: 0.6
 Mn: 2
 B: 0.4

Objective:

In past years, much work has been done with foliar fertility programs for navy beans. This year's foliar treatments evaluated low rate applications of Agro-Culture Liquid Fertilizers including Sure-K, NResponse and ferti-Rain. Applications were made at flowering with the Hagie plot sprayer.



LSD (0.1):3.3 CV:14.5%

Conclusions:

- A foliar application of 1 gal/A Sure-K with 1 qt Micro 500 did not show a yield increase. In past research a rate of 3 gal/A was tested, showing positive results. More work will be done looking at rate effects of Sure-K foliar applied on navy beans.
- Similar to 2010 (270 lb/A yield increase), a foliar program of NResponse and eNhance increased yield by over 150 pounds in the 2011 experiment.
- Highest yield was achieved with 2 qt/A ferti-Rain, yielding 32.3 cwt/A. This is an increase of over 400 pounds per acre.

Experiment Info:

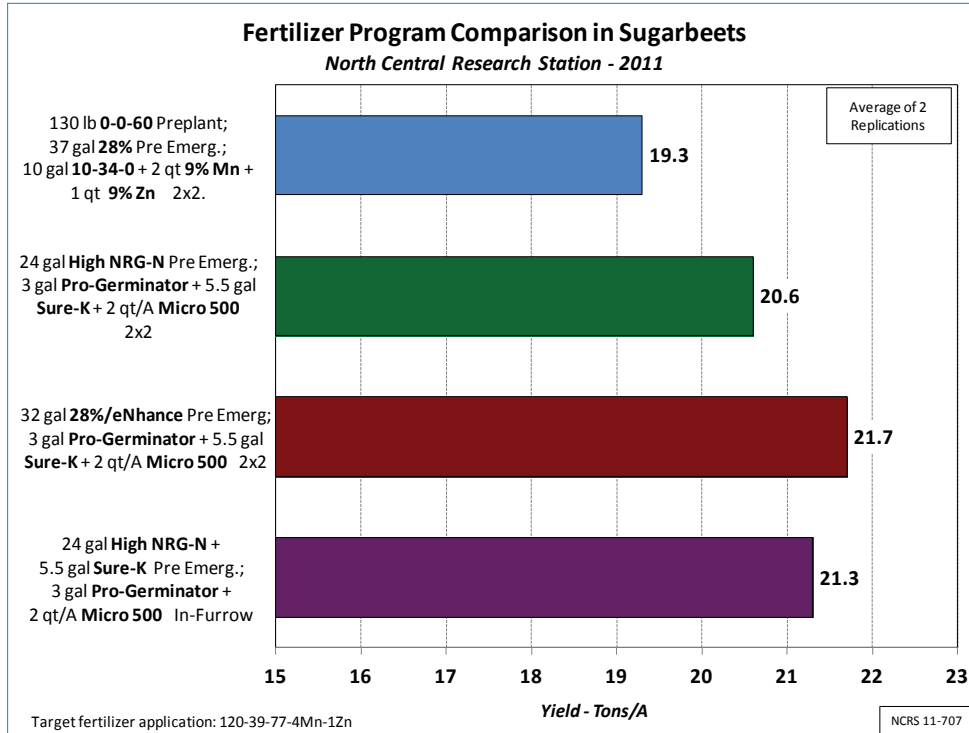
Planted: 5/3/2011
 Variety: Beta 18RR26
 Population: 26,000
 Previous Crop: soybean
 Plot Size: 15' x 265'
 Replications: 2
 Dry Broadcast: 5/1/2011
 N Broadcast: 5/5/2011
 Harvested: 11/7/2011
 N Broadcast: 5/5/2011

Soil Test Values (ppm):

pH: 6.7
 CEC: 12.4
 % OM: 2.8
 P1: 15
 K: 132
 S: 6
 % K: 2.7
 % Mg: 21.2
 % Ca: 75.9
 % H: 0
 % Na: 0.2
 Zn: 1.2
 Mn: 5
 B: 0.5

Objective:

Sugarbeets are a high-intensity crop requiring careful applications of nutrients to produce high tonnage along with quality sugar content. This years experiment at the North Central Research Station compared Agro-Culture Liquid Fertilizers nitrogen sources, High NRG-N and 28% + eNhance along with a comparison of Pro-Germinator applied in-furrow. These were compared to a conventional fertilizer program (120-39-77). Treatments are listed on the chart below.



Conclusions:

- Heaving rain following planting likely had an effect on yield. But it was decided that there was sufficient stand and replanting was not necessary.
- All Agro-Culture Liquid Fertilizer treatments increased yield over the conventional fertilizer program.
- In the nitrogen source comparison, 28% + eNhance showed a yield increase of just over 1 ton/A compared to High NRG-N.
- Applying the 3 gal/A Pro-Germinator in-furrow instead of 2x2, showed a slight numerical increase (0.7 ton/A). Although no stand reduction was seen, note that in-furrow applications on sugarbeets may cause stand reduction in soils with low CEC or in dry conditions. Please consult your ACLF representative before making in-furrow applications.

Experiment Info:

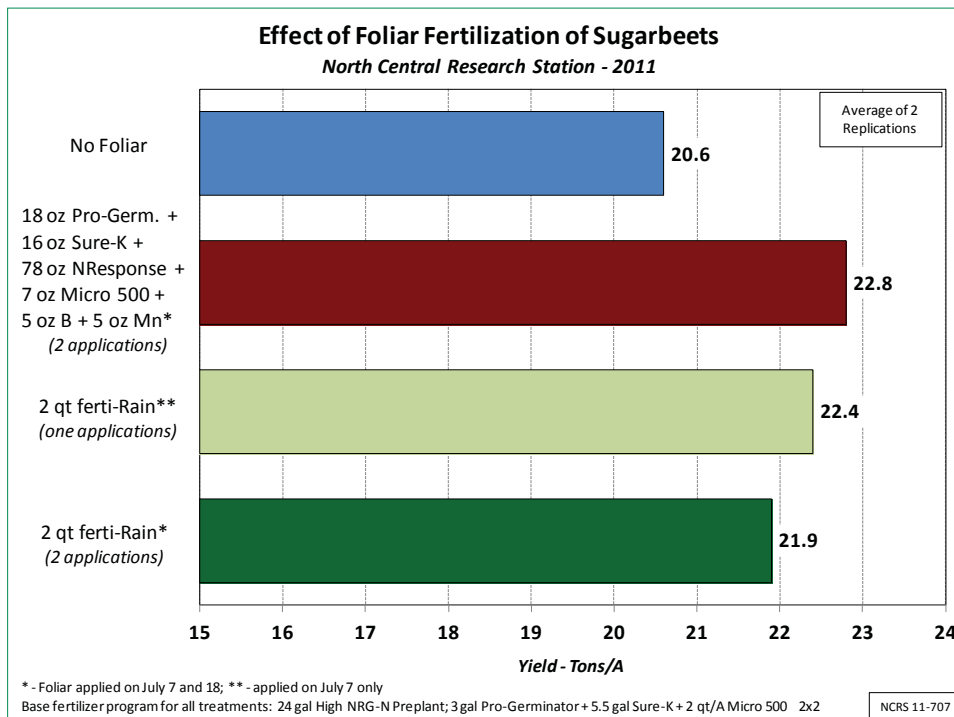
Planted: 5/3/2011
 Variety: Beta 18RR26
 Population: 26,000
 Previous Crop: soybean
 Plot Size: 15' x 265'
 Replications: 2
 Harvested: 11/7/2011
 Dry Broadcast: 5/1/2011
 N Broadcast: 5/5/2011
 Foliar 1: 7/7/2011
 Foliar 2: 7/18/2011

Soil Test Values (ppm):

pH: 6.7
 CEC: 12.4
 % OM: 2.8
 P1: 15
 K: 132
 S: 6
 % K: 2.7
 % Mg: 21.2
 % Ca: 75.9
 % H: 0
 % Na: 0.2
 Zn: 1.2
 Mn: 5
 B: 0.5

Objective:

Many postemergence applications are made for disease and insect control in sugarbeet production each season. These provide perfect opportunities to add some additional nutrition to the growing crop while combining the applications. This experiment compared different foliar programs and timings for effect on sugarbeet yield. The first treatments were either 1 or 2 applications of ferti-Rain compared to 2 applications of a blend of Agro-Culture Liquid Fertilizer products developed for more broad-spectrum application. Treatment descriptions and yields appear on the chart below.



LSD (0.2): 2.6 CV: 8.1%

Conclusions:

- All treatments yielded higher than the no foliar treatment.
- There was no additional yield achieved with the second application of 2 qt/A ferti-Rain compared to the single application.
- Highest numerical yield was achieved with the blend of Agro-Culture Liquid Fertilizer products, increasing sugarbeet yield over 2 ton/A
- Regrettably sugarbeet sugar analysis was not evaluated as we search for a source.



Sugarbeet foliar applications being made in mid-July. These applications can be combined with postemergence pesticide applications.

Experiment Info:

Planted:	10/4/2011
Variety:	Pioneer 25W43
Population:	2 mill seed/A
Previous Crop:	Navy beans
Plot Size:	15'x180'/210'/130'
Replications:	5
Topdress:	4/13/2011
Late Foliar:	5/24/2011
Harvest:	7/13/2011

Soil Test Values (ppm):

pH:	7.5
CEC:	8.3
% OM:	1.6
Bicarb:	7
K:	70
S:	12
% K:	2.2
% Mg:	15.5
% Ca:	81.7
% H:	0
% Na:	0.6
Zn:	1.2
Mn:	3
B:	0.6

Objective:

1) Evaluate the effects of a drill application of 4 gal/A of Pro-Germinator + 2 qt/A on yield of winter wheat compared to no fertilizer applied, which is the most common treatment option. (2) Evaluate the effects of a fungicide application (Quadris) at flag leaf (Feekes stage 10) either alone or with foliar fertilizers.

(Note: all treatments received the same topdress application: 12 gal/A High NRG-N + 16 gal/A 28% + eNhance.)

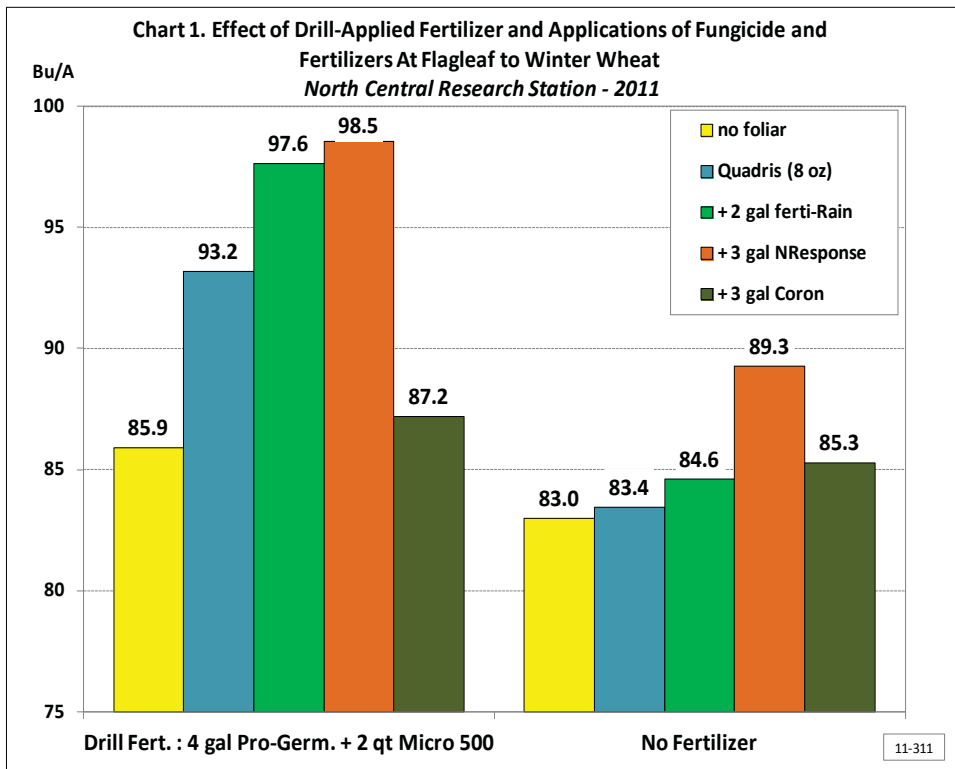
Winter wheat is usually planted right after soybean harvest here in the Upper Midwest, and is usually not fertilized at that time. Later in the growing season, foliar applications of fungicides have often shown yield increases due to suppression of fungal diseases. The application of fungicides presents an excellent opportunity for the inclusion of some crop nutrition. An experiment was conducted to evaluate the above two objectives, and this was the second year of application of these treatments. For the foliar application, spray volume was at 20 gal/A with Turbo TeeJet nozzles (TJ-03) at a pressure of 60 psi.



The two pictures on the left are from this experiment. The picture on the left was taken on May 5. The plot to the left of the stake received the Pro-Germinator + Micro 500 through the drill at planting. The plot to the right of the stake received nothing at that time. At the time, it was apparent that the plots that received the fall fertilizer had larger wheat and the plants were darker green. The picture on the right is during the late foliar application on May 24. There were no visible signs of wheat disease at any time before or after the applications. There was no fertilizer burn on the wheat leaves following application.



Treatment yields appear in the following chart.



Treatment LSD(0.05): 10.1; (0.1): 8.4. CV: 9.6%. Drill fertilizer effect: LSD(0.1): 6.5.
Averaged over foliar applications: With drill fertilizer: 92.5 Bu/A. No drill fertilizer: 85.1 Bu/A

Conclusions:

- The application of the Pro-Germinator + Micro 500 at planting resulted in a significant yield increase.
- Application of Quadris, Quadris + ferti-Rain and Quadris + NResponse had a larger yield effect on the wheat that received Pro-Germinator + Micro 500 at planting. It is possible that the addition of fertilizer at planting increased yield potential. The presence of the foliar inputs was able to take advantage of wheat that was not limited by lack of nutrition in the fall, whether this was due to larger plants, or better fed.
- The application of the planting-time fertilizer did not seem to have a major effect on the treatment that received no foliar application. There must have been a synergistic effect where the presence of both had a far greater effect than that of either input alone.

Treatment averages from the two years of this experiment appear in the following table.

Effect of Drill-Applied Fertilizer and Foliar Applications on Winter Wheat Yield. North Central Research Station. 2010-2011			
	-----Bu/A-----		
<u>With Drill Fertilizer</u>	2010	2011	2 yr avg.
no foliar	83.7	85.9	84.8
Quadris alone	86.3	93.2	89.8
Quadris + ferti-Rain	85.5	97.6	91.6
Quadris + NResponse	88.2	98.5	93.4
Quadris + Coron	83.9	87.2	85.6
Average:	85.5	92.5	89.0
<u>No Drill Fertilizer</u>			
no foliar	73.6	83	78.3
Quadris alone	71.7	83.4	77.6
Quadris + ferti-Rain	81.4	84.6	83.0
Quadris + NResponse	79.2	89.3	84.3
Quadris + Coron	81.4	85.3	83.4
Average:	77.5	85.1	81.3

Conclusions:

- There was a 7.7 Bu/A advantage per year from the application of the planter-time fertilizer (4 gal/A Pro-Germinator + 2 qt/A Micro 500).
- Addition of ferti-Rain and NResponse to the foliar application of Quadris did result in further yield increase of wheat.

Application rates in table:
Quadris: 8 fluid oz/A
NResponse and Coron: 3 gal/A
ferti-Rain: 3 gal/A (2010); 2 gal/A (2011)

Experiment Info:

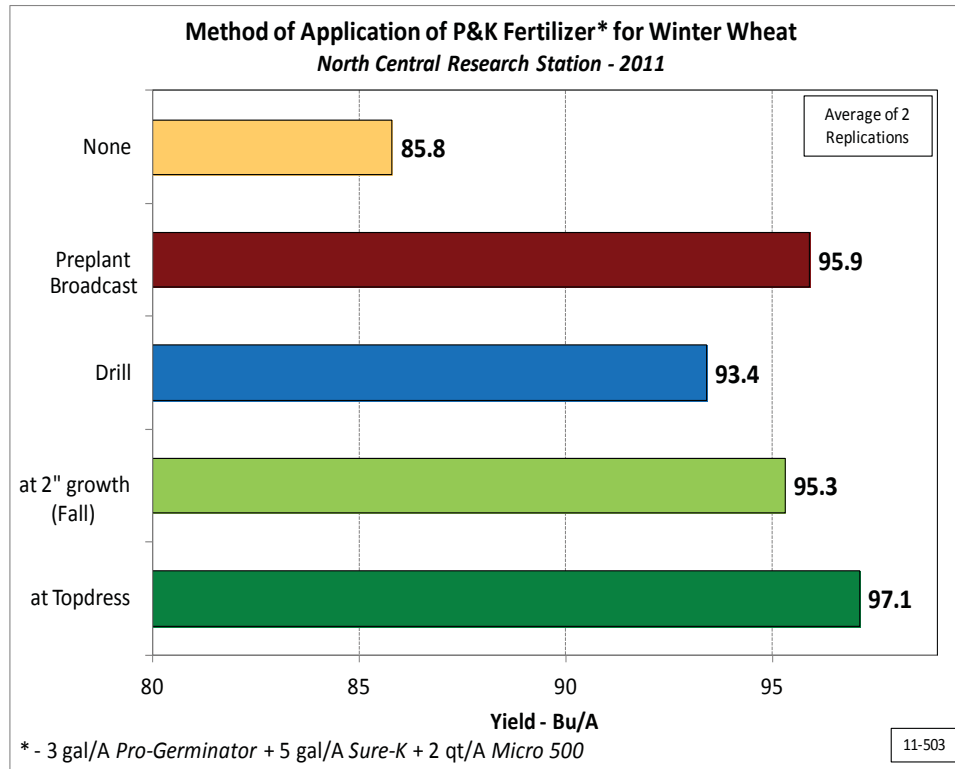
Planted:	10/13/2010
Variety:	Pioneer 25W43
Population:	2 mill. seed/A
Previous Crop:	soybeans
Plot Size:	15' x 290'
Replications:	4
Pre Broadcast:	10/13/2010
2" growth:	11/1/2010
Topdress:	4/13/2011
Harvested:	7/15/2011

Soil Test Values (ppm):

pH:	7.0
CEC:	11.1
% OM:	3.1
Bicarb:	10
K:	52
S:	7
% K:	1.2
% Mg:	22.4
% Ca:	75.3
% H:	0
% Na:	1.1
Zn:	1.1
Mn:	2
B:	0.7

Objective:

Compare different placement and timing options for Pro-Germinator + Sure-K and Micro 500 for effects on yield of winter wheat. Usually when conducting research plots for fertilizer effects on winter wheat, we rely on application through the drill. But in reality, most drills are not set up for liquid fertilizers. Additionally, in the Upper Midwest where wheat is planted after soybean harvest, the main concern is getting the wheat in the ground as quickly as possible for growth development and finishing harvest of soybeans as well as corn. So timing is also an issue. This experiment was conducted to compare four different application options of 3 gal/A Pro-Germinator + 5 gal/A Sure-K + 2 qt/A Micro 500: 1) pre-plant broadcast, 2) in-furrow through the drill, 3) in the fall after 2 inches of growth, and 4) applied with nitrogen at topdress. The entire experiment was topdressed with 12 gal/A High NRG-N + 16 gal/A 28% + eNhance. Treatment yields appear in the following chart.



LSD (0.1): 7.4. CV: 5.4%

Conclusions:

- All fertilizer treatments resulted in a significant yield increase.
- There were no significant yield differences between the fertilizer methods of application. This greatly increases fertilizer application options to time-conscious growers.

Experiment Info:

Planted: 4/15/2011
 Variety: Newdak
 Population: 90 lbs
 Previous Crop: corn
 Plot Size: 15'x265'
 Replications: 4
 Topdress: 5/3/2011
 Harvested: 8/1/2011

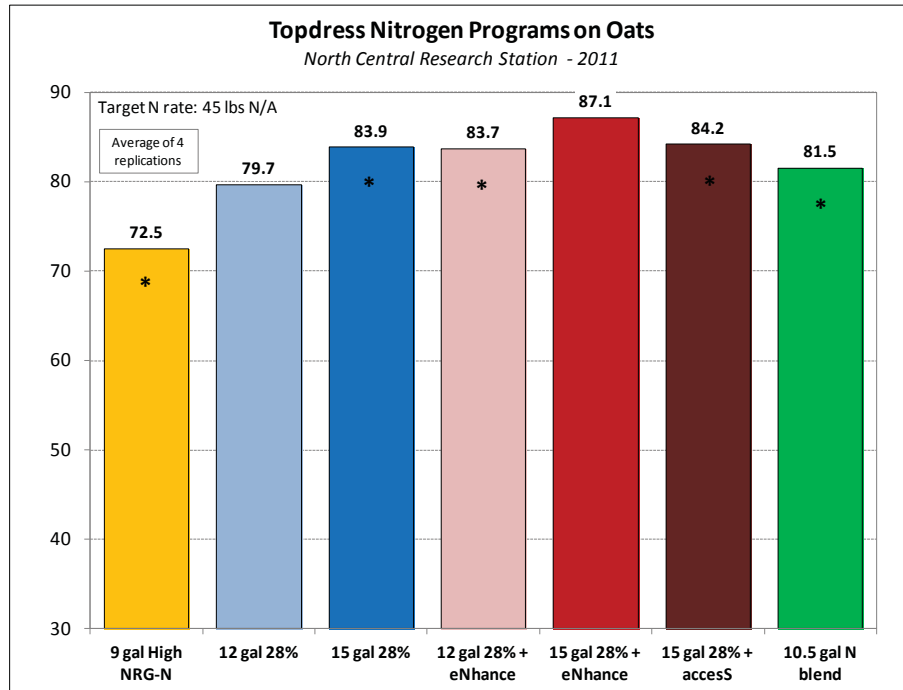
Soil Test Values (ppm):

pH: 6.9
 CEC: 9.5
 % OM: 2.1
 P1: 10
 K: 112
 S: 7
 % K: 3.0
 % Mg: 19.5
 % Ca: 77.2
 % H: 0
 % Na: 0.3
 Zn: 1.5
 Mn: 10
 B: 0.5

The 2011 oat experiment had 2 objectives. (1) a comparison of 5 different nitrogen sources at recommended rates. (2) a comparison of the effects of drill applied fertilizer on oat yield.

Objective 1:

A topdress nitrogen comparison for oats was established with these at nitrogen sources: High NRG-N, 28% + eNhance, 28% + accesS, N blend (50/50 blend of High NRG-N(43%) and 28% + eNhance(57%) by equivalent pounds), and 28% UAN. Each product was applied at the recommended equivalent rate to provide 45 lbs N/A. Those treatments applied at reduced "equivalent" rates appear with an asterisk (*) in the bar.



LSD (0.1): 9.4 CV: 13.1%

Conclusions:

- With the exception of High NRG-N, there was no statistically significant difference between the recommended rates of each nitrogen sources.
- There was over a 4 bu/A yield increase when eNhance was added to 12 gal/A of 28% UAN.
- Addition of eNhance to the full rate of 28% UAN produced the highest yield.
- The N blend applied at 30% rate reduction provided similar yield to the nitrogen sources and was the most efficient.

Objective 2:

Also evaluated in this study was comparing the yield effects of drill applied fertilizer on oats. Drill fertilizer was applied according to soil test and consisted of 3 gal/A Pro-Germinator + 2 gal/A Sure-K and 2 qt/A Micro 500. Fertilizer was applied through fertilizer tubes behind the seed wheel. Yields reported on the table below are averages over all nitrogen treatments.

Conclusions:

- There was a significant yield increase of over 11 bu/A from 7.5 gal/A of drill applied fertilizer.

Drill Fertilizer Effects on Oat Yield

North Central Research Station - 2011

No Planter Fertilizer	76.0 bu
3 gal Pro-Germinator + 2 gal Sure-K + 2 qt Micro 500	87.5 bu

Experiment Info:

Planted: 5/19/2011
 Plot Size: 10' x 40'
 Replications: 3
 N applications: 5/15/2011

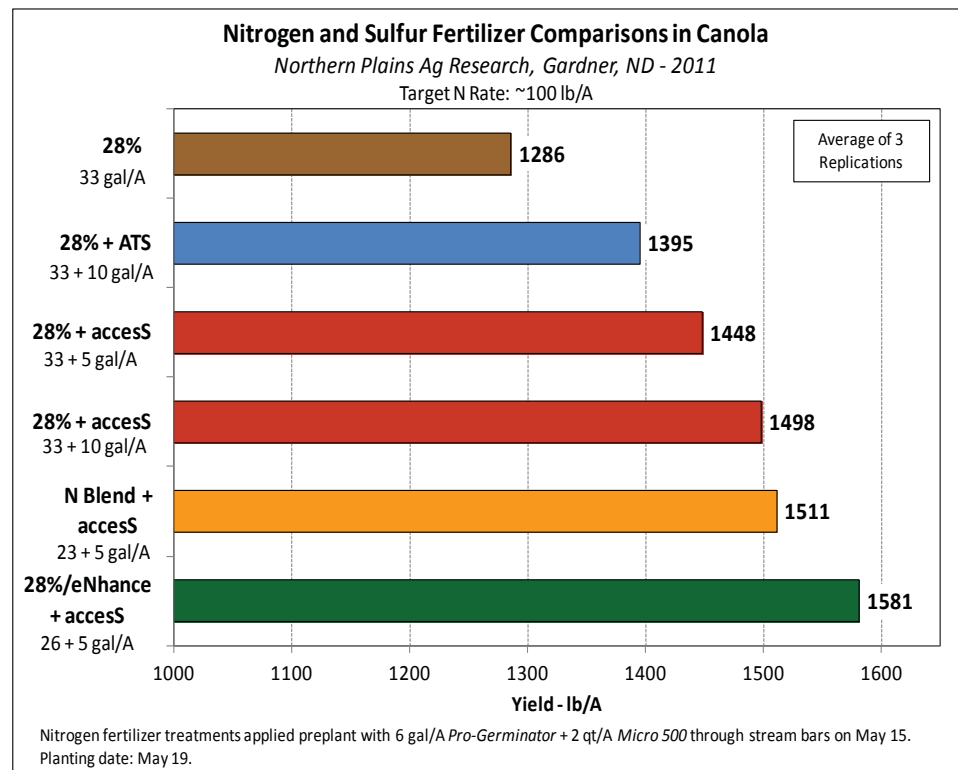
Soil Test Values:

(minimal soil test data provided)

NO₃-N: 6.5
P: 3
K: 385
Zn: 0.9
Cu: 1.6
SO₄-S: 5.5

Introduction:

Canola is an important oil-seed crop grown in many areas of the country, but is primarily grown in the Northern plains states and up into Canada. Canola is known to need sulfur fertilizer applied for best results. An experiment was conducted through the services of Northern Plains Ag Research in Gardner, ND to evaluate several different sulfur applications for effect on yield of canola. The canola was planted May 19, which is later than normal due to excessive spring rain. It was planted with a drill (7 in. spacing) into plots that were 10 feet wide by 40 feet long. There were four replications of treatments, although only three replications are used for yield calculations due to variability in rep 4. All fertilizers were liquid formulations and were applied with stream type nozzles in combination with 6 gal/A Pro-Germinator + 2 qt/A Micro 500 to provide required phosphorus and micronutrients. Target N rate was 100 lb/A. The standard N fertilizer was 28% UAN applied at 33 gal/A. This was applied alone, in combination with 10 gal/A of Ammonium Thio-Sulfate (ATS) and accesS at 5 and 10 gal/A. There was also an application of 23 gal/A "N Blend" (43% High NRG-N/57% 28% + eNhance v/v) + accesS (5 gal/A) and finally, 26 gal/A of 28% + eNhance + 5 gal/A accesS. So the treatments were applied with application of sulfur as the goal. Yield results appear in the following chart.



LSD(0.1): 265; (0.2): 202; CV = 11.6%

Conclusions:

- Addition of sulfur did result in a yield increase over no sulfur.
- Yield numbers indicated that accesS was a better sulfur source than was ATS.
- The highest yield was where both ACLF sulfur source additives, eNhance and accesS, were applied in combination with 28% UAN. Higher yield was obtained even though applied at only 26 gal/A vs. 33 gal/A as with most of the other treatments. This is the first year of research with this treatment, but it warrants further plot testing.

Experiment Info:

Planted:	9/9/2010
Variety:	HoCP 96-540
Plot Size:	2 rows x 50'
Replications:	4
Dry broadcast:	4/4/2011
Offbarring:	4/4/2011
Knife after offbar:	4/4/2011
Knife at N appl.:	4/20/2011

Introduction:

An experiment was initiated in Louisiana to evaluate fertilizer programs in sugarcane. Sugarcane is a perennial crop that re-grows from seedcane pieces. The seedcane was planted in the fall of 2010, so this is the first year crop from that. The intention is to continue these programs for several years to come. Sugarcane in this area is typically fertilized in two different applications. The first is at the "offbar" operation. This is a tillage operation done in the early spring that plows the middles between the rows which enables warming of the raised cane bed to promote growth. Dry P and K fertilizer is broadcast ahead of this operation. Weeks after the offbar operation, nitrogen solution fertilizer is knifed into the side of the bed. In this experiment, Agro-Culture Liquid Fertilizers treatments were adapted to fit into this practice. However, to enable early application of P and K fertilizer, Pro-Germinator + Sure-K + Micro 500 + accesS were knifed in immediately following the offbar operation. For practical application by growers, this application could be combined with the offbar operation. Another treatment was to apply all of the fertilizer at the time of the nitrogen application which is knifed in. This may delay the early utilization of P and K and other nutrients, but it could be combined with an application that is already being done, and skipping the extra trip for dry or knife after offbar. One of the other experimental variables in this test was the utilization of eNhance as a nitrogen additive. The 28% + eNhance was applied at the 80% rate with the other Liquid fertilizers as well as following the dry P and K for comparison. Additionally, it was also applied at the 100% rate with Liquid fertilizers. These were compared to a standard program of dry P and K broadcast before offbarring, and then 28% knifed in. Based on soil test and discussion with Grady Coburn of Pest Management Enterprises, a fertilizer program of 110-40-120-20S was formulated for the different fertilizers. (But for some reason the 20S was not applied to the conventional treatments.)



The picture on the above left is of offbarring. The sides of the bed are disked leaving the top intact where the shoots will soon emerge. The picture on the above right is of the top of the bed following offbarring. Fertilizer granules can be seen, and these will not make it down into the root zone. So knifing the fertilizer in a root zone band has potential. The next picture is how a plot looked on July 14.



Yield data are in the following table.

Fertilizer Comparisons in 1st Year Sugarcane.

Pest Management Enterprises. Cheneyville, LA

Variety: HoCP 96-540 (planted Sept. 9, 2010). Plot size: 2 row x 50 ft with 4 replications.

Fertilizer Recommendation: 110-40-120-20S

#	Treatment	Rate/A	placement	Yield Data			
				Stalks T/A	% sucrose	TRS lb/T	sugar: lb/A
1	Pro-Germ + Sure-K + Micro 500 + accesS 28% UAN/eNhance	4 gal + 9 gal + 2 qt + 4 gal 28 gal (80% rate)	knife after offbar knife at N appl.	40.2	17.3	243.2	9761.4
2	Pro-Germ + Sure-K + Micro 500 + accesS + 28% UAN/eNhance	4 gal + 9 gal + 2 qt + 4 gal 28 gal (80% rate)	knife at N appl.	39.1	17.5	246.4	9627
3	Pro-Germ + Sure-K + Micro 500 + accesS + 28% UAN + eNhance	4 gal + 9 gal + 2 qt + 4 gal 35 gal (100% rate)	knife at N appl.	43.7	17.5	246.6	10,780.9
4	0-46-0 + 0-0-60 28% UAN	100 lb + 200 lb 35 gal (100% rate)	broadcast knife at N appl.	38.7	16.6	232.1	8952.5
5	0-46-0 + 0-0-60 + 28% UAN/eNhance	100 lb + 200 lb 28 gal (80% rate)	broadcast knife at N appl.	41.9	17	238.1	9994.9
	Dry broadcast: April 4		LSD(0.1)	nsd	--	12.8	1894.4
	Offbarring: April 4		LSD(0.2):	nsd	--	9.7	1441.5
	Knife after offbar: April 4		CV(%):	14.5		4.2	15.3
	Knife at N appl. April 20						

Conclusions:

- Highest yield was with the Liquid program where the entire fertility program was applied through the knife with the nitrogen. The nitrogen rate was at the 100% level with eNhance. Such a program would be beneficial to growers since this would eliminate the earlier fertilizer application, Liquid or dry.
- Where the nitrogen was applied at the 80% rate (28 gal/A vs 35 gal/A), there was no difference in timing of P and K fertilizer application, again showing that the early application could be eliminated.
- The all conventional fertilizer treatment had the lowest yield in the experiment. However, it should be pointed out that this treatment did not have any sulfur applied as was planned.
- There was a yield increase with the application of 28% + eNhance at the 80% rate (trt 5) compared to the 28% alone at the 100% rate (trt 4). This may have been partly a sulfur effect, although most likely was an increase in N efficiency in the sandy soil.
- The plan is to repeat these same treatments in the same plots in 2012, although the conventional treatments should receive sulfur as was planned.

Experiment Info:

Planted:	5/1/2011
Variety:	Pioneer 94Y80
Plot Size:	4 (38") rows x 30'
Replications:	4
Early Flood:	6/23-6/25/201 6/27-7/2/2011
Late Flood:	7/25 - 8/1/2011
Foliar (22" beans):	7/3/2011
Foliar (28" beans):	8/4/2011

Introduction:

Although the title of this experiment may sound strange, it is of concern in rice-growing areas of the South where soybeans are planted in rotation with rice in levied fields. The soil is a heavy silt and is poorly drained. Thunderstorms can produce heavy rainfall events that can lead to flooding of soybean fields. This experiment was conducted to evaluate the effects of foliar fertilization on soybeans that had been flooded to determine if this could improve yields. R & D Research has small plot areas that are levied for rice research, and this was utilized for the experiment. It was decided to have two flood events, both early and late, on soybeans in separate levies. The researchers here had not done this type of experiment before, and it was not clear how long the water should be held in order to induce stress. The first time the levy was flooded for two days, and then drained. But this did not cause stress. So it was re-flooded for 6 days, and this caused yellowing. Foliar applications were the following day. For the second flood, water was kept for 6 days and then drained. Foliar applications were three days later. There were three different foliar treatments. One was straight ferti-Rain, which is a multi-nutrient product and should be effective in stress situations. The next was ferti-Rain plus Pro-Germinator, Manganese and Micro 500, kind of the "shotgun" approach. The third was an application of NResponse (for some nitrogen "kick start") plus Pro-Germinator + Micro 500. The plots were 4-38 inch rows by 30 feet long. There were 4 replications of treatments.

Yields appear in the following table.

Foliar Applications to Soybeans that were Flooded				
R&D Research, Washington, LA				
94Y80 soybeans planted on May 1.				
Early Flood: 6/23 - 6/25 6/27 - 7/2; Foliar on: 7/3 (22" beans)				
Late Flood: 7/25 - 8/1. Foliar on: 8/4 (28" beans)				
trt	foliar fertilizer	rate	Early Flood Bu/A	Late Flood Bu/A
1	no fertilizer	--	30	33.7
2	ferti-Rain	2 gal/A	33.4	37.1
3	ferti-Rain + Pro-Germinator + Micro 500 + Manganese	2 gal/A 1 gal/A 2 qt/A 2 qt/A	34.8	38
4	NResponse + Pro-Germinator + Micro 500	2 gal/A 2 qt/A 2 qt/A	34.5	36.2
<i>LSD(0.2) - 4.3</i>				
<i>CV - 14.3%</i>				



The picture was taken on July 14 of the early flood beans. This was 12 days after the water was drained and 11 days after fertilizer application. There were no visual effects from any foliar treatment.

Conclusions:

- All of the foliar applications increased soybean yield.
- There were no significant differences between the yield with the ferti-Rain only compared to the other treatments that had more fertilizers.
- The early flooding resulted in lower yields than did the later flooding.
- Therefore, application of ferti-Rain to soybeans that have been flooded increased yield and should be an effective option for stressed soybeans.

Experiment Info:

Planted: 5/19/2011

Plot Size: 6' x 30

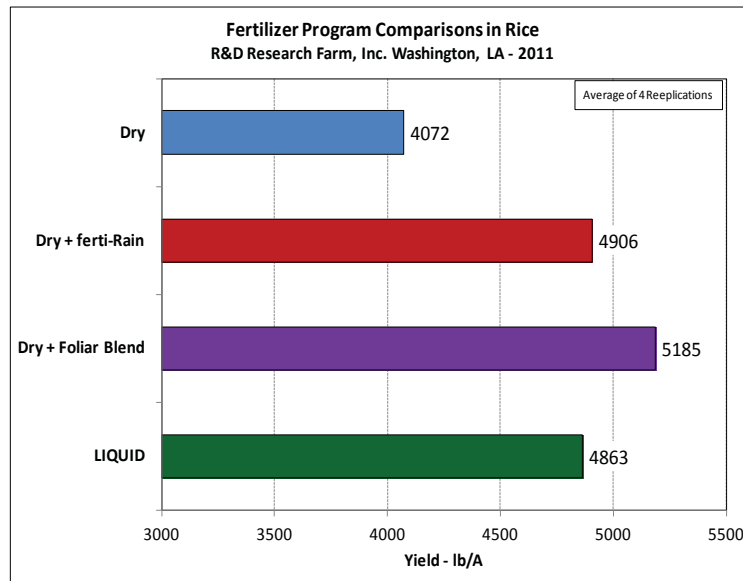
Replications: 4

Dry Broadcast: 4/15/2011

Foliar: 5/7/2011

Introduction:

Rice is an important crop of the Southern U.S. primarily grown in the Mississippi Delta region and parts of Texas. Typical fertilizer programs involve dry broadcast of P and K ahead of planting and then application of urea after flooding. UAN nitrogen is not an effective N program for rice compared to urea, although some can be applied to the soil early, but urea is the clear standard. But there is an opportunity for liquid to supply the other essential nutrients. An experiment was established with a contract researcher to evaluate fertilizer programs for rice. The fertilizer applications were based on a 150-30-70-8S-0.8Zn program. Plots were 6 ft x 30 ft with four replications of treatments. A standard program is a pre-plant broadcast application of dry fertilizer. A commonly used herbicide for rice is an application of Command when the rice is emerged to about 2 inches tall. This would be an option for application of Liquid fertilizers, and treatments were set up for this. Two foliar treatments were on top of the standard dry program: ferti-Rain and a Foliar Blend of five different ACLF fertilizers to provide a broad spectrum of nutrients. Both were applied at a low rate of only 1 gal/A, just to see what effect a relatively low-cost nutrient supplement would have on yield. The fourth program was total Liquid for all nutrients, except nitrogen. This too was applied in combination with the Command. All treatments received urea for nitrogen. The picture is of the plots on July 14. Yields are in the following chart with treatment information in the adjoining table.



LSD(0.05): 749. CV: 12.1%

Fertilizer Program Description:

	Fertilizer	Rate/A	Date	Method
1.	5-16-36-4S-0.4Zn	200 lb	15-Apr	Preplant broadcast
2.	5-16-36-4S-0.4Zn	200 lb	15-Apr	Preplant broadcast
	ferti-Rain	1 gal	7-May	foliar with Command*
3.	5-16-36-4S-0.4Zn	200 lb	15-Apr	Preplant broadcast
	Foliar Blend**	1 gal	7-May	foliar with Command
4.	Pro-Germinator +	3 gal	7-May	foliar with Command
	Sure-K +	5.75 gal		
	acesS +	2 qt		
	Micro 500 +	2 qt		
	Liberate Ca	1 qt		

Plots were planted on April 15 with CL151 rice.

* - Command herbicide, applied to 2 inch rice.

** - 1 qt/A each of Pro-Germinator + Sure-K + ferti-Rain + Micro 500 Urea was applied to all plots on May 28 at 304 lb/A (140 lb-N/A)

Conclusions:

- First, the yields were lower than expected. likely due to a late planting date and a very hot summer. But comparisons are valid of treatment effects.
- Both foliar applications had a strong and significant yield increase for the standard dry program.
- The total Liquid program also yielded significantly higher than the Dry program.
- Liquid fertilizers do have a place in rice production and also have the advantage of reducing field trips.

Introduction:

Winter wheat plots were again established at the University of Maryland research facility on the Eastern shore region of the state. This experiment focused on the fall application of nutrients with total Liquid, total Dry and combinations. There were four replications of treatments. The same topdress treatment was applied to all. The standard University of Maryland application was in Treatment 7, although the experiment topdress included eNhance which is not part of the university recommendation, but used for consistency. The weather was hot and dry in the early summer which resulted in lower than average yields.

The yield data table is on the next page.

Conclusions:

- As you would hope, fertilizer applications did significantly increase wheat yield vs. the check (trt 1)
- It was interesting to observe that the yield from application of drill fertilizer only (trt 2) was not significantly different from that of topdress only (trt 3).
- Unfortunately, there was no yield effect from the application of Micro 500.
- The yield from the drill applied ACLF treatment (trt 5) was equal to that with the university recommendation (trt 7).
- The use of 0-0-60 as a potassium source (trt 6) yielded almost the same as where Sure-K was used (trt 5).
- Application of extra nitrogen in the fall (trt 8 and 9) with the drill did result in increased yield. However, this N was in addition to that in the topdress. So it is not known if this is just a rate effect, or how it would have been had the fall N been subtracted from the topdress. (Always more questions.)
- As has been observed in previous research, the highest yield was with a broadcast application of the fertilizer rates in trt. 9 to wheat that had emerged to a height of 3 inches.
- It is apparent that there is an advantage to application of some extra nitrogen in the fall.

Agro-Culture Liquid Fertilizer Wheat Study for 2011

Univ. of Maryland, Poplar Hill Research Facility

Replicated Data (4 Reps)

Avg. Bu/A

1.	Check, no fall or Spring Fertility		52.7
2.	Fall 2010, drill in furrow: Pro Germ(9-24-3) + Sure-K(2-1-6) @ + Micro 500 No Spring 2011 Nitrogen	3.0 gal/a 5 gal/a 2 qts/a `	65.7
3.	No Fall Fertilizer Spring 2011. 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	68.9
4.	Fall 2010, drill in furrow: Pro Germ(9-24-3) + Sure-K(2-1-6) Spring 2011. 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	3.0 gal/a 5 gal/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	72.2
5.	Fall 2010, drill in furrow: Pro Germ(9-24-3) + Sure-K(2-1-6) @ + Micro 500 Spring 2011: 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	3.0 gal/a 5 gal/a 2 qts/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	72.8
6.	Fall 2010 - Pre Plant broadcast Application of 0-0-60 drill in furrow: Pro Germ(9-24-3) + Micro 500 Spring 2011. 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	100 lbs/a 3 gal/a 2 qts/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	73.5
7.	Fall 2010 - Pre Plant broadcast Application of 0-0-60 + DAP(18-46-0) + Ammonium Sulfate(21-0-0-24) Spring 2011. 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	100 lbs/a 45 lbs/a 67 lbs/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	72.2
8.	Fall 2010, drill in furrow: Pro Germ(9-24-3) + Sure-K(2-1-6) @ + Micro 500+ 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent Spring 2011: 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	3.0 gal/a 5 gal/a 2 qts/a 7.5 gal/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	79.3
9.	Fall 2010, drill in furrow: Pro Germ(9-24-3) + Sure-K(2-1-6) @ + Micro 500 + High NRG-N(27-0-0-1S) Spring 2011: 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	3.0 gal/a 5 gal/a 2 qts/a 5 gal/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	82.6
10.	Broadcast application, late fall 2010 on 12/14/2010. Wheat had 3" of growth. Pro Germ(9-24-3) + Sure-K(2-1-6) @ + Micro 500 + High NRG-N(27-0-0-1S) Spring 2011: 1 st topdress - Greenup: 30% UAN(30-0-0) w/eNhance @ 30 # N equivalent 2 nd topdress - Feeks Growth Stage(GS) 5 to 6, 30% UAN(30-0-0) w/eNhance @ 50 # N equivalent.	3.0 gal/a 5 gal/a 2 qts/a 5 gal/a 7.5 gal /a =24.4 lbs of N 12.25 gal/a = 39.8 lbs of N	86.5
All plots were sprayed with Harmony SG @ .6 oz/a + a non ionic surfactant @ 16 oz/100 gal of spray solution on 4/14/2011.			
All plots were sprayed with Warrior insecticide @ 3.5 oz/acre on 4/21/2011.			

LSD(0.05): 5.9; (0.1): 4.9. CV: 13.3%

Experiment Info:

Plot Size: 15' x 193.8'/196'

Replications: 3

Harvest: 9/2/2011

**Soil Test Values:
(PPM)**

pH: 5.9

P: 38

K: 98

Mg: 74

Ca: 48

Introduction:

A large replicated corn experiment was established in a grower field by Mr. Ron Mulford to evaluate corn fertilizer programs to test low rate of ACLF against higher rates of conventional programs. Again, the focus was on various programs of ACLF and others as compared to a conventional fertilizer program following University of Maryland recommendations. In this field, that was for total nutrient application of 156-65-60. Dry fertilizers were broadcast pre-plant and incorporated. Liquid fertilizers were planter applied either in-furrow or 2x2. Solution nitrogen was applied sidedress as a surface dribble. The nitrogen was a 30% UAN solution which is common for this area. It is often combined with eNhance (2 gallons per ton) and applied at a rate that is 90% of the straight 30% UAN rate. This was the case for the sidedress N rates. However, in the conventional treatment, there was an additional 5 gal/A of 30% applied with the 7.5 gal/A of 10-34-0 (in 2x2 placement) that was not matched in the ACLF treatment. So the ACLF treatments had a total actual N rate of about 120 lb/A vs. 156 for the conventional treatments, which was about 77% of the total for the conventional. But it turned out ok in the end. But this year was very dry by mid-season and the corn was drought stressed. Yields were greatly reduced, but that happens and there was still some good information obtained. The plans are to have this again in 2012. The yield table as obtained from Mr. Ron Mulford is on the next page. The table includes the yields from all three replications.

Conclusions:

- Although all yields were low, the yield from the unfertilized check (trt 1) was significantly lower than that of the full programs.
- The application of planter fertilizer only (trt 2) did increase yield of the check treatment (trt 1).
- Under stress conditions, the yields with the full programs were higher than the N only treatments (trt 3 and 4), but yield increases weren't as high as may have been expected.
- The ACLF program (trt 5) yielded very close to that of the conventional treatment (trt 8). The ACLF treatment applied only 83% of the N, 25% of the phosphate and 7% of the soluble potash applied by the conventional treatment.
- The ACLF treatment applied in-furrow (trt 5) yielded higher than when applied 2x2 (trt 6). This is consistent with findings at the NCRS.
- Addition of fertilizer additives for 10-34-0 and 30% UAN did not result in increased yields under stress conditions (trt 9).
- Using a reduced rate of 30% + eNhance at sidedress for the conventional program actually increased yield (trt 10 vs trt 8).
- Treatment 11 actually applied reduced rates of conventional fertilizers to approximately match pounds of nutrients applied with ACLF (trt 5). The yield was slightly lower for this treatment under stress conditions and hopefully will be repeated under favorable conditions in 2012.
- Surprisingly, application of the sulfur product accesS, either 2x2 (trt 12) or at sidedress with N (trt 13) resulted in reduced yields vs the standard ACLF (trt 5). This is puzzling and unexpected as the placement was plenty far from the seed. But I believe this is the first report of plot yields from use in stress conditions, and will need further investigation.
- Another source of in-furrow fertilizer was tested in trt 14, but yield was lower than that of other treatments.
- Yield from another N source (a combination of ATS and 30% UAN) also resulted in lower yield than the regular conventional (trt 8) or ACLF (trt 5).

2011 Agro-Culture Liquid Fertilizer Corn Study

With Ron Mulford

Cooperator/Location: Dr. Ed Senkbeil Farm, Greenhill, Maryland

Soil Type: Mattapeake Silt Loam

Previous Crop: Notill Single Crop Soybeans

Tillage: Notill into a wheat cover crop

Corn Variety: Population

Soil Test: pH – 5.9, Phosphorus – 38 ppm(Med), Potassium – 98 ppm(VH), Magnesium – 74 ppm(H), Calcium – 48 ppm(M)

Plots were: 6 - 30” rows

Replications: 3, Rep A was 193.83’ long, Rep B was 196’ long and Rep C was 196’ long

Harvested: 9/02/2011. Harvested 4 center rows of each plot with a Case/International Combine

Sidedress nitrogen treatments were dribbled between rows

Trt	Treatment:	Rate/acre	Placement	Rep A	Rep B	Rep C	Ave.
1.	Unfertilized Check	Nothing		63.9	83.4	73.2	73.5
2.	Starter only: Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500	6 gal + 4 gal + 2 qts	2 x 2	76.5	92.8	76.4	81.9
3.	30% UAN with eNhance(eN 30)	34.7 gal	Sidedress	106.4	120.1	131.0	119.2
4.	30% UAN	38.5 gal	Sidedress	108.8	113.0	131.0	117.6
5.	Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500 30% UAN with eNhance(eN 30)	6 gal + 4 gal + 2 qts 34.7 gal	In furrow Sidedress	111.2	126.3	139.6	125.7
6.	Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500 30% UAN with eNhance(eN 30)	6 gal + 4 gal + 2 qts 34.7 gal	2 x 2 Sidedress	113.5	121.6	127.1	120.7
7.	Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500 + Capture LFR 30% UAN with eNhance(eN 30)	6 gal + 4 gal + 2 qts + 5 1/2 oz 34.7 gal	In furrow Sidedress	111.2	127.9	136.4	125.2
8.	Map(11-52-0) + 0-0-60 applied before planting 10-34-0 + 30% UAN 30% UAN	67.5 lbs/a + 100 lbs/a 7.5 gal/a + 5 gal/a 38.5 gal	Broadcast 2 x 2 Sidedress	116.7	135.7	124.0	125.5
9.	Map(11-52-0) + 0-0-60 applied before planting 10-34-0 w/Avail + 30% UAN 30% UAN + Nutrisphere N	67.5 lbs/a + 100 lbs/a 7.5 gal/a + 5 gal/a 38.5 gal	Broadcast 2 x 2 Sidedress	114.3	131.0	125.5	123.6
10.	Map(11-52-0) + 0-0-60 applied before planting 10-34-0 + 30% UAN 30% UAN with eNhance(eN 30)	67.5 lbs/a + 100 lbs/a 7.5 gal/a + 5 gal/a 34.7 gal	Broadcast 2 x 2 Sidedress	123.8	136.4	127.1	129.1
11.	10-34-0 + 0-0-13 (equivalent plant nutrient rates as pro germ and Sure K) + 30% UAN 30% UAN	4.3 gal/a + 3.6 gal/a + .62 gal/a 38.5 gal	2 x 2 Sidedress	106.4	126.3	136.1	122.9
12.	Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500 + accessS 30% UAN with eNhance(eN 30)	6 gal + 4 gal + 2 qts + 2 gal 34.7 gal	2 x 2 Sidedress	106.4	125.5	120.8	117.6
13.	Pro-Germinator(9-24-3) + Sure K(2-1-6) + Micro 500 30% UAN with eNhance(eN 30) + accessS	6 gal + 4 gal + 2 qts 34.7 gal + 3 gal	In furrow Sidedress	109.6	115.4	120.1	115.0
14.	0-0-60 applied before planting Black Label + Trisert K + Awaken 28-00-5	100 lbs/a 2 gal + 1 gal + 3 pts 40.2 gal	Broadcast In Furrow Sidedress	127.1	108.4	127.1	120.9
15.	Map(11-52-0) + 0-0-60 applied before planting 10-34-0 + 30% UAN 27-0-03	67.5 lbs/a + 100 lbs/a 7.5 gal/a + 5 gal/a 42.7 gal	Broadcast 2 x 2 Sidedress	121.4	111.0	130.2	120.9

Experiment Info:

Planted:	6/1/2001
Population:	220,000
Plot Size:	4 rows
Strip-Till:	4/1/2011
N application:	6/29 & 7/17
Harvest:	9/2/2011

Soil Test Values (ppm):

pH:	7.1
CEC:	11.8
% OM:	1.2
Bicarb:	89
K:	17
S:	6
% K:	8
% Mg:	24
% Ca:	67
% H:	0
% Na:	1
Zn:	1.9
Mn:	4.6
B:	0.5
Fe:	12.7

Introduction:

The Irrigation Research Foundation is a non-profit research farm set up for the purpose of agricultural research under intensive crop management in Northeastern Colorado. Strip tillage is becoming the leading cultural practice in this area. The strip till fertilizer was applied with an Orthman 1tRIPr machine that applied liquid fertilizer at two depths. It applied 8 gal/A at 4 inches and 13 gal/A at 10 inches deep. It was an 8-row unit. The plots were planted with a 4-row planter in 30 inch row spacing. Planter fertilizer was in 2x2 placement. With this configuration of equipment, there were two different planter treatments on top of the single 8-row strip till treatment. So this experiment had four different treatments (two 8-row strip till applications under four 4-row planter applications). Treatments were not replicated, but plots were adjacent to each other and 500 feet long, so long enough for a good sample.

The conventional treatment had 21 gal/A of 8-15-0 applied through the strip till and 9 gal/A of 14-18-0 w/zinc and sulfur with the planter. So this applied 51-76-0-4S-0.5Zn per acre. On 4 of the 8 rows, a foliar application of 1 gal/A of ferti-Rain was applied twice: with second Roundup application and again prior to canopy.

The ACLF treatment had 8 strip till rows with 4 gal/A of High NRG-N + 5 gal/A of accesS + 5 gal/A of Pro-Germinator + water to make up the balance up to 25 gal/A (10 gal/A at 4 inches and 15 gal/A at 10 inches.) Then there were two passes of the planter which applied 3 gal/A of High NRG-N + 3 gal/A of Pro-Germinator + 2 qt/A of Micro 500 in 2x2 placement. As with the conventional treatment, the same ferti-Rain treatment was applied to half of the 8 rows. These rates are higher than those of most soybean programs, but yield potential is high. (Additionally, there was 7 gal/A of 32-0-0 applied to all plots through the sprinkler.) The below picture was taken during a visit on June 13. They were planted only 12 days earlier, and no differences were visible then.

Yield results appear on the opposite page as reported by the IRF.



Conclusions:

- The ACLF program (#3: 82.51 Bu/A) resulted in higher yield than did the Standard (#1: 75.47 Bu/A).
- The foliar applications of ferti-Rain increased the yield of the Standard program by nearly 5.5 Bu/A (80.92 Bu/A vs. 75.47 Bu/A).
- The ferti-Rain applications did not increase yield of the ACLF program (81.59 Bu/A vs. 82.51 Bu/A). Perhaps it can be concluded that the ACLF soil-applications provided all of the nutrition needed and foliar nutrient application was not effective.
- As has been seen with other crops in other experiments, if a crop was not fertilized at the beginning with ACLF, then ferti-Rain is an excellent choice to try and make up some of the difference.

Show Plots - Soybeans

ACLF

www.agroculreliquid.com

Irrigation Research Foundation -- Yuma, CO--Circle A East

Circle A East
Plot Size: 4 rows/
Population: 220,000

Planting Date: 6/1/11
Harvest Date: 9/27/11

Application Dates

<u>Strip-Till</u> : 21-36-0 (Actual) = 8gal @ 4 " & 13 gal @ 10"	4/11/11
<u>Starter</u> : 30-40-0-4s-.053zn @ 9 gal./acre	6/1/11
<u>Humalfa @ 5 ton/acre</u>	3/11/11
<u>Through Sprinkler</u> : 7 gal. 32-0-0	6/29/11 7/17/11
Headline @ 10oz./acre + Sulpak @ 1 gal./acre	7/23/11

Applied Water

10.65"

Herbicide Treatments

Round-up Weathermax @ 32 oz./acre	6/3/11 7/2/11
AMS @ 17lbs. Per 100 gal./ acre	
NIS @ 32oz. Per 100 gal./acre	
Assure II @ 9 oz./acre applied with the above on:	6/25/11 & 7/11/11

Treatment Dates	Treatment	Moisture/ Test Weight	Yield
4/11/11 6/1/11	#1 Strip-Till = 21-36-0 @ 21 gal./ acre - Followed by 2x2 @ 30-40-0-4s-.5zn @ 9 gal./acre (Standard)	7.2/57	75.47
4/11/11 6/1/11 7/11/11 7/20/11	#2 Strip-Till = 21-36-0 @ 21 gal./ acre - Followed by 2x2 @ 30-40-0-4s-.5zn @ 9 gal./acre (Standard) Foliar Ferti-Rain @ 1 gal/ac foliar with 2nd round-up application and repeat prior to canopy	7.3/56	80.92
4/2/11 4/11/11 6/1/11	#3 Strip Till = High NRG-N @4gal/ac + Pro-Germinator @ 4 gal/acre + Access @ 4 gal/ac mixed with 13 gal H2O @ 25 gal/acre - Followed by 2x2 High NRG-N @ 3 gal+ Pro-Germinator@ 3.5gal/ac + Micro 500 @ 0.5 gal/ac mixed w/2gal H2O @ 9 gal/acre	7.3/57	82.51
4/2/11 4/11/11 6/1/11 7/11/11 7/20/11	#4 Strip-till = High NRG-N @4gal/ac + Pro-Germinator @ 4 gal/ac + Access @ 4 gal/ac mixed with 13 gal H2O @ 25 gal/acre - Followed by 2x2 High NRG-N @ 3 gal+ Pro-Germinator@ 3.5gal/ac + Micro 500 @ 0.5 gal/ac mixed w/2gal H2O @ 9 gal/acre Foliar Ferti-Rain @ 1gal/ac foliar with 2nd round-up application and repeat prior to canopy	7.3/57	81.59

Plant subject to high winds

Weather, daytime temperatures and other factors affect data results, as in any year.

The Irrigation Research Foundation strives to record and control these factors where possible.

Not all of these factors are measurable or recognized.

Experiment Info:

Planted:	4/29/2011
Variety:	Hillshog #9024
Population:	49,000
Plot Size:	4 rows
Strip Till:	4/2/2011
N application:	6/9, 24, 29
Harvest:	9/2/2011

**Soil Test Values
(ppm):**

pH:	7.1
CEC:	11.8
% OM:	1.2
Bicarb:	89
K:	17
S:	6
% K:	8
% Mg:	24
% Ca:	67
% H:	0
% Na:	1
Zn:	1.9
Mn:	4.6
B:	0.5
Fe:	12.7

Introduction:

The Irrigation Research Foundation is a non-profit research farm set up for the purpose of agricultural research under intensive crop management in Northeastern Colorado. Strip tillage is becoming the leading cultural practice in this area. Strip till fertilizer was applied with an Orthman 1tRIPr machine that applied liquid fertilizer at two depths. It applied 8 gal/A at 4 inches and 13 gal/A at 10 inches deep. It was an 8-row unit. The plots were planted with a 4-row planter in 30 inch row spacing. Planter fertilizer was in 2x2 placement. With this configuration of equipment, there were two different planter treatments on top of the single 8-row strip till treatment. So this experiment had four different treatments (two 8-row strip till applications under four 4-row planter applications). Treatments were not replicated, but plots were adjacent to each other and 500 feet long, so long enough for a good sample.

The conventional treatment had 21 gal/A (8 gal/A at 4" depth and 13 gal/A at 10" depth) of 8-15-0 applied through the strip till and 12.5 gal/A of 10-34-0 with the planter in 2x2 placement. So this applied 36-86-0 per acre. On 4 rows of the 8 rows, a foliar application of 1 gal/A of ferti-Rain was applied twice: with second Roundup application and again prior to canopy.

The ACLF treatment had 8 strip till rows with 5 gal/A of High NRG-N + 3.5 gal/A of Pro-Germinator + 4 gal/A of accesS + water to make up the balance up to 25 gal/A (10 gal/A at 4 inches and 15 gal/A at 10 inches.) Then there were two passes of the 4-row planter which applied 2 gal/A of High NRG-N + 5 gal/A of Pro-Germinator + 2 qt/A of Micro 500 in 2x2 placement. As with the conventional treatment, the same ferti-Rain treatment was applied to half of the 8 rows. Additionally, there was an additional 24 gal/A of 32-0-0 applied to all plots in three applications through the sprinkler irrigation. Experiments appear on the following page. Note that the early emergence counts are low for treatment 3. This is due to some early wash through the plot from a rainstorm. But it obviously recovered since it had the highest yield.

Conclusions:

- Highest yields and sugar produced were with the ACLF program.
- With the sugarbeets, the application of ferti-Rain at the later stages of growth resulted in lower yields in each case. This was unexpected, although current thinking is that perhaps the application at the later growth stages in July stimulated vegetative growth at the expense of root growth and sugar. The amount of fertility in these two applications is low, but may have had an effect as it was a similar response in both conventional and ACLF programs.
- Future research with sugarbeet foliar applications will be on early applications, as banded over the row soon after emergence. This is when beets are the weakest and maybe not yet tapped into the fertilizer bands.

Sugar Beets

Agro-Culture Liquid Fertilizer

www.agroliquid.com

Irrigation Research Foundation -- Yuma, CO

Plot size: 4 rows Variety: Hillshog # 9024

Planting date: 4/29/11

Planting Population: 49,000

Harvest date: 10/7/11

Applied Water - 10.7"

Fertilizer

Humalfa @ 5 ton/acre
 Starter Fertilizer: 10-34-0 @ 12.5 gal./acre
 Strip-Till: 21-36-0 (Actual) = 8gal @ 4" & 13 gal @ 10"
 Through Sprinkler: 32-0-0

Application Dates

3/16/11
 4/29/11
 4/2/11
 6/9/11
 7 gal./acre
 6/24/11
 7 gal./acre
 6/29/11

Herbicide Treatments

Touchdown @ 24oz./acre
 Touchdown @ 24oz./acre w/ Quadris @ 6 oz. AMS @ 17#'s /100 gal. water NIS@ 1qt./100 gal water
 Sequence @ 2.5pts/acre AMS @ 17#'s/100gal. water Fuselade DX @ 24 oz/acre NIS@ 1qt./100 gal. water
 Inspire XT @ 7 oz./acre Touchdown + Fuselade DX @ 24 oz./acre NIS@ 1qt./100 gal. water

5/5/11
 6/3/11
 6/16/11
 7/8/11

Soil Detoxifier

Reclaim @ 1qt/acre

4/13/11

Protocol Treatments

1st treatment

2nd treatment

3rd treatment

	<u>1st treatment</u>	<u>2nd treatment</u>	<u>3rd treatment</u>
#1 4/2 4/29	Standard strip-till and starter		
#2 4/2 4/29 7/8 7/20	Standard strip-till and starter		FERTI-RAIN 1gal/ac with 2nd app of round-up and 1gal/ac @canopy
#3 4/5 4/29	Strip-till program: High NRG-N @ 5 gal/acre + Pro-Germinator @ 3.5 gal/acre + AacesS @ 4 gal/acre mixed with 12.5 gal/H2O @ 25gal/acre	2x2 program: High NRG-N @ 2 gal/acre + Pro-Germinator @ 5 gal/acre + Micro 500 @ 0.5 gal/acre mixed with 1.5 gal water/acre @ 9 gal/acre	
#4 4/5 4/29 7/8 7/20	Strip-till program: High NRG-N @ 5 gal/acre + Pro-Germinator @ 3.5 gal/acre + AacesS @ 4 gal/acre mixed with 12.5 gal/H2O @ 25gal/acre	2x2 program: High NRG-N @ 2 gal/acre + Pro-Germinator @ 5 gal/acre + Micro 500 @ 0.5 gal/acre mixed with 1.5 gal water/acre @ 9 gal/acre	FERTI-RAIN 1gal/ac with 2nd app of round-up and 1gal/ac @canopy

Harvest Results

Trials	Average Pop	Average Pop	Average Pop	% of Emergence			Tons per Acre	Sugar %	Pounds of Sugar per acre	Sugar loss to molasses
	#1	#2	#3	1st	2nd	3rd				
ACLF #1	17424	33977	40946	35.56%	69.34%	83.56%	34.91	16.14%	11269	1.6404
ACLF #2	20038	34848	40075	40.89%	71.12%	81.79%	33.67	15.36%	10343	1.7350
ACLF #3	5227	17424	37462	10.67%	35.56%	76.45%	39.24	16.62%	13043	1.5884
ACLF #4	31363	32234	40946	64.01%	65.78%	83.56%	35.73	16.12%	11519	1.6010

This past year at the North Central Research Station began with a cool and wet spring followed by hot and dry conditions by mid-season. These conditions made for some very interesting challenges getting all the annual vegetable crops established in a timely manner. Delays in planting crops like onions reduced both size and yields. Other crops like cantaloupe had very good yields, but harvests were delayed compared to past seasons. Over all, it was a slow start followed by a typically busy season and then all too quickly a killing frost to ended the harvests of many late maturing crops such as our market tomatoes. I am sure many of you faced these same issues this year as well. We are always at the mercy of the weather and subsequently finding ways to get all the work done in optimal timing.

The 2011 season also saw continued progress in the perennial crop research plots which were established in 2009. Some preliminary yield data was collected this season and was included in this report. However, in a majority of these plots the various treatment programs were followed, but due to immaturity no yield information has yet been collected. The impact of fertility on plant establishment and eventually yield are the main objectives for these trials with the focus currently on establishment. Plans are to collect the first yield data for the grapes and blueberries as well as more data on asparagus and strawberries next season.

As always, vegetable crops are picked for yield on a timely basis based on their maturity. This may mean several harvests per week for some crops like peppers and fresh market tomatoes. Additionally, some crops are graded for size and quality, like potatoes and onions, as is the case in these industries. All of this and more is done to reflect the "real world" of vegetable production and to maintain quality controls on the relevance on NCRS research.

In addition to generating data supporting the use of ACLF nutrition for vegetable production, produce from the plots fed many of the local ACLF families, friends. As in the past, the NCRS weekly contributions of fresh vegetables to a mid-Michigan food bank. This year the total donated was our biggest ever: over 60,000 pounds! Agro-Culture Liquid Fertilizer was one of two recipients for the "Beacon of Light" award from the Michigan Food Bank Association. Sharing the benefits of these harvests has been a special blessing for those at the NCRS who have been a part of these vegetable trials.

A new Research Agronomist, Dan Janzen, joined the NCRS Staff last spring and helped almost exclusively with the fruit and vegetable plots this season. Dan has an extensive background in specialty crops, especially orchards. He will be highly involved in the establishment and maintenance of a new apple orchard which will be planted during the spring of 2012. Additionally, Tim Brussel, the summer help and other full-time staff at the station were called out on more than one occasion to assist with maintaining and harvesting the increased quantity of vegetables produced this past season. Without this assistance the quantity of research performed and the quality of the information would not have been possible – Thanks everyone.

As we now make plans for the 2012 season, some new questions were raised by the results of the 2011 trials. Still, other basic questions remain as to the optimal way to produce high quality fruits and vegetables taking into consideration new varieties and the perpetual search for practices resulting in higher quality and yields. Across the United States and with our international dealers as well, Agro-Culture Liquid Fertilizers plant nutrition products continue to show greater and greater positive results in quality and yield from the use of our main fertilizer products as compared to conventional materials. Significant benefits have been found in our research with the new specialty products as well, which target specific crops and have potential for a wide range of uses.

Brian C. Levene Ph.D.
Specialty Crops Research Manager



NCRS

Effect of ACLF fertigation treatments on the yield of fresh market asparagus (11-P101)

Multiple foliar fertilizer application to enhance the yield and/or maturity of broccoli (11-101)

Various nitrogen type fertilizer applications to enhance the yield and/or maturity of cauliflower (11-103)

Effect of ACLF fertigation treatments on the yield of fresh market Beefsteak and Roma tomatoes (11-104)

Impact of using different pre-plant fertilizer treatments on the yield and quality of cantaloupe (11-305)

Comparison of yield and quality of yellow onion as affected by conventional & ACLF fertility treatment and application timing of some nutrients (11-106)

Foliar fertility comparisons for impact on sweet corn yields and/or maturity (11-109)

Foliar fertility comparisons for impact on sweet corn yields and maturity (11-302)

Sweet corn soil fertilizer application comparisons for impact on yields and/or maturity (11-209)

Foliar fertility comparisons for impact on carrot yields (11-110)

Fresh market potato (Russet Norkota) soil fertility program comparisons (11-201)

Soil applied fertility program comparisons, for bell (green and purple) peppers (11-203)

Soil applied fertilizer program comparisons for Watermelon production (11-305)

Experiment Info:

Planted:	5/2/2008
Variety:	Jesery Knight
Population:	7,840
Plot Size:	5' x 20'
Replications:	5
# of Appl.:	2
Harvest:	multiple

Soil Test Values (ppm):

pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

Determine the potential for ACLF fertilizers to enhance the yield and/or maturity of Fresh Market asparagus.

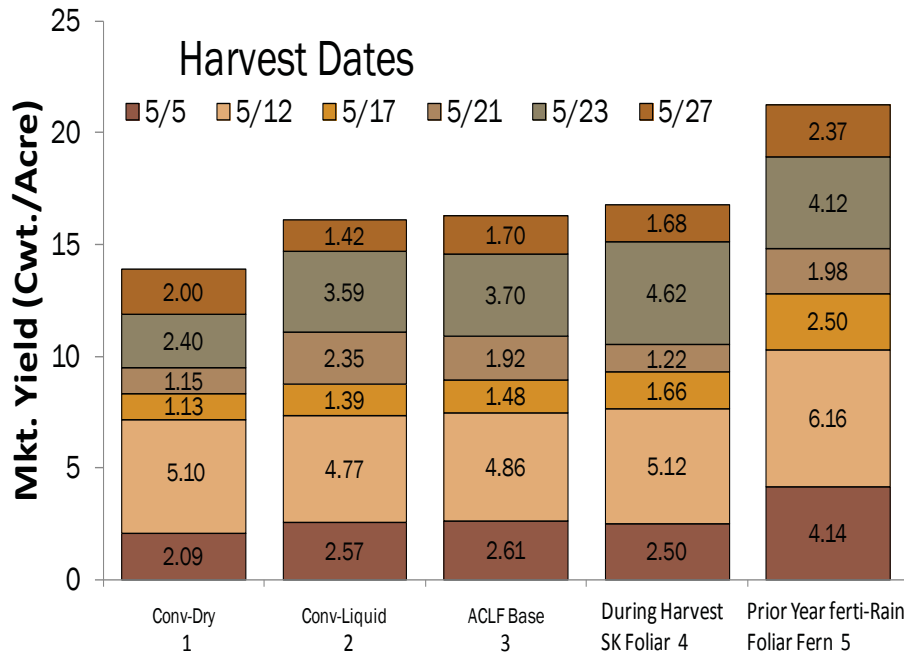


Figure A1. Cumulative yields from four weekly harvests of fresh market asparagus.

Conclusions:

- The ACLF Base program (Trt #3) produced more asparagus than each of the conventional programs, especially the Conventional Dry program (Trt #1) over the harvest period. There was an advantage for the Conventional Liquid program (Trt #2) over the Conventional Dry (Trt #1), but yield results were similar to the ACLF Base program. Still, the ACLF Base program required only a single application per season (all liquids combined) vs. two applications for the conventional program (Liquids & potash).
- Foliar applications of Sure-K during the harvest period (Trt. #4) did improve the overall asparagus yields slightly. However, the application of ferti-Rain during the fern growth the prior season (Trt. #5) dramatically improved the quantity of asparagus harvest for most harvests and in total compared to all other treatments. It is uncertain if the yield differences in the two foliar programs was relate to the product used or the application timings? Clearly the foliar applications made after harvest was complete provided a great benefit to the next seasons yield.

Table A1. Fertility programs for Asparagus production, 2011.

	Treatment	Rate/A (gal/A)	Method of Application
1	46-0-0+0-0-60+18-46-0+Mn+Zn	97#,60#,100#,4#,4#,	spring
	46-0-0+0-0-60 Conv Dry	115#,60#	summer
2	28% + 0-0-60 + 10-34-0 + Mn+Zn	36+60#+11.8+Mn+Zn	spring
	28% + 0-0-60 Conv Liq	36+60#	summer
3	HN + PG + SK + M-500 + Mn	11+5+6+3qt+1qt	spring
	HN + SK ACLF Base	11+6	summer
4	HN + PG + SK + M-500 + Mn	11+5+6+3qt+1qt	spring
	HN + SK	11+6	summer
	Sure-K SK Foliar	2 GPA / A / wk	during harvest
5	HN + PG + SK + M-500 + Mn	11+5+6+3qt+1qt	spring
	HN + SK	11+6	summer
	ferti-Rain ferti-Rain Foliar	2	Monthly - Fern

HN=High NRG-N™, eN28=eNhance™+28%UAN, PG=Pro-Germinator™, SK=Sure-K™

Materials and Methods:

The asparagus for this trial was planted as one year old crowns in 2008. In that initial year, only the spring fertilizer applications were made. Starting in 2009, the treatments described in Table A1, have been followed. The dry products used for these applications were broadcast over the center section of each plot and lightly incorporated as the plots were tilled for weed control. All liquid fertilizers were banded with streamer bars down the center of the plots directly over the area of crown development. As this is a relatively new planting, the interval of harvest has been relatively short prior to this season to allow the crowns to establish. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. As spears began to emerge in the spring, regular harvests were conducted to collect all marketable sized asparagus. As the size and quantity of the harvest fell, harvests were discontinued and the asparagus was allowed to grow vegetatively for the remainder of the season. After a killing frost, the plots were mowed and the resulting residue left on the soil surface until the following spring when the plots were cleaned and prepared for a new season of growth and harvesting.



Experiment Info:	
Planted:	5/11/2011
Variety:	Diplomat
Population:	8,700
Plot Size:	1 row x 30' (5' bed)
Replications:	3
Foliar:	June 15,22,29
Sidedress:	6/14/2011
Harvest:	multiple

Soil Test Values (ppm):	
pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

To determine if the growth and yield of broccoli is influenced by foliar fertilizer applications at various rates and timings. To demonstrate the value of ACLF fertilizers over conventional materials in broccoli.

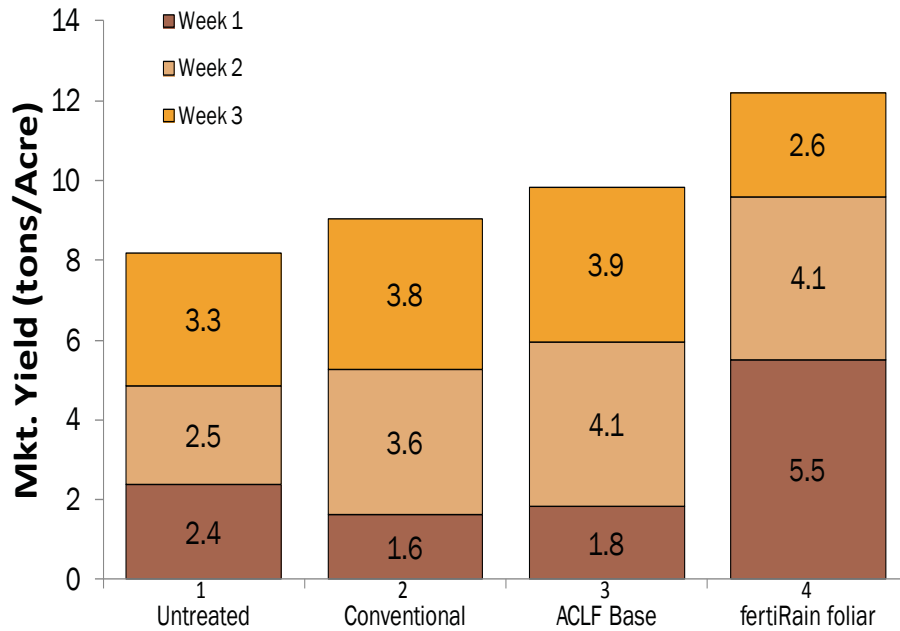


Figure B1. Broccoli weekly totals as influenced by various types of soil applied and foliar fertilizer treatments.

Conclusions:

- The ACLF Base program outperformed the Conventional program for yield each week and in total for this trial.
- When foliar applications of ferti-Rain were added to the ACLF Base program, the result was increased head size, advanced maturity for the largest early harvests. Utilizing ferti-Rain as a foliar on spring grown broccoli also had a positive impact on the total yield and quality. The above graph shows that the gain in yield was primarily due to the initial harvest. Growers desiring a larger head size and/or a reduced harvest season or the opportunity to rotate into planting another crop one or two weeks sooner might see the greatest benefit from this foliar fertility program.
- When compared to conventional materials, the nutrient use efficiencies were nearly 3X for the ACLF Base program and even greater for the ferti-Rain program (Table B1).
- Despite no fertilizer application, the untreated program yielded fairly well in 2011. Still, head size was rather small and plant development was delayed compared to the fertility treatments.

Table B1. Fertility comparisons for impact on the yield and maturity of broccoli, 2011.

Treatment		Rate/A (gal/A)	Method of Application	Nutrient lbs./ac	NUE*
1	Untreated Control	0	na		
2	0-0-60 + 18-46-0 + Mn + Zn	144#, 55#, 4#, 4#	PPI	256.6	61.1
	10-34-0	6	transplant		
2	28% UAN	48	SD		
3	PG + SK + Micro 500 + Mn	3.7, 2, 3.8 qt, 1 pt	transplant	129.3	174.4
	HN + SK	32 + 4.6	SD		
4	PG + SK + Micro 500 + Mn	3.7, 2, 3.8 qt, 1 pt	transplant	104.4	211.1
	HN + SK	32 + 4.6	SD		
	ferti-Rain	3x2qt	foliar		

*NUE = Nutrient Use Efficiency – (Lb. Yield / Total Lb. N,P,K&S as Fertilizer Applied); HN=High NRG-N™, PG=Pro Germinator™, SK=Sure-K™;

Materials and Methods:

The plots were established on May 6th by broadcasting the appropriate dry fertilizers listed in above table into the appropriate plot areas and then building raised beds (2ft wide x 4" tall) down the center of each 5 ft wide plot. Broccoli transplants with 3-4 leaves were then planted every 12" on alternating sides of the bed for every plot. Each of the 30 plants in every plot then received 4.2 oz of water containing the appropriate fertilizer solutions as shown in the above table or only water. Sidedress applications occurred on June 14th when the plants were approximately 8-10" tall. These treatments were knifed down the center of each plot, approximately 4" deep into the soil and 6-8" to the side of each plant. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. These foliar treatments were applied weekly for three weeks following initial head development. As the broccoli heads began to mature, harvests were conducted once or twice per week to track yields and crop development. After a total of seven harvests (2-3 day interval), nearly all primary heads had been harvested from each plot and no further evaluations were conducted. For data analysis and graphing purposes, yields from individual harvests were combined and fit into 7 day weekly intervals. The harvest frequency in this trial was not meant to reflect commercial practices, but instead used to identify subtle treatment differences in crop maturity.



Experiment Info:	
Planted:	5/6/2010
Variety:	Absolute
Population:	8,700
Plot Size:	1 row x 30' (5' bed)
Replications:	3
Sidedress:	6/14/2011
Harvest:	multiple

Soil Test Values (ppm):	
pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

To determine if the growth and yield of cauliflower is influenced by the type of nitrogen fertilizer used. To demonstrate the value of ACLF fertilizers over conventional materials in cauliflower

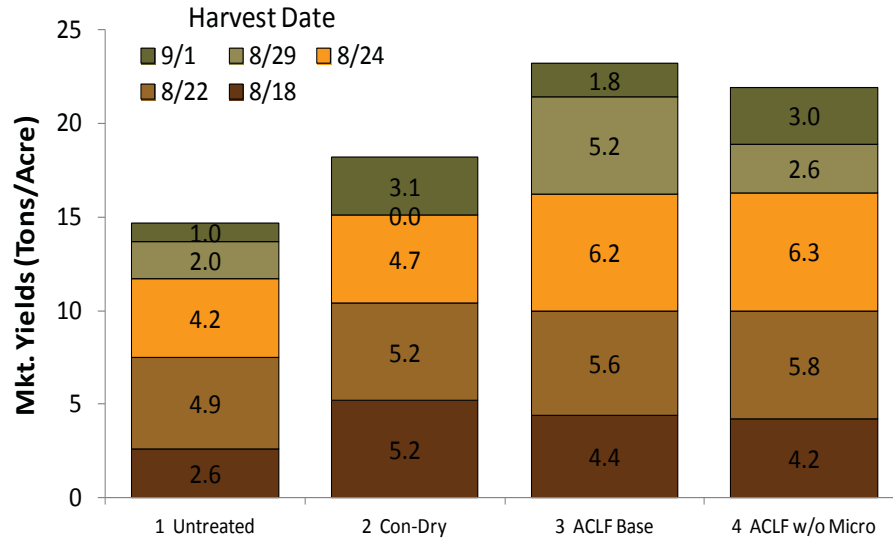


Figure Ct1. Cauliflower weekly totals as influenced by various types of nitrogen fertilizers.

Conclusions:

- The ACLF Base program with High NRG-N (Trt. #2) outperformed the Conventional program (Trt. #1) each week of harvest and for total yield in this trial. With the ACLF Base the harvesting was earlier and average head size was increased, particularly during early harvests. This would be of greatest advantage for those desiring a larger head size or growers interested in targeting earlier markets with higher prices.
- The ACLF program with 50% of the nitrogen source switched to eNhanse 28% UAN (Trt. #5) resulted in a yield intermediary between the ACLF High NRG-N program (Trt. #2) and the other fertility programs (Trt. #3 & #4).
- The total yield for the ACLF program with eNhanse and an 80% UAN rate (Trt. 3) is comparable to the ACLF program with UAN at full rate (Trt #4). This is another nitrogen option (besides the High NRG-N program) that could result in using substantially less nitrogen per acre.
- Prior trials have shown the use of eNhanse with UAN solutions to outperform High NRG-N for Cole crop yields in cooler seasons at the NCRS. Compare both to find what best fits your local conditions.

Table Cf1. Foliar fertility comparisons for impact on the yield and maturity of cauliflower, 2011

Treatment		Rate/A (gal/A)	Method of Application
1	0-0-60 + 18-46-0 + Mn + Zn	126#, 65#, 2#, 2#,	PPI
	10-34-0	6	transplant
	28% UAN	48	SD
2	PG + SK + Micro 500 + Mn	3, 5.8, 3.8 qt, 2 pt	transplant
	HN	32	SD
3	PG + SK + Micro 500 + Mn	3, 5.8, 3.8 qt, 2 pt	transplant
	28% w/ eNhance (80% rate)	38.5	SD
4	PG + SK + Micro 500 + Mn	3, 5.8, 3.8 qt, 2 pt	transplant
	28%UAN (100%)	48	SD
5	PG + SK + Micro 500 + Mn	3, 5.8, 3.8 qt, 2 pt	transplant
	HN:28% w/ eNhance (50:50 Blend)	42.6	SD

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

Materials and Methods:

The plots were established on May 6th by broadcasting the appropriate dry fertilizers listed in above table into the appropriate plot areas and then building raised beds (2ft wide x 4" tall) down the center of each 5 ft wide plot. Cauliflower transplants with 3-4 leaves were then planted every 12" on alternating sides of the bed for every plot. Each of the 30 plants in every plot then received 4.2 oz of water containing the appropriate fertilizer solutions as shown in the above table. Sidedress nitrogen occurred on June 14th when the plants were approximately 8-10" tall. These nitrogen treatments were knifed down the center of each plot, approximately 4" deep into the soil and 6-8" to the side of each plant. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. As the cauliflower heads began to mature, harvests were conducted once or twice per week to track yields and crop development. After a total of seven harvests (2-3 day interval), nearly all heads had been harvested from each plot and no further evaluations were conducted. For data analysis and graphing purposes, yields from individual harvests were combined and fit into 7 day weekly intervals. The harvest frequency in this trial was not meant to reflect commercial practices, but instead used to identify subtle treatment differences in crop maturity.



Experiment Info:

Planted:	6/2/2011
Beefsteak:	Fletcher
Roma:	Mariana
Population:	8,700
Plot Size:	5' x 30
Replications:	2
Fertigation:	8 weekly apps
Harvest:	mulip. 5 weeks

Soil Test Values (ppm):

pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

Determine the potential for ACLF fertilizers applied through fertigation to enhance the yield and/or maturity of Fresh Market Beefsteak and Roma type tomatoes.

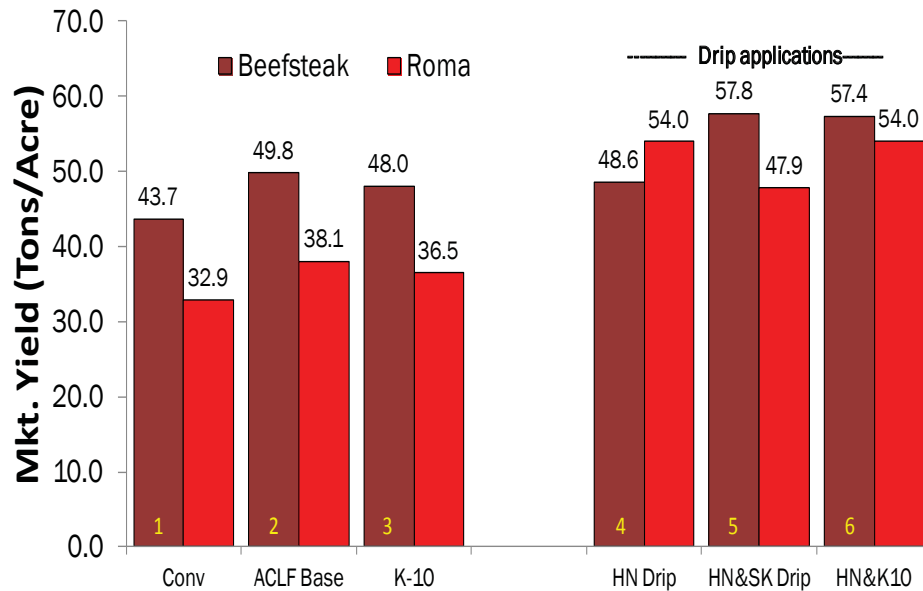


Figure MT1. Cumulative yields from six weekly harvests of fresh market Beefsteak and Roma tomatoes

Conclusions:

- The ACLF Base program (Trt. #2) outperformed the Conventional program (Trt #1) for the yield of Beefsteak and Roma type tomatoes when 100% of the fertilizer was applied pre-plant.
- Drip irrigation applications (Trt 4-6) supplied 40% of the total nitrogen and in some cases nearly half of the potassium during the growing season (Trt #5 & #6). These changes in the application timing improved the tomato yields without using any additional fertilizer compared to the ACLF Base program (Trt.#1). Table MT 1 shows these changes in application timing and volumes.
- An experimental potassium product K-10, (Trt.#3 & #6) that may have some winter storage advantages over Sure-K, appeared to perform as well as Sure-K (Trt.#2 & #5) when it was used in a similar manner.
- Spring rain delayed planting significantly and therefore harvest was delayed with a majority of the yield for all treatments occurring in final portion of the season.

Table MT1. Fertility programs for Fresh Market tomato production, 2011.

Treatment		Rate/A (gal/A)	Method of Application
1	0-0-60+Mn+B+Zn	482#, 5#, 1#, 4#	PPI
	10-34-0	6	Transplant
	28% UAN+10-34-0 Conventional	58+5.9	Band
2	PG + SK + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + SK ACLF Base	40+20.5	PPI/band
3	PG + K-10 + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + K-10 K-10 Drip	40+20.5	PPI/band
4	PG + SK + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + SK	24+20.5	PPI/band
	HN HN Drip	2	Drip/Wk
5	PG + SK + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + SK	24+10.5	PPI/band
	HN + SK HN&SK Drip	2+1.25	Drip/Wk
6	PG + K-10 + Micro 500+ Mn	3.6+1.5+4 qt, 1 pt	Transplant
	HN + K-10	24+10.5	PPI/band
	HN + K-10 K-10 Drip	2+1.25	Drip/Wk

HN=High NRG-N™, eN28=eNhance™+28%UAN, PG=Pro-Germinator™, SK=Sure-K™, K-10=experimental potassium

Materials and Methods:

The plots were established on June 1 by banding the liquid fertilizers down the center of the plots and/or broadcasting the appropriate dry fertilizers into the plot areas. The center 2 ft of each 5 ft wide plot was then covered with plastic mulch. The following day Tomato transplants were placed every 12" in two rows with alternating spacing, 15 of each variety per plot. The soil around each transplant was doused with approximately 4.2 oz of a transplant solution (~300 GPA) containing the fertilizers described in the above table. The rest had only water. Every plant also received Ridomil and Admire as part of the transplant water for early season disease and insect management. During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. The drip applications were started at early bloom and repeated regularly up until mid- September. This resulted in 8 weekly fertigation applications for the season. As the tomatoes began to mature, the plots were harvested regularly. The ripe fruit were removed from each plot, counted and weighed to determine yields. There were five harvests during the season: the initial harvest occurred on Aug. 13 and the last on Oct 18th.



Experiment Info:	
Planted:	6/9/2011
Variety:	Aphrodite
Population:	2,900
Plot Size:	7.5' x 30
Replications:	3
Harvest:	multiple

Soil Test Values (ppm):	
pH:	6.8
CEC:	5.2
% OM:	1.0
P1:	77
K:	69
S:	8
% K:	3.4
% Mg:	22.8
% Ca:	72.8
% H:	0
% Na:	1.0
Zn:	1.3
Mn:	5
B:	0.4

Objective:

To determine if basic fertility programs impact the yield and/or maturity of cantaloupe. Will conventional fertilizer materials or ACLF products produce the greatest return on investment for cantaloupe production?

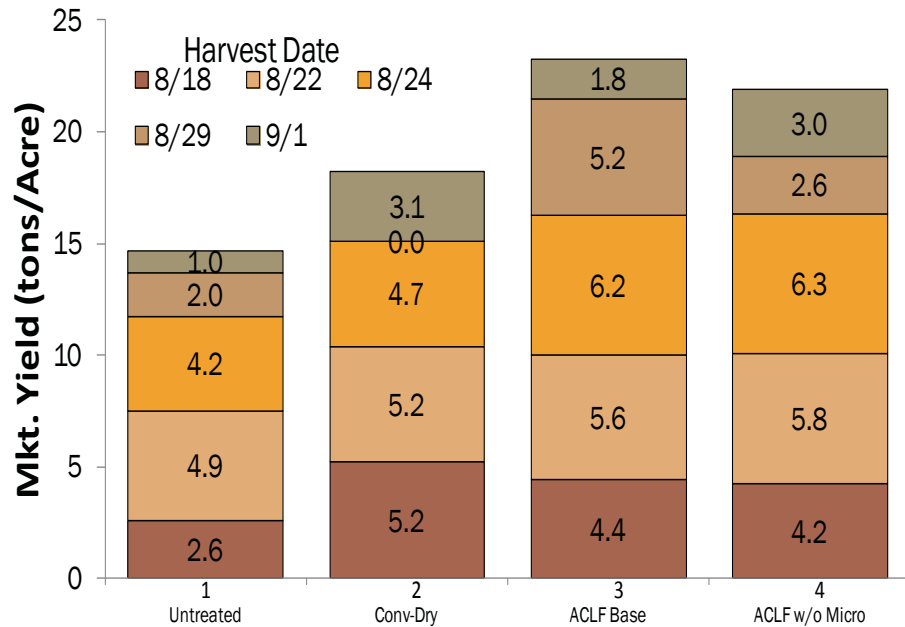


Figure C1. Yields of cantaloupe as influenced by soil applied treatments

Conclusions:

- The ACLF Base fertility program produced 16% greater yields than the conventional dry for the entire growing season. Early season yields were similar for both treatments, but the ACLF program continued to produce more melons later into the season. Additionally, the average melon size was 0.46 lb larger for the ACLF fertility program. Lastly, in taste test comparisons among these treatments, a majority of the guests touring the North Central Research Station preferred the flavor of the ACLF fertilized melons this season.
- When Micro-500 was left out of the ACLF Base fertility program, there was a 6% yield decline. Melon size remained the same for these treatments, so this yield decline was related to fewer harvested melons. A small amount of product made a big difference in the yield and Nutrient Use Efficiency (NUE) as show in Table C1. The ACLF Based programs were nearly 4.5X over 5.5X greater than that achieved with conventional fertilizers.

Table C1. Fertility treatment programs to promote cantaloupe yields, 2011.
Conventional and ACLF based fertility comparisons in cantaloupe

Treatment		Rate/A (gal/A)	Method of Application	Nutrient lbs./ac	NUE*
1	Untreated	NA			
2	SOP+Mn 28% UAN + 10-34-0	364#, 4# 42+8	broadcast band	439.8	83.0
	10-34-0	5	transplant		
3	PG + SK+Micro 500+ Mn	4+1+1+0.25	transplant	101.4	458.9
	HN + Sure-K	30+13.6	band		
4	PG + SK	4+1	transplant	118.2	370.4
	HN + Sure-K	30+13.6	band		

PG = Pro-Germinator™, SK = Sure-K™, HN = High NRG-N™, eN28% = eNhance™ & 28% UAN, SOP = sulfate of potash 0-0-50

Materials and Methods:

The plots were established in early June by banding liquid fertilizers down the center and/or broadcasting dry fertilizers over each plot area. The center 2 ft of each 7.5 ft wide plot was then covered with plastic mulch. On June 9th, 3-5 leaf transplants were planted in the plastic mulch on 3 ft intervals. Approximately 4 oz of total solution was dispensed by the transplanter around each plant at the time of planting.

During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. Harvests were initiated when the melons became ripe and could easily be removed from the vine. Every two or three days following the initial harvest the plots were evaluated for more ripe melons until only a very few melons remained.



Experiment Info:	
Planted:	5/8/2011
Variety:	Millennium
Population:	200,000
Plot Size:	2 double rows x 30'
Replications:	4
Sidedress:	6/30, 7/14
Harvest:	10/10/2011

Soil Test Values (ppm):	
pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

Determine the impact of conventional and ACLF fertilizer treatments on the yield and size of yellow onions.

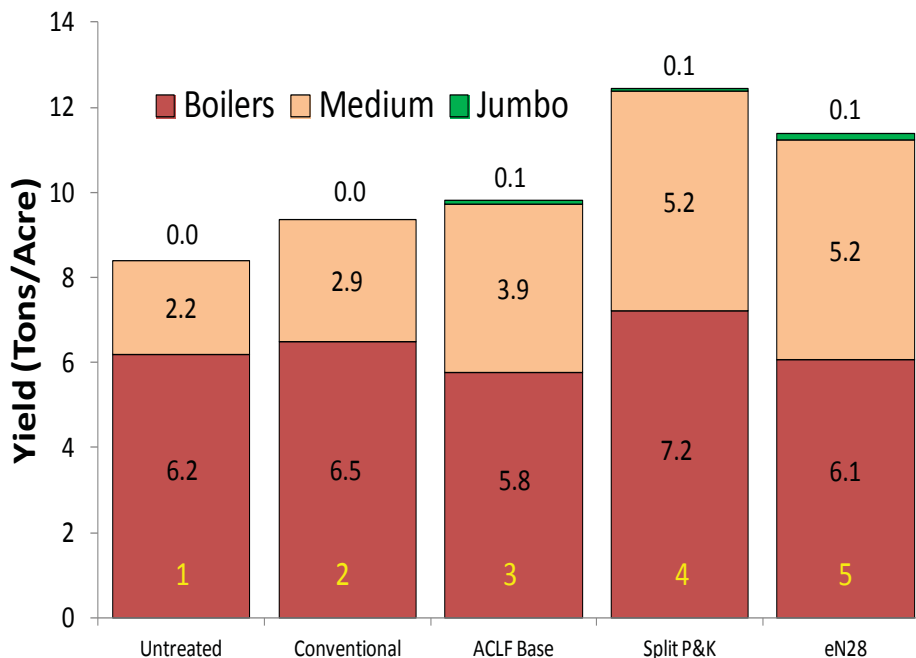


Figure O1. Yield response of yellow onions in response to various fertility programs

Conclusions:

- The ACLF based fertility programs (Trt. #s 3-5) resulted in a greater yields and higher market value for the onions produced than conventional program (Trt. #2).
- The ACLF Base program (Trt. #3) yielded 5% more than the conventional program (Trt. #2). In addition, grade distribution and therefore value per acre was increased resulting in a financial gain of \$347 per acre based on local market prices at harvest (Table O1).
- When the phosphorus (Pro-Germinator) and potassium (Sure-K) were split into two applications (Trt. #4), the yield and income were greatly increased. Yields were 24% higher than the conventional program and income increased by \$1225 per acre in gross value. This treatment had exactly the same fertility products and total rates of application as the ACLF Base program (Trt. #3), only the timing of application was changed for this treatment.
- 2011 was a cool season with later than normal planting. The use of eNhanse with 28% UAN (Trt. #5) as the nitrogen source provided greater early nitrogen availability and more early crop development than the High NRG-N (Trt. #3). This early growth carried forward into better yields at harvest.
- Nutrient use efficiency (NUE) was best among the ACLF based treatments (Tbl. O1), with all treatments approximately 3 times more efficient in nutrient use than the conventional treatment.

Table O1. ACLF Base and conventional fertility program comparisons for onion productions, 2011.

Treatment		Rate/A (gal/A)	Method of Application	Nutrient #/Acre*	NUE**	Est. Crop \$/acre
1	Untreated Control	0	na			\$2,459
2	0-0-60 + Micro-Blend	284, 5#	Broadcast/PPI	478	41	\$2,816
	10-34-0	10.4	Surface Band			
2	28% UAN	33 x 2	Side dress			
3	PG + SK + Micro 500	8, 6, 3.8 qt	Surface Band	171	121	\$3,163
	HN + SK	(21 + 7.5) x 2	Side dress			
4	PG + SK + Micro 500	4, 3, 1.9 qt	Surface Band	171	152	\$4,041
	PG + SK + Micro 500	4, 3, 1.9 qt	Foliar*			
	HN + SK	(21 + 7.5) x 2	Side dress			
5	PG + SK + Micro 500 eN28 + SK	8, 6, 3.8 qt (26.5 + 7.5) x 2	Surface Band Side Dress	209	115	\$3,797

*Micronutrients not included in total fertilizer per acre calculations; HN=High NRG-N™, eN28=eNhance™+ 28%UAN, PG=Pro-Germinator™, SK=Sure-K™
 **NUE=Nutrient Use Efficiency – (Lb. Yield / Total Lb. Nutrient as Fertilizer Applied) HN=High NRG-N, PG= Pro-Germinator, SK= Sure-K
 Crop Values based on Detroit Terminal Market prices on 11/8/2011 Jumbo @ \$13.25/50#, Med @ \$10/50#, Boilers @ \$3/50# (est.)

Materials and Methods:

The plot was originally established and planted on May 8th, 2011 by spreading dry fertilizer and dry micronutrients into their respective plots. Then 24" wide by 4" tall raised beds were formed in the center of each 5' wide plot area. Planting the plot area was accomplished by with a twin row push type onion planter operated twice on the top of the bed for each plot. Therefore, two pairs or four rows of onions were seeded into each plot with a population of approximately 200,000 seeds per planted acre. The respective surface band fertilizer applications shown above in Table O1 were made across the top (24") of each bed in the afternoon of the same day. Onions from this planting began to emerge about two weeks after planting. Two side dress nitrogen applications were made to each plot as described in the above table. During the course of the growing season, irrigation, herbicide, fungicides and insecticides were each applied uniformly to all plots as necessary. Two weeks prior to the actual harvest, all onion bulbs were lifted and placed back in the plots to allow the tops and roots to dry. On October 10th, all the marketable sized onions collected from each plot. Over the next few days the harvested onions were hand sorted by size and each grade category weighted to determine yields.



Experiment Info:

Planted:	5/23/2011
Variety:	SS-867309
Population:	32,000
Plot Size:	5' x 20' (2 rows)
Replications:	3
Sidedress:	6/28/2011
Foliar:	7/20/2011
Harvest:	8/19/2011

Soil Test Values (ppm):

pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

Determine if foliar fertility treatments can influence sweet corn yield potential and/or quality positively.

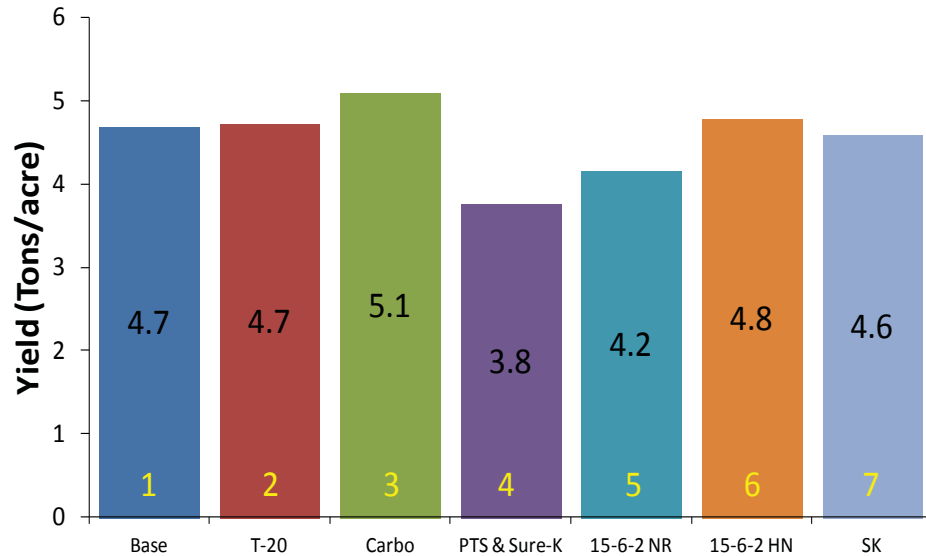


Figure SC1. Sweet corn yields as influenced by various soil and foliar fertility programs.

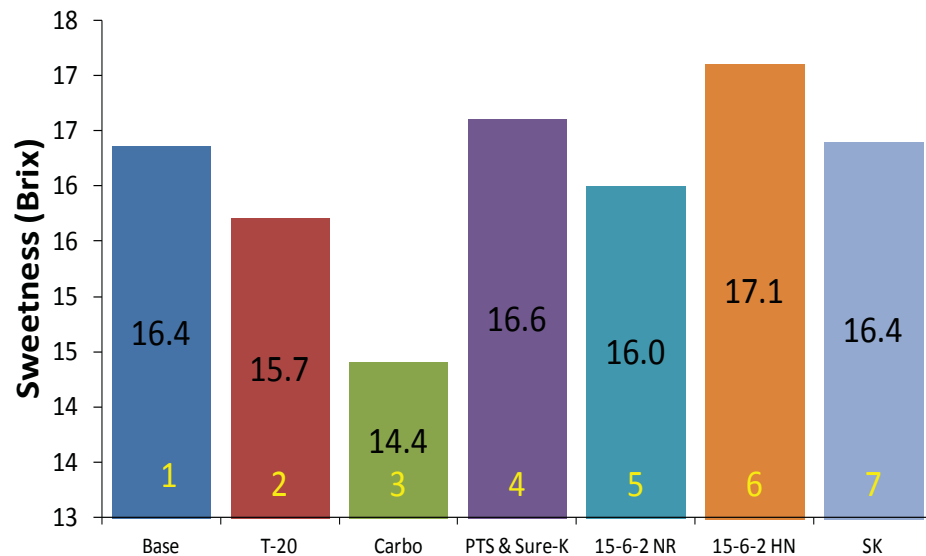


Figure SC2. Sweet corn Brix (sweetness) as influenced by fertility treatments

Conclusions:

- Foliar fertilizer treatments selected for this trial (Trt. #2-7) resulted in little or no improvement in sweet corn yields over that of the ACLF base program (Trt #1). As this was a single harvest for all plots, differences in yield may have been related in part to changes in maturity from the foliar applications. The decision to harvest was based on a majority of the plots being mature, not an individual treatment.
- The use of Carbo as a foliar treatment resulted in the highest yield, but it had the lowest Brix level or sweetness of the treatments evaluated. Had this treatment been allowed to mature a few more days the results may have changed dramatically?
- The best sweetness or quality as measured by Brix level was the 15-6-2 HN foliar (Trt #6). This treatment showed a little improvement in yield, but better sweetness than the others. Still, it might be difficult to detect this level of difference while eating this corn.

Table SC1. Sweet corn fertility programs and foliar applications for yield enhancement in 2011.

	Treatment	Rate/A (gal/A)	Method of Application
1	HN+PG + SK + Micro 500+ Mn HN	16 + 3.4 + 8.5 + 3 qt 21.6	planter 2x2 sidedress
2	HN+PG + SK + Micro 500+ Mn HN Plant Product T-20	16 + 3.4 + 8.5 + 3 qt 21.6 3 lb	planter 2x2 sidedress foliar
3	HN+PG + SK + Micro 500+ Mn HN Carbo	16 + 3.4 + 8.5 + 3 qt 21.6 2 qt	planter 2x2 sidedress foliar
4	HN+PG + SK + Micro 500+ Mn HN PTS & Sure-K	16 + 3.4 + 8.5 + 3 qt 21.6 2 oz & 2	planter 2x2 sidedress foliar
5	HN+PG + SK + Micro 500+ Mn HN 15-6-2 NR	16 + 3.4 + 8.5 + 3 qt 21.6 2 qt	planter 2x2 sidedress foliar
6	HN+PG + SK + Micro 500+ Mn HN 15-6-2 HN	16 + 3.4 + 8.5 + 3 qt 21.6 2 qt	planter 2x2 sidedress foliar
7	HN+PG + SK + Micro 500+ Mn HN Sure-K	16 + 3.4 + 8.5 + 3 qt 21.6 2	planter 2x2 sidedress foliar

HN=High NRG-N™, PG=Pro-Germinator™, SK=Sure-K™; 15-6-2: 45.5% *NR or **HN, 23% PG, 17% SK, 15% M-500, NR = NResponse

Materials and Methods:

All plots were planted utilizing 6 row Monosem planter. The plots were planted May 22. The plots were side dressed on June 29 with High NRG-N at 21.6 gallons per acre 4" to 6" to the side of each row. Corn was approximately V-6 when side dressed.

Foliar fertilizer applications were made at V7-V8. All foliar applications were made with a backpack sprayer and hand boom equipped with flat fan nozzles. Please see above table SC1 for more details. The fertilizer mixtures were diluted with water and applied at a total volume of 15 gallons per acre. Additionally, no adjuvant was used with any of these applications.

Only marketable sized ears were hand harvested and removed from each plot. All plots were only harvested once for this trial. Any small ears and/or immature ears were left in the plots at the time of harvest. The weight and counts from both rows of the plot were combined for data analysis.



Experiment Info:	
Planted:	6/28/2011
Variety:	BC-0805
Population:	32,000
Plot Size:	5' x 20' (2 rows)
Replications:	2
Sidedress:	7/12/2011
Foliar:	7/21/2011
Harvest:	9/22/2011

Soil Test Values (ppm):	
pH:	6.9
CEC:	7.5
% OM:	1.6
P1:	12
K:	62
S:	6
% K:	3.1
% Mg:	17.3
% Ca:	79.7
% H:	0
% Na:	0.9
Zn:	2.7
Mn:	8
B:	0.5

Objective:

Determine if foliar fertility treatments can influence sweet corn maturity and/or yield potential positively.

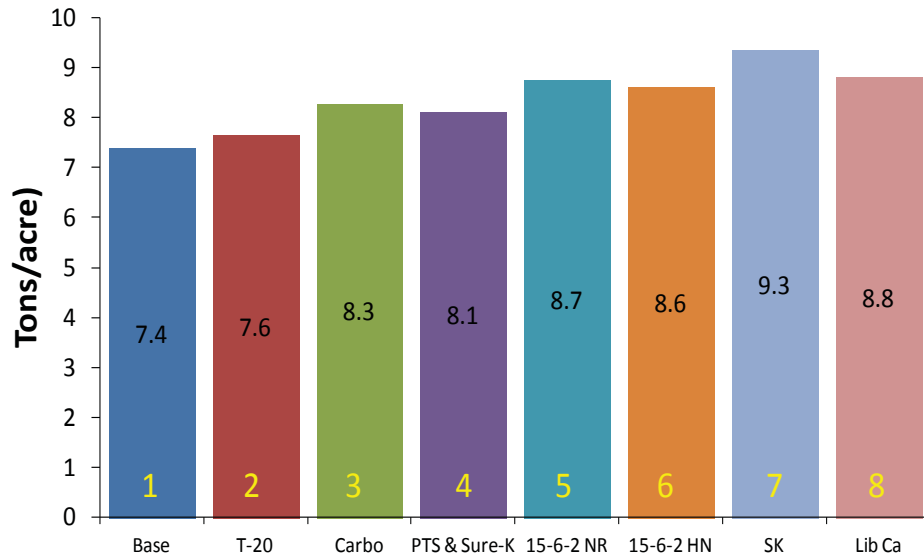


Figure SC4. Sweet corn yields as influenced by various foliar fertility programs.

Conclusions:

- All foliar fertilizer treatments increased the observed sweet corn yields, in most case by at least one ton per acre over the base treatment (Trt. #1).
- Each foliar fertilizer selected for this trial offered different nutrient combinations. The best performance was offered by a single application of Sure-K at the V-7 growth stage (Trt. #7). The yield was enhanced by 20% over the base ACLF fertility program (Trt. #1).
- Little or no difference was observed in the average ear size among all these treatments. The number of marketable sized ears harvested from these plots was strongly correlated with yield. Therefore, the observed yield enhancements were primarily a result of earlier maturity. Later maturing ears were left behind in the plots.

Table SC3. Sweet corn fertility programs and foliar fertilizer applications for yield enhancement in 2011.

Treatment		Rate/A (gal/A)	Method of Application
1	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN (Base)	21.6	sidedress
2	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	Plant Product T-20	3#	foliar
3	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	carbo	2 qt	foliar
4	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	PTS & Sure-K	2 oz & 2	foliar
5	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	15-6-2 NR*	2 qt	foliar
6	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	15-6-2 HN**	2 qt	foliar
7	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	Sure-K	2	foliar
8	HN+PG + SK + Micro 500+ Mn	16+3.4+8.5+3 qt	planter 2x2
	HN	21.6	sidedress
	LiberateCa & SK	2 qt & 2	foliar

HN=High NRG-N™, NR=NRResponse™, PG=Pro-Germinator™, SK=Sure-K™; 15-6-2: 45.5% *NR or**HN, 23% PG, 17% SK, 15% M-500

Materials and Methods:

All plots were planted utilizing 6 row Monosem planter. The plot was planted on June 28. The plot was side dressed on 7/12 with High NRG-N at 21.6 gallons per acre placed just to the side of each row. The sweet corn was approximately V-4 when side dressed.

Foliar fertilizer applications were made at V7-V8 growth stage. 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. Additionally, no adjuvant was used with any of these applications.

All marketable sized ears were hand harvested and removed from each plot on Sept 22. Each plot was only harvested once for this trial. Any small ears and/or immature ears were left in the plots at the time of harvest. The weight and counts from both rows of the plot were combined for data analysis.



Experiment Info:	
Planted:	6/3/2011
Variety:	GSS-0966
Population:	24,000
Plot Size:	5' x 25' (2 rows)
Replications:	3
Sidedress:	6/29/2011
Harvest:	9/6//2011

Soil Test Values (ppm):	
pH:	6.1
CEC:	6.5
% OM:	1.9
P1:	42
K:	111
S:	11
% K:	4.7
% Mg:	14.6
% Ca:	66.7
% H:	13.6
% Na:	0.4
Zn:	1.8
Mn:	13
B:	0.4

Objective:

Determine if foliar fertility treatments can influence sweet corn maturity and/or yield potential positively.

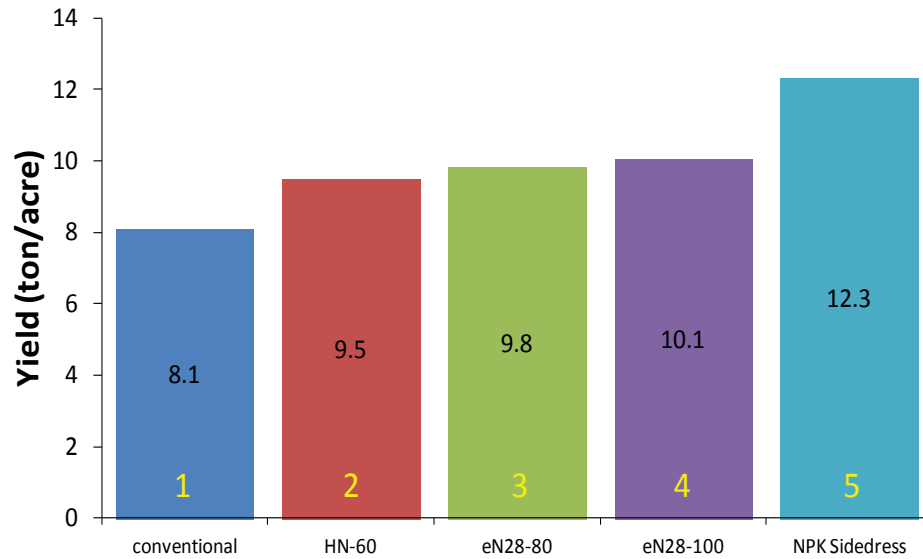


Figure SC3. Sweet corn yields as influenced by various sidedress application programs.

Conclusions:

- The NPK sidedress treatment (Trt #5) application increased the observed sweet corn yields by over two tons per acre. This was a 52% increase over the conventional fertility program (Trt#1) and increase over Trt. #2 which did not have the additional Pro-Germinator, Sure-K, and Micro 500.
- The eNhanced 28% UAN @ 100% rate (trt#4) showed a yield increase of 25% over that of the conventional treatment, up slightly over that at the 80% rate (Trt #3).
- The High NRG-N treatment (Trt #2) showed a yield increase of 17% over the conventional yield.
- The number of marketable sized ears harvested from these plots was strongly correlated with yield. Since it was a one-time pick harvest, lack of maturity of ears was a key factor affecting yield. Later harvests may have helped the lower yielding treatments but, crop quality would likely be less as some ears become over mature with a delayed harvest.

Table SC2. Sweet corn fertility programs of soil fertilizer applications for yield enhancement in 2011.

Treatment		Rate/A (gal/A)	Method of Application
1	46-0-0, 0-0-60	176#, 185#	PPI
	10-34-0	11.4	planter 2x2
	28% UAN	23	sidedress
2	HN+PG + SK + Micro 500+ Mn	16 + 3.4 + 8.5 + 3 qt	planter 2x2
	HN	16	sidedress
3	eN28+PG + SK + Micro 500+ Mn	16 + 3.4 + 8.5 + 3 qt	planter 2x2
	eN28 80%	21.6	sidedress
4	eN28+PG + SK + Micro 500+ Mn	16 + 3.4 + 8.5 + 3 qt	planter 2x2
	eN28 100%	27	sidedress
5	HN+PG + SK + Micro 500+ Mn	16 + 3.4 + 8.5 + 3 qt	planter 2x2
	HN+PG + SK + Micro 500	16 + 1 + 2 + 1qt	sidedress

HN=High NRG-N™, eN28=eNhance™+28%UAN, PG=Pro-Germinator™, SK=Sure-K™

Materials and Methods:

All plots were planted utilizing 6 row Monosem planter. The plot was planted on June 3. The plot was side dressed on June 29 with the products and rates shown in Table SC2. Corn development was approximately V-4 when side dressed.

At harvest, only marketable sized ears were handpicked and removed from each plot. Plots were only harvested once for this trial. Any small ears and/or immature ears were left in the plots at the time of harvest. The weight and counts from both rows of the plot were combined for data analysis.



Experiment Info:	
Planted:	6/5/2011
Variety:	Indiana
Population:	45,000
Plot Size:	5' x 35' (4 rows)
Replications:	4
Sidedress:	7/18/2011
Foliar:	Multiple
Harvest:	9/6//2011

Soil Test Values (ppm):	
pH:	7.0
CEC:	6.8
% OM:	1.2
P1:	89
K:	80
S:	11
% K:	3.0
% Mg:	23.2
% Ca:	72.7
% H:	0
% Na:	1.1
Zn:	1.0
Mn:	5
B:	0.5

Objective:

Determine if foliar fertility treatments can influence carrot yield potential and/or quality positively.

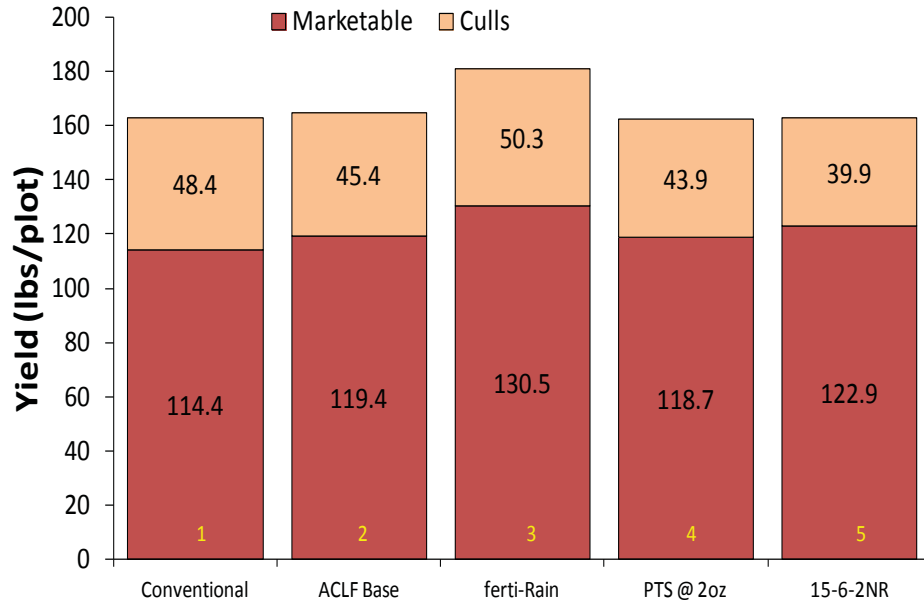


Figure Ca1. Carrot yields as influenced by various soil and foliar fertility programs.

Conclusions:

- The marketable yield of carrots for ACLF program (Trt. #2) exceeded the conventional program (Trt. #1) by 4% with a small reduction in the quantity of culls.
- All of the ACLF treatments (Trt. 2-5) resulted in higher yields than the conventional program. However, the total yields for all the treatments were not statistically different from each other.
- Foliar applications of ferti-Rain™ (Trt #3) resulted in a 9% higher yield than the ACLF base program over which it was applied.
- During the growing season, deer feeding within the plots severely impacted some plots. These data were dropped from the average for the treatments. Still, a minimum of three replications were utilized for each data point shown. It is uncertain how much the deer truly impacted the yield from all plots as some damage occurred to all areas of this trial.
- The addition PTS and 15-6-2 foliars to the ACLF Base fertility program did not show any impact on carrot yield this season. This was surprising, especially for the 15-6-2 as it is fairly similar in analysis to the ferti-Rain. I guess that ferti-Rain has more than just the numbers to make it such a great foliar.

Table Ca1. Carrot fertility programs and foliar applications for yield enhancement in 2011.

Treatment		Rate/A (gal/A)	Method of Application
1	0-0-60 + 28% UAN	379# + 12	PPI
	10-34-0 + 28% UAN	10	planting
	28% UAN	26	Side dress
2	HN + PG + SK + Micro 500 + Mn	14 + 3 + 10 + 4 qt + 2pt	Below seed
	HN + Sure-K	11 + 9.6	Side dress
3	HN + PG + SK + Micro 500 + Mn	14 + 3 + 10 + 4 qt + 2pt	Below seed
	HN + Sure-K	11 + 9.6	Side dress
	ferti-Rain	3	2x Foliar
4	HN + PG + SK + Micro 500 + Mn	14 + 3 + 10 + 4 qt + 2pt	Below seed
	HN + Sure-K	11 + 9.6	Side dress
	Sure K + PTS	2 + 2 oz	2x Foliar
5	HN + PG + SK + Micro 500 + Mn	14 + 3 + 10 + 4 qt + 2pt	Below seed
	HN + Sure-K	11 + 9.6	Side dress
	15-6-2*	2qt.	2x Foliar

HN = High NRG-N™, PG = Pro-Germinator™, SK = Sure-K™; *15-6-2: 45.5% N-Response, 23% PG, 17% SK, 15% M-500

Materials and Methods:

- In early June the entire plot area was divided into individual plots and the dry fertilizers were broadcast in their treatment areas. Beds were formed (4" tall x 24" wide x 30' long) and the various liquid fertilizer materials were banded 2" below the soil surface as two separate bands placed 4-6" off-center for the remaining plot areas. Four rows of "Indiana" variety carrot seeds were planted over the banded fertilizer applications with 0.75 to 0.8 inch spacing between seeds.
- Sidedress nitrogen application was made during the growing season. This application was knifed into the center of the plot area. The next day water was applied with drip irrigation tape placed directly over the nitrogen band to incorporate the fertilizer further.
- Foliar fertilizer applications were made to selected plots on July 11nd and July 24th. 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 with an air-blast backpack sprayer as needed throughout the season.
- The carrots were harvested, topped, sorted by hand and then weighed by use category in late October. Harvest was finished Nov. 2nd.



Experiment Info:	
Planted:	5/12/2011
Variety:	Russet Norkota
Population:	13,750 (1ton)
Plot Size:	2 rows (38") x 30'
Replications:	4
Vine Kill:	8/27/2011
Harvest:	9/10//2011

Soil Test Values (ppm):	
pH:	6.1
CEC:	6.5
% OM:	1.9
P1:	42
K:	111
S:	11
% K:	4.7
% Mg:	14.6
% Ca:	66.7
% H:	13.6
% Na:	0.4
Zn:	1.8
Mn:	13
B:	0.4

Objective:

Compare ACLF products in various combinations with conventional fertilizer materials to determine if programs or individual fertility components have a greater impact on total yield and sizing of potatoes.

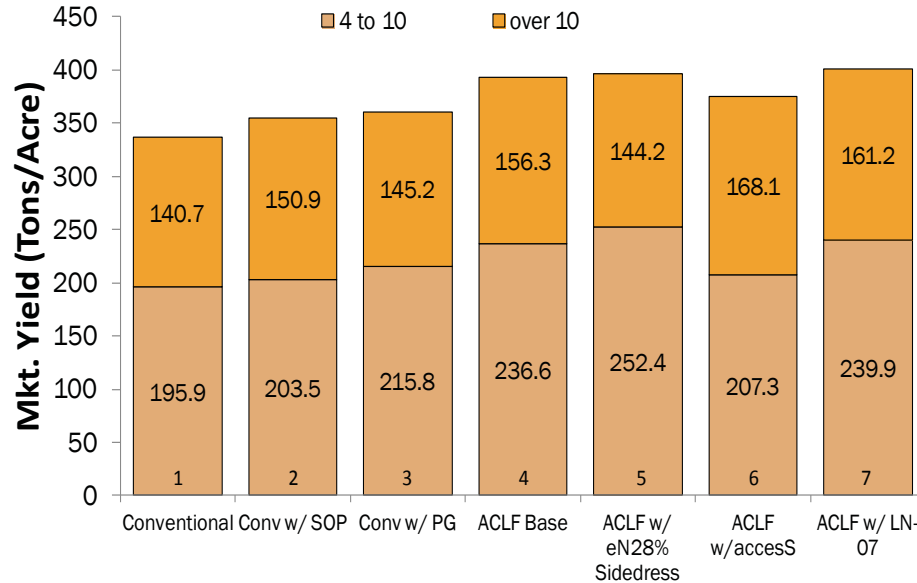


Figure P1. Marketable yields from multiple potato fertility programs in 2011. Bars are stacked on the basis of potato size and are ordered to match treatments shown in Table P1. See next page for full treatment details.

Conclusions:

- The ACLF based programs (Trt #4-7) treatments generally yielded more than the comparable conventional fertility programs (Trt #1-3). The use of conventional sources of nitrogen and potassium with Pro-Germinator (Trt #3) instead of 10-34-0 at planting was the best yielding among the conventional based fertility programs. Therefore, changing only one part of that fertility program had a very positive impact on potato yields.
- Treatment #7 was the highest for total yield in this trial. It utilized an ACLF experimental sulfur product, LN-07, in conjunction with the ACLF base fertility products. With this modification, the quantity of potatoes in both grade categories was increased over the ACLF Base (Trt. #4).
- Additional sulfur in the form of accesS™ with the ACLF Base (Trt. 6) did increase the yield of 10 oz and larger potatoes, but there was a decline in the potato yield under 10 oz. Still, the total value per acre would have been similar for these treatments due to the yield increase for the premium grade.
- Sulfate of potash (SOP) as the potassium source improved the potato yields for the conventional fertility program (Trt #2) as compared to murate of potash (Trt #1). The presence of sulfur as well as the lack of chlorine in SOP likely contributed to this increase. Data from treatments 2, 6 and 7 show the value of sulfur, but also the “inert” ingredients they include can be just as important.
- The ACLF Base program (Trt #4) utilizing High NRG-N or eNanced 28% UAN (Trt #5) both were similar for total yields. There was small advantage in total yield for the eNanced 28% treatment, but a slight advantage in the over 10 oz yield for the ACLF Base, essentially treatments yielded the same. Crop variability adjusted the numbers.
- Nutrient Use Efficiency (Table P1) with the ACLF Based programs (Trt #4-7) was at least twice as high as the conventional program (Trt. #1-3).

Fresh market potato fertility programs utilizing various sulfur products and fertilizer combinations to impact yield and sizing, 2011.

Treatment		Rate/A	Method of Application	Total* lb./acre	NUE**
1	0-0-60 + 18-46-0 + 46-0-0 + Mn + Zn	416# + 87 + 54 + 6# + 5#	PrePlant Inc	610.7	0.7
	10-34-0	10	beside seed		
	28% UAN x 2	38.3	2 x Side dress		
Conv - Fert Prog					
2	0-0-52-18 + 18-46-0 + 46-0-0 + Mn + Zn	480# + 87 + 54 + 6# + 5#	PrePlant Inc	697.1	0.6
	10-34-0	10	beside seed		
	28% UAN x 2	38.3	2 x Side dress		
Conv - Fert Prog w/ SOP					
3	0-0-60 + 46-0-0 + Mn + Zn	416# + 88 + 6# + 5#	PrePlant Inc	567.4	0.8
	PG	8	beside seed		
	28% UAN x 2	38.3	2 x Side dress		
Conv w/ PG					
4	HN + PG + SK + Micro 500 + Mn + B	11 + 8 + 20 + .75 + .125 + .125	beside seed	216.7	2.1
	HN x 2	22.5	2x Side dress		
ACLF Base					
5	eN-28% + PG + SK + Micro 500 + Mn + B	16 + 8 + 20 + .75 + .125 + .125	beside seed	327.2	1.5
	eN-28% x 2	38.3	2x Side dress		
eNhanced 28%					
6	HN + PG + SK + Micro 500 + Mn + B + Access	11 + 8 + 20 + .75 + .125 + .125 + 3	beside seed	269.0	1.7
	HN & accesS x 2	22.5 + 7	2x Side dress		
accessS					
7	HN + PG + SK + Micro 500 + Mn + B + LN-07	11 + 8 + 20 + .75 + .125 + .125 + 3	beside seed	233.5	2.1
	HN & LN-07 x 2	22.5 + 7	2x Side dress		
LN-07					

*Micronutrients not included in total fertilizer per acre calculations. **NUE = Nutrient Use Efficiency = Lb. Yield / Total Lb. N,P,K&S as Fertilizer Applied, HN=High NRG-N, PG= Pro-Germinator, SK= Sure-K, eN-28% = eNhance blended with 28% UAN.

Materials and Methods:

- On May 11th, 2011, the dry fertilizers were broadcast then lightly incorporated with a field cultivator as the entire plot area was tilled. A single row cup type planter was used to establish 2 rows of potatoes, approximately 38" apart within each plot. All liquid fertilizer treatments described in the above table was split into two bands, each was 2" above and 2" to the side of the seed-piece. Whole "Russet Norkota" seed pieces averaging about 3 oz each were planted 6" deep with ~12" spacing between each piece.
- Admire® and Ridomil® pesticides were banded over the seed potatoes at recommended rates of application during planting. Additional fungicides (7-10 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.
- Two side dress nitrogen applications were made during the growing season. Each application was applied to the side of the row and covered with a hilling disk immediately after application. The initial application occurred at hilling and the second 10 days later.
- Irrigation of the plots was accomplished from the use of drip irrigation lines placed beside each potato row prior to hilling. The hilling operation pushed these lines against the plants and buried them within the hill, but they remained functional in all plots. Water was applied to the plot area weekly in quantities necessary to maintain adequate soil moisture for proper potato development.
- The potatoes were killed on August 27th with an application of Diquat® herbicide. On Sept 10th the potatoes larger than 1.5" were dug and bagged for each plot with a single row potato harvester. Later the potatoes were hand sorted according to size / shape and then each grade weighted to determine yields



Experiment Info:	
Planted:	6/3/2011
Green:	Vanguard
Purple:	Tequila
Population:	8,700
Plot Size:	5'x30'
Replications:	3
Harvest:	multiple

Soil Test Values (ppm):	
pH:	6.1
CEC:	6.5
% OM:	1.9
P1:	42
K:	111
S:	11
% K:	4.7
% Mg:	14.6
% Ca:	66.7
% H:	13.6
% Na:	0.4
Zn:	1.8
Mn:	13
B:	0.4

Objective:

Compare the conventional pepper fertility program to that of the ACLF program for two varieties of pepper: Vanguard (green) and Tequila (purple).

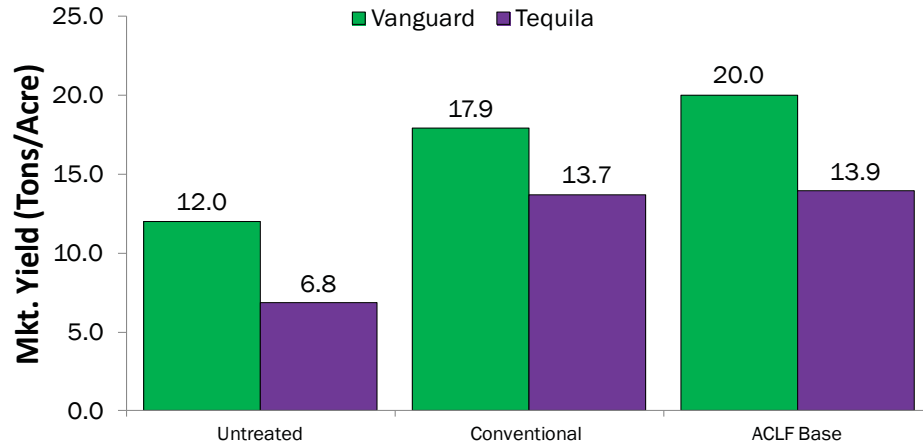


Figure BP1. Total season yields from various basic programs in 2011. Bars are paired by treatment and there are different bell pepper varieties within each treatment.

Conclusions:

- The ACLF Base fertility program for the Vanguard bell peppers (green) out yielded the conventional program by 20% over the entire growing season.
- The Vanguard variety bell pepper yields were substantially greater than that of the Tequila variety within the same fertility program despite having nearly identical harvest counts for each variety. The Vanguard showed a greater improvement of yield relative to the yield of the conventional liquid program. However, yields for the Tequila variety were also numerically increased with the ACLF Base program.
- The nutrient use efficiency (NUE) for the ACLF Base treatment was almost 3X higher than that of the conventional treatment (Table BP1).
- The average quantity of Tequila peppers harvested from each plot was very similar to that of the Vanguard. Therefore the differences in yield were due primarily to differences in individual pepper weight with the Tequila variety having a much thinner side wall and lower weight for equal size.

Table BP1. Bell pepper fertility programs utilizing conventional and ACLF products to impact growth and yield, 2011.

Treatment		Rate/A (gal/A)	Method of Application	Nutrient Total*	NUE**
1	Untreated Control	0	na		
2	28% UAN + 10-34-0 + 0-0-60	55.6 + 10.4 + 192#	Band/PPI	336.7	321.9
	10-34-0	5	Transplant		
3	HN + SK	33 + 9.6	Band/PPI	120.3	901.2
	PG + SK + Micro 500 + Mn	4, 1, 4 qt, 1 pt	Transplant		

**NUE = Nutrient Use Efficiency = Lb. Yield/Total Lb. N,P,K&S as Fertilizer Applied for Vanguard variety, HN = High NRG-N, PG = Pro-Germinator, SK = Sure-K. *Micronutrients not included in total fertilizer per acre calculations.

Materials and Methods:

- The beds for the peppers were prepared and covered with plastic mulch in late May, 2011. All plants were then transplanted and transplant water applied at 4.5 oz/plant on June 3rd, 2011. The 30 foot rows were planted with two rows of peppers, on 10.5 inch inter-row spacing & , split between purple (Tequila) on one side and green (Vanguard) on the other. Over the next few days the transplants that didn't survive were replaced with extra transplants of the same variety. The dead plants were removed and the new plant was placed in the same hole and a small amount of water applied with these new plants.
- During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary. The first peppers reached a marketable size on Aug. 1st and were harvested regularly (Aug. 1st – Oct. 6th) until a killing frost. The weights and counts from each pepper variety in each plot were recorded for every regular harvest.



Experiment Info:	
Planted:	6/9/2011
Variety:	Ruby Seedless
Population:	1,450
Plot Size:	10' x 30'
Replications:	3
Harvest:	multiple

Soil Test Values (ppm):	
pH:	6.9
CEC:	7.5
% OM:	1.6
P1:	12
K:	62
S:	6
% K:	2.1
% Mg:	17.3
% Ca:	79.7
% H:	0
% Na:	0.9
Zn:	2.7
Mn:	8
B:	0.5

Objective:

Determine the differences between Conventional fertilizers and ACLF based fertility programs on watermelon maturity, yield and quality.

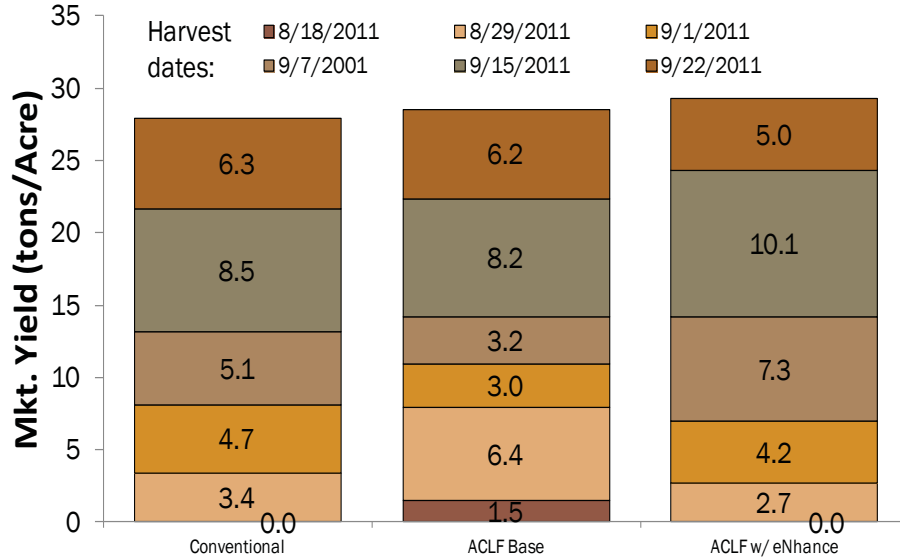


Figure W1. Yield distribution by harvest date from various watermelon fertility programs in 2011. Bars are stacked by harvest date for each fertility treatment.

Conclusions:

- The ACLF Base fertility program provided the best early season yields, especially for the first three harvest dates. The conventional treatment had no yield for the 8/18 harvest date but the ACLF base had a 1.5 ton per acre yield. On 8/29, the ACLF Base program was 55% ahead of the Conventional program for yield.
- The ACLF fertility program with eNhanca had the highest total season yield (5% higher than conventional) for the season. The initial yields were similar to the Conventional program, but the later harvests were where the advantage occurred.
- The ACLF based programs exhibited nutrient use efficiencies (NUE) approximately 2.5X greater than the conventional program (Table W1).

Table W1. Fertility treatment programs for soil applied plant nutrients utilized in 2011 watermelon production trial.

	Treatment	Rate/A (gal/A)	Method of Application	Nutrient lbs./ac	NUE*
1	0-0-60 + DAP + B	181#, 56.5#, 4#	broadcast	310.6	179.7
	10-34-0	2	transplant		
	28% UAN & 10-34-0 Conventional	45 + 4	band		
2	PG + Micro 500 + B	1 + 1 + .25	transplant	113.0	505.5
	HN + PG + Sure-K ACLF Base	30 + 3 + 10.2	band		
3	PG + Micro 500 + B	1 + 1 + .25	transplant	119.2	491.2
	HN + PG + Sure-K + eNhance ACLF w/ eNhance	30 + 3 + 10.2 + 3.25	band		

*NUE = Nutrient Use Efficiency – (Lb. Total Yield / Total Lb. N,P,K&S in the Fertilizer Applied); HN=High NRG-N™, PG=Pro-Germinator™, SK=Sure-K™.

Materials and Methods:

- The plots were established on June 8th by banding or broadcasting the appropriate fertilizers down the middle each plot area and then covering the center 2 ft of each 10 ft wide plot with plastic mulch.
- Transplants were planted every 3 ft into the plastic on June 9th. Each 30 ft plot length contained 8 Ruby Seedless watermelon plants and 2 pollinator plants. Additional pollinator plants were located just outside the plots in the borders areas.
- During the course of the growing season, irrigation, fungicides and insecticides were applied uniformly to all plots as necessary.
- At each harvest, the vines were used to trace each ripe melon back to their home plots so they could be accurately collected, counted and weighted for determining yields. Melons produced by the pollinator variety (Ace) were not used for yield evaluations in this trial.

