Summary of the 2011 SMaRT On-farm Research Projects

The Old Adage "It Ain't What It Used To Be" Certainly Applies to Soybean Production

Keith Reinholt, MSPC Field Operations Director

We believe importance should be placed in reviewing the past as we operate in the present and to plan for the future. With this said, a few comments will be made relative to the past, the present, but mostly planning for the future.

It is interesting how "coffee shop" discussions have changed over the years relative to soybean production. "Old" conversation addressed drilling vs. row, inoculants, tillage needs, et.al. while we now discuss GPS, RTK, SBA, SBR, corn stover management, seed treatments (fungicide, insecticides, harpin protein, growth promoters), singulated seed delivery, etc. How does the soybean producer confidently make management decisions without being overwhelmed with all the new products and practices?

Since the soybean checkoff board of directors are producers, like you, funding has been allocated to address these needs. The SMaRT (Soybean Management and Research Technology) program was initiated in 2010 with a new resolve for emphasis over the next five years. This program will be very prominent.

We believe new products and practices need an independent, third party to evaluate their effectiveness. This evaluation should have sound research protocol with the ability to do a statistical analysis to address the treatment effect. An effort will be made to conduct the research on a field-scale basis, with multiple locations, and over years. Once the data is collected, analyzed, and summarized, educational venues (electronic, meetings, mailings, et.al.) will be used for reporting the data to allow producers to use SMaRT for making management decisions. The key component of the program is individual data will be confidential (available only to the cooperator) while sharing the group data.

S	Only soybean challenges will be addressed; however, these will include rotations, residue management, cover crops, etc.
M	We are told 60% of your soybean yield is derived from the genetics inherited in your varieties planted which leaves 40% of your yield potential from management
and	
R	Field scale research is one of the keys to our program. With proper experimental design, accurate data recording, and statistical analysis, the treatment effects can be defined.
T	With the technologies now available of GPS, RTK, VRT because of satellite systems, receivers, et.al., these can be used to allow field research enabling the producer to use his own tractor, planter, sprayer, combine, and beyond.

This publication is intended to report field research from the 2011 SMaRT program. While appreciating not all applications can be included such as row spacing, populations, and tillage, we have attempted to address the most prominent needs as identified by producers in county focus groups. While we appreciate "conventional research wisdom" emphasizes multi-locations/multi-years, our industry is changing so fast this may not be possible for some products/practices. There is little argument that this philosophy has value; however, producers must make their decisions annually! With this said, I believe in is insulting to assume you need to be "protected" by not providing such data. Today's producer is wise enough to use such data conservatively when making their management decisions. Knowing the SMaRT program is the result of your checkoff investment and the need to make decisions annually, data is presented, even if for a single year - single location, from which you can CONSERVATIVELY make management decisions.

The 2011 SMaRT program and the many projects reported upon would not have been possible without the effort of our summer intern, **Kyle Miller**. Thanks, Kyle, for your long hours worked, many miles driven, tedious collection of data, and your overall enthusiasm exhibited in such a professional manner. Best of luck in the future!

Introduction to Experimental Design, Statistical Analysis, and Interpretation

Producers will often evaluate new products or practices by comparing them side by side in two strips or by splitting a field in half. This practice may introduce a tremendous amount of experimental error and may not produce reliable information regarding the performance of the product or practice. The information generated is heavily influenced by factors other than the practice or product being evaluated. Good experimental design followed by careful statistical analysis can eliminate much of the experimental error and help producers determine the actual performance of the new practice, equipment, or product.

Developing and implementing a sound experimental design is the first step to generating meaningful and reliable results from on-farm research trials. One of the most common and effective designs is called the Randomized Complete Block Design (RCBD). The RCBD is also one of the easiest to lay out in the field. The RCBD reduces the experimental error by grouping or blocking all of the treatments to be compared within blocks or replications. This design improves the likelihood that all the treatments are compared under similar conditions. Blocking the treatments together and replicating the blocks across the field is a simple and effective way to account for variability in the field. Increasing the number of blocks generally increases the sensitivity of the statistical analysis by reducing the experimental error. The SMaRT program encourages cooperators to use four blocks or replications.

Another important aspect of a good experimental design is the concept of randomization. Randomly assigning the order of the treatments within each block is critical to removing bias from treatment averages or means and reducing experimental error. Figure 1 shows the actual RCBD design that was used for the 2011 planting population trials. It demonstrates the principles outlined above. Note how each planting population is included and randomized within the blocks or replications.

Figure 1. The randomized complete block design used for all of the 2011 planting population trials.

120	**160**	**180**	**140**	**180**	**120**	**140**	**160**	**120**	**160**	**140**	**180**	**140**	**120**	**180**	**160**
Replication 1				**Replication 2**				**Replication 3**				**Replication 4**			

After the trial is harvested, proven statistical methods are used to determine if the differences in yields are due to the treatments or a result of other outside factors. It is important to look at two figures as you interpret the information contained in the tables and graphs in this publication - Coefficient of Variation (C.V.) and the Least Significant Difference (LSD 0.05).

Coefficient of Variation (C.V.):

- Expresses the percentage of the variation in the trial that is not attributable to the treatments.
- Any individual plot data with a C.V. greater than 10% is not considered reliable and is not included when multiple locations are combined for analysis.

Least Significant Difference (LSD 0.05):

- This is normally expressed at the 95% confidence level. The LSD 0.05 is a calculated figure that producers can use to determine with a confidence level of 95% that the yield difference between two or more treatments is due to the treatments and not other factors.
- For example, if the LSD 0.05 is 2 bushels per acre and the average yield for the new product or practice being evaluated was 55 bushels per acre and the average for the untreated control was 54 bushels per acre, the difference in yield cannot be attributed to the treatment with 95% certainty. Therefore, the difference between the two yields is not statistically significant.
- Letters are used in the tables and graphs in this publication to identify yields or other measurements that are, or are not statistically different. When the same letter appears next to the yield or other measureable condition of two or more treatments, the difference between them is not statistically significant.

The SMaRT program designs and analyzes field research trials enabling Michigan soybean producers to reliably evaluate the performance of new products, equipment and practices on their farms. In many cases, a given trial like planting populations will be conducted at multiple locations and over multiple years. This greatly improves the reliability of the information produced.

2011 SMaRT Planting Population Trial

Purpose: Increasing seed costs have motivated soybean producers to identify the most profitable planting populations for their farms. The purpose of this project was to evaluate how various planting populations affect soybean yields and profitability.

Procedure: Four planting populations were compared in a randomized complete block experimental design at six locations. Each population was planted in four replications at the Cass, Monroe, Washtenaw and Lenawee locations, and in three replications at the Hillsdale location. Four of the six sites were planted in 15" rows in an effort to fine-tune planting populations in this row spacing.

Yield (bushels per acre)								
Planting Population	**Cass**	**Monroe**	**Washtenaw**	**Lenawee**	**Lenawee**	**Hillsdale**	***Average (5 locations)**	****Gross Minus Seed Costs**
120,000	50.8 a	42.6 a	49.5 a	43.2 a	52.8 a	53.7 b	47.8 a	$497
140,000	50.5 a	43.0 a	49.5 a	40.5 a	54.4 a	55.1 b	47.6 a	$488
160,000	48.3 b	45.2 a	49.4 a	39.9 a	53.6 a	58.2 a	47.3 a	$477
180,000	50.1 ab	43.0 a	50.8 a	39.2 a	53.8 a	57.1 a	47.4 a	$471
C.V. %	2.6	4.7	6.4	8.5	3.6	1.9	5.3	
LSD 0.05	2.1	3.3	5.1	5.5	3.1	2.1	1.6	

*The Hillsdale site was not included in the combined analysis as only 3 replications were harvested.
** Assumptions: 2011-2012 marketing year price of $11.30 per bushel and seed costs of $50.00 per 140,000 seeds.

Population (30 days after planting)							
Planting Population	**Cass**	**Monroe**	**Washtenaw**	**Lenawee**	**Hillsdale**	***Average**	**Percent Stand Loss**
120,000	96,875	65,667	104,250	110,750	100,666	95,642	20.3
140,000	115,625	72,233	126,500	122,375	127,220	112,791	19.4
160,000	130,250	85,365	148,625	138,625	140,553	128,684	19.5
180,000	134,125	106,104	162,000	152,500	158,996	142,745	20.7

***Plant population counts from the first Lenawee County site were not included.

Results: Planting population did not affect soybean yields when the results of the first five trials were combined. However, at the Hillsdale location, the two highest populations yielded significantly more than the lowest population. At this site the 160,000 population produced yields that were significantly higher than the 120,000 and the 140,000 populations. At the Cass County location, the 160,000 planting population produced the lowest yield and was significantly lower than the 120,000 and the 140,000 planting populations. Because the yields were essentially equal for all of the planting populations when the locations were combined, the lowest seeding rate was the most profitable in 2011.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

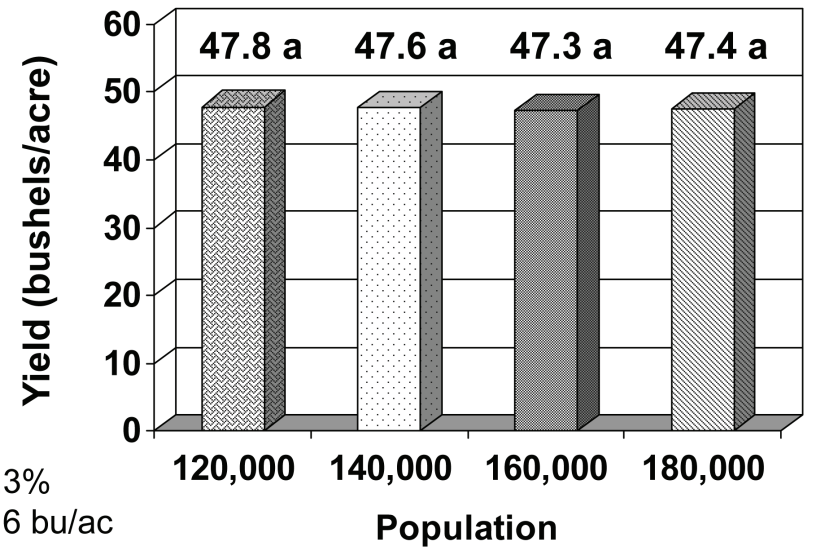
We appreciate the assistance provided by the cooperating farmers.

2011 SMaRT Planting Population Trial Locations

2011 SMaRT Planting Population Trial

Planting Population Effects on Soybean Yield

(average of 5 locations)



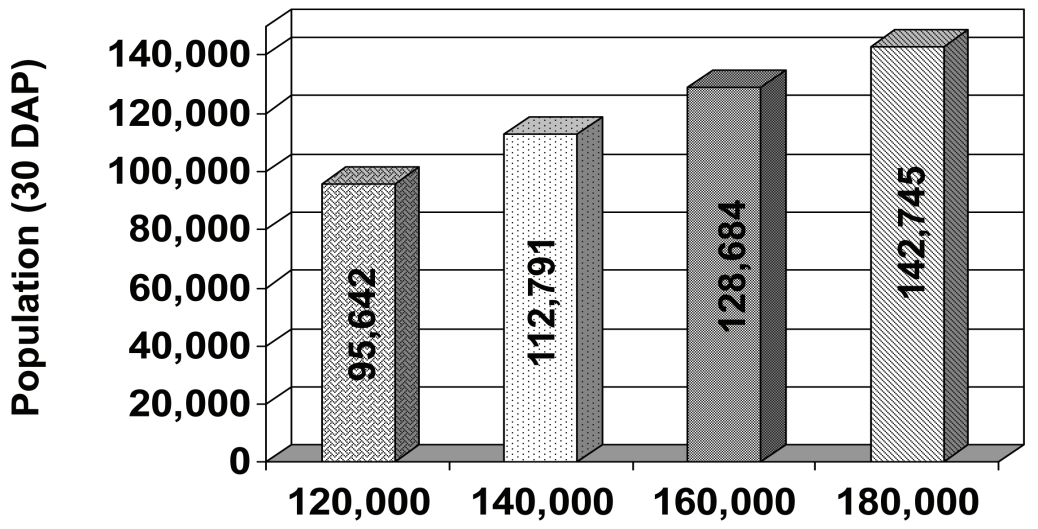
C.V. = 5.3%

LSD $_{0.05}$ = 1.6 bu/ac

2011 Data

2011 Plant Populations (30 Days After Planting)

(average of 5 locations)



no statistical data available

Planting Population

2011 Data

Planting Population Effects on Plant Mortality 30 Days After Planting in 2011

(average of 5 locations)

Planting Population	120,000	140,000	160,000	180,000
Plant Mortality (%)	20.3	19.4	19.5	20.7

no statistical data available

2011 SMaRT Planting Population Trial

Planting Population Effects on Income

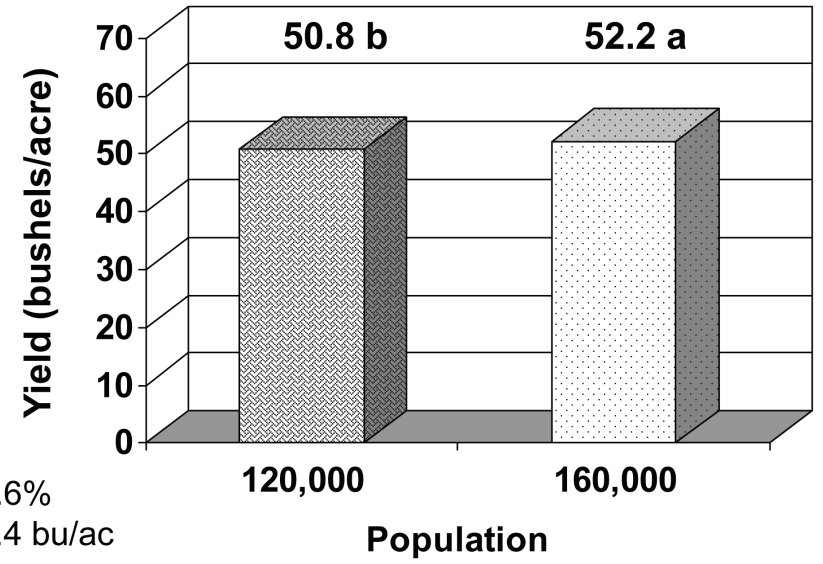
(average of 5 locations)

Planting Population	120,000	140,000	160,000	180,000
Average yield (bu/ac)	47.8	47.6	47.3	47.4
Gross income ($/ac)	$540	$538	$534	$535
Seed cost ($/ac)	$43	$50	$57	$64
Gross minus seed ($/ac)	**$497**	**$488**	**$477**	**$471**

Assumptions: Soybean price = $11.30/bu
Seed cost = $50/140,000 seeds

2011 Data

Planting Population Effects on Soybean Yield in 15 Inch Rows in 2010 and 2011 (average of 9 locations)



C.V. = 5.6%
LSD $_{0.05}$ = 1.4 bu/ac

Note: This two-year data summary was available where only these two populations occured in 15" row spacing.

Planting Population Effects on Income (15 inch Rows from 2010 & 2011)

Planting Population	120,000	160,000
Average yield (bu/ac)	50.8	52.2
Gross income ($/ac)	$574	$590
Seed cost ($/ac)	$43	$57
Gross minus seed ($/ac)	**$531**	**$533**

Assumptions: Soybean price = $11.30/bu
Seed cost = $50/140,000 seeds

NACHURS Pop-Up Fertilizer

Purpose: Michigan soybean producers have identified the use of pop-up fertilizer as a potential way to improve soybean yield and profitability. This project was designed to evaluate the effect of pop-up fertilizer on soybean yields.

Procedure: A liquid fertilizer (NACHURS 2-20-18) applied in the seed furrow was compared to an unfertilized control in a randomized complete block experimental design at eight locations. The pop-up fertilizer was applied at the following rates (2 gallons per acre in 30" rows and 4 gallons per acre in 15" rows).

County	Planting Date	Soil Test Phosphorus (ppm)	Soil Test Potassium (ppm)	CEC meq/100 g	NACHURS 2-20-18 Yield (bu/ac)	Control Yield (bu/ac)	C.V. (%)	LSD 0.05
Sanilac	5/10/2011	79	188	8.3	61.0 a	57.9 b	2.1	2.8
Sanilac	5/7/2011	27	111	12.2	70.4 a	70.2 a	4.9	7.7
Iosco	6/4/2011	48	164	5	44.8 a	43.7 a	9.5	9.5
Shiawassee	6/7/2011	47	176	7.8	52.0 a	51.5 a	1.8	2.2
Calhoun	5/11/2011	142	231	7.7	56.2 a	56.9 a	3.1	4.4
Sanilac	6/2/2011	57	202	15.1	39.2 a	38.1 a	3.4	2.7
Lapeer	6/6/2011	43	164	9.6	55.1 a	55.9 a	3.6	4.5
Huron	6/1/2011	73	211	12	59.9 a	61.6 a	3.0	4.1
All sites combined					**54.8 a**	**54.5 a**	**4.3**	**1.2**

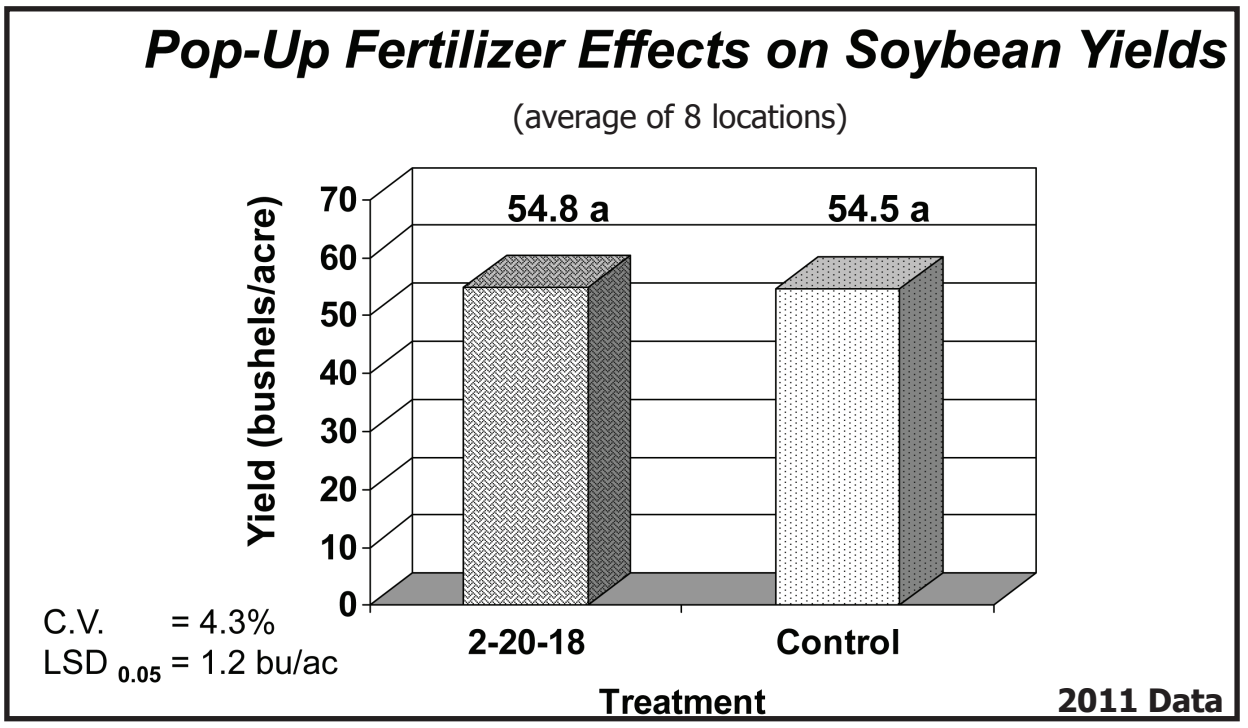
Results: The pop-up fertilizer increased yields significantly at one of the eight locations conducted in 2011. However, the pop-up fertilizer did not significantly increase soybean yields when compared to the unfertilized control at the other seven locations and when all locations were combined. The potential for a pop-up fertilizer to increase soybean yields is greater when phosphorus and/or potassium soil test levels are low or when planting early.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We appreciate the support of NACHURS for providing and delivering the pop-up fertilizer. We also appreciate the assistance of the farmers that cooperated on this project and MSU Extension educators Martin Nagelkirk, Phil Kaatz, and Bob Battel.

2011 SMaRT Pop-Up Fertilizer Trial Locations

NACHURS Pop-Up Fertilizer



Research evaluating the effect of starter/pop-up fertilizers on soybean yields was also conducted in Ontario in 2011. This data is included here because the researchers also evaluated the performance of the NACHURS 2-20-18 in their trials. The 2-20-18 was applied at a rate of 3 gallons per acre in the Ontario trials.

Ontario Soybean Fertility Trial Results (2011)

Treatment	Yield	Adv.
1) Untreated	**57.6**	**ab**
2) 25P w/ Seed	58.4	0.8 ab
3) 25P + 40K Inc.	57.4	- 0.2 ab
4) 25P + 40K (2X2)	57.8	0.2 ab
5) 2-20-18 (3 gal.)	**57.6**	**0.0 ab**
6) 2-20-18 + HiStick	**58.5**	**0.9 ab**

5 Fertility Trials P = 22, K = 107 (ppm)

Source: Horst Bohner, Soybean Specialist, OMAFRA

Results: In 2011, none of the starter/pop-up fertilizer treatments evaluated in Ontario significantly increased soybean yields when compared to the unfertilized control. However, starter/pop-up fertilizer did significantly increase soybean yields in similar research conducted in Ontario in 2010. Responses to starter/pop-up fertilizers are more likely to occur when phosphorus or potassium soil test levels are low and when soils are cool.

Conklin Foliar Package

Purpose: To evaluate the effect that a foliar fertilizer package provided by Conklin has on soybean yields in Michigan.

Procedure: A foliar fertilizer package developed by Conklin was compared to an unfertilized control in a randomized complete block experiment. Analysis of the Conklin foliar fertilizer package was 2-14-16+2% Sulfur+Manganese+Boron+X-Cyto+Kombind+Rainfast+sugar. Each treatment was replicated four times at two locations. The foliar fertilizer package was custom applied at a rate of 2.25 gallons per acre during the V3 to V4 growth stages. The sprayers were driven across all treatments to prevent stand loss due to tire traffic from being a factor. Soil and plant tissue samples were collected from both locations.

County	Soil Test P (ppm)	Soil Test K (ppm)	Soil Test pH	Soil Test CEC	Conklin Foliar Yield (bu/ac)	Unfertilized Yield (bu/ac)	C.V. (%)	LSD 0.05
Monroe	51	208	6	11.9	53.2 a	54.1 a	4.6	5.6
Washtenaw	116	222	6.2	9.4	53.0 a	54.5 a	4.21	5.1
All sites combined.					**53.1 a**	**54.3 a**	**4.41**	**2.9**

Monroe	Tissue Sulfur	Tissue Phosphorus	Tissue Potassium	Tissue Boron	Tissue Manganese
	---------- percent ----------			---------- ppm ----------	
Fertilizer	0.30 a	0.33 a	1.75 a	46.50 a	39.75 a
Control	0.31 a	0.32 a	1.70 a	43.50 a	39.25 a
C.V. (%)	3.46	6.47	11.58	7.48	7.94
LSD 0.05	0.02	0.05	0.45	7.58	7.06

Washtenaw	Tissue Sulfur	Tissue Phosphorus	Tissue Potassium	Tissue Boron	Tissue Manganese
	---------- percent ----------			---------- ppm ----------	
Fertilizer	0.30 a	0.34 a	2.05 a	52.50 a	68.75 a
Control	0.30 a	0.35 a	2.03 a	42.50 a	82.50 a
C.V. (%)	2.98	1.18	2.96	11.47	21.23
LSD 0.05	0.02	0.01	0.14	12.26	36.13

Results: There were no significant differences in yields between the Conklin foliar fertilizer package and the unfertilized control at the two trial locations. The untreated control treatment was more profitable than the foliar fertilizer treatment at these locations. The difference between the two treatments was the cost of the fertilizer plus application costs.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We want to express our appreciation to Conklin for providing and delivering the foliar fertilizer package. We also appreciate the assistance provided by the cooperating farmers and Ned Birkey.

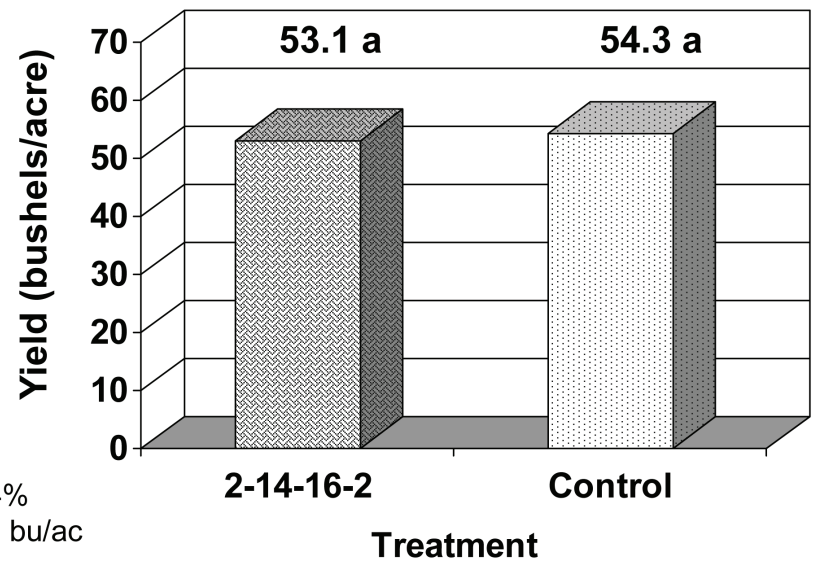
Conklin Foliar Package

2011 Conklin Foliar Fertilizer Trial Locations

Each bushel of soybeans can be made into 1.5 gallons of biodiesel.

Conklin Foliar Fertilizer Effects on Soybean Yield

(average of 2 locations)



C.V. = 4.4%

$LSD_{0.05}$ = 2.9 bu/ac

2011 Data

NACHURS Boron Foliar Fertilizer

Purpose: Past research has shown that 0.25 lbs. of actual boron per acre applied at the R1 growth stage improved soybean yields by 1.4 bushels per acre. However this research was conducted across many different soils types and Boron is most likely to be limiting in coarse-textured soils. This project was designed to evaluate the effect that a single application of a Boron foliar fertilizer would have on soybean yields when grown on coarse-textured soils.

Procedure: A single application of a NACHURS foliar fertilizer containing 10% Boron was compared to an unfertilized control in a randomized complete block experimental design at four locations. The foliar fertilizer was applied at one quart per acre at the R1 growth stage. Sprayers were driven across the unfertilized control treatment at all locations to eliminate tire traffic from being a factor. Soil samples were collected from the Tuscola site to measure the available Boron levels. The available Boron levels in the soil were very low (0.2 ppm) at this site. However, plant tissue sampling showed that the boron levels in both the fertilized and the unfertilized treatments were well above the critical concentration level for Boron at all locations.

Treatment	Tuscola	Kalamazoo	Berrien	Cass	**Average
	Yield (bushels/acre)				
Boron	45.8 a	55.1 a	64.5 a	37.5 a	50.5 a
Control	45.0 a	55.0 a	68.2 a	35.9 a	50.0 a
C.V. (%)	5.0	2.03	6.6	1.8	3.6
LSD 0.05	5.1	2.5	15.3	8.3	2.2

** The average does not include the Berrien and Cass County locations due to a reduced number of replications at these sites.

Results: A foliar application of boron did not significantly increase soybean yields at four sites in 2011. This was true even though three of the trials (Tuscola, Kalamazoo, and Cass) were conducted on sites having coarse-textured soils which are susceptible to boron losses through leaching.

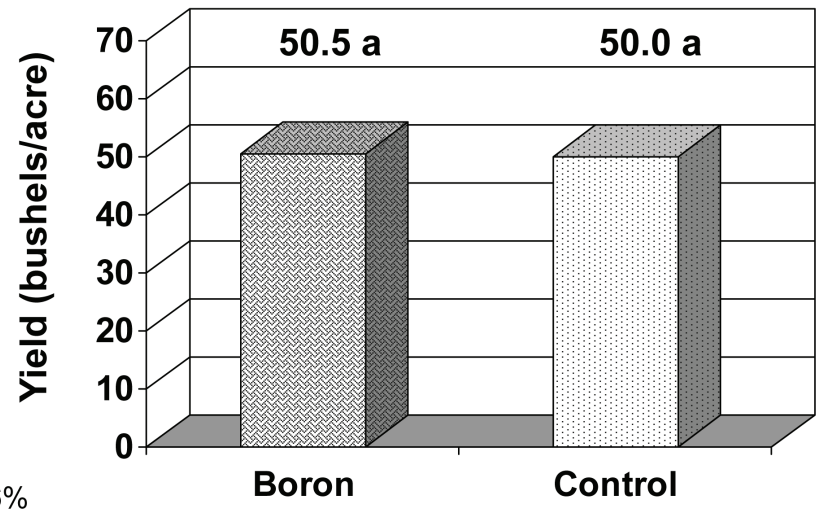
We appreciate NACHURS for providing and delivering the boron fertilizer and the assistance of the cooperating farmers.

2011 Boron Foliar Fertilizer Trial Locations

Like us on Facebook for up-to-date soybean information.

Boron Foliar Fertilizer Effects on Soybean Yield

(average of 2 locations)



C.V. = 3.6%

LSD $_{0.05}$ = 2.2 bu/ac

2011 Data

Center for Excellence (CfE) Foliar Fertilizer Trials

Purpose: There is interest in foliar feeding soybeans as a way to increase soybean yields and profitability. The purpose of this trial was to evaluate the performance of a foliar fertilizer package (K-Man) marketed by Widmer and Associates.

Procedure: A foliar fertilizer package was compared to an unfertilized control in a randomized complete block experimental design at two locations in Lenawee County. The analysis of the foliar fertilizer package marketed as K-Man is 0.46 N, 0.91 P2O5, 2.48 K2O, 0.367 Ca, 0.137 Mg, 0.046 Zn, 0.6 Mn, 0.065 Bo + Bio-forge. The fertilizer was applied in two applications at a rate of 3 gallons per acre. The first application was applied at the V2 to V3 growth stage and the second application was made 14 to 21 days later. The treatments were replicated seven times at location #1 and three times at location # 2.

Location	K-Man	Control	C.V. (%)	LSD 0.05
	Yield (bu/ac)			
#1 Lenawee	49.8 a	49.7 a	2.4	1.6
#2 Lenawee	55.3 a	50.7 b	1.6	3.0

Results: The foliar fertilizer package did not improve soybean yields at the first location. However, yields were significantly improved by the foliar fertilizer package at the second location. Further research is required to determine why the second location responded to the foliar fertilizer. The most logical explanation is that the soil was deficient in one or more nutrients supplied by the foliar fertilizer. This was the case at the second location. The phosphorus soil test levels were low and phosphorus fertilizer would have been recommended prior to planting soybeans at this site.

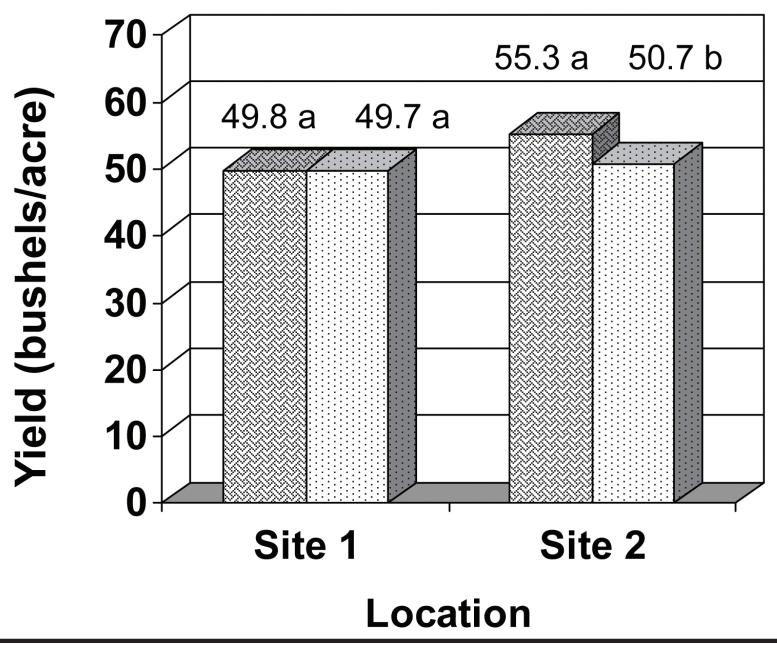
We appreciate Widmer and Associates for providing product and delivery of the product as well as the assistance provided by the cooperating farmers and the CfE's Tom Van Wagner.

Center for Excellence (CfE) Foliar Fertilizer Trials

2011 Conklin Foliar Fertilizer Trial Locations

16.86% of U.S. soybean is used for human consumption. Nearly 72% of the soymeal from soybeans grown is used as animal feed.

Foliar Fertilizer Effects on Soybean Yield (2 locations at the Center for Excellence)



Site 1 C.V. = 2.4%
Site 1 $LSD_{0.05}$ = 1.6 bu/ac

Site 2 C.V. = 1.6%
Site 2 $LSD_{0.05}$ = 3.0 bu/ac

2011 Data

Wilbur Ellis Foliar NDemand High End 26-0-0

Purpose: To evaluate the effect that NDemand High End 26-0-0, a commercially available foliar fertilizer marketed by Wilbur Ellis has on soybean yields in Michigan.

Procedure: NDemand High End 26-0-0 was compared to an unfertilized control in a randomized complete block experiment. Each treatment was replicated four times at eight locations. The NDemand was applied at one gallon per acre between R2 and R4. Applications were made in the morning or the evening with at least 15 gallons of water per acre. Spray pressures were maintained at 40 psi and sprayer ground speeds did not exceed 10 mph. The sprayers were driven across all treatments to prevent stand loss due to tire traffic from being a factor.

County	NDemand High End Yield (bu/ac)	Unfertilized Control Yield (bu/ac)	Difference	C.V. (%)	LSD 0.05
Sanilac	42.1 a	38.1 b	4.00	3.87	3.49
Huron	60.7 a	61.6 a	-0.85	2.46	3.38
Lapeer	55.4 a	55.4 a	0.00	0.79	0.98
Sanilac	33.0 a	33.0 a	0.00	1.75	1.30
Washtenaw	56.2 a	54.8 a	1.35	3.39	4.24
Monroe	50.6 a	49.2 a	1.37	7.03	7.88
Isabella	65.6 a	67.0 a	-1.41	2.27	3.39
Isabella	51.4 a	52.2 a	-0.78	0.68	0.79
All sites combined	**51.85 a**	**51.4 a**	**0.46**	**3.31**	**0.88**

Results: The NDemand High End 26-0-0 produced a significantly higher soybean yield than the unfertilized control at one of the eight locations. However, there were no significant differences in yields between the NDemand High End 26-0-0 and the unfertilized control at the other seven locations or when all locations were combined.

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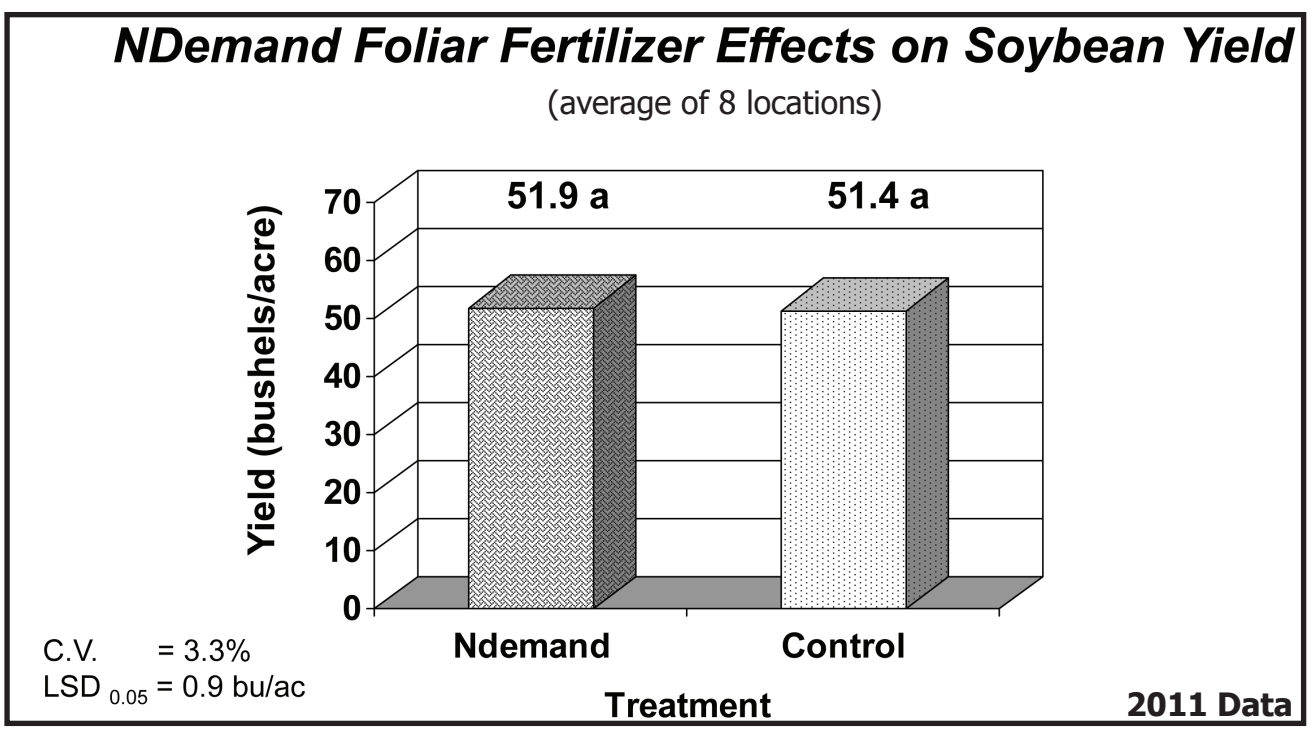
We want to express our appreciation to Wilbur Ellis for providing and delivering the NDemand High End 26-0-0. We also appreciate the assistance provided by the cooperating farmers, Ned Birkey, Paul Gross, and Bob Battel.

2011 NDemand Fertilizer Trial Locations



Pre-Plant Nitrogen

Purpose: This trial evaluated the effect that pre-plant nitrogen fertilizer has on soybean yields.

Procedure: A pre-plant nitrogen fertilizer application consisting 100 lbs. of 46-0-0 per acre and 100 lbs. of 21-0-0-26 per acre was compared to an unfertilized control in a randomized complete block experimental design. The treatments were replicated four times at a single location in Sanilac County.

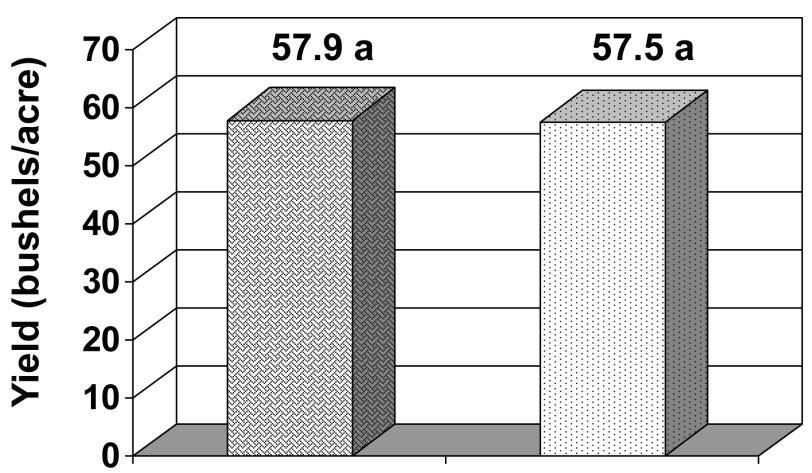
Treatment	Protein (%)	Yield (bushels per acre)
Nitrogen Fertilizer	36.4 a	57.9 a
Unfertilized Control	36.6 a	57.5 a
C.V.	0.8	4.2
LSD 0.05	0.7	5.5

Results: The pre-plant nitrogen fertilizer treatment did not significantly increase soybean yields or protein content when compared to an unfertilized control at this site. These results are consistent with those produced by numerous research trials evaluating nitrogen fertilizer effects on soybeans. Nitrogen fertilizer has been shown to increase soybean yields in some cases but rarely increased net income when compared to an unfertilized control.

We want to express appreciation to the cooperating farmers.

2011 Pre-Plant Nitrogen Fertilizer Trial Location

Pre-Plant Nitrogen Fertilizer Effects on Soybean Yield



C.V. = 4.2%
LSD $_{0.05}$ = 5.5 bu/ac

2011 Data

In-Season Nitrogen at R3

Purpose: Research generated at Kansas State University demonstrated a significant yield increase from an in-season application of nitrogen on coarse-textured irrigated soils. This project was designed to evaluate the effect that 21 lbs. of nitrogen per acre applied at R3 has on soybean yields.

Procedure: An in-season application of nitrogen fertilizer was compared to an unfertilized control in a randomized complete block experimental design at two locations. 21 pounds of actual nitrogen was applied at the R3 growth stage to soybeans grown on coarse-textured irrigated soils. Each treatment was replicated four times. 21-0-0-26 was used at location #1 and 28% UAN was applied at location #2.

County	Nitrogen Plant Tissue Nitrogen (%)	Control Plant Tissue Nitrogen (%)	C.V. (%)	LSD 0.05	Nitrogen Yield (bu/ac)	Control Yield (bu/ac)	C.V. (%)	LSD 0.05
#1 St. Joseph	5.24 a	5.35 a	4.07	0.49	83.8 a	83.6 a	3.8	7.1
#2 St. Joseph*					67.9 a	67.4 a	1.7	2.6

*Plant tissue samples were not collected at this location.

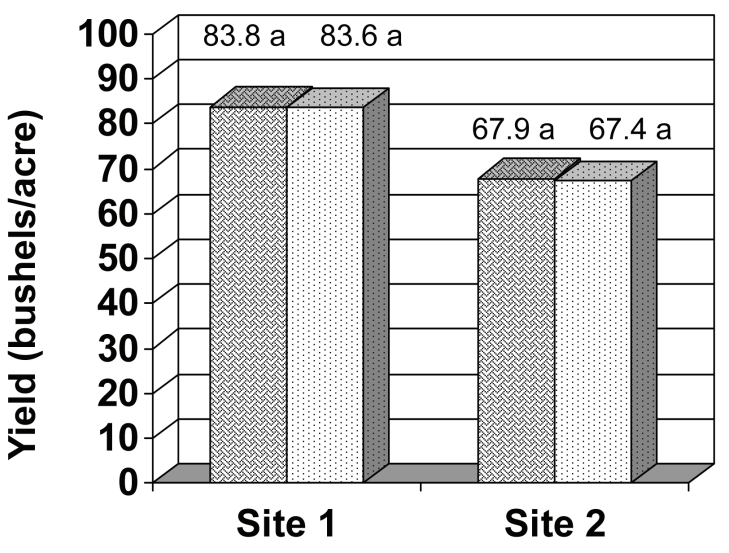
Results: Nitrogen fertilizer applied at the R3 growth stage did not increase soybean yields at either of the two locations in 2011. In 2012 the nitrogen fertilizer will be applied at the beginning of the R3 growth stage. These trials show that high soybean yields can be attained on coarse-textured, irrigated soils without the addition of nitrogen fertilizer.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We appreciate the assistance of the farmers that cooperated on this project and MSU Extension educators Lyndon Kelley and Maury Kaercher.

2011 In-Season Nitrogen Fertilizer Trial Locations

In-Season Nitrogen Fertilizer Effects on Soybean Yield



Site 1 C.V. = 3.8%
Site 1 LSD $_{0.05}$ = 7.1 bu/ac

Site 2 C.V. = 1.7%
Site 2 LSD $_{0.05}$ = 2.6 bu/ac

2011 Data

Broadcast Potassium Fertilizer Trial

Purpose: Potassium is a critical nutrient to producing high soybean yields and the potential for potassium to leach beyond to root zone increases significantly in coarse-textured soils. Because of this, MSU soil fertility specialists do not recommend applying potassium fertilizer in the fall on soils having cation exchange capacities less than 6 meq/100g.

The purpose of this trial was to evaluate the effect of spring potassium fertilizer rates on soybean yields produced on coarse-textured soils. This is one of the SMaRT trials conducted in 2011 aimed at increasing irrigated soybean yields.

Procedure: Two potassium fertilizer application rates (100 lbs. of 0-0-60 and 200 lbs. of 0-0-60 per acre) were compared to an unfertilized control in a randomized complete block experimental design at one location. The potassium soil test level at the site was 100 ppm and the CEC was 4.3 meq/100g.

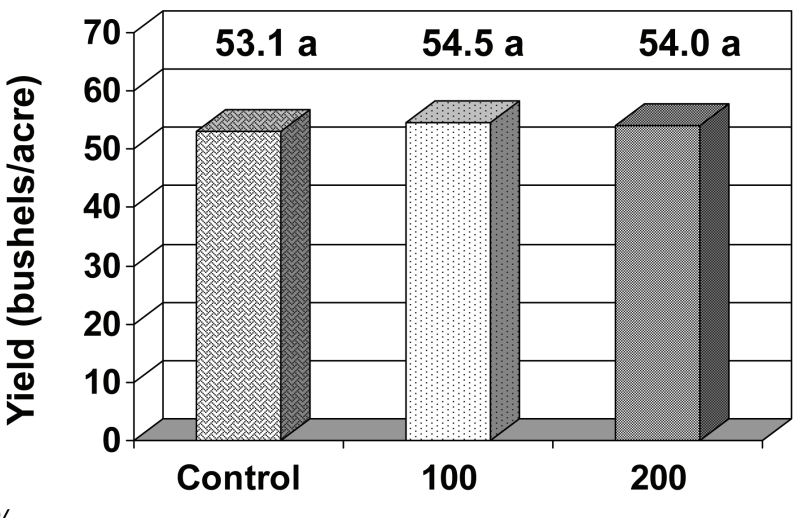
Treatment	Yield (bu/ac)
200	54.0 a
100	54.5 a
Control	53.1 a
C.V. (%)	6.3
LSD 0.05	5.9

Results: The spring broadcast applications of potassium did not significantly increase soybean yields when compared to the unfertilized control. This was surprising given all the rain that occurred this spring and the fact that the MSU fertilizer recommendation called for 85 lbs. of K20 or 142 lbs. of 0-0-60 per acre. The soybean yields did not reach the producer's yield goal of 60 bushels per acre.

We appreciate the assistance of the cooperating farmer.

2011 Potassium Fertilizer Trial Location

Broadcast Potassium Fertilizer Effects on Soybean Yield



C.V. = 6.3%
LSD $_{0.05}$ = 5.9 bu/ac

2011 Data

Growth Promoter Trial

Purpose: To evaluate the effect that two growth promoter products from Novozymes BioAg Inc. would have on soybean yields in Michigan.

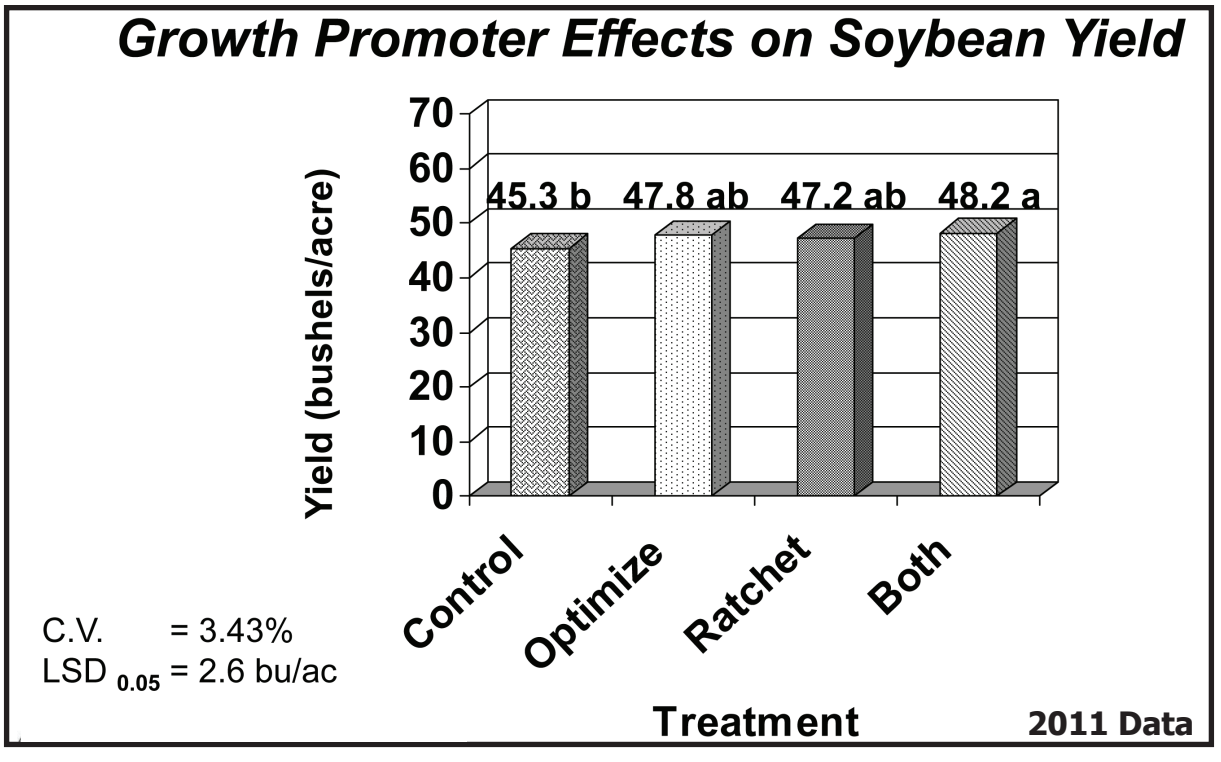
Procedure: A seed treatment containing a growth promoter and an inoculant (Optimize 400), a foliar growth promoter (Ratchet) and the two combined were compared to an untreated control in a randomized complete block experiment. Each treatment was replicated four times at one location. The Ratchet was applied at 4 ounces per acre at the V2 to V6 growth stage. The sprayer was driven across all treatments to prevent stand loss due to tire traffic from being a factor.

Treatment	Yield (bu/ac)	Nodules
Control	45.3 b	8.2 a
Optimize 400	47.8 ab	9.8 a
Ratchet	47.2 ab	8.2 a
Optimize 400 + Ratchet Foliar	48.2 a	9.8
C.V.%	3.4	16.1
LSD 0.05	2.6	2.3

Results: The treatment which consisted of the Optimize 400 followed by the Ratchet produced a significantly higher yield than the untreated control. However the combination treatment did not significantly increase yields when compared to Optimize 400 or the Ratchet as stand alone treatments. The control treatment was not inoculated. MSU recommends inoculating soybean seed whenever soybeans are planted.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We want to express our appreciation to Novozymes BioAg Inc. for providing and delivering the growth promoter products. We also appreciate the assistance provided by the cooperating farmers and Tom Van Wagner at the CfE.



Vertical Tillage Case IH 330

Purpose: Soybean producers are looking for efficient and economical ways to manage corn residue prior to planting soybeans. Vertical tillage has been identified as a possible solution. This project was designed to evaluate vertical tillage effects on soybean yields.

Procedure: A single pass of the CASE IH 330 Turbo Disk conducted prior to planting was compared to no-till in a randomized complete block experimental design. Each treatment was replicated four times at two locations.

Case Turbo Disk 330

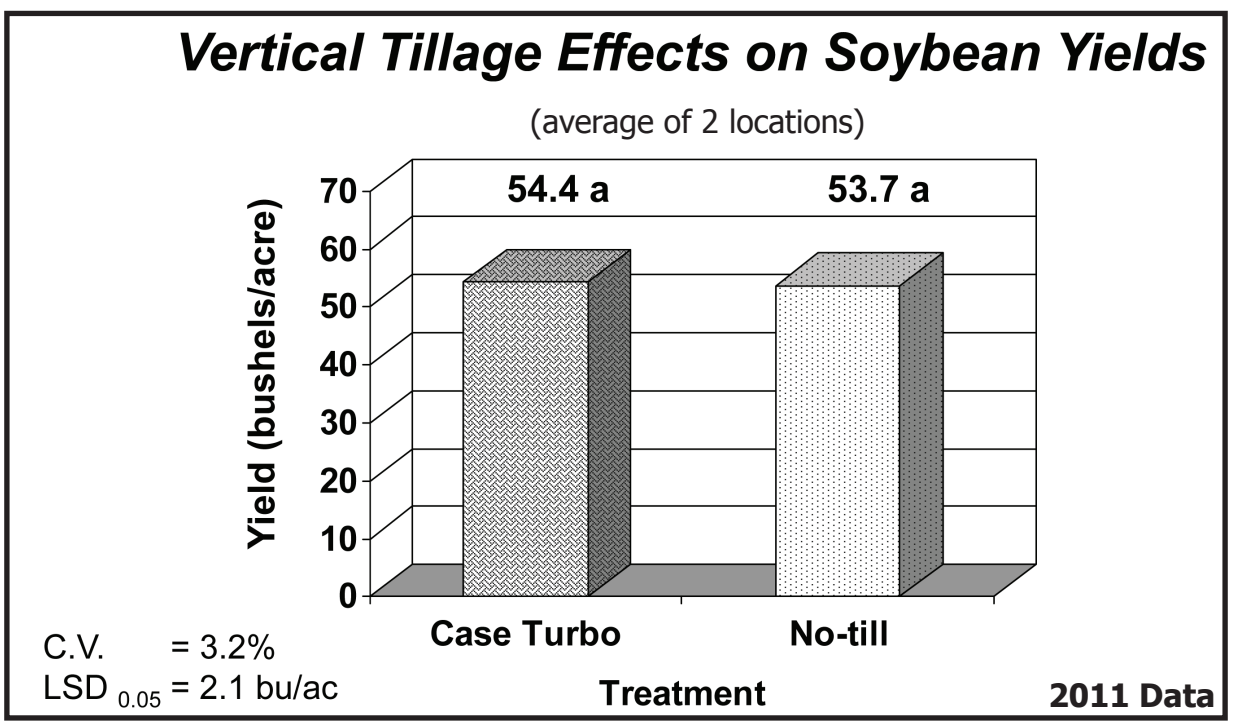
				Case IH Population	No-till Population		CASE IH	No-till			
County	**Planting Date**	**Previous Crop**	**Planter/ Drill**	**30 DAP**	**30 DAP**	**CEC**	**Yield**	**Yield**	**Diff**	**C.V. (%)**	**LSD 0.05**
Clinton	6/9/2011	Corn	JD 1990	144,625	138,125	7	54.3 a	54.0 a	0.3	2.6	3.2
Ingham	6/4/2011	Corn	JD 1790	157,500	153,625	8.2	54.5 a	53.4 a	1.1	3.6	4.4
2011 Combined analysis for all locations				**151,062**	**145,875**		**54.4 a**	**53.7 a**	**0.7**	**3.2**	**2.1**

Results: The spring vertical tillage operations conducted at these sites did not significantly increase soybean yields when compared to no-till. Considerable white mold pressure was present in the tilled strips but absent in the no-till strips at the Clinton County site. The no-till treatment was the most profitable at these sites in 2011. The total cost of owning, operating and maintaining vertical tillage tools is $9.00 per acre. The potential for vertical tillage to increase soybean yields is greater on fine-textured soils and when planting early.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We appreciate the assistance provided by the cooperating farmers and Marilyn Thelen at the Clinton County MSU Extension office.

2011 Vertical Tillage Trial Locations



Tandem Disk Tillage

Purpose: Soybean producers are looking for efficient and profitable ways to manage corn residue prior to planting soybeans. This trial evaluated the effect that a single pass of a tandem disk has on soybean yields.

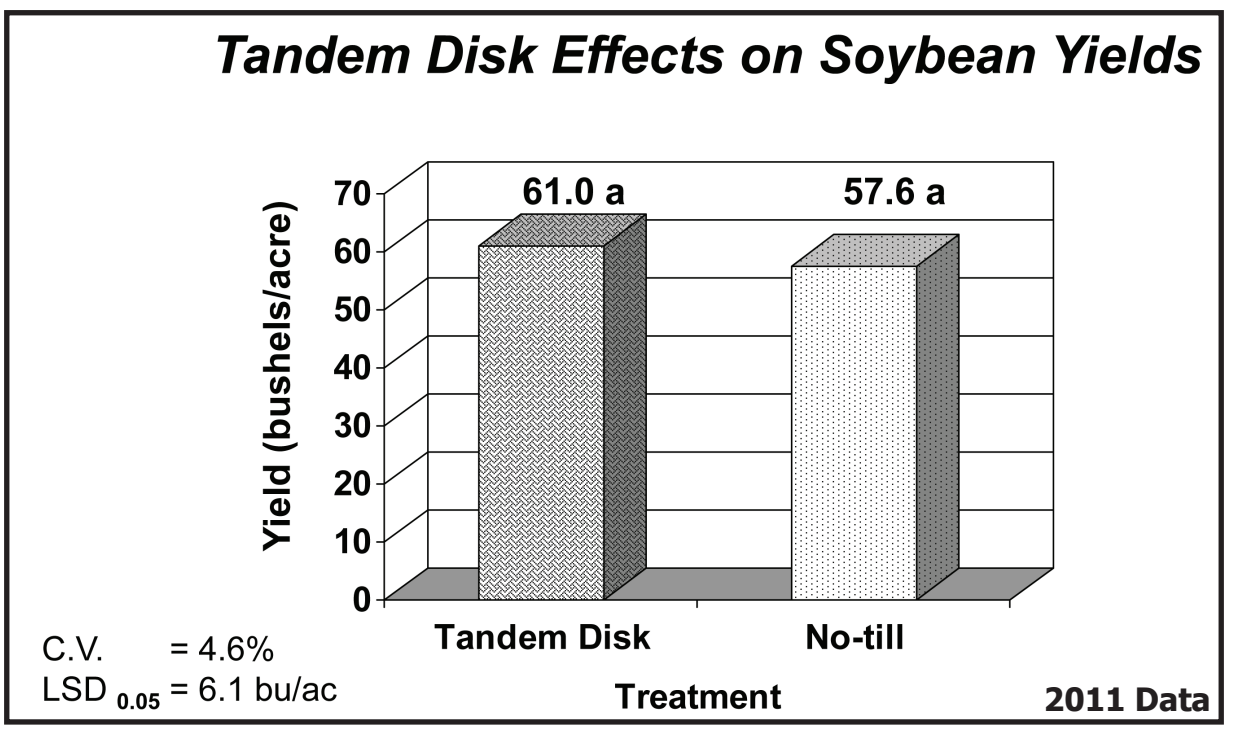
Procedure: A single pass of a tandem disk was compared to no-till in a randomized complete block design at one location in 2011. The disk treatment was performed in the spring and each treatment was replicated four times.

Treatment	Population (30 DAP)	Protein (%)	Oil (%)	Yield (bu/ac)
Disk	157,600	34.9	19.30	61.0
No-till	151,092	34.8	19.35	57.6
C.V. (%)	9.09	0.37	0.37	4.6
LSD 0.05	31,588	0.29	0.16	6.2

Results: A single pass of the tandem disk tended to increase plant populations and soybean yields when compared to the no-till treatment. However, the differences were not statistically significant and cannot be attributed to the tillage treatment with a high degree of confidence. According to MSU Extension, the total cost of owning, operating and maintaining a tandem disk is $9.27 per acre.

We appreciate the assistance provided by the cooperating farmer.

2011 Tandem Disk Trial Location



Center for Excellence Tillage

Purpose: Soybean producers are looking for efficient and profitable ways to manage corn stalks prior to planting soybeans. The purpose of this trial was to evaluate the effect that various tillage systems would have on soybean yields.

Procedure: Four tillage implements were compared to no-till in a randomized complete block experimental design at a single location in Lenawee County. The tillage implements used included a Blue Jet subtiller in-line ripper, a John Deere 512 disk ripper, a Case IH Turbo Disk 330 and an Orthman 1tRIPr strip tillage tool. Each treatment was replicated three times. All plots were planted with Kinze 3600 planter equipped with coulters, row cleaners, and seed firmers.

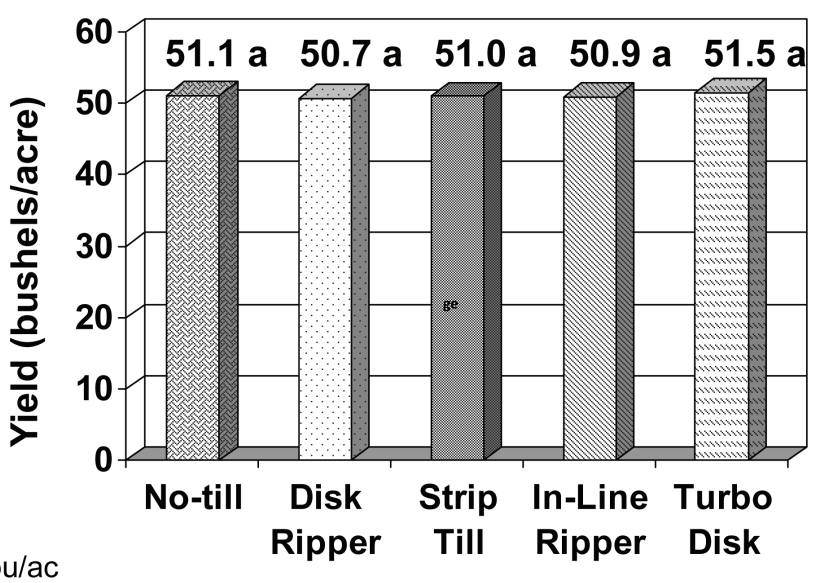
Tillage Treatment	Yield (bu/ac)
No-till	51.1 a
Blue Jet In-line Ripper	50.9 a
Orthman Strip Till	51.0 a
John Deere Disk Ripper	50.7 a
Turbo Disk	51.5 a
C.V. (%)	3.4
LSD 0.05	3.3

Results: None of the tillage implements increased soybean yields when compared to the no-till treatment. Because of this, the no-till treatment was the most profitable tillage option at this site. According to MSU Extension, the total cost of owning, operating, and maintaining tillage implements ranges from $7.35 per acre for a field cultivator to $19.16 per acre for a disk ripper.

We appreciate the assistance provided by the cooperating farmer along with the coordination by Tom Van Wagner at CfE.

2011 CfE Tillage Location

Tillage Effects on Soybean Yield



2011 Data
C.V. = 3.4
LSD $_{0.05}$ = 3.3 bu/ac

Strip Tillage Trial

Purpose: Soybean producers are looking for efficient and profitable ways to manage corn residue prior to planting soybeans. The project was designed to evaluate the effect that operating a strip tillage tool prior to planting soybeans has on soybean yields.

Previous Crop: Corn
Strip Tillage Dates: Fall, 11/5/2010 and Spring, 4/17/2011
Tillage Depth: 3.5 to 4.5 inches
Planting Date: 5/5/2011
Fertilizer: 200 lbs. of 0-0-60 per acre
Row Spacing: 30 inches
Soil Type: Sandy Loam

Procedure: Spring and fall strip tillage treatments were compared to no-tillage in a single randomized complete block experimental design with four replications. The tillage implement used was a Dawn Pluribus set to operate on 30" centers. We measured soil temperatures and plant populations in the spring.

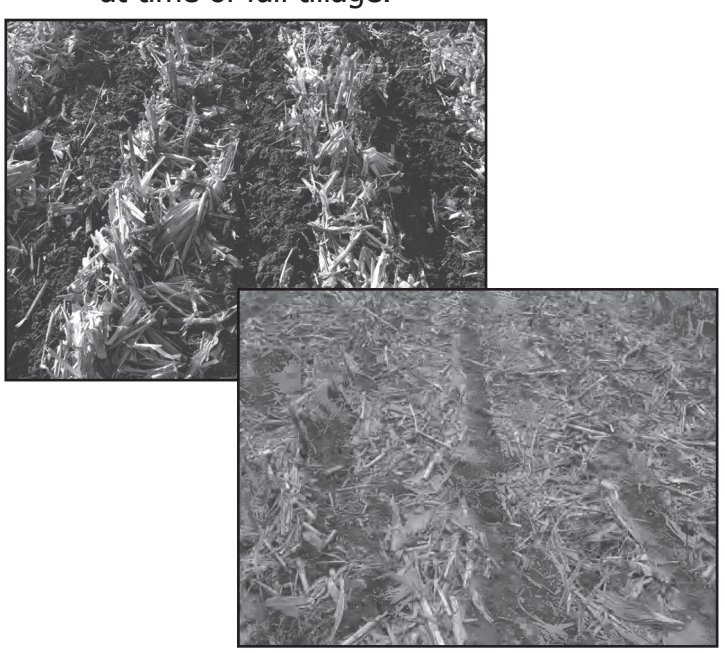
Cass County	Population 6/6/2011	Soil Temp 5/3/2011 (ºF)	Soil Temp 5/8/2011 (ºF)	Yield (bu/ac)
Fall Strip Till	126,500 a	57.5 a	65.0 a	58.3 a
Spring Strip Till	128,500 a	58.5 a	62.5 ab	59.1 a
No-till	125,250 a	53.8 b	60.3 b	55.5 b
C.V. (%)	3.8	3.3	3.2	2.4
LSD 0.05	8,373	3.2	3.5	2.4

Results: Both the fall and the spring strip tillage operations produced significantly higher soybean yields than the no-till treatment. However, the yields produced by the fall and the spring tillage operations were not significantly different from each other. Tillage did not significantly affect plant populations 30 days after planting. Tillage did have a significant effect on soil temperatures in the top two inches near planting.

This research was produced by the SMaRT project (Soybean Management and Research Technology). The SMaRT project was developed to help Michigan producers increase soybean yields and farm profitability. The SMaRT program is a result of your Michigan soybean checkoff investment with the program management a collaborative effort of the checkoff and the MSU Extension.

We appreciate the assistance of the cooperting farmer.

Fall strips - picture taken at time of fall tillage.



Fall strips - picture taken prior to planting.

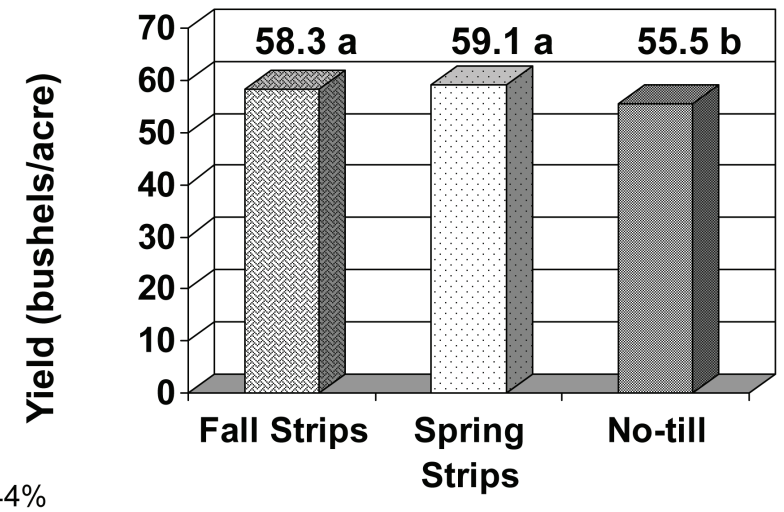
Spring strips picture taken prior to planting.

No-till as pictured prior to planting.

Strip Tillage Trial

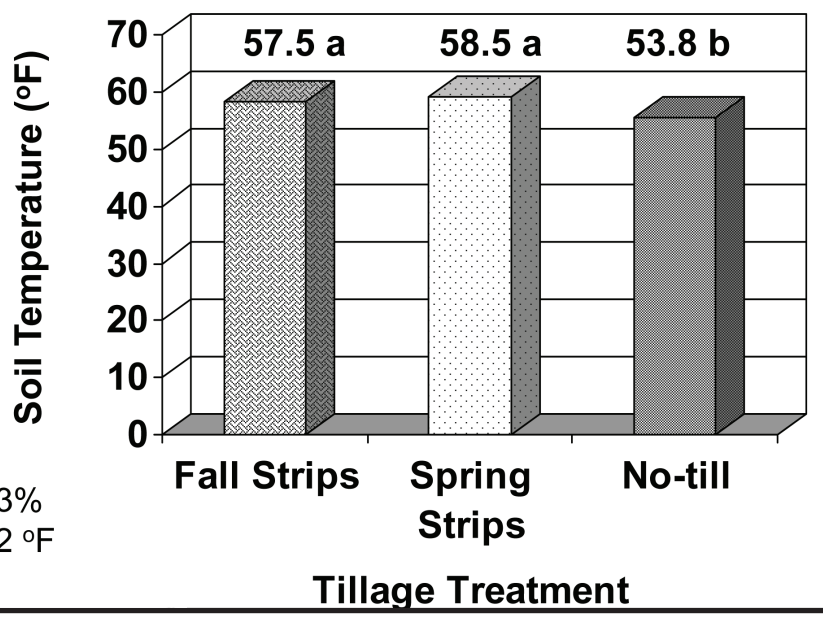
2011 Strip Tillage Trial Location

Strip Tillage Effects on Soybean Yield



C.V. = 2.44%
LSD $_{0.05}$ = 2.44 bu/ac

Strip Tillage Effects on Soil Temperature on May 3rd



C.V. = 3.3%
LSD $_{0.05}$ = 3.2 °F

Leading With A Vision
Thoughts from a Board Member

Dear Michigan Soybean Producers,

On a cold winter day in December a little more than a year ago I met with Keith Reinholt at Das Essenhaus in Middlebury, IN. Since my region is in the SW corner of our state and at that time my area of responsibility was research, Keith felt it would be a good time to talk about an idea he had for continuing and expanding on-farm research in our state to address yield in soybeans or more specifically the lack of increase in yield when compared to corn.

We talked about his vision for the future and the opportunities that may lie ahead for the Michigan Soybean Promotion Committee (MSPC). With the Soybean 2010 program just wrapping up, he suggested finding an extension employee who would be 100% dedicated to soybean research and education. The MSPC would fund 50% of this person's salary, a win-win for extension and the soybean industry. Keith had even thought up an acronym for this program: SMaRT – Soybean Management and Research Technology, a cooperative effort between extension and the soybean industry. We talked at length about on farm testing and, with Michigan being so diverse in soil types and weather patterns, the need for testing to be local. This type of testing in the past was headed up by the extension service but with personnel changes and budget cuts the MSPC may take a more hands-on roll in soybean research, perhaps even hiring our own researchers.

In the time since our meeting many of the things we discussed have come to fruition. We are all well aware of the financial constraints placed upon MSU extension and the many budget cuts which have somewhat handcuffed extension researchers. The MSPC was able to assist in the hiring of Mike Staton who became the County and University Research and Extension Soybean Educator. Mike had previously worked on the Soybean 2010 program and continuing on with someone so well respected, dedicated and professional was a natural fit. The SMaRT program was born. During the 2011 growing season Mike and Keith coordinated many on farm plots throughout the state and results will be forthcoming at research meetings this winter. Although successful, it was quickly realized that this undertaking would be a large one. Even with a summer intern more help would be needed.

In the summer of 2011 more budget cuts and personnel changes came to the MSU extension service. Excellent and well respected longtime employees were being cut and some were choosing retirement as a result of the budget cuts. Late in the fall and early winter of 2011 the MSPC was able to contract with two well respected former extension agents. Ned Birkey who had been the extension representative to the board from Monroe County has been hired to work in the eastern part of the state on soybeans research. Ned has headed up the Soybean Yield Contest and worked on numerous plots and research sites in his part of our state. We were also able to contract with Dan Rajzer the past extension director in Cass County to conduct on-farm research in 10 counties in the southwest part of the state. Dan will conduct up to 20 trials researching such items as best practices for irrigating soybeans, tillage systems, fertility, and weed control. Both are excellent at working with producers and disseminating information in a way the producers can understand and put to work on their farms.

The challenges for the soybean grower in Michigan have taken a decisive turn in a positive direction. We now have four excellent soybean professionals working to make growing soybeans in Michigan more profitable. Keith Reinholt, Mike Staton, Ned Birkey, and Dan Rajzer when coupled with MSU researchers make up about as strong of a group to collaborate and work on production issues that Michigan soybean growers could hope for. I have been fortunate enough to see some of the ideas and projects they plan to undertake and everyone should benefit from their work. If you are interested in participating in a research plot on your farm, please contact one of the four listed above. They will be looking for growers to work with in the coming years throughout the state.

In summary, I think we can be proud of how our checkoff dollars are being invested. In the near future a silver bullet for soybean yields may not be found, but rather a list of well researched recommendations proven by region will equal a steady increase in soybean yields when put into practice. Keith Reinholt led with a vision back on that cold December day and, along with MSPC's employees, continues to do so through your soybean checkoff investment.

Best Wishes,
Herb Miller, MSPC Director