2015 Mississippi County Agriculture Demonstration Report

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Irrigation Efficiency Demonstration:
Computer Hole Selection, Surge, E.T. and Termination Timing

Ray Benson

Problem:

Irrigation is a vital part of production agriculture in Mississippi County. The availability of ground water is important for the state's producers and is a growing concern for environmentalists. As the global demand for food and fiber increases, irrigation will likely continue to expand. Improving irrigation efficiency is necessary to ensure an adequate supply of high quality ground water for crop production and public use in the future.

Methods:

Two loamy sand demonstration fields were identified on a cotton farm 5 miles south of Manila during the 2015 production season (Figure 1). The objective of the demonstration was to compare water used under a typical producer managed irrigation plan to the water used in a field that was managed with an irrigation plan that included a combination of surge-valve, computerized- hole selection and E.T. gage irrigation timing. Field #1(CES managed irrigation) was selected to be irrigated with the combined irrigation tools listed above and field #2, which represented the producer's standard production practice for furrow irrigation. All other production practices were consistent in both fields and were based on recommendations provided to the producer by his crop advisor (Table 1).

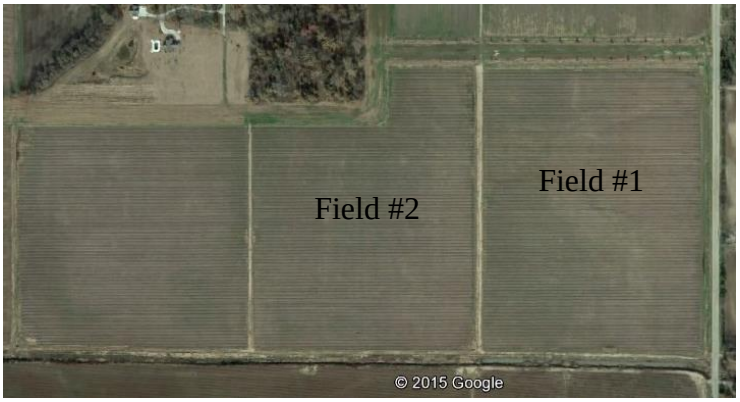


Figure 1. Fields selected for irrigation demonstrations in Mississippi County, 2015.

To monitor the water use under both management programs, risers at each field were fitted with flow meters and readings were recorded prior to the initial irrigation and again after the final irrigation for each field. Total water use was converted to acre inches per field. Delta Plastic's Pipe Planner program was used to determine the correct hole size for the CES managed furrow irrigated field using irrigation efficiency improving tools (Appendix). The producer used his best estimate for determining the hole size on the adjacent field. Water Mark brand moisture sensors and were placed at approximately the mid-way point in the CES managed-field and were installed in the drill on top of the bed. Sensors were installed at 4 depths (6, 12, 18 and 30 inches) and were used as a reference to determine the effectiveness of irrigation events. Both

fields were machine harvested and yields were collected from the producer's on-board John Deere yield monitor.

Table 1. 2015 Mississippi County Irrigation Demonstration Report for Field Managed Using Computer Hole Selection, Surge Valve and E.T. Gage Irrigation Timing.

Practice	Notes	Date	Rate
Planting	Stoneville 4946 B2RR	May 1, 2015	41,000 seeds/A
Installed moisture sensor	Water Mark Sensor	June 9, 2015	1
Check well flow		June 29, 2015	2200 GPM
Set surge-valve	Pro-JR III	June 29, 2015	
Set poly-pipe	15 in pipe	June 29, 2015	
Computer Hole Selection	Pipe planner design	June 29, 2015	1 hole/row
Set ET gage		June 29, 2015	
Irrigation	Furrow (each row)	June 29, 2015	
Irrigation	Furrow (each row)	July 18, 2015	
Cutout	NAWF = 5	July 26, 2015	
Irrigation	Furrow (each row)	July 28, 2015	
Rain		July 29,2015	
Rain		August 5, 2015	
Rain		August 7, 2015	
Rain		August 10, 2015	
Irrigation[1]	Furrow (each row)	August 19, 2015	
Harvest	Both fields harvested and yield monitor data obtained	Ocotober 12, 2015	

[1] Irrigation applied to producer managed field only. CES irrigation demonstration Field was not irrigated.

Results:

Soil moisture sensors in the CES managed field provided evidence that irrigation water was not filling the soil profile at a depth believed necessary to supply adequate moisture for the developing crop (Figure 2).

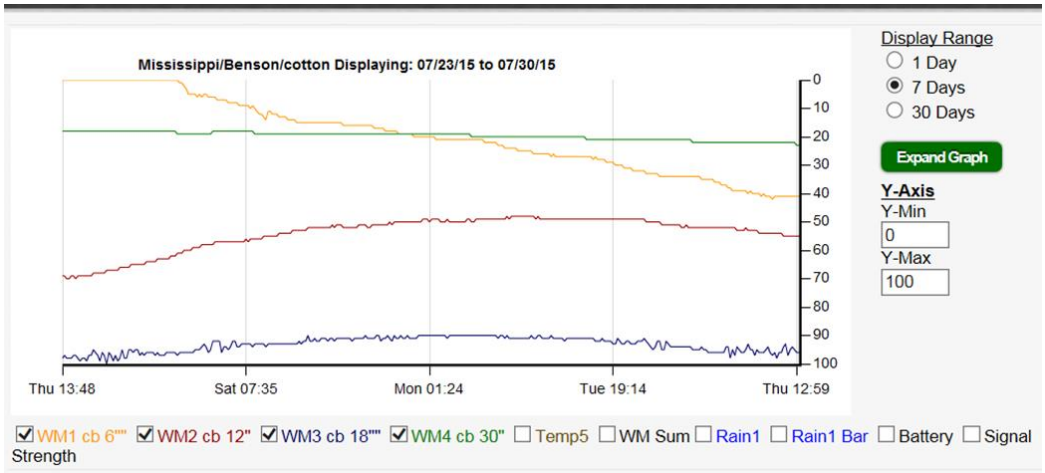


Figure 1. Soil moisture data from 4 depths; Mississippi County irrigation demonstration, 2015.

In the graph, the yellow line represents soil moisture at a 6 inch depth, red is the moisture at 12 inches, blue is 18 inches and the green line is a measure of moisture at a 30 inch depth. As the soil dries, the line will fall and get further from the top of the graph. The near flat slopes of the lines from sensor readings below 6 inches indicate that moisture is neither being added or removed from these depths.

Irrigation applied on June 29, 2015 (Monday in Figure 2.) did not register on soil moisture sensors at any of the four depths. After the June 29th observation, the objective of our program was revised to include adjusting irrigation practices in an attempt to improve water movement into the soil profile. Current irrigation scheduling assumes that water applied during an irrigation evet is sufficient to fill the soil profile throughout the rooting zone. This assumption is the basis for the intervals recommended between irrigations. The recognition that water was not filling the soil profile warranted further investigation and resulted in altering the demonstration protocols in this field. Subsequent irrigations included extending the soak cycle setting on the surge valve to promote a longer saturation period and improve water infiltration into the root zone. Adding additional time to irrigation cycles did not appear to improve the infiltration of water into the root zone (Figure 3). The irrigation applied on July 18, 2015 included an extension of the prescribed soak cycle time. As was seen in earlier irrigations, water did not appear to permeate to the root zone. The additional water applied during this irrigation only appeared to inflate the amount of water that was recorded on the flow meter, but did not improve the moisture status of the soil profile and would therefore, not allow for an increase in time

between irrigations. Water use difference between the two fields therefore, is misleading and likely do not provide a true representation of the potential efficiency improvements of the irrigation tools used in this demonstration.

Figure 3. Soil moisture stats at 4 depts. in the CES managed field; Mississippi County, 2015.

Total water use between the producer's standard irrigation practices and the field managed with CES irrigation tools illustrate the inability of irrigation to fill the soil profile in this demonstration (Figure 4).

Although nearly twice as much water was applied to the CES managed field (6.8 acre inches) compared to the producer's standard practice (3.6 acre inches), soil moisture sensors indicated that very little moisture improvements were achieved at depths below 6 inches. Yield, obtained

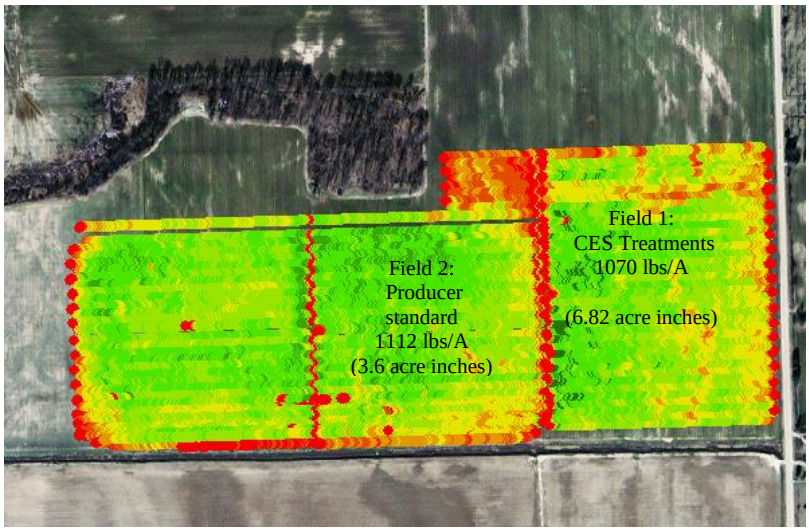


Figure 4. Yield and water use differences between CES managed irrigation and the producer's standard practice.

from the producer's yield monitor, showed little differences between the two fields. The increased water use in the CES managed field was the result of extending irrigation times to facilitate water movement into the soil profile and may not necessarily reflect water usage under typical production irrigation situations. The success of this demonstration was that potential water infiltration problems were identified. Further, more controlled research is needed to address the problems identified in this irrigation demonstration.

Appendix:

PIPE PLANNER

Pipe Planner Irrigation Design Results

Farm Name: Benson
Field Name: Wagner North test field
Plan Name: Wagner North field
Saved: 6/29/2015
Calculated Flow Rate (gpm): 2196.42
Field / Irrigated Acres: 18 / 18

Distribution Uniformity: 96 %
Min. Head Pressure: 1.31 ft
Min. Head Pressure Location: 703 ft
Max Head Pressure: 2.11 ft
Max Head Pressure Location: 0 ft

Gross inches applied	Hours required
2 in	7
3 in	11
4 in	15

Diameter (in)	Pipe Type	Pipe Function	Pipe Length (ft)	Furrows Irrigated	Holes per Furrow	Hole Size (in)	Furrow Count	Starting Hole Location	Ending Hole Location
15.0	10 mil	Furrow Irrigation	0 - 209	EveryFurrow	1	3/4	67	35.795486 -90.182202	35.795773 -90.182202
15.0	10 mil	Furrow Irrigation	212 - 703	EveryFurrow	1	13/16	156	35.795782 -90.182202	35.796452 -90.182202

Use a round tool 1/8 inch in diameter to relieve air that forms at the top of the polytubing. Do not use a tool that could slice the polytubing. If faster furrow flow is detected in wheel-track furrows, punch a 1/8 inch smaller hole in these furrows to achieve more even water distribution. All other tips can be found at 'http://www.deltapl.com/irrigation-resources/'. DO NOT USE A TOOL THAT COULD SLICE THE POLYTUBING!

Plan Notes:

PIPE PLANNER

Pipe Planner Irrigation Design Results

Farm Name: Benson
Field Name: Wagner South Field
Plan Name: Wagner south test
Saved: 6/29/2015
Calculated Flow Rate (gpm): 2192.63
Field / Irrigated Acres: 19 / 19

Distribution Uniformity: 96 %
Min. Head Pressure: 1.18 ft
Min. Head Pressure Location: 742 ft
Max Head Pressure: 2.03 ft
Max Head Pressure Location: 0 ft

Gross inches applied	Hours required
2 in	8
3 in	12
4 in	16

Diameter (in)	Pipe Type	Pipe Function	Pipe Length (ft)	Furrows Irrigated	Holes per Furrow	Hole Size (in)	Furrow Count	Starting Hole Location	Ending Hole Location
15.0	10 mil	Supply	0 - 6	Supply					
15.0	10 mil	Furrow Irrigation	6 - 234	EveryFurrow	1	3/4	73		35.794816 -90.182188
15.0	10 mil	Furrow Irrigation	237 - 742	EveryFurrow	1	13/16	160	35.794807 -90.182188	35.793422 -90.182202

Use a round tool 1/8 inch in diameter to relieve air that forms at the top of the polytubing. Do not use a tool that could slice the polytubing. If faster furrow flow is detected in wheel-track furrows, punch a 1/8 inch smaller hole in these furrows to achieve more even water distribution. All other tips can be found at 'http://www.deltapl.com/irrigation-resources/'. DO NOT USE A TOOL THAT COULD SLICE THE POLYTUBING!

Plan Notes:

Automatic Soybean fungicide and Insecticide Demonstration

Jason Osborn

Purpose:

Many producers make and automatic fungicide application that include an insecticide at R3 in soybeans.

Methods:

To determine if there is a benefit to applying an automatic fungicide and insecticide to soybeans, a field trial was conducted in the southern part of the county. The field was planted and standard cultural practices were followed. Treatments across the field were applied in 40 acre blocks. One block received an application of Quadris Top SB fungicide at a rate of 10 ounces per acre; a second block received an application of Belt insecticide at a rate of 2 ounces per acre. A third block received an application of both Quadris and Belt together at the same 10 ounce and 2 ounce respectively. The final block received no fungicide or insecticide applications. All applications were made with and airplane. Two strips were harvested using the producer's combine and a calibrated yield monitor. The strips were 40 feet wide and 2360 feet long resulting in 2.17 acers per plot. Two strips (A&B) were harvested in the middle of each 40 acre block 100 rows apart. Both strips (A&B) were averaged together for one final yield and adjusted to a per acre basis. The combine speed was a constant 4.0 mph

Results:

See Table 1.

Table 1. Automatic Fungicide and Insecticide Demonstration
Mississippi County 2015

North

West | No Application | Fungicide Application Only | Fungicide and Insecticide Application | Insecticide Application Only | East

South

Plot width	40'	Plot size	2.17 acres				
Plot Length	2360'						
A-110	bu	A-113	bu	A-112	bu	A-102	bu
B-109	bu	B-109	bu	B-109	bu	B-107	bu
Avg-109.5	bu	Avg-111	bu	Avg-110.5	bu	Avg-104.5	bu
YLD 50.4	bu/ac	YLD 51.1	bu/ac	YLD 50.9	bu/ac	YLD 48.2	bu/ac
Extra Cost	$0	Extra Cost	$25.01	Extra Cost	$38.29	Extra Cost	$17.29
Yield Diff.	0	Yield Diff.	0.7 Bu	Yield Diff.	0.5	Yield Diff.	-2.2
Revenue	0	Revenue	$5.25	Revenue	$3.75	Revenue	($16.50)
Profit/Loss	0	Profit/Loss	($19.76)	Profit/Loss	($34.54)	Profit/Loss	($33.79)

* Revenue includes numerical yield differences between treatments and the untreated block adjusted for a 25% rent.
Price per bushel was assumed to be $10.00.

On-farm Corn Variety Demonstration

Jason Osborn

Purpose:

At the County Extension Council meeting, the council continues to request more on farm variety trials. Having more on-farm corn variety demonstrations helps producers and consultants choose more adapted varieties.

Methods:

Identifying growers and working with seed industry representatives and consultants, a corn variety demonstration was established. All field work, including planting and harvest, was performed using the producer's equipment. All cultural practices were based on the producer's standard production practices and were consistent for all corn varieties in the demonstration. Inputs were based on producer recommendations and were not necessary based on University of Arkansas Extension recommendations for corn production.

Results:

Yields for each corn variety were calculated from weights collected from producer's harvested plots using yield monitor data (Table 1).

Table 1.

County:	Mississippi		Corn
Lat/Lon	35.9050389 -90.140591		
County Agent:	Jason Osborn		
Location of Field:	Manila		
Soil Type:	Dundee-Dubbs-Crevasse complex		
Previous Crop:	Corn		
Planting Date:	April 23, 2015		
Row Width:	38 inches		
Planting Population:	33,500		
Irrigation Type	furrow		
Total number of irrigations			
Emergence Date	5/2/2015		
Herbicides:	1 pint Dual	Applied April 26, 2014	
Fertilizer:	250 Units N/ P,K variable rate		
Harvest Date:	September 14-18, 2015		

Table 2 Yield

Hybrid		Adj. Yield[1]	Area Acres	Weight	Yield	% Moisture	Test Weight
DG 2888		N/A					
DG 3660		201.58	0.444	5,036	202.54	15.9	61.2
AgriGold A6659		205.16	0.444	5,089	204.67	15.3	59.8
AgriGold A6573		179.18	0.444	4,398	176.88	14.4	59.8
Cropland 7927		175.60	0.444	4,320	173.75	14.6	58.8
Cropland 6640		196.44	0.444	4,816	193.69	14.3	60.9
Terrell 23HR55		189.40	0.444	4,676	188.06	14.9	58.6
Terrell 24BHR93		174.05	0.444	4,302	173.02	15.0	59.9
Dyna Grow D57VP51		N/A					
Dyna Grow 56VC46		N/A					
Mycogen 797		182.08	0.444	4,506	181.23	15.1	58.8
Mycogen 744		201.22	0.444	4,962	199.57	14.8	57.2
DeKalb DKC 66-87		210.47	0.444	5,184	208.49	14.7	58.7
Dekalb DKC 67-72		204.31	0.444	5,086	204.55	15.6	60.2
Dekalb DKC 64-69		178.53	0.444	4,418	177.69	15.1	58.7
Pioneer P1197		196.20	0.444	4,810	193.45	14.3	59.1
Pioneer P1311		165.63	0.444	4,070	163.69	14.5	56.4
Pioneer P 1319		174.03	0.444	4,232	170.21	13.6	62.3
Pioneer P1602		178.38	0.444	4,358	175.27	14.0	61.7
Pioneer P1730		199.89	0.444	4,872	195.95	13.8	60.8
Pioneer P1916		167.73	0.444	4,146	166.75	15.0	57.2
Pioneer P2160		N/A					
Pioneer P2089		150.59	0.444	3,662	147.28	13.6	62.3
Dekalb DKC 66-87		182.57	0.444	4,450	178.97	13.8	56
Terrell 22BHR43		178.76	0.444	4,332	174.23	13.3	58.1
Terrell 17HR73		171.43	0.444	4,140	166.51	13.0	61.2
Terrell 25BHR26		171.09	0.444	4,146	166.75	13.3	58.8
Terrell 24BHR93		156.58	0.444	3,790	152.43	13.2	58.2
Terrell 23BHR55		135.17	0.444	3,268	131.44	13.1	56.6
Terrell 18BHR84		165.71	0.444	3,988	160.39	12.7	54.6
Terrell 28HR20		189.70	0.444	4,656	187.26	14.4	58.5
Terrell 28HR10		172.95	0.444	4,260	171.33	14.7	59.3
Mycogen 786		182.07	0.444	4,412	177.45	13.3	57.2
Mycogen 797		170.96	0.444	4,162	167.39	13.7	55.8
Mycogen X13813VH		155.63	0.444	3,802	152.91	14.0	55
Mycogen X13759S3		179.30	0.444	4,350	174.95	13.4	55.6
Mycogen X13652VH		188.37	0.444	4,570	183.80	13.4	58.6
Mycogen X14730VH		191.76	0.444	4,674	187.98	13.8	57.8
Mycogen 765		181.91	0.444	4,444	178.73	14.0	58
Mycogen 848		179.67	0.444	4,510	181.39	16.3	56.8
Mycogen X13728VH		183.20	0.444	4,460	179.38	13.7	54.6
DeKalb 62-08		186.85	0.444	4,528	182.11	13.3	56.8
DeKalb 66-59		181.40	0.444	4,468	179.70	14.7	59

DeKalb 63-60AR	191.46	0.444	4,672	187.90	13.9	59.4
DeKalb 64-69	170.61	0.444	4,168	167.63	14.0	58.6
DeKalb 63-60AF	186.78	0.444	4,542	182.67	13.6	59.9
DeKalb 61-88	144.91	0.444	3,528	141.89	13.7	
DeKalb 68-26	184.23	0.444	4,570	183.80	15.3	
DeKalb 66-87	194.97	0.444	4,808	193.37	14.8	
DeKalb 67-72	201.81	0.444	5,000	201.09	15.2	
DeKalb 66-97	195.96	0.444	4,838	194.58	14.9	
DeKalb 67-14	175.15	0.444	4,264	171.49	13.7	
DeKalb 65-71	171.69	0.444	4,320	173.75	16.5	
Syngenta N75H	174.04	0.444	4,312	173.42	15.2	
Syngent N76H	178.54	0.444	4,372	175.84	14.2	
DeKalb 64-69	181.48	0.444	4,470	179.78	14.7	
Syngenta S79Z	187.33	0.444	4,708	189.35	16.4	
Syngenta N78S	167.06	0.444	4,144	166.67	15.3	
Syngenta N79M	160.77	0.444	3,960	159.27	14.7	
Syngenta N83D	166.37	0.444	4,122	165.78	15.2	
Pioneer 2089	172.53	0.444	4,176	167.95	13.2	
Sum Totals	**179.67**		**4,409**	**177.33**	**14.4**	

[1] Yield is adjusted to 15.5% moisture.

Large Plot Potassium Demonstration in Milo – Yield Monitor Data

Ray Benson

Problem:

In an effort to maximize yield, producers often 'push' fertilizer rates beyond current CES recommendations. A soil test based fertilizer program can help maximize profits and reduce the negative environmental consequences of over fertilizing fields. Improving profitability should be the goal of production agriculture, not necessarily achieving the highest yield.

Method:

An on-farm (large plot) demonstration of current potassium fertilizer recommendations was established in Mississippi County during the 2015 production season. Prior to planting, soil samples were collected on 2.5 acre grids. Lab analysis of the samples indicated areas with low soil test levels of potassium (Figure 1). Grain sorghum (cultivar Terral REV 9926) was planted on April 29, 2015. Fertilizer was applied at approximately 2 weeks after stand establishment. Nitrogen and phosphorus rates were constant within the demonstration area, only the per acre rates of potassium (K) were adjusted, and included rates of 0 lbs. per acre, 30 lbs. per acre, 60 lbs. per acre, 90 lbs. per acre and 120 lbs. per acre (Figure 2). All other production inputs were consistent across all treatment strips and were based on the producer's standard practices. The field was machine harvested using the producer's combine and yield was determined using data collected from the on-board John Deere yield monitor (Figure 3).

Results:

Severe winds storms after heading caused excessive lodging throughout this field and most likely resulted in significant yield reductions. Yields ranged from a low of 107 to a high of 122 bushels per acre (Table 1).

Table 1. Yield monitor results from K fertilizer demonstration; Mississippi County, 2015

Treatment Block	Area (Acres)	K applied (lbs./A)	Yield (bu./A)
Block 1 (Green)	0.6	120	107
Block 2 (Yellow)	0.8	90	119
Block 3 (Orange)	0.8	60	114
Block 4 (Red)	0.8	30	116
Block 5 (Bare Soil)	0.8	0	122
Block 6 (Green)	0.6	120	111

The block receiving no K-fertilizer resulted in the highest numerical yield, while the average yield of the blocks fertilized with 120 lbs. K/acre was the lowest yield of all treatments (109 bushels/A). Although lodging may have masked treatment effects in this case, the demonstration does suggest that increasing K application rates may not always provide the best economical return. More research is needed, especially in terms of site-specific recommendations that include fertilizer applications based on soil type and projected yield potential.

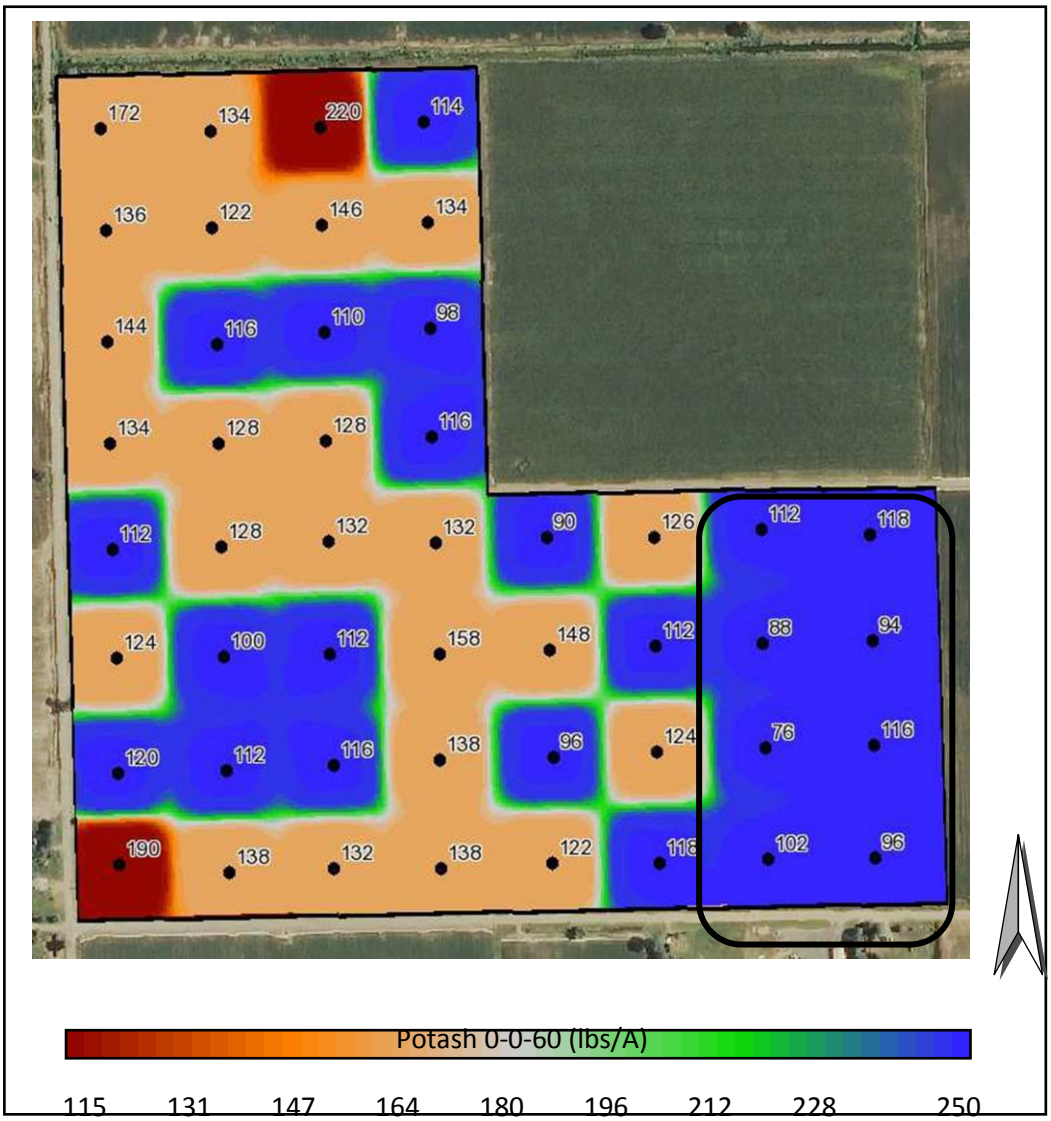


Figure 1. Soil test levels for potassium; Mississippi County, 2015*.

* Blue areas denote sections with low soil test K levels; demonstration area outlined in black.
* Overlay values represent the raw soil nutrient value. This is not the recommendation value.

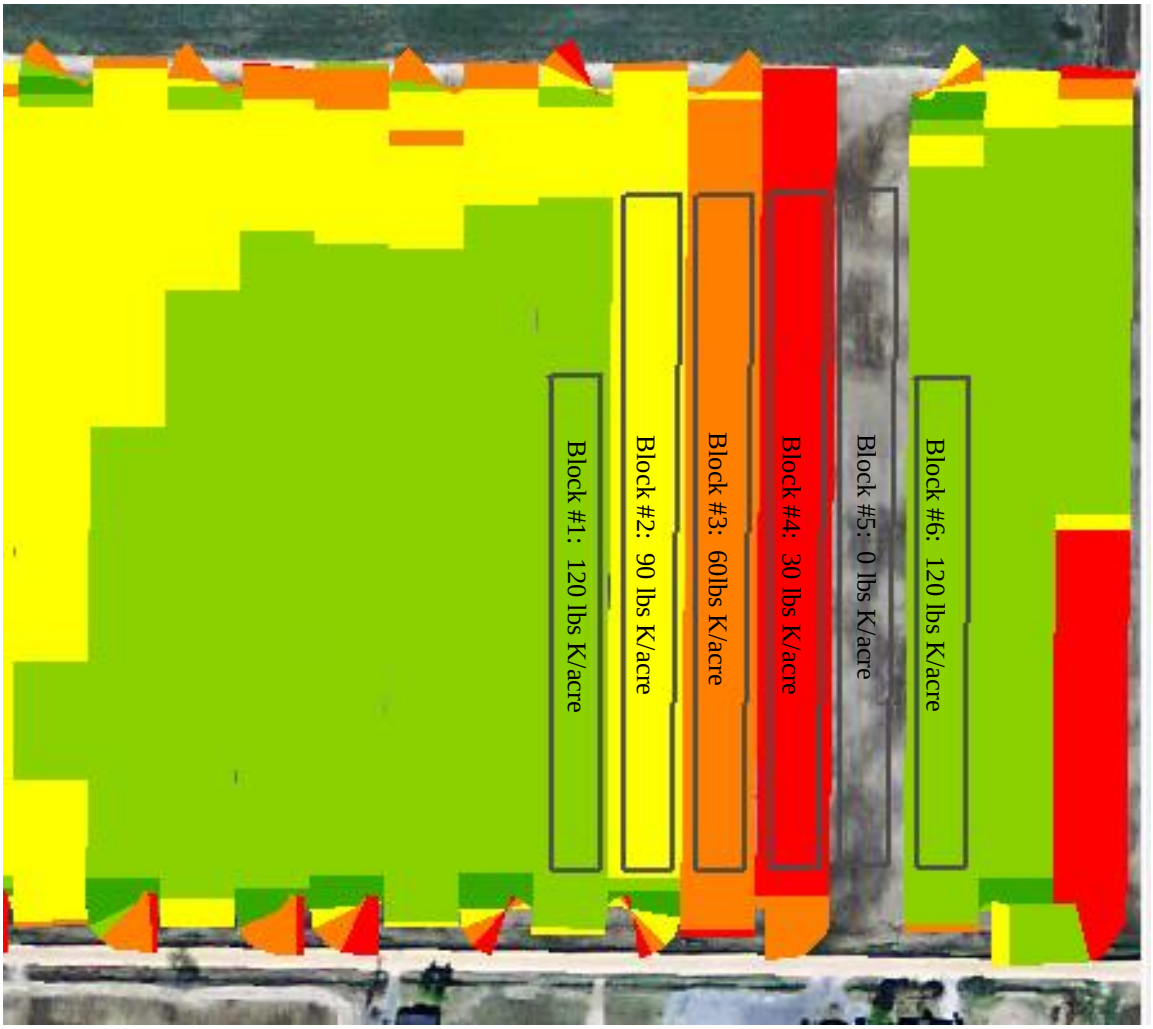


Figure 2. K fertilizer blocks; Mississippi County Demonstration, 2015.

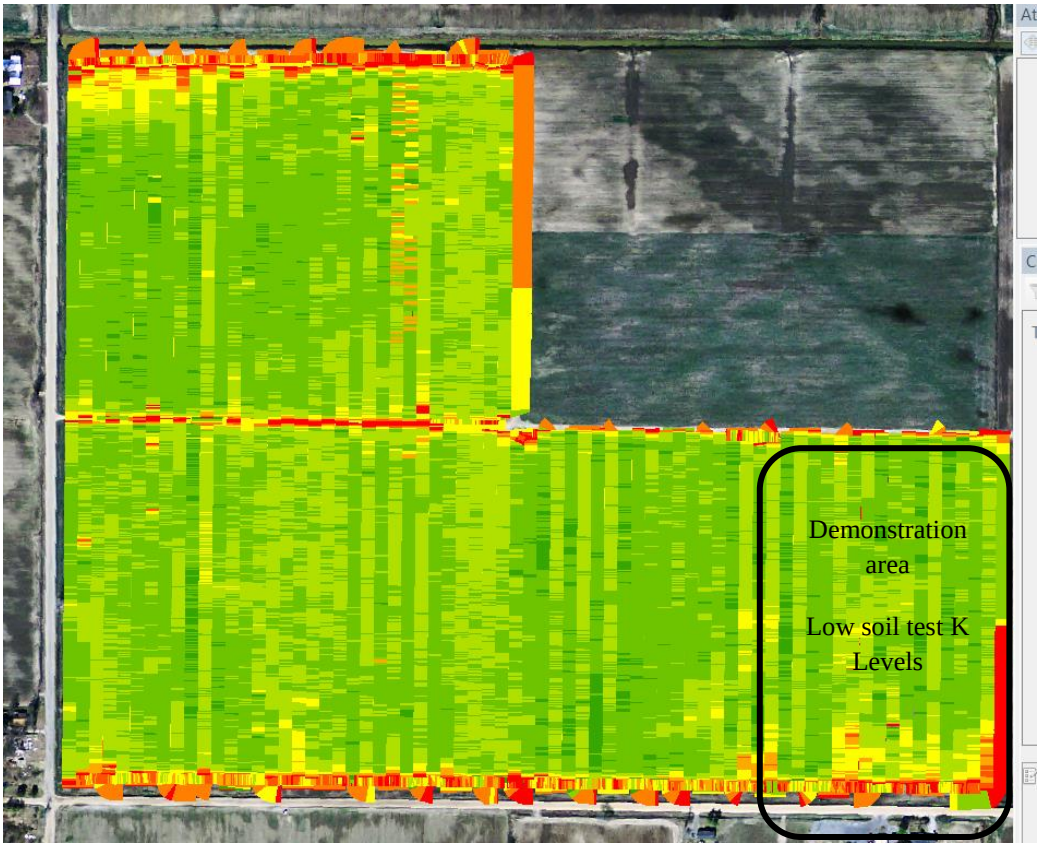


Figure 3. Yield monitor results from potassium strip demonstration; Mississippi County, 2015

Delta District Irrigation Grant Demonstration

Jason Osborn
Terry Hall; cooperating producer

Purpose:

Declining ground water supplies continue to generate much concern about meeting future irrigation needs in Eastern Arkansas. The goal was to increased adoption of computerized hole selection for poly pipe, educate producers on water use efficiency using computerized hole selection programs (CHS), surge valves, and Evapotranspiration Gages (ET Gauge) and better manage our natural resources compared to a control field .

Methods:

5 agriculture agents in the delta district were selected to lead a county cluster composed of 5 counties each. Only 3 irrigation demonstrations were conducted in the 5 cluster set with two agents cooperating on a single demonstration for both counties. Producers were identified by the county agent in each county where the demonstration was conducted. The producer chose one water managed field use all possible irrigation saving methods and an unmanaged field using non research methods.

The irrigation water managed field consisted of 38 acres. The well output was 950 gallons per minute with the well-off set of center and the field had to be designed with two irrigation sets irrigated separately. The total duration of both sets was a total of 24 hours.

Soil sensors were installed to determine the correct irrigation timing to meet crop demands along with an ET gauge. Fuel flow was measured and calculated to determine average cost of water.

Results:

The control field was irrigated three times from August 27 thru September 17 using a total of 123.48 acre inches of water on 16 acres or 7.71 acre inches of water per acre. The IWM field was also irrigated three times from June 30 thru August 27 using a total of 238.74 acre inches of water on 38.7 acres or 6.17 acre inches of water per acre. This calculates to a 20% reduction in water use and savings.

By using computerized hole selection, soil sensors, and an ET gauge to correctly time field irrigation the producer was able to save 1.54 acres inches of water (1,618,324 million gallons) in the IWM field compared to the producer control field. The IWM field had an average $1.35 acre inch cost which was comparable to the control field.

The producer used the computerized hole selection program on 759.7 acres. Using an average of $2.00 for this year's diesel price a 20% cost reduction is a .40 cents savings. He irrigated the fields 3 times on average he saved $911.64 on those acres. On the 2000 acres of soybeans not using a computer selection program and utilizing the same fuel prices and frequency of irrigation it cost the producer $2,400.

Seeding Rate Decisions and Impacts on Spatial Yield Variability in Northeast Arkansas Cotton

Ray Benson, Amanda Mann, D. Keith Morris and Tina Gray Teague

Purpose:

Cotton remains an exceedingly important crop for rural communities in the Midsouth, but with high production costs and stagnant commodity prices, cotton producers must find ways to improve profitability if they are to sustain the industry. Expenditures for seed embedded technology including transgenic traits, licensing fees, and seed protection treatments make seed one of the most expensive input costs in cotton. At standard recommended seeding rates, treated, transgenic seeds can cost as much as $100/acre, and a simple reduction in seeding rate could reduce overall production costs.

Methods:

The study was conducted in a 35-acre field on Wildy Family Farms in Mississippi County in Northeastern Arkansas. There were four treatments, and these were arranged in a randomized complete block with 6 replications. One 12-row planter swath across the field was one treatment main plot. Treatments included 3 target seeding rates of 1.5, 3.0 and 4.5 seeds per foot of row. A forth treatment utilizing a variable planting prescription was included in the study. Variable seeding rates were based on three management zones classified using soil EC measurements (Fig. 1). Stoneville 4946GLB2 was planted on raised beds spaced at 38 inches on May 8, 2015 using the cooperating producers' 12-row John Deere 1720XP vacuum planter. Other than seeding rates, all other production practices including land preparation, fertilizer application, irrigation and pest control were performed by the cooperating producers following their standard management regime and using their equipment (Table 1).

Yield and fiber quality assessments were made with hand-picked samples from the 10-foot harvest sites; these data were converted to lint yield per acre. In addition, whole plot yields were extracted from the producer's yield monitor with data post-calibrated, and lint yields determined from the center 6 rows of each treatment strip. Mean yields were separated using Fisher's Protected LSD test at the P= 0.05. The experiment was analyzed as a split plot design with seeding rates considered main plots and soil textural classes considered sub-plots

Table 1. Dates of planting, irrigation and harvest for the 2015 seeing rate study, Wildy Family Farms, Manila, AR.

Operation	Date	Days after planting
Date of planting	6 May 2015	
Stand Counts	13, 20, 27 May and 1 June	7, 15, 21, 26
Insecticide	3, 16, 25 June, 11,17, 27 July	50, 74, 85, 92
Irrigation	25 June, 2 July	50, 67
Defoliation/boll opener	25 September, 5 October	142, 152
Hand harvest	16 October	163

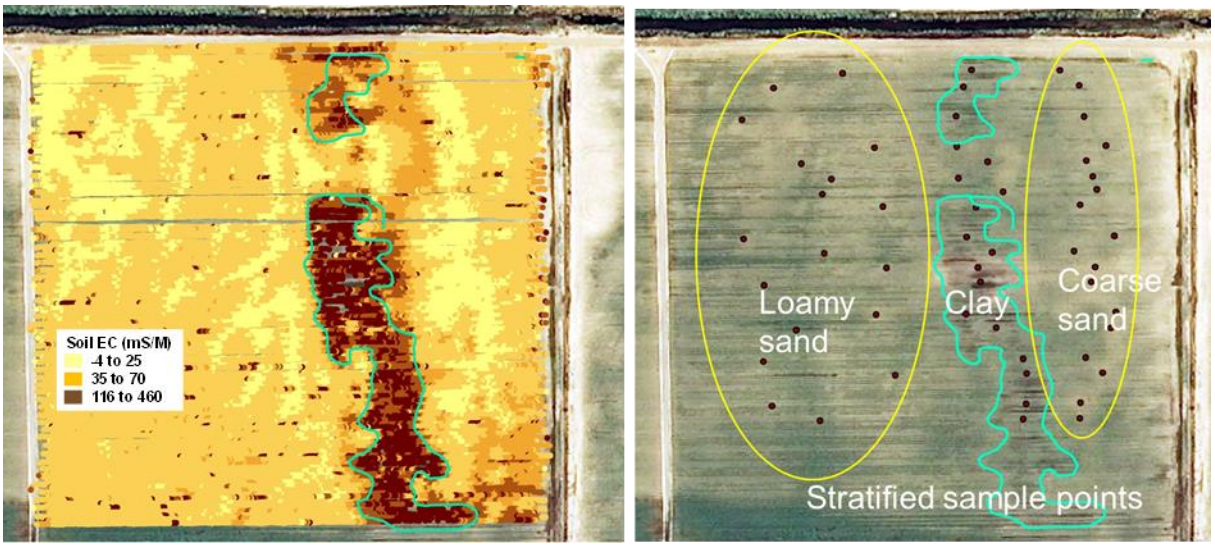


Figure 1. Soil textural zones - coarse sand, loamy sand and clay - for the 35 acre study site were based on three soil EC categories (left). Sample site designations for 2015 also are shown (right) – Wildy Family Farms, Manila, AR.

Results:

Uniform seeding of 1.5, 3.0 and 4.5 seeds per foot resulted in stands within 85% of the targeted stand density in the coarse sand and loamy sand; lower stands (~50%) were observed in clay soil (Figure 2). In the prescribed VR seeding application, inconsistent stands were observed compared to the targeted seeding rate; similar results were recorded in 2014.

Within the variable rate seeding plots, inconsistencies in stand densities were more pronounced in the clay and course sand zones than in the loamy sand soil zones. Stand densities ranged from approximately 150% of the prescribed target rate in the coarse sand soil zones to slightly above 25% of the target seeding rate density in the clay zones. Variations in size and frequency of the clay and coarse sand zones across the field likely contributed to the observed inconsistencies in stand densities in these zones. The rates prescribed for the zone with the largest area, the loamy sand soil texture resulted in stand counts similar to the rate observed in the single rate whole plot treatments. The consistency of stand densities observed in the larger sandy loam soil type zones was likely the result of planter rate controllers having sufficient time to adjust and equilibrate to prescribed rates. Adequate equipment calibration, and appropriate zone size are critical factors in successful variable seeding in designated zones. Additional work is needed to address these factors.

Analysis of yield data from hand harvested plots indicated in no differences in lint yield among seeding rate treatments (Figure 3). Hand harvest yield from plants in the clay and coarse sand zones was significantly lower compared to plants in the loamy sand area of the field. It should be noted that areas with large skips between plants were not included in those hand harvest sites,

but skips were included in yield assessments from whole plots collected from producer's yield monitor data. There were no differences in lint yield among any of the seeding rates in whole plot assessments (Figure 4 and 5).

Seeding rate density had no effect on yield in this field trial in either 2015 or 2014. These results indicate that reducing seeding rates may provide an opportunity for producers to lower production costs. Cost savings of ~$90 per acre would have been possible with lowest compared to highest seeding rate assuming a conservative per bag seed cost of $500 (Figure 6). Based on these preliminary data, we suggest that reducing seeding rates to less than 2.5 seeds per foot should be considered a viable cost-saving tactic for Midsouth producers using high-cost, treated, genetically enhanced seed. Producers should use the lowest rate required to get a stand of 1.5 plants per foot. Variable rate seeding across variable soils appears to offer no practical advantage compared to uniform seeding in the production system under evaluation.

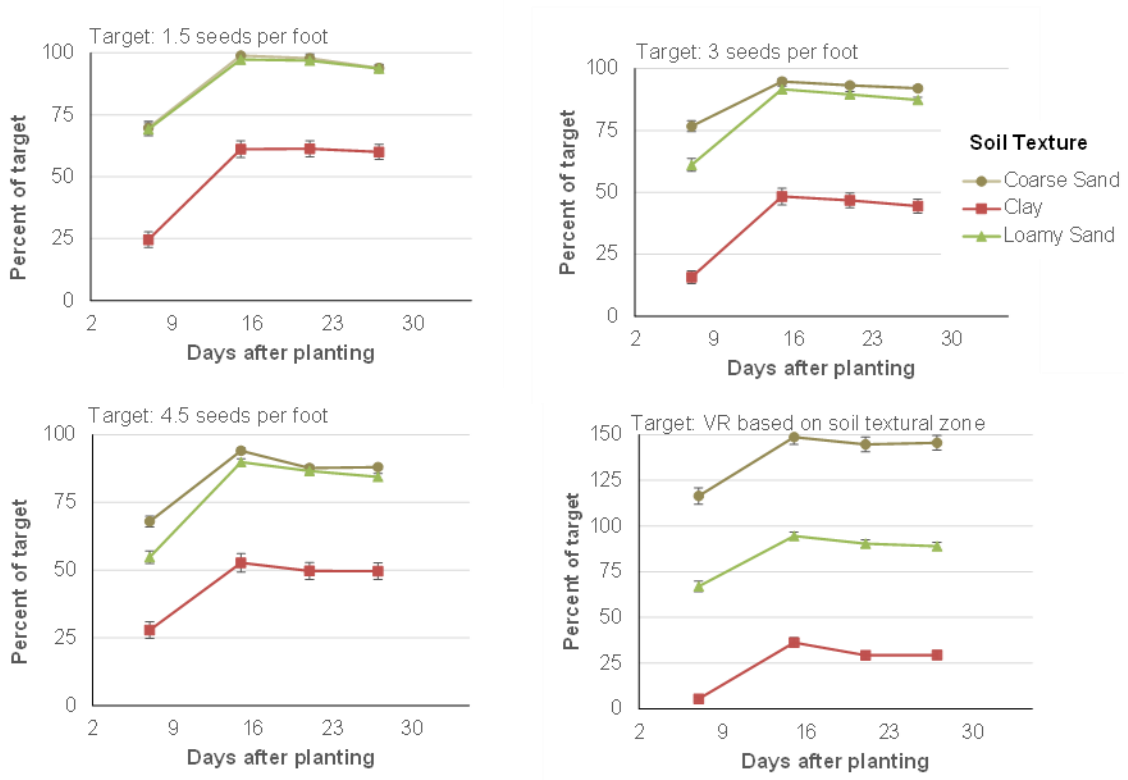


Figure 2. Stand counts were made to determine the accuracy of the target seeding rates and the variable rate prescription seeding. Observed plant stand densities were determined in transect sampling across each soil textural zone over 12 rows and were made on four dates in the first month after planting for each of the four seeding rates (1.5, 3, 4.5 and variable rate (VR)). Results are expressed as a % of target seeding rate in 2015 seeding rate field trial – Wildy Family Farms, Manila, AR.

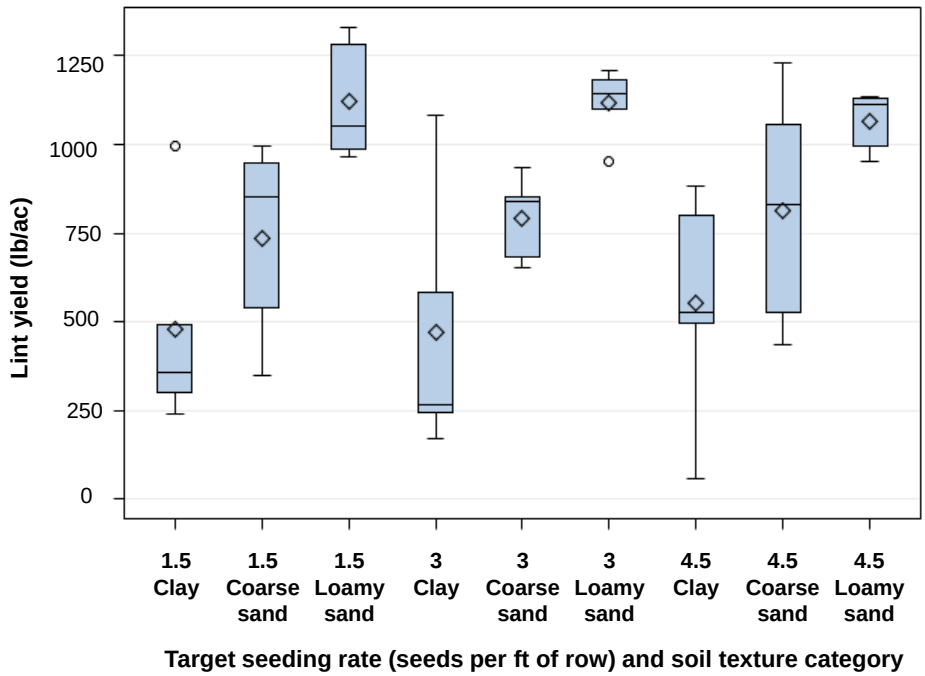


Figure 3. Mean lint yield from hand harvested plots within soil textural zones in 2015 seeding rate field trial. Boxes represent 50% quartile; diamonds within the box depict means and the line is the median value – Wildy Family Farms, Manila, AR.

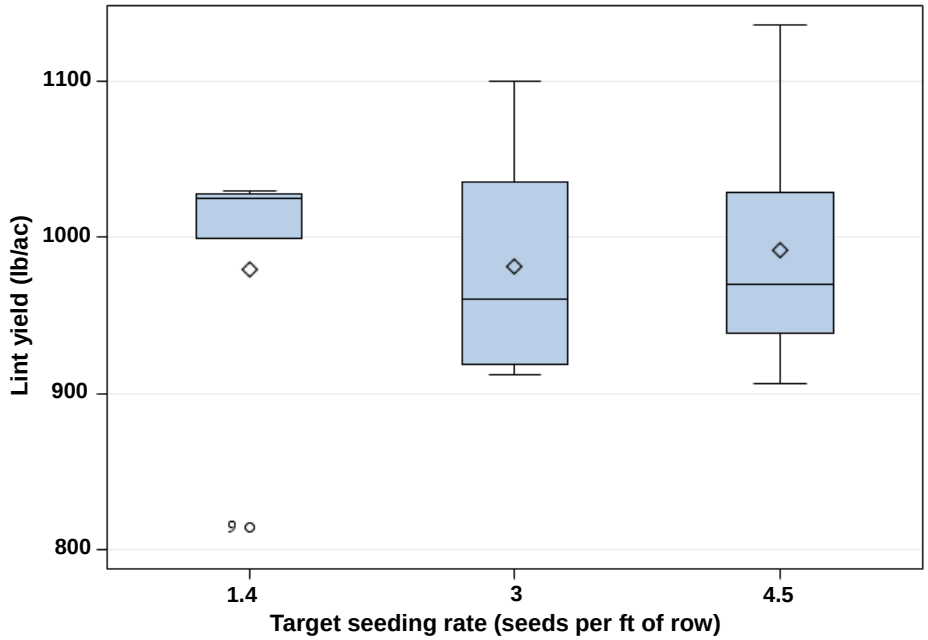


Figure 4. Seeding rate was not significant (P>0.60) in lint yield assessments from field length strips determined from yield monitor evaluations Boxes represent 50% quartile; diamonds within the box depict means and the line is the median value – Wildy Family Farms, Manila, AR.

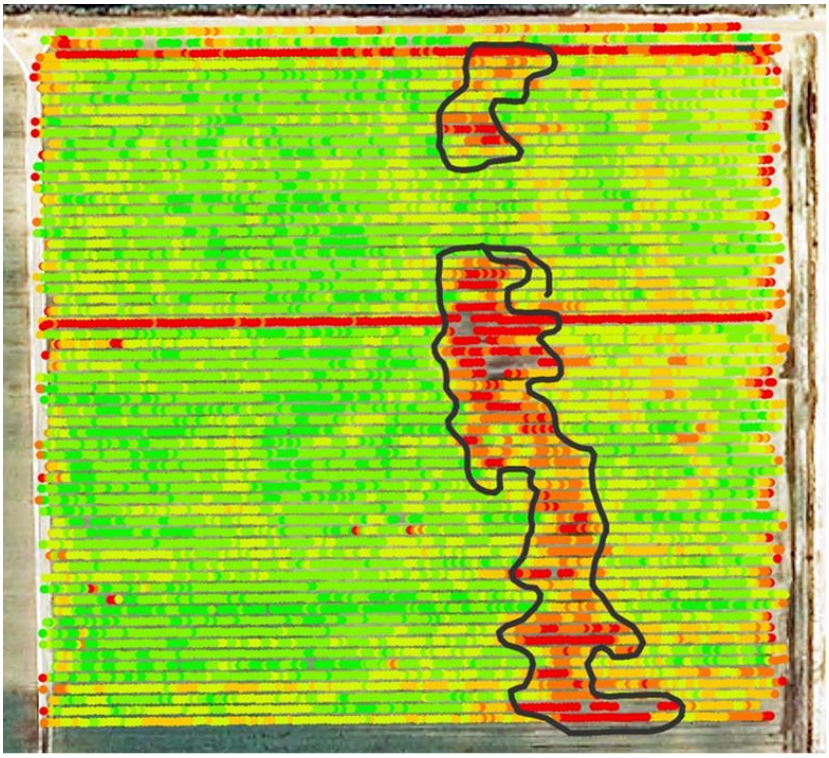


Figure 5. The 2015 yield map shows the same "low yield" zones as the previous years, particularly in the clay textural zones.

Seed costs for 38 inch row spacing

Cost per bag (50lb)	$500
No. seeds/bag	225,000
Cost per seed	$0.002

Seeding rate	No. seeds	Seed cost
(per foot of row)	(per acre)	
1.5	20634	$45.85
3	41267	$91.71
4.5	61901	$137.56

Figure 6. Seed cost estimates for the seeding rate treatments for the 2015 seeding rate study -- Wildy Family Farms, Manila, AR.

Phaucet Irrigation in Mississippi County

Jason Osborn

Purpose:

Resource Conservation is an important part of agriculture in Mississippi County. As water table levels drop across the state and fuel prices that have doubled in the last five years, producers are searching for ways to improve efficiency and lower cost.

Methods:

The Mississippi County Staff answered the call by implementing and demonstrating the Phaucet Irrigation program. The program was developed by the NRCS-USDA and first used in County in 2011. The program takes well flow (GPM), poly pipe length, and row lengths of the field and calculates the correct hole size per row. Field detentions are generated by using an iPad and Google maps to plot boundaries to get the row lengths, pipe lengths and any other points needed. The program calculations give an approximate time when the field will be fully irrigated. The producer can then turn off the well at a specific time reducing irrigation cost.

Results:

Pumping cost average $75 an acre, and the Computer Hole Selection programs reduced that cost by 18% to $61.60 an acre, which is a savings of $13.50 per acre. This equates to a fuel savings of $471,833.10 or 188,733 gallons of diesel not used in Mississippi County. The program is used on 34,950.6 acres. 42 producers use the program with 9 producers being new for 2015. One new producer was trained in 2015 and 10 use the program with no further assistance from Extension Staff. This brings the county to 11 producers using the program with no further assistance from Extension Staff.

Rice Research Verification Program in Mississippi County

Jason Osborn

Purpose:

The RRVP is the research-based recommendations developed by the University of Arkansas Extension and Research Center for the purpose of increasing the profitability of rice production in Arkansas. It demonstrates and verifies research-based, the benefits of available technology and inputs for the economic production, identifies specific problems for further investigation, and promotes timely implementation of management practices.

Methods:

An interested grower was selected as the cooperator for the Mississippi County RRVP in the southern end of the county. The field chosen was an Alligator Sharky Clay and the Jupiter medium grain rice was selected as the variety to grown. All tillage practiced was performed by the producer. N-ST*R soil samples were collected and Nitrogen recommendations were based on these samples. Aerial applications of mid-season fertilizer were applied when recommended.

Results:

Rice Research Verification Program Data Sheet												
						Cooperator:	Becton Bell		Days to Flood:	4		
						County:	Mississippi		Cultivar Planted:	Jupiter		
						Soil Type:	Alagator Sharky Clay		Row Width:	7.5 inch		
						Grain Yield:	191		Previous Crop:	Fallow		
						Harvest Moisture:	21		Levees / Well Source:	Precision (S	Surface Diesel	
						Irrigation Method:	Conventional Flood		Irrigation / Rainfall:	21	22.32	
DATE	OPERATION	TRACTORS & SELF PROPELLED EQUIPMENT				MATERIAL, LABOR, OR MISCELLANEOUS						
		BRAND & MODEL NO.	HP (PTO)	EQUIPMENT WIDTH	TIMES OVER	CHEMICAL TRADE NAME OR ITEM	UNITS (pts, lbs, etc.)	TOTAL UNITS APPLIED	PRODUCT RATE PER ACRE	PRICE PER UNIT	ACRES COVERED	BAND WIDTH IF APPLICABLE (INCHES)
4/6	Preemergence app			airplane	1	Prowl H2O	pint	63	2.1		30	
						RoundupWeatherMax	oz	660	22		30	
						FacetL	oz	960	32		30	
4/6	Plant	JD1990 CCS		40'	1		lb	2700	90		30	
4/20	stand 22/sq ft											
5/24	Preflood N app			airplane	1	urea	lbs	7500	250		30	
6/15	Midseason N app			airplane	1	urea	lbs	2250	75		30	
	Midseason N app			airplane	1	urea	lbs	2250	75		30	
7/27	Insecticide			airplane	1	Karate	oz	60	2.0		30	
9/1	Harvest	JD S690		35'	1						30	

Irrigation Timing Demonstrations for Soybean Production

In cooperation with researchers and graduate students from USDA-ARS, University of Arkansas and Arkansas State University

Purpose:

Timing the application of irrigation is required to meet the water demands of crops grown in the mid-south. Rainfall in the area is often sporadic and inadequate to ensure optimal yields. Proper irrigation management strategies should be designed to meet the needs of the crop while ensuring the long-term sustainability of our natural resources. Identifying better cues that can be used to trigger irrigations would improve the efficiency of agriculture's water use by limiting unnecessary irrigation events.

Methods:

On-farm large plot strip trials were established in Mississippi County to investigate the timing of irrigation on soybeans. The Mississippi County Cooperative Extension Service participated in a research project involving USDA-ARS, UAAES and ASU. The report below represents a summary of the 2015 on-farm research project.

Results:

Results of this study indicate that timing irrigations based on E.T. (Evapotranspiration) may improve irrigation efficiency in soybean production. Timing irrigation may be a way to maintain crop production levels and reduce total water use in Mississippi County.

Plant, Soil & Weather Based Cues for Irrigation Timing in Soybean Production

M.L. Reba, T.G. Teague & Justin Chlapecka

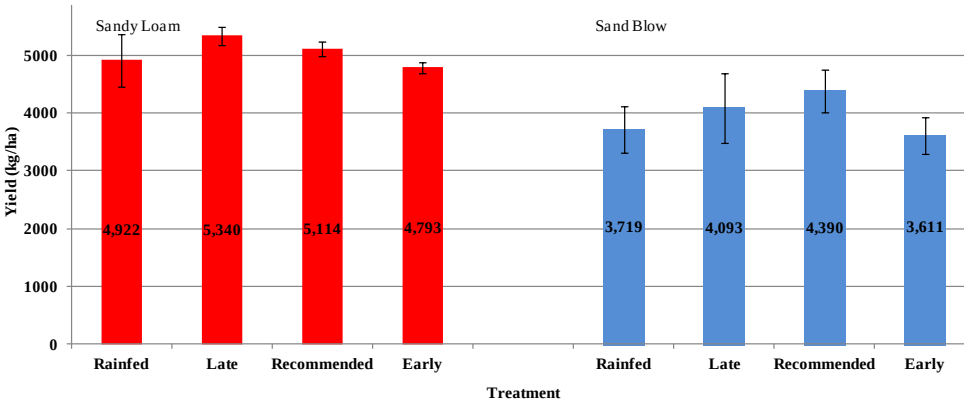
Irrigation timing decision-making may be improved by using technology to assess water deficits using estimates of evapotranspiration (ET). Decision guides developed by the UA Cooperative Extension Service (CES) recommend irrigation timing using an estimate of ET deficit based on predominant soil type and plant growth stage. Current recommendations on initiation timing have not been validated on sandy soils in northeast Arkansas. In the second year of this ASPB funded project, we evaluated irrigation initiation timing in a commercial field using cues based on ET estimates using information from a local weather station and atmometers. The study included evaluation of spatial variability of production associated with different soil textures.

The research site was located in Mississippi County field mapped as a sandy loam soil (Routon-Dundee-Crevasse Complex) that ranged from sand to sandy loam to silt loam. There were four irrigation treatments 1) Early Start (ET=1 in), 2) Standard CES Recommendation (Based on CES ET Chart, ET = 2.5 in), 3) Late Start (ET Deficit = 3 in), and 4) Rainfed. The ET was estimated using an atmometer as well as calculations using a modified Penman equation using meteorological data from an on-farm weather station. Plots were 32 rows wide running the full length of the field (approx. 1250 ft.); each plot strip was separated by 16 rows (Fig 1). The experiment was arranged as a randomized complete block with 3 replications. CV Asgrow 3735 (MG III) was planted 23 April on twin rows on raised beds spaced at 38 inches. Irrigation was applied using poly-tubing using a PHAUCET plan and surge valve to maximize the effectiveness of the irrigation. The cooperating producer performed all standard field operations. A soil EC map for the study field was developed using output from a dual depth Veris Soil Surveyor. Sample allocations for plant, insect and soil moisture monitoring were made among soil textural zones to increase understanding of how in-field variability impacted irrigation efficiency. Soil moisture was monitored using Watermark sensors installed at different depths (6 & 12 in) across different soil textures in each plot. Yields were determined by grain cart catch weights and yield monitor data from the cooperating growers' combine. Yield components were assessed using samples from 3ft hand-harvests.

Figure 2. Irrigation treatment strips are apparent in this mid-season aerial view of 2015 irrigation study. Note the lighter colored sand blows extending across the upper portion of the Mississippi County field. Severe lodging from a wind storm are apparent in the adjacent grain sorghum field (right).

In the high rainfall 2015 season, yield results showed little variation among irrigation treatments (Fig 2). Yield monitor results indicated yield differences only within rainfed strips in areas of the field with soils characterized as sand blows (<12% of total field). Increased incidence of lodging was documented with early irrigation start times suggesting yield penalties for over-watering. The current CES guidelines using ET appear to be conservative and if widely adopted could result in critical water savings. Additional observations are needed under low rainfall conditions.

Figure 3. Yield among irrigation treatments and soil textures (sandy loam and coarse sand (=sand blow)) in 2015 trial.



On-farm Soybean Variety Demonstration based on soil type

Jason Osborn

Cooperators: Gordon Miller

Soil Types: Routon-Dundee-Conevasse Complex

Purpose:

At the County Extension Council meeting, the council continues to request on farm variety trials. With the implementation of the new Farm Bill and market changes soybeans are being planted on an array of soil types. Many of those fields have a history of root Knot Nematodes (RKN) and other problems. Having more on-farm soybean variety demonstrations based on soil types will help producers and consultants choose more adapted varieties for the farms soil type.

Methods:

Identifying growers and working with seed industry representatives and consultants. All field work, including planting and harvest, was performed using the producer's equipment. All cultural practices were based on the producer's standard production practices and were consistent for all soybean varieties in the demonstration (Table 1). Inputs were based on producer and consultant recommendations and were not necessary based on the University of Arkansas recommendations for soybean production

Results:

Yields for each soybean variety were calculated from weights collected from producer's harvested plots using yield monitor data (Table 1). Nematode test Results (Table 2.)
University of Arkansas County Demonstration
County: Mississippi Crop: Soybeans
Grower: Gordon Miller
County Agent: Jason Osborn
Location of Field: 35.949202, -90.23097
Soil Type: Routon-Dundee-Crevasse complex
Previous Crop: Watermelons
Planting Date: April 26,2015
Row Width: 38 inches
Planting Population: 130,000
Harvest Date: October 2, 2015
Yield is adjusted to 13% moisture.

Table 1. Nematode Variety Yield Results Miller Farms 2015

Variety	Adj Yld	Area	Weight	Yield	%M	Length	Width
Delta Grow 4940	32.9	0.55	1102.0	33.4	14.1	1262	19
Terrell 4846	49.7	0.55	1666.0	50.4	14.3	1262	19
Armor 43R43	45.6	0.55	1522.0	46.1	13.9	1262	19
Asgrow 4835	48.7	0.55	1610.0	48.8	13.1	1262	19
Asgrow 4633	48.9	0.55	1635.0	49.5	14.1	1262	19
Mycogen 5N522	48.0	0.55	1605.0	48.6	14.0	1262	19
Mycogen 5N490	42.1	0.55	1405.0	42.5	13.9	1262	19
Mycogen X55523	48.9	0.55	1641.0	49.7	14.3	1262	19
Mycogen 5N479	40.6	0.55	1362.0	41.2	14.3	1262	19
Mycogen 5N501	40.6	0.55	1361.0	41.2	14.2	1262	19
Total Avg.	44.6		1491.0	45.1	14.0		

Nematode sample results.

Delta Grown 4940 (584 Soybean Cyst Nematode eggs) Levels of Soybean nematodes are high enough to be a major concern
Terrell 4846 (353 Soybean Cyst Nematode eggs) Soybean cyst nematode populations are not high enough to be a major concern; Spiral and Stubby root nematodes are not concern.
Armor 43R43 Root-knot nematode populations is not high enough to be a major concern, (615 Soybean Cyst Nematode eggs) Soybean cyst nematode populations are high enough to be a major concern, Further testing on Root knot Nematodes are required and results pending.
Asgrow 4835 (184 Soybean Cyst Nematode eggs) Soybean cyst nematode populations are not high enough to be a major concern; Stubby root nematodes are not concern.
Asgrow 4633 (1230 Soybean Cyst Nematode eggs) Levels of Soybean nematodes are high enough to be a major concern; Root-knot nematode populations is high enough to be a major concern, Spiral and Stubby root nematodes are not concern.
Mycogen 522 Root-knot nematode populations is high enough to be a major concern; Spiral root nematodes are not concern.
Mycogen 490 Root-knot nematode populations is high enough to be a major concern.
Mycogen X55523 Spiral nematode does not indicate a problem in soybeans.
Mycogen 479 Spiral nematode does not indicate a problem in soybeans.
Mycogen501 Soybean cyst nematode populations not high enough to be a major concern; Root-knot nematode populations is high enough to be a major concern; Spiral nematode does not indicate a problem in soybeans.

On-farm Soybean Variety Demonstration based on soil type – Clay Soil

Jason Osborn

Cooperators: Ron Holthouse

Soil Types: Tunica Silt Loam

Purpose:

At the County Extension Council meeting, the council requested more on farm variety. With the implementation of the new Farm Bill and market changes soybeans are being planted on an array of soil types. Many of those fields have a history of root Knot Nematodes (RKN) and other problems. Having more on-farm soybean variety demonstrations based on soil types will help producers and consultants choose more adapted varieties for the farms soil type.

Methods:

Identifying growers and working with seed industry representatives and consultants, three soybean variety demonstrations were established. These variety demonstrations were group IV soybeans. All field work, including planting and harvest, was performed using the producer's equipment. All cultural practices were based on the producer's standard production practices and were consistent for all soybean varieties in the demonstration. Inputs were based on producer and consultant recommendations and were not necessary based on the University of Arkansas recommendations for soybean production

Results:

Yields for each soybean variety were calculated from weights collected from producer's harvested plots using yield monitor data (Table 1).

University of Arkansas County Demonstration
County: Mississippi Crop: Soybeans
Grower: Ron Holthouse
County Agent: Jason Osborn
Location of Field: 35 42' 19.83 N 90 10' 34.58 W
Soil Type: Sharky Clay
Previous Crop: Rice
Planting Date: May 7,2015
Row Width: 38 inches
Planting Population: 165,000
Harvest Date: October 8, 2015

Note: Moisture and yield estimates are based on producer yield monitor data, and should reflect relative differences among hybrids in this demonstration.

Table 1. Yield monitor results from soybean variety demonstration on clay soil; 2015.

Variety	Adj Yld	Area	Weight	Yield[1]	% Moist.	Length	Width
Asgrow 4135	71.6	0.222	952	71.5	12.8	509	19
Asgrow 4232	60.0	0.222	800	60.1	13.1	509	19
Asgrow 4336	74.9	0.222	994	74.6	12.7	509	19
Asgrow 4533	72.7	0.222	968	72.7	13.0	509	19
Asgrow 4633	70.3	0.222	935	70.2	12.9	509	19
Asgrow 4835	61.8	0.222	827	62.1	13.4	509	19
Asgrow 4934	67.3	0.222	895	67.2	12.9	509	19
Asgrow 4632	66.5	0.222	884	66.4	12.8	509	19
Pioneer 41T33	65.8	0.222	873	65.5	12.6	509	19
Pioneer 46T21	75.8	0.222	1008	75.7	12.9	509	19
Pioneer 47T36	67.6	0.222	900	67.6	12.9	509	19
Pioneer 49T80	72.0	0.222	955	71.7	12.6	509	19
Pioneer 47T89	69.5	0.222	924	69.4	12.8	509	19
Pioneer 49T09	67.3	0.222	891	66.9	12.5	509	19
Pioneer 50T15	62.4	0.222	827	62.1	12.5	509	19
Armor 4956	70.1	0.222	930	69.8	12.7	509	19
Delta Grow 4825	70.1	0.222	937	70.3	13.3	509	19
Delta Grow 5230	67.4	0.222	897	67.3	12.9	509	19
Delta Grow 4670	65.2	0.222	864	64.9	12.5	509	19
Delta Grow 4755	64.2	0.222	851	63.9	12.6	509	19
Terrell 46007	62.5	0.222	827	62.1	12.4	509	19
Terrell 47014	65.5	0.222	864	64.9	12.1	509	19
Terrell 47R34	62.6	0.222	829	62.2	12.5	509	19
Terrell 48A16	63.6	0.222	840	63.1	12.2	509	19
Terrell 48A78	62.3	0.222	820	61.6	12.0	509	19
Terrell 48A26	67.0	0.222	891	66.9	12.8	509	19
Terrell 48A46	62.3	0.222	829	62.2	12.9	509	19
Terrell 47017	73.1	0.222	972	73.0	12.8	509	19
Terrell 49A55	60.8	0.222	805	60.4	12.5	509	19
Terrell 49A75	50.8	0.222	675	50.7	12.8	509	19
Terrell 49R94	64.4	0.222	849	63.7	12.1	509	19
Terrell 51A56	67.0	0.222	891	66.9	12.8	509	19
Renegade 4908	65.0	0.222	864	64.9	12.8	509	19
Renegade 4779	70.4	0.222	933	70.0	12.5	509	19
Syngenta 41J6	54.2	0.222	714	53.6	12.1	509	19

Syngenta 42E5	66.4	0.222	873	65.5	11.9	509	19
Syngenta 45R7	61.4	0.222	811	60.9	12.2	509	19
Syngents 45V8	70.5	0.222	928	69.7	12.0	509	19
Syngenta 46L2	60.0	0.222	794	59.6	12.4	509	19
Asgrow 4632	69.2	0.222	913	68.5	12.2	509	19
Syngenta 47K5	61.4	0.222	811	60.9	12.3	509	19
Pioneer 47T36	69.3	0.222	915	68.7	12.2	509	19
Syngenta 48D9	68.3	0.222	904	67.9	12.5	509	19
Syngenta 49F8	64.2	0.222	849	63.7	12.4	509	19
Armor 43R43	62.2	0.222	818	61.4	11.9	509	19
Armor 4305	71.2	0.222	937	70.3	11.9	509	19
Armor 44R08	67.6	0.222	889	66.7	11.9	509	19
Armor 46R14	59.8	0.222	789	59.2	12.1	509	19
Asgrow 4632	65.9	0.222	869	65.2	12.1	509	19
Armor 4665	57.4	0.222	761	57.1	12.6	509	19
Armor 47R14	55.7	0.222	739	55.5	12.6	509	19
Armor 4705	70.7	0.222	935	70.2	12.4	509	19
Armor4866	62.3	0.222	827	62.1	12.7	509	19
Armor 49R56	66.7	0.222	884	66.4	12.5	509	19
Armor 4904	63.7	0.222	842	63.2	12.3	509	19
Armor 50R21	60.9	0.222	807	60.6	12.5	509	19
Progeny PY4613	67.3	0.222	895	67.2	12.9	509	19
Progenyy 4788	68.2	0.222	900	67.6	12.2	509	19
Progeny 4850	56.2	0.222	741	55.6	12.1	509	19
Progenyy 4900	64.1	0.222	847	63.6	12.3	509	19
Total	65.4		867	65.1	12.5		

[1] Yield is adjusted to 13% moisture.

Large Plot Soybean Fungicide Demonstration – Yield Monitor Data

Ray Benson

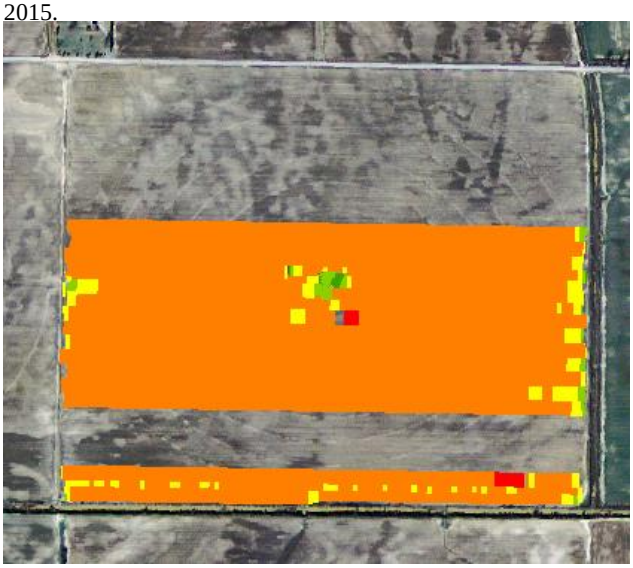
Problem:

Fungicides help protect the yield potential of many southern row crops, especially soybeans. When established disease thresholds are reached, the application of fungicides becomes a necessary part of production agriculture. Too often however, producers apply fungicides in an attempt to "push" the crop for higher yields. The use of fungicides for sub-threshold disease populations can promote the development of resistance, decrease field profits and contribute to unnecessary environmental loading of pesticides. Applying crop protecting pesticides only in situations where thresholds warrant treatment can improve production efficiency and reduce the development of resistance problems.

Methods:

An on-farm demonstration of fungicide applications in soybeans was established during the 2015 production season. AgVenture 38X1 RR soybean variety was planted on Wildy Family Farms near Manila Arkansas on April 26, 2015. The field was established on 38 inch rows and was center pivot irrigated. On June 27, the field was treated with Quadris Top at a rate of 12 oz per acre. A second application was made on July 28, 2015. During the second application, a strip demonstration was established in which areas of the field received no application and others received a rate of 12 oz/A (figure 1). Areas treated with fungicide are colored orange in the figure. Other than fungicide application differences, all other production practices were consistent for this field.

Figure 4. Soybean fungicide demonstration, Wildy Farms - 2015.



Results:

Yield was determined using the producer's on-board John Deere yield monitor (Figure 2). Within the different treatment areas, a continuous selection of 7.5 acres was used for yield comparisons. On the north half of the field (upper area of the map) there was essentially no difference in yield between to treated and untreated areas. On the south half of the field (lower area of the map) the area

treated with fungicide yielded 86.8 bushels per acre and the untreated area yielded 80.5 bushels per acre. Averaged across both sections, the fungicide treated blocks yielded 3.1 bushes more than the untreated blocks. Using current University of Arkansas Division of Agriculture crop production budgets, the application of 12 oz of Quadris Top per acre resulted in an increase in production cost of $29.93 per acre ($2.16 per ounce @ 12 oz + $4.01 application cost). If a $10.00 per bushel value for soybeans is assumed, the increased yield observed from the plots treated with fungicide resulted in an additional $31.00 per acre. Adjusted for rent (25% crop share), the application of fungicide resulted a loss of $6.68 per acre compared to the untreated blocks. The results observed in this demonstration support the use established thresholds to determine the need for fungicide application in soybeans. Unwarranted application of fungicide (or other pesticide) may result in increased production per acre, but not necessarily an increase in profits. Treatments based on established thresholds provide the best option for protecting yield potential and reducing negative environmental effects associated with over application of pesticides.

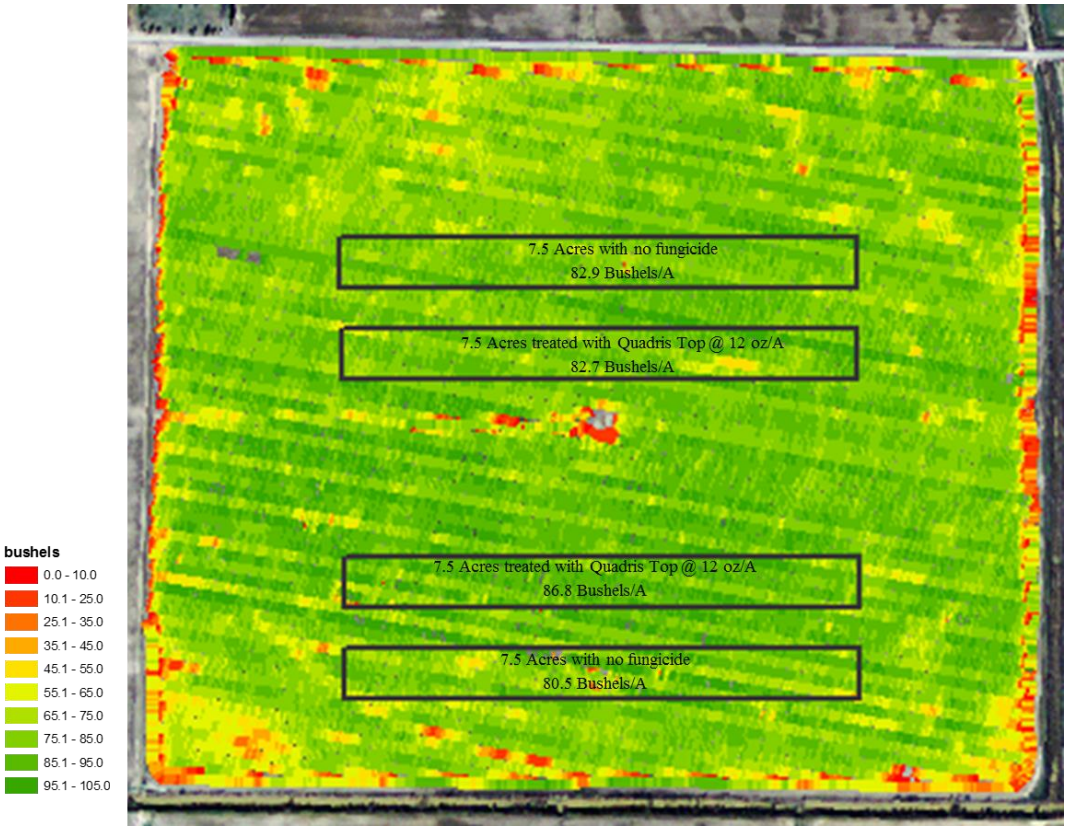


Figure 5. Yield of fungicide treated and untreated blocks, Wildy Farms - 2015.