TEXAS A&M AGRILIFE RESEARCH

Improving Life Through Science and Technology

Lubbock-Pecos-Halfway

Helm Research Farm

Summary Report

2013

Technical Report
14-4

Texas AgriLife Research / Craig Nessler, Director
The Texas A&M University System / College Station, Texas

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Introduction

The Texas A&M University System purchased 373 acres of farmland from the estate of Ardella Helm in December, 1999, for the sole purpose of conducting large scale research and extension programs to enhance producer profitability and sustainability in an irrigated environment. The farm is located 2 miles south of the Texas A&M AgriLife Research and Extension Center at Halfway in Hale County.

Current projects at the Helm Research Farm involve production options and economics of Subsurface drip irrigation (SDI). Other research projects include weed and insect control, plant breeding and yield trials for several commodities and production systems projects. Irrigated experiments were conducted under the 130 acre center pivot and on 86-acres of SDI.

The soils are predominantly deep clay loams and silty clay loams, with 0-1% and 1-3% slopes, moderately to moderately slowly permeable subsoils and high water and fertility holding capacities. Supplemental water for irrigation comes from five wells, 320 to 340 feet deep, pumping at rates of 150 to 250 gallons per minute each.

Grain Sorghum Performance at Multiple Irrigation Levels (Field 5a,b).
James Bordovsky, Wayne Keeling, K.C. Amerson, Casey Hardin, and Andy Cranmer

Objective: A field experiment was conducted to determine yield and in-season water use efficiency of grain sorghum at three irrigation levels.

Figure 1. Irrigated grain sorghum at the Helms Research Farm,

Methodology: Grain sorghum was planted using DeKalb 4945 hybrid in 2013. The **Base** irrigation level (8.06" of seasonal irrigation) along with rain met approximately 60% of crop water needs using ET scheduling. The other water levels were ±50% of the **Base** amount (**Low** - 4.0" and **High** - 12.1"). The test area had been in cotton in 2012. Other agronomic information is included in the appendix.

Results: Rainfall for the summer of 2013 was close to average with favorable distribution for sorghum. Although, in 2013, rain and irrigation capacity were less than in 2009 and 2010, grain yields were very respectable ranging from 4800 to 9300 lbs per acre from the low to high irrigation (Figure 2). Water productivity in 2013 was near 600 lb/ac-in of seasonal irrigation at all irrigation levels. Of the five years considered, water productivity among water levels for individual years was highest in the **High** treatment in the dry year of 2012, the highest in the **Low** treatment in the wetter years of 2009 and 2010, and fairly equal among treatments in the average, timely rainfall year of 2013.

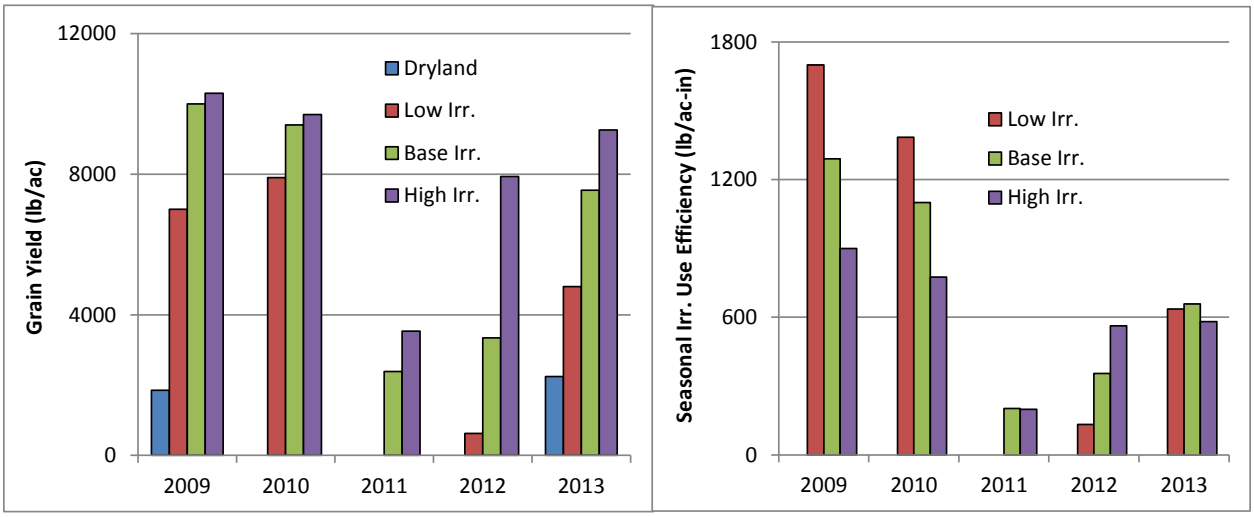


Figure 2. Grain sorghum yield and seasonal irrigation use efficiency at the Helms Research Farm, 2009-2013.

Preemergence Weed Control in Sorghum (Field 5a,b).
Wayne Keeling, Justin Spradley, and Joel Webb

Objective: Evaluation of preemergence herbicide treatments in sorghum for Palmer amaranth control.

Methodology: Eleven herbicide treatments, applied alone or in combinations, were applied preemergence at sorghum planting on June 4. Weed control was evaluated early, mid-and late-season and sorghum yields were calculated.

Results: Outlook, Atrazine, Milo-Pro, Verdict, Sharpen, Warrant, and Linex were evaluated alone or in various combinations applied preemergence in sorghum. Effective season-long Palmer amaranth control (97-100%) was achieved with all treatment tank-mix combinations (Table 1). Outlook, Atrazine, or Milo-Pro applied alone were less effective as the season progressed. No treatment affected sorghum yield. These results indicate that combinations of Atrazine or Milo-Pro, combined with Outlook, Dual, or Warrant, as well as Verdict are effective preemergence treatments in sorghum.

Table 1. Palmer amaranth control and sorghum yield at Helms farm, Halfway, TX, 2013.

Treatment	Rate	Palmer amaranth control			Sorghum yield
		6-20	7-22	9-12	10-10
	Fl oz/A	——— % ———			lbs/A
1 UNTREATED		0 b	0 b	0 b	5943 a
2 OUTLOOK	12	100 a	88.3 a	38.3 c	5826 a
3 ATRAZINE	32	100 a	96.0 a	78.3 b	6958 a
4 MILO-PRO	32	100 a	95.0 a	75.0 b	6987 a
5 OUTLOOK +	12	100 a	99.0 a	97.3 a	5650 a
ATRAZINE	32				
6 OUTLOOK +	12	100 a	99.0 a	99.0 a	7057 a
MILO-PRO	32				
7 VERDICT	10	100 a	98.3 a	97.0 a	6917 a
8 SHARPEN +	2	100 a	100.0 a	99.7 a	7319 a
OUTLOOK	12				
9 LINEX +	16	100 a	100.0 a	100.0 a	6686 a
MILO-PRO	32				
10 LINEX +	24	100 a	99.3 a	97.7 a	8063 a
MILO-PRO	32				
11 DUAL +	16	100 a	100.0 a	98.3 a	7442 a
MILO-PRO	32				
12 WARRANT +	48	100 a	100.0 a	98.3 a	7342 a
MILO-PRO	32				

Cotton Response to Irrigation Level, Crop Rotation, and Variety (Field 5c,d,e)
James Bordovsky, Wayne Keeling, Casey Hardin, K.C. Amerson, and Andy Cranmer.

Objective: A field experiment was conducted to determine yield and in-season water productivity of two cotton varieties irrigated at three levels in a rotation sequence of two years of cotton and one year of grain sorghum.

Methodology: Two popular cotton varieties were evaluated in a long term cotton-sorghum rotation. The base irrigation level (7.5" of seasonal irrigation in 2013) met approximately 60% of crop water needs using ET scheduling. The other water levels were ±50% of the base amount (4.0" and 11.0"). All variety x irrigation treatments were planted in areas of either continuous cotton or in rotation with grain sorghum, with sorghum planted once every three years. Crop responses were evaluated by harvesting 4 rows x 60^0 pivot arc and determining turnout and fiber data from 2-lb sub-samples from each treatment. Seasonal irrigation treatments were replicated six times. The crop sequence areas (pivot wedges) were not replicated, therefore, only general comparisons can be made regarding rotation.

Results: Cotton yields and seasonal irrigation water use efficiencies (WUE) from the three rotation sequences, two cotton varieties, and three irrigation levels are in Figures 1 and 2. Generally, lint yields and WUE's were lower for continuous cotton (ccc) than the cotton immediately following grain sorghum (ccs) or cotton following cotton and sorghum (csc); lower for DP 1219B2RF than the Fibermax 2484B2RF variety, and uniformly lower with reduced seasonal irrigation. Having higher cotton yields in rotations having grain sorghum is partially due to the reduction in cotton diseases following a sorghum crop (see Wheeler, et al. report). These field tests provide management options that help maintain grower productivity in the short term while providing information to improve water value in the future.

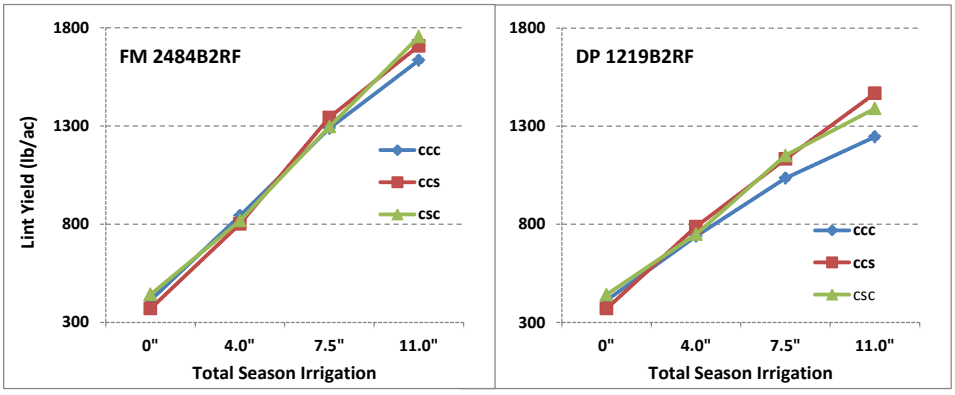


Figure 1. Cotton lint yield of two cotton varieties and three cropping sequences at three irrigation levels at the Helms Research Farm, 2013.

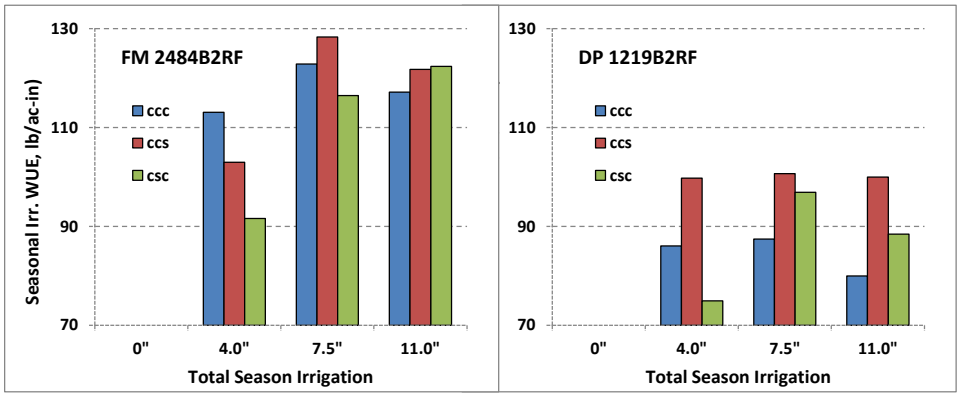


Figure 2. Seasonal irrigation water use efficiencies of two cotton varieties and three cropping sequences at three irrigation levels at the Helms Research Farm, 2013.

Verticillium Wilt of Cotton: Economic Analysis from 2007–2010 and 2012 at Helms Farm (Field 5c,d,e)

Praveen Sapkota, Terry Wheeler, Jim Bordovsky, and Wayne Keeling

Objective: Compare the economic return of continuous cotton to cotton grown in a three year rotation with grain sorghum in a field having Verticillium wilt.

Methodology: The comparisons in the analysis were cropping system (continuous cotton versus a 2-year cotton/1-year sorghum rotation) and irrigation rate (Base [B], B+50% and B-50% rates). The returns above total specified expenses were calculated by subtracting total expenses from total income. Cotton prices for each year from 2007-2012 were recorded, though 2011 was omitted from the analysis because of the unusual nature of the weather that year. When calculating the total income, cotton lint and cotton seed were used. Prices of each year were adjusted to the price of 2013 using the CPI inflation calculator which is available online in the official website of United States Bureau of Labor Statistics. Cotton prices from 2007-2012 were, in 2007 $0.54/lbs, 2008 $0.60/lbs, 2009 $0.54/lbs, 2010 $0.62/lbs, 2011 $0.90/lbs and 2012 $0.80/lbs.

Results: The return above total specified expenses when averaged across the five years was always higher for the cotton rotated 1 of 3 years with sorghum than for continuous cotton (Table 1). However, this result only includes the cotton expenses, and does not include the economics for the one year of sorghum out of every 3 years. The economic return was higher for the Base irrigation rate than the Base+50% or Base-50% irrigation rates (Table 1). The Base irrigation rate was designed to replace 80% of the evapotranspiration rate of cotton in 2007 – 2009, and 60% of the evapotranspiration rate of cotton in 2010 and 2012, when pumping capacity was adequate. These results indicate that in the presence of Verticillium wilt, the economic returns are better when crop rotation is used. The results also indicate that more water does not necessarily equal better economic returns, at least when Verticillium wilt is a problem. However, too little water can also reduce economic returns, as is seen by the Base-50% irrigation rate, and the "none" irrigation rate (Table 1).

Table 1. Economic return ($/acre, above total specified expenses, adjusted to 2013 prices) for a large plot experiment conducted from 2007 – 2012 (omitting 2011 data), based on cropping system of continuous cotton (CC) and a cotton/cotton/sorghum rotation, and four irrigation rates.

Irrigation Rate[1]	Cropping System	
	CC	Rotation
0	-91.11	-85.32
0.5	-29.24	21.37
1.0	120.08	244.58
1.5	83.52	233.53

[1]Base irrigation rate was 1.0, and other rates were 50% above or below this rate.

Effect of Crop Rotation, Irrigation Rate, and Irrigation Strategy on Verticillium Wilt (Field 5c,d,e)

Terry Wheeler, Jim Bordovsky, and Aaron Osborn

Verticillium dahliae causes Verticillium wilt in cotton. The density of a spore-type formed by the fungus, called a microsclerotia, infects cotton and ultimately leads to the wilt that reduces cotton yield. The density of this spore type, which has been monitored since 2008, dropped dramatically in the January of 2013 (Fig. 1), but was still sufficient to cause substantial symptoms of Verticillium wilt in 2013 (Fig. 2). The continuous cotton wedge has considerably higher levels of microsclerotia and Verticillium wilt than the cotton that is in wedges rotated with sorghum (Fig. 1,2). The high (Base+50%) irrigation rate, has much more Verticillium wilt than the Medium (Base) or low (Base-50%) irrigation rate (Fig. 2) in both cropping systems.

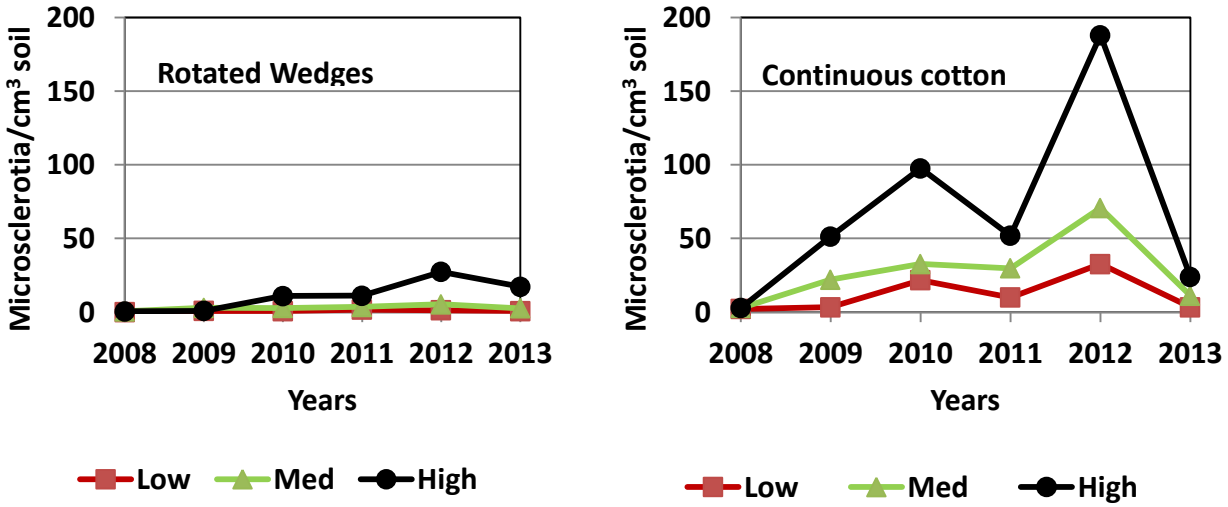


Figure 1. Dynamics of microsclerotia of *Verticillium dahliae* over time in rotated and continuous cotton and low, medium (Med), and high irrigation rates.

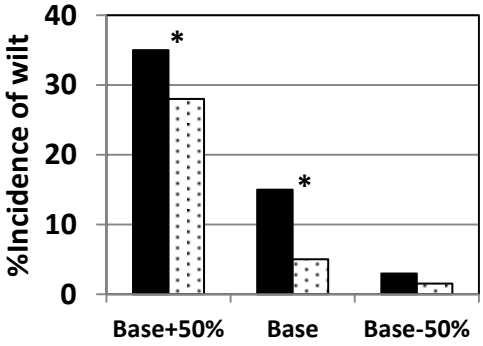


Figure 2. Effect of irrigation rate (Base, Base+50%, and Base-50%), and cropping system (continuous cotton and cotton rotated with sorghum) on incidence of Verticillium wilt.

Evaluation of Zero-Early Cotton Irrigation Strategy (Field 5d)
James Bordovsky and Joe Mustian

Objective: Compare cotton lint yield and water productivity of a recently develop "Zero-Early" cotton irritation strategy compared to the traditional limited irrigation strategy.

Methodology: Recently completed small plot field experiments showed treatments with reduced irrigation in early cotton growth stages (through mid-July) used 20 percent less total seasonal irrigation with minor yield loss compared to the traditional strategy of applying irrigations when the crop is small and water use demands of the plant are low, hoping to store water in the profile. A large scale field evaluation compared these strategies using two varieties at three irrigation levels. The "zero-early" treatments were irrigated at 30% of the traditional treatments from crop establishment until July 9.

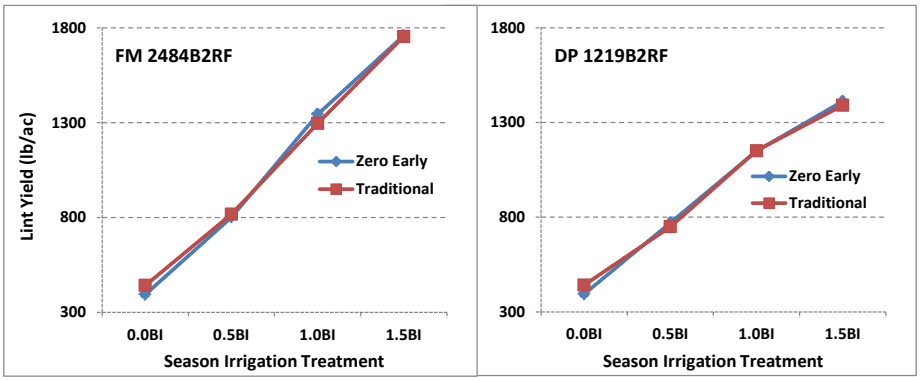


Figure 1. Cotton lint yield of two cotton varieties and three irrigation levels at the Helms Research Farm, 2013.

Results: Cotton yields and seasonal irrigation water use efficiencies (WUE's) resulting from the two cotton varieties and the three irrigation levels are displayed in Figures 1 and 2. Lint yields were the same for both strategies at all irrigation levels of a variety. Due to rain events during the vegetative period, the differences in irrigation amounts of the two strategies was only 0.3", 0.6" and 0.9" at the 0.5BI, 1.0BI, and 1.5BI irrigation levels, respectively. However, this slight reduction in irrigation resulted in differences in WUE. This outcome validates the results of earlier experiments. Further evaluations will provide grower recommendations that improve water productivity in this water short area.

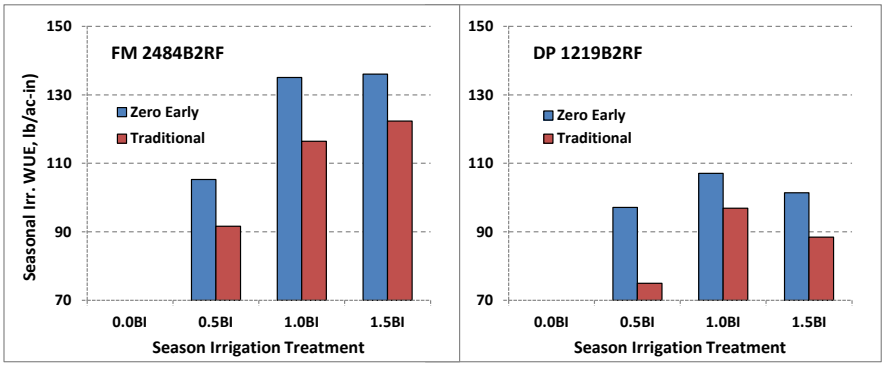


Figure 2. Seasonal irrigation water use efficiencies of two cotton varieties and three irrigation levels at the Helms Research Farm, 2013.

Planting Date, Seeding Rate and Variety Effects on Verticillium Wilt, Yield and Fiber Quality (Field 5d)

Jason Woodward, Xiaoxiao Liu, Ira Yates and Bobby Rodriguez

Objective: Determine the effect of cultural practices, such as planting date and seeding rate on the performance of cotton varieties with differing reactions to Verticillium wilt.

Fig. 1. Foliar symptoms and vascular discoloration associated with Verticillium wilt.

Methodology: The study was conducted in an area of the field which had been in continuous cotton and had a history of moderate Verticillium wilt pressure. Treatments were arranged in a split-split plot design with four replications. Whole plots consisted of planting date (22-Apr, 12-May and 8-Jun). Sub-plots consisted of seeding rates (2 and 4 seed ft^{-1}). The varieties (FiberMax 2484B2F and FiberMax 9180B2F, partially resistant, and DeltaPine 0912B2RF and Phytogen 499WRF, susceptible) served as sub-sub-plots. Disease symptoms (Fig. 1), yield, fiber quality and net returns were used to compare treatments. Data were subjected to ANOVA and means separated via Fisher's protected LSD ($P \leq 0.05$).

Results: Below average temperatures were experienced early in the growing season, resulting in differences in stands for the three planting dates (Table 1). Higher stands were achieved for the later planting date and differed by variety, as well as seeding rate. Disease onset occurred in early July for the Apr and May planting dates, but was delayed in the Jun planted cotton. Disease assessments in mid-August revealed differences for all factors evaluated (Table 1). Less disease was observed for the later planting date compared to the two earlier planting dates. Incidence was lowest for FiberMax 2484B2F (6.6, and similar for all other varieties.

Cotton planted in Apr provided the highest yield whereas later planting dates led to a reduction in yield (Fig. 2). The partially resistant varieties out yielded the susceptible varieties by an average of 235 lb/A. Fiber quality was similar for the two seeding rates, but differed by planting date and variety (Table 1). Additional studies investigating the interactive effects of these and other cultural practices on disease development, lint yield, fiber quality and net returns are needed.

Table 1. Cotton stand, Verticillium wilt incidence, micronaire and length for different planting dates, seeding rates of susceptible and partially resistant cotton varieties†

Factor, level	Stand (plants/ft)	Disease (%)	Mic (units)	Length (in)
Planting date				
April 22	2.1 b	12.1 a	3.66 a	1.085 a
May 12	2.0 b	13.0 a	3.56 ab	1.092 a
June 8	2.9 a	5.5 b	3.53 b	1.062 a
Variety				
Deltapine 0912B2RF	2.3 ab	12.3 a	3.69 a	1.063 b
FiberMax 2484B2F	2.6 a	6.6 b	3.43 b	1.102 a
FiberMax 9180B2F	2.2 b	10.4 a	3.46 b	1.102 a
PhytoGen 499WRF	2.5 ab	11.5 a	3.75 a	1.053 b
Seeding rate				
2 per foot	1.7 b	11.0 a	3.61 a	1.081 a
4 per foot	3.1 a	9.3 a	3.55 a	1.079 a

†[a]Means for each factor within a column followed by the same letter are not different ($P \geq 0.05$).

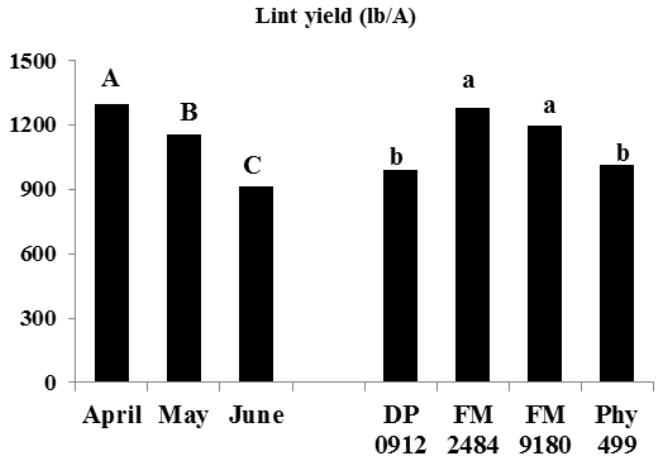


Fig. 2. Lint yields for different planting dates (n=32) and varieties (n=24). Bars with the same letter are not different ($P \leq 0.05$).

Bayer Cotton Agronomic Performance Trial (Field 5f)
Wayne Keeling, Justin Spradley, Joel Webb, and Daniel Olivier

Objective: The objective was to compare yield, fiber quality, and gross revenue as a function of five Bayer CropScience varieties and water levels.

Methodology: Irrigations were at a base irrigation level (M), 1.5 x base irrigation level (H), and 0.5 x base irrigation level (L). See appendix for additional agronomic details.

Results: One experimental and four commercial FiberMax cultivars were evaluated under three irrigation levels. When averaged across cultivars, yields ranged from 700 to 1605 lbs lint/A as irrigation level increased (Table 1). Fiber quality improved as irrigation level increased, but was similar at the base and high irrigation levels (Table 2). Differences were observed in fiber quality between cultivars. Gross revenues increased with increased irrigation, and was highest with BX 1455GLB2 (Table 3)

Table 1. Effects of cotton variety and LEPA irrigation levels on cotton lint yields at Helms farm, Halfway, TX, 2013.

Variety	Low	Base	High	Irrig. Avg.
		lbs/A		
BX 1445GLB2	770 a	1301 a	1775 a	1282 A
FM 1944GLB2	735 a	1045 a	1506 a	1095 B
FM 9250GL	719 a	1192 a	1469 a	1172 AB
FM 2484B2F	654 a	1184 a	1648 a	1162 AB
FM 2011GT	623 a	1102 a	1629 a	1118 AB
Avg.	700 C	1165 B	1605 A	
% change	(-39%)	(——)	(+37%)	

Table 2. Effects of cotton variety and LEPA irrigation levels on lint value at Helms farm, Halfway, TX, 2013.

Variety	Low	Base	High	Irrig. Avg.
		¢/lb		
BX 1445GLB2	54.45 a	57.03 a	57.23 a	56.23 A
FM 1944GLB2	51.61 ab	53.90 b	55.93 ab	53.81 B
FM 9250GL	49.00 ab	52.48 bc	52.48 c	51.32 CD
FM 2484B2F	51.40 ab	53.60 bc	53.93 bc	52.97 BC
FM 2011GT	48.81 b	51.40 c	52.26 c	50.82 D
Avg.	51.05 B	53.68 A	54.37 A	

Table 3. Effects of cotton variety and LEPA irrigation levels on gross revenues at Helms farm, Halfway, TX, 2013.

Variety	Low	Base	High	Irrig. Avg.
		$/A		
BX 1445GLB2	418 a	742 a	1016 a	725 A
FM 1944GLB2	380 a	563 b	843 a	595 B
FM 9250GL	350 a	626 ab	771 a	582 B
FM 2484B2F	337 a	634 ab	888 a	620 B
FM 2011GT	305 a	567 b	851 a	574 B
Avg.	358 C	626 B	874 A	
% change	(-42%)	(——)	(+39%)	

Yield and Water Productivity of SDI Cotton Having Traditional Versus Wide Crop Row Spacing (Field 6cdef).

James P. Bordovsky, Joe Mustian, K.C. Amerson, and Casey Hardin

Objective: To make comparisons of germination, yield, and water productivity resulting from SDI system/plant position strategies.

Methodology: Cotton seed germination has been a major issue when irrigating with SDI in some soils, particularly in years with little rain during the planting period. A strategy of planting 60" crop rows directly over drip laterals to insure germination was compared to the traditional method of planting two 30" crops equidistant and 15" from 60" spaced drip laterals. Cotton was irrigated in a 24-acre field with treatments replicated in 60 ft x 1600 ft plots. Planting occurred on May 17 (traditional) and May 22 (skip row). The irrigation volume and timing were the same for both treatments (see appendix).

Figure 1. SDI cotton planted on 30" rows in a traditional planting manner.

Figure 2. SDI cotton planted in a 60" skip row pattern with crop rows directly above drip laterals.

Results: Pre- and at-plant irrigation totaled 8.0" in the treatment area. Soil water in the traditional seed zones was somewhat less than optional at planting, however rain events on 3 and 6 June provided sufficient water to achieve an acceptable plant stand (Figure 1). The skip row plantings germinated quickly and resulted in a uniform plant stand (Figure 2). Yield, water productivity, and lint loan values are shown in Figure 3. The traditional planting resulted in significantly higher lint yield and water use efficiency using the same volume of water as the skip row strategy. However, seed costs were lower and lent values were significantly higher in the skip row compared to the traditional planting. Skip row planting may be an acceptable strategy in years with questionable germination due to lack of planting moisture when irrigating with SDI.

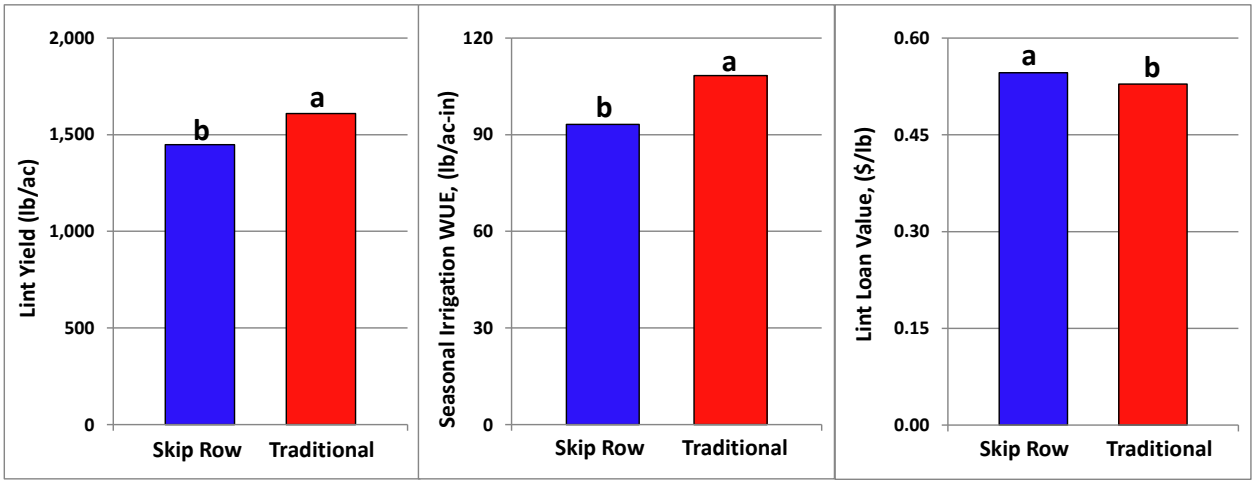


Figure 3. Cotton lint yield, water use efficiency, and cotton lint loan value of cotton planted in a 60" skip row verse a traditional 30" pattern irrigated by SDI on 60" lateral spacing at the Helms Research Farm, 2013.

Effect of Nitrogen Fertilizer on Cotton Host-Plant Quality and Its Impact on Arthropod Activity (Field 6g)

M.N. Parajulee, A. Hakeem, R. Norman, S.C. Carroll, J.P. Bordovsky

Objective: The objective was to evaluate the effect of nitrogen fertilizer application rates on the population dynamics of cotton arthropods, plant growth parameters, and lint yield.

Methodology: A high-yielding FiberMax cultivar, FM 9063B2R, was planted at a targeted rate of 56,000 seeds/acre on May 23, 2013. The experiment consisted of a randomized block design with five treatments and five replications. Pre-treatment soil samples (consisting of three soil cores; 0 to 24-inch depth), were collected from each of the 25 experiment plots on June 20, 2013. The five side-dress N fertilizer application treatments at rates of 0, 50, 100, 150, and 200 lb N/acre were applied on July 11, 2013. Crop growth and insect activity were monitored during the crop season. Weekly during most of July and August, numerous plant variables were measured to evaluate the influence of residual soil nitrogen on early plant growth patterns. Examples of collected plant data variables included: 1) plant biomass, 2) plant height, 3) total leaf area, 4) percent leaf nitrogen, 5) number of 1st position cotton squares/plant, and 6) percent fruit shed.

Results: Soil residual N levels were significantly higher in plots that received the two highest rates of N versus plots receiving lower-rate or no N augmentation. Averaged over the six-year study period, soil residual N levels were lowest in zero and 50 lb/acre plots, although the 50 lb/acre plots had numerically higher residual N than in zero N. The highest N augmentation plots (200 lb/acre) had significantly highest average residual N (Fig. 1). The two second highest N plots (100 and 150 lb/acre) resulted in significantly higher amount of residual N compared to that in zero and 50 lb/acre plots. Plants ceased setting additional squares in zero and 50-lb N plots 2 wk into flowering while higher N plots were actively producing squares.

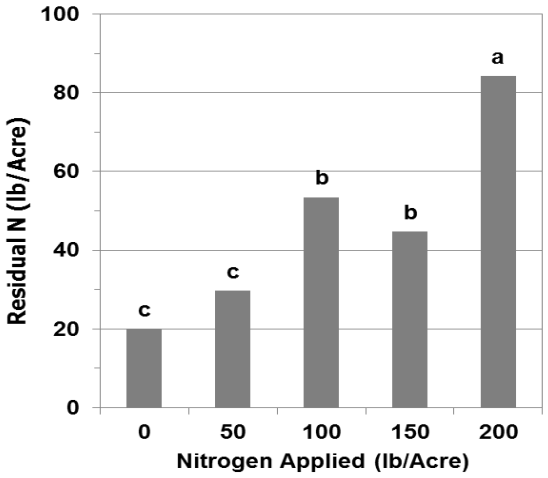


Fig. 1. Averaged over six years, effect of prior year's N application on residual N accumulation for the current crop year, 2008-2013.

Zero-N applied plots produced the lowest yield and yield increased curvilinearly, with highest average yield occurring in the 150 and 200 lb/acre (Fig. 2). Numerical decline in yield beyond 150 lb/acre in most years suggests that N application beyond 150 lb/acre may be unfavorable for cotton yield. Averaged over five years, micronaire values were similar and at the base range (3.5-3.6) across the three lower N levels, whereas the two highest N levels resulted in micronaire values in a discount range (<3.4).

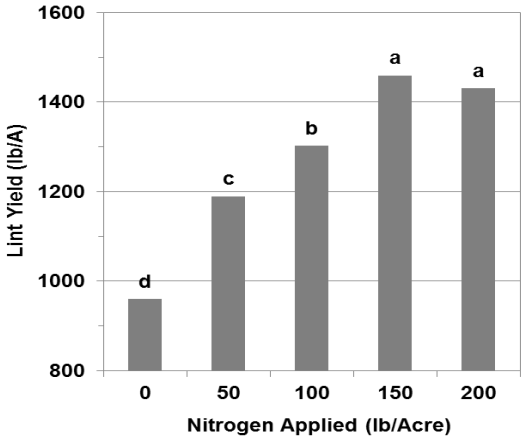


Fig. 2. Averaged over six years, effect of N application rates on lint yield, 2008-2013.

APPENDIX

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)					Field 5 - A Span 2	Field 5 - A Spans 3-8				Field 5 - B Span 2	Field 5 - B Spans 3-8				Field 5 - C Span 2	Field 5 - C Spans 3-8				Field 5 - D East Span 2	Field 5 - D East Spans 3-8			
					Drip			Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Pivot	Pivot			
					Cot			G.Sorg	G.Sorg				G.Sorg	G.Sorg				Cot	Cot				Cot	Cot			
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	All Zones	Border	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%
1	9	2013	0.89	1.19																							
2	12	2013	0.21	0.20																							
2	20	2013	0.16	0.21																							
2	22	2013	0.34	0.37																							
2	25	2013	0.65	0.65																							
3	8	2013	0.27	0.25																							
4	8	2013																0.35	0.35	0.35	0.35	S	0.35	0.35	0.35	0.35
4	9	2013																									
4	12	2013																									
4	13	2013																0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30
4	22	2013																0.40	0.40	0.40	0.40	L				
4	24	2013			0.11	0.10	D																0.40	0.40	0.40	0.40
4	25	2013			0.11	0.10	D	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L	0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40
4	26	2013			0.14	0.10	D																			
4	27	2013			0.12	0.10	D	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
4	28	2013			0.10	0.09	D	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
4	29	2013			0.11	0.10	D	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L									
4	30	2013			0.12	0.11	D	0.07	0.07	0.07	0.07	L						0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
5	1	2013			0.11	0.11	D						0.07	0.07	0.07	0.07	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
5	2	2013			0.09	0.11	D																			
5	3	2013			0.12	0.11	D																			
5	4	2013			0.15	0.11	D																			
5	5	2013			0.09	0.11	D																			
5	6	2013			0.12	0.11	D																			
5	7	2013			0.12	0.11	D	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L				
5	8	2013			0.12	0.11	D	0.30	0.30	0.30	0.30	L											0.30	0.30	0.30	0.30
5	9	2013			0.12	0.11	D						0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
5	10	2013			0.12	0.11	D	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L									
5	11	2013			0.13	0.11	D											0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
5	12	2013			0.11	0.11	D	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L									
5	13	2013			0.12	0.11	D																			
5	14	2013			0.12	0.11	D																			
5	15	2013			0.11	0.11	D																			
5	16	2013			0.12	0.11	D											0.65	0.65	0.65	0.65	S				
5	17	2013			0.10	0.11	D																0.65	0.65	0.65	0.65
5	18	2013			0.12	0.11	D																			
5	19	2013			0.11	0.11	D	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L									
5	20	2013			0.12	0.11	D											0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30
5	21	2013			0.12	0.11	D																			

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)		Field 3			Field 5 - A Span 2	Field 5 - A Spans 3-8				Field 5 - B Span 2	Field 5 - B Spans 3-8				Field 5 - C Span 2	Field 5 - C Spans 3-8				Field 5 - D East Span 2	Field 5 - D East Spans 3-8			
					Drip			Pivot	Pivot				Pivot	Pivot					Pivot	Pivot				Pivot	Pivot			
					Cot			G.Sorg	G.Sorg				G.Sorg	G.Sorg					Cot	Cot				Cot	Cot			
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	All Zones	Border	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	
5	22	2013			0.12	0.11	D	0.23	0.23	0.23	0.23	L	0.23	0.23	0.23	0.23	L										
5	23	2013			0.12	0.11	D	0.23	0.23	0.23	0.23	L	0.23	0.23	0.23	0.23	L	0.23	0.23	0.23	0.23	L	0.07	0.07	0.07	0.07
5	24	2013			0.12	0.11	D	0.23	0.23	0.23	0.23	L	0.23	0.23	0.23	0.23	L										
5	25	2013			0.12	0.11	D	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L										
5	26	2013																									
5	27	2013																									
5	28	2013																									
5	29	2013						0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L										
5	30	2013						0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L										
5	31	2013																									
6	1	2013																									
6	2	2013																									
6	3	2013	0.11	0.10														0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30
6	4	2013																									
6	5	2013																0.20	0.20	0.20	0.20	L	0.20	0.20	0.20	0.20
6	6	2013	0.42	0.41																							
6	7	2013																									
6	8	2013	0.33	0.35																							
6	9	2013	0.15	0.20																							
6	10	2013																									
6	11	2013																									
6	12	2013																									
6	13	2013																									
6	14	2013																									
6	15	2013	0.08	0.08																							
6	16	2013																									
6	17	2013			0.02	0.06	D																				
6	18	2013	1.98	1.36																							
6	19	2013																									
6	20	2013	0.05	0.05																							
6	21	2013	0.30	0.25																							
6	22	2013																									
6	23	2013																									
6	24	2013																									
6	25	2013																									
6	26	2013						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
6	27	2013			0.13	0.11	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
6	28	2013			0.13	0.11	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
6	29	2013			0.11	0.11	D	0.06	0.06	0.03	0.09	L	0.06	0.06	0.03	0.09	L						0.20	0.20	0.10	0.30
6	30	2013	0.91	0.86														0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)					Field 3			Field 5 - A Span 2	Field 5 - A Spans 3-8				Field 5 - B Span 2	Field 5 - B Spans 3-8				Field 5 - C Span 2	Field 5 - C Spans 3-8				Field 5 - D East Span 2	Field 5 - D East Spans 3-8			
								Drip			Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Pivot	Pivot			
								Cot			G.Sorg	G.Sorg				G.Sorg	G.Sorg				Cot	Cot				Cot	Cot			
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1		All Zones	Border	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	
7	1	2013	0.27	0.23																										
7	2	2013																												
7	3	2013							0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L												
7	4	2013																												
7	5	2013																												
7	6	2013																												
7	7	2013																												
7	8	2013																												
7	9	2013				0.13	0.10	D																						
7	10	2013				0.11	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
7	11	2013				0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
7	12	2013				0.13	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L					
7	13	2013				0.12	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	
7	14	2013	0.52	0.75		0.12	0.06	D	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
7	15	2013												0.20	0.20	0.10	0.30	L										
7	16	2013																												
7	17	2013	2.03	2.81																										
7	18	2013	0.85																											
7	19	2013																												
7	20	2013																												
7	21	2013																												
7	22	2013				0.12		D																						
7	23	2013				0.12	0.06	D																						
7	24	2013				0.11	0.06	D																						
7	25	2013		0.30		0.12	0.06	D																						
7	26	2013																												
7	27	2013																												
7	28	2013																												
7	29	2013				0.15	0.12	D																						
7	30	2013				0.13	0.11	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L					
7	31	2013				0.11	0.06	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	
8	1	2013		0.04		0.13	0.09	D	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	2	2013				0.11	0.07	D						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	3	2013				0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	4	2013				0.11	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	5	2013				0.13	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L					
8	6	2013				0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	
8	7	2013				0.13	0.07	D											0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	8	2013				0.11	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	
8	9	2013				0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)		Field 3			Field 5 - A Span 2	Field 5 - A Spans 3-8				Field 5 - B Span 2	Field 5 - B Spans 3-8				Field 5 - C Span 2	Field 5 - C Spans 3-8				Field 5 - D East Span 2	Field 5 - D East Spans 3-8			
					Drip			Pivot	Pivot				Pivot	Pivot					Pivot	Pivot				Pivot	Pivot			
					Cot			G.Sorg	G.Sorg				G.Sorg	G.Sorg					Cot	Cot				Cot	Cot			
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	All Zones	Border	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	
8	10	2013			0.13	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L					
8	11	2013			0.12	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30
8	12	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	13	2013	0.10	0.15	0.11	0.07	D						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	14	2013	1.50	0.80	0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	15	2013						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
8	16	2013																								
8	17	2013			0.14	0.07	D																			
8	18	2013			0.11	0.07	D																			
8	19	2013			0.13	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	20	2013			0.13	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	21	2013			0.11	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
8	22	2013			0.11	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30
8	23	2013			0.13	0.07	D	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	24	2013			0.13	0.08	D						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	25	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	26	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
8	27	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
8	28	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30
8	29	2013			0.11	0.07	D																			
8	30	2013			0.12	0.07	D																			
8	31	2013			0.12	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
9	1	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
9	2	2013			0.12	0.08	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
9	3	2013			0.13	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30
9	4	2013			0.13		D																			
9	5	2013			0.12	0.07	D											0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
9	6	2013			0.12	0.07	D	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
9	9	2013						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
9	13	2013						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30
9	14	2013						0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
9	15	2013																								
9	16	2013	0.52	0.66																						
9	18	2013	0.13	0.01																						
9	27	2013	0.42	0.40																						
9	28	2013	0.56	0.54																						
Pre & At Plant			2.52	2.87	3.73	3.45		3.21	3.21	3.21	3.21		3.21	3.21	3.21	3.21		4.73	4.73	4.73	4.73		4.57	4.57	4.57	4.57
Seasonal			11.23	10.35	6.22	3.77		8.06	8.06	4.03	12.09		8.06	8.06	4.03	12.09		7.50	7.50	4.00	11.00		7.50	7.50	4.00	11.00
TOTALS			13.75	13.22	9.95	7.22		11.27	11.27	7.24	15.30		11.27	11.27	7.24	15.30		12.23	12.23	8.73	15.73		12.07	12.07	8.57	15.57

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)			Field 5 - D West Span 2	Field 5 - D West Spans 3-8				Field 5 - E Span 2	Field 5 - E Spans 3-8				Field 5 - F Span 2	Field 5 - F Spans 3-8				Field 6 - A,B,C, E,F	Field 6 - G	Field 6 - H	
						Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	
						Cot	Cot				Cot	Cot				Cot	Cot				Cot	Cot	Cot	
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system				system
1	9	2013	0.89	1.19																				
2	12	2013	0.21	0.20																				
2	20	2013	0.16	0.21																				
2	22	2013	0.34	0.37																				
2	25	2013	0.65	0.65																				
3	8	2013	0.27	0.25																				
4	8	2013			S	0.35	0.35	0.35	0.35	S														
4	9	2013									0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S				
4	12	2013									0.40	0.40	0.40	0.40	S	0.40	0.40	0.40	0.40	S				
4	13	2013			S	0.30	0.30	0.30	0.30	S														
4	22	2013				0.40	0.40	0.40	0.40	L														
4	24	2013			L						0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.19	0.30	0.27	D
4	25	2013			L	0.40	0.40	0.40	0.40	L											0.17	0.26	0.26	D
4	26	2013									0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.24	0.26	0.27	D
4	27	2013			L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L						0.23	0.26	0.27	D
4	28	2013			L	0.30	0.30	0.30	0.30	L						0.30	0.30	0.30	0.30	L	0.14	0.26	0.27	D
4	29	2013									0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.24	0.28	0.29	D
4	30	2013			L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.24	0.27	0.29	D
5	1	2013			L	0.30	0.30	0.30	0.30	L											0.21	0.26	0.27	D
5	2	2013																			0.17	0.27	0.28	D
5	3	2013																			0.24	0.27	0.28	D
5	4	2013																			0.34	0.19	0.28	D
5	5	2013																			0.14	0.33	0.28	D
5	6	2013									0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.23	0.25	0.27	D
5	7	2013																			0.23	0.24	0.27	D
5	8	2013			L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.23	0.24	0.27	D
5	9	2013			L	0.30	0.30	0.30	0.30	L											0.23	0.24	0.27	D
5	10	2013									0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.21	0.24	0.27	D
5	11	2013			L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.22	0.25	0.28	D
5	12	2013																			0.21	0.25	0.27	D
5	13	2013																			0.21	0.24	0.27	D
5	14	2013																			0.21	0.25	0.27	D
5	15	2013																			0.18	0.24	0.27	D
5	16	2013																			0.22	0.24	0.27	D
5	17	2013			S	0.65	0.65	0.65	0.65	S											0.28	0.45	0.27	D
5	18	2013									0.65	0.65	0.65	0.65	S						0.23	0.24	0.27	D
5	19	2013														0.60	0.60	0.60	0.60	S	0.19	0.24	0.27	D
5	20	2013			S	0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S						0.21	0.24	0.27	D
5	21	2013														0.30	0.30	0.30	0.30	S	0.21	0.24	0.27	D

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)			Field 5 - D West Span 2	Field 5 - D West Spans 3-8				Field 5 - E Span 2	Field 5 - E Spans 3-8				Field 5 - F Span 2	Field 5 - F Spans 3-8				Field 6 - A,B,C, E,F	Field 6 - G	Field 6 - H	
						Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	
						Cot	Cot				Cot	Cot				Cot	Cot				Cot	Cot	Cot	
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system				system
5	22	2013																			0.27			D
5	23	2013			L	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L	0.07	0.07	0.07	0.07	L	0.30			D
5	24	2013																			0.28			D
5	25	2013																			0.28			D
5	26	2013																						
5	27	2013																						
5	28	2013																			0.28			D
5	29	2013									0.30	0.30	0.30	0.30	L	0.50	0.50	0.50	0.50	L	0.25			D
5	30	2013									0.20	0.20	0.20	0.20	L						0.27			D
5	31	2013																						
6	1	2013																						
6	2	2013																						
6	3	2013	0.11	0.10	L	0.30	0.30	0.30	0.30	L														
6	4	2013																						
6	5	2013			L	0.20	0.20	0.20	0.20	L														
6	6	2013	0.42	0.41																				
6	7	2013																						
6	8	2013	0.33	0.35																				
6	9	2013	0.15	0.20																				
6	10	2013																						
6	11	2013																						
6	12	2013																						
6	13	2013																						
6	14	2013																						
6	15	2013	0.08	0.08																				
6	16	2013																						
6	17	2013																			0.07			D
6	18	2013	1.98	1.36																				
6	19	2013																						
6	20	2013	0.05	0.05																				
6	21	2013	0.30	0.25																				
6	22	2013																						
6	23	2013																						
6	24	2013																						
6	25	2013																						
6	26	2013			L	0.06	0.06	0.03	0.09	L	0.20	0.20	0.10	0.30	L									
6	27	2013			L	0.06	0.06	0.03	0.09	L						0.20	0.20	0.10	0.30	L	0.24	0.30	0.27	D
6	28	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.26	0.24	0.27	D
6	29	2013			L	0.06	0.06	0.03	0.09	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.22	0.24	0.32	D
6	30	2013	0.91	0.86	L	0.06	0.06	0.03	0.09	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)			Field 5 - D West Span 2	Field 5 - D West Spans 3-8				Field 5 - E Span 2	Field 5 - E Spans 3-8				Field 5 - F Span 2	Field 5 - F Spans 3-8				Field 6 - A,B,C, E,F	Field 6 - G	Field 6 - H	
						Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	
						Cot	Cot				Cot	Cot				Cot	Cot				Cot	Cot	Cot	
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system				system
7	1	2013	0.27	0.23																				
7	2	2013																						
7	3	2013																						
7	4	2013																						
7	5	2013																						
7	6	2013																						
7	7	2013																						
7	8	2013																						
7	9	2013																			0.21	0.24	0.23	D
7	10	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.17	0.24	0.27	D
7	11	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.17	0.24	0.27	D
7	12	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.23	0.24	0.27	D
7	13	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.24	0.24	0.27	D
7	14	2013	0.52	0.75	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.21	0.24	0.27	D
7	15	2013																						
7	16	2013																						
7	17	2013	2.03	2.81																				
7	18	2013	0.85																					
7	19	2013																						
7	20	2013																						
7	21	2013																						
7	22	2013																			0.23	0.24	0.27	D
7	23	2013																			0.22	0.24	0.27	D
7	24	2013																			0.21	0.24	0.27	D
7	25	2013		0.30																	0.21	0.24	0.27	D
7	26	2013																						
7	27	2013																						
7	28	2013																						
7	29	2013																			0.31	0.24	0.27	D
7	30	2013																			0.24	0.24	0.27	D
7	31	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.22	0.20	0.27	D
8	1	2013		0.04	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.25	0.20	0.27	D
8	2	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.27	D
8	3	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.27	D
8	4	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.19	0.20	0.27	D
8	5	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.26	0.20	0.27	D
8	6	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.23	0.20	0.27	D
8	7	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.24	0.20	0.27	D
8	8	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.22	0.20	0.27	D
8	9	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.25	0.18	0.24	D

2013 Rain and Irrigation Amounts at Helm Research Farm, Halfway

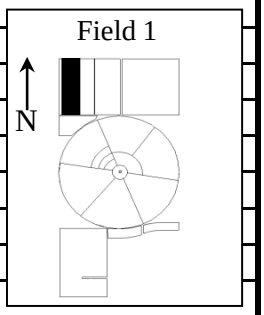
Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Date			Rainfall (inches)			Field 5 - D West Span 2	Field 5 - D West Spans 3-8				Field 5 - E Span 2	Field 5 - E Spans 3-8				Field 5 - F Span 2	Field 5 - F Spans 3-8				Field 6 - A,B,C, E,F	Field 6 - G	Field 6 - H	
						Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	
						Cot	Cot				Cot	Cot				Cot	Cot				Cot	Cot	Cot	
Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system		Base	Base-50%	Base+50%	system				system
8	10	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.26	0.18	0.24	D
8	11	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.23	0.18	0.24	D
8	12	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.24	0.18	0.24	D
8	13	2013	0.10	0.15	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.26	0.18	0.24	D
8	14	2013	1.50	0.80	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.25	0.18	0.24	D
8	15	2013														0.20	0.20	0.10	0.30	L				
8	16	2013																						
8	17	2013																			0.26	0.18	0.24	D
8	18	2013																			0.22	0.18	0.24	D
8	19	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L						0.25	0.18	0.24	D
8	20	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L	0.24	0.18	0.24	D
8	21	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.21	0.18	0.24	D
8	22	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.21	0.18	0.24	D
8	23	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
8	24	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
8	25	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
8	26	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L				
8	27	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.29	0.18	0.24	D
8	28	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.24	0.18	0.24	D
8	29	2013																			0.22	0.19	0.24	D
8	30	2013																						
8	31	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
9	1	2013			L	0.20	0.20	0.10	0.30	L						0.20	0.20	0.10	0.30	L				
9	2	2013									0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L				
9	3	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.26	0.14	0.19	D
9	4	2013																			0.26	0.14	0.19	D
9	5	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.25	0.14	0.19	D
9	6	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L	0.25	0.14	0.19	D
9	9	2013																						
9	13	2013			L	0.20	0.20	0.10	0.30	L	0.20	0.20	0.10	0.30	L									
9	14	2013														0.20	0.20	0.10	0.30	L				
9	15	2013																						
9	16	2013	0.52	0.66																				
9	18	2013	0.13	0.01																				
9	27	2013	0.42	0.40																				
9	28	2013	0.56	0.54																				
Pre & At Plant			2.52	2.87		4.57	4.57	4.57	4.57		4.57	4.57	4.57	4.57		4.52	4.52	4.52	4.52		7.98	7.30	7.64	
Seasonal			11.23	10.35		6.94	6.94	3.72	10.16		7.50	7.50	4.00	11.00		7.50	7.50	4.00	11.00		10.10	8.73	10.85	
TOTALS			13.75	13.22		11.51	11.51	8.29	14.73		12.07	12.07	8.57	15.57		12.02	12.02	8.52	15.52		18.08	16.03	18.49	

Operations Summary

Year	2013	
Farm	Helm	
Field ID	Field 1	Corn Hybrids for Drought Tolerance Xu
Exp. Design		
Soil Type		

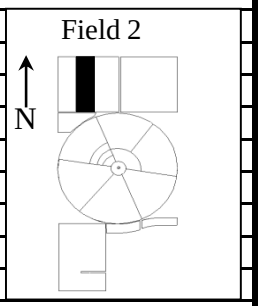
Field Operations	Date	Activity
Tillage	11/29/2012	Shredd F.1 North & F.1 South
	12/14/2012	Disk F.1 South 3 Times
	12/19/2012	Disk F.1 North
	2/13/2013	Field Cultivate F.1 North & F.1 South
	2/13/2013	List F.1 North & F.1 South
	3/9/2013	Cultivate F.1 North & F.1 South
	6/24/2013	Disk F.1 South
	7/9/2013	Field Cultivate F.1 South
Fertility	3/13/2013	130-70-0 Dry
	6/14/2013	80 lbs N/ac (32-0-0 applied thru coulter rig F.1North)
Planting	5/7/2013	Corn plots F.1 North
Herbicide/Growth Regulator	5/10/2013	Bicept 3pt/ac
	6/13/2013	Laudis 22oz/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting		
Seasonal		



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 2
Exp. Design	Fallow
Soil Type	

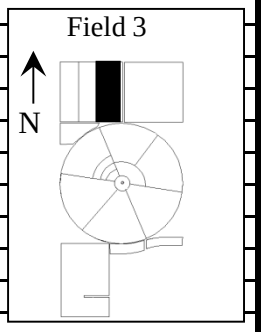
Field Operations	Date	Activity
Tillage	12/7/2012	Shredder
	3/22/2013	Stalk Puller
	3/24/2013	Rotary Hoe
	6/12/2013	Cultivate
	6/19/2013	Rotary Hoe
	6/28/2013	Cultivate
Fertility		None
Planting		No Crops were Planted, Update Susurface Drip Irrigation
Herbicide/Growth Regulator	4/15/2013	Prowl H2O 3pt/ac with Weather Max 32oz/ac
	7/2/2013	GlyStar Gold 32oz/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		None
Seasonal		None
Rainfall		
PrePlant & Planting		
Seasonal	1/9 to 3/8	2.87 in
	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 3
Exp. Design	Cotton
Soil Type	

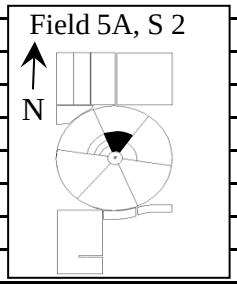
Field Operations	Date	Activity
Tillage	12/7/2012	Shredder
	3/23/2013	Stalk Puller
	3/24/2013	Rotary Hoe
	6/12/2013	Cultivate
	6/19/2013	Rotary Hoe
	7/8/2013	Cultivate & Dike
Fertility	7/10,11	23 lbs N/ac (32-0-0 applied thru drip lines)
	7/24,25	23 lbs N/ac (32-0-0 applied thru drip lines)
Planting	5/16/2013	FM 9180B2F at 54,000 seed/ac
Herbicide/Growth Regulator	4/15/2013	Prowl H2O 3pt/ac with Weather Max 32oz/ac
	5/8/2013	Weather Max 48oz/ac
	5/17/2013	Caporal 3pt/ac
	7/24/2013	GlyStar Gold 32oz/ac
Insecticide	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/24 to 5/25	3.73 in
Seasonal	6/17 to 9/6	6.22 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5a (Span 2)
Exp. Design	Milo
Soil Type	

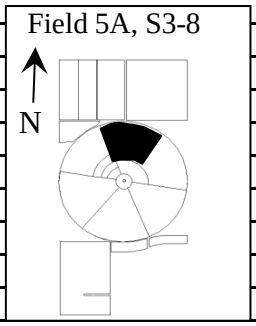
Field Operations	Date	Activity
Tillage	11/2/2012	Shredder Span 3,4
	11/2/2012	Disk Span 3,4
	12/5/2012	Shred Span 2
	12/5/2012	Paratil
	1/24/2013	Lister (Roller & Bed Conditioners)
	3/3/2013	Cultivate & Dike
	6/17/2013	Rotary Hoe
	6/19/2013	Rotary Hoe
	7/2/2013	Cultivate & Dike
	7/24/2013	Cultivate & Dike Span 3,4
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	7/3/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
	7/3/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
Planting	6/4/2013	FACT Test 16 Rows Span 3 (Keeling) Span 4 DKS 4945
	6/5/2013	Weed Study Span 2 (Keeling)
Herbicide/Growth Regulator	4/29/2013	Sharpen 2oz/ac
	5/13/2013	Clarity 4oz/ac with Weather Max 28oz/ac
	6/6/2013	Weather Max 32oz/ac
	6/6/2013	Milo Pro 1.25pt/ac with Medal II EC 1.25pt/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/25 to5/30	3.21 in
Seasonal	6/26 to 9/14	8.06 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5a (Spans 3-8)
Exp. Design	Milo
Soil Type	

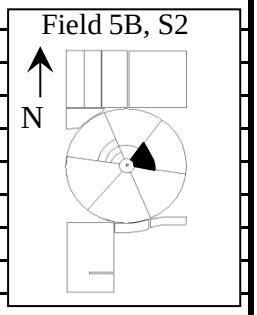
Field Operations	Date	Activity
Tillage	12/5/2012	Shredder
	12/5/2012	Paratil
	1/24/2013	Lister (Roller & Bed Conditioners)
	3/3/2013	Cultivate & Dike
	6/17/2013	Rotary Hoe
	6/19/2013	Rotary Hoe
	7/2/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	7/3/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
	7/3/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
Planting	6/4/2013	DKS 4945 at 75,392 seed/ac Med Irr
	6/4/2013	DKS 4945 at 56,006 seed/ac Low Irr
	6/4/2013	DKS 4945 at 98,010 seed/ac High Irr
Herbicide/Growth Regulator	4/29/2013	Sharpen 22oz/ac
	5/13/2013	Clarity 4oz/ac with Weather Max 28oz/ac
	6/6/2013	Weather Max 32oz/ac
	6/6/2013	Milo Pro 1.25pt/ac with Medal II EC 1.25pt/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/25 to5/30	3.21 in
Seasonal	6/26 to 9/14	Base = 8.06 in; Base -50% = 4.03 in; Base+50% = 12.09 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5b (Span 2)
Exp. Design	Milo
Soil Type	

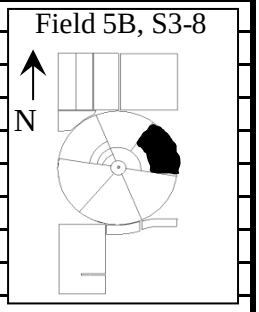
Field Operations	Date	Activity
Tillage	11/2/2012	Shredder Span 3,4
	11/2/2012	Disk Span 3,4
	12/5/2012	Shredder Span 2
	12/5/2012	Paratil
	1/24/2013	Lister (Roller & Bed Conditioners)
	3/3/2013	Cultivate & Dike
	6/17/2013	Rotary Hoe
	6/19/2013	Rotary Hoe
	7/2/2013	Cultivate & Dike
	7/24/2013	Cultivate & Dike Span 3,4
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	7/3/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
	7/3/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
Planting	6/4/2013	FACT Test 16 Rows Span 3 (Keeling) Span 4 DKS 4945
	6/5/2013	Weed Study Span 2 (Keeling)
Herbicide/Growth Regulator	4/29/2013	Sharpen 22oz/ac
	5/13/2013	Clarity 4oz/ac with Weather Max 28oz/ac
	6/6/2013	Weather Max 32oz/ac
	6/6/2013	Milo Pro 1.25pt/ac with Medal II EC 1.25pt/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/25 to5/30	3.21 in
Seasonal	6/26 to 9/14	8.06 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5b (Spans 3-8)
Exp. Design	Milo
Soil Type	

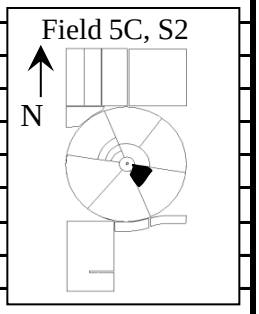
Field Operations	Date	Activity
Tillage	12/5/2012	Shredder
	12/12/2012	Paratil
	1/24/2013	Lister (Roller & Bed Conditioners)
	3/3/2013	Cultivate & Dike
	6/17/2013	Rotary Hoe
	6/19/2013	Rotary Hoe
	7/2/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	7/3/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
	7/3/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
Planting	6/4/2013	DKS 4945 at 75,392 seed/ac Med Irr
	6/4/2013	DKS 4945 at 56,006 seed/ac Low Irr
	6/4/2013	DKS 4945 at 98,010 seed/ac High Irr
Herbicide/Growth Regulator	4/29/2013	Sharpen 22oz/ac
	5/13/2013	Clarity 4oz/ac with Weather Max 28oz/ac
	6/6/2013	Weather Max 32oz/ac
	6/6/2013	Milo Pro 1.25pt/ac with Medal II EC 1.25pt/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/25 to5/30	3.21 in
Seasonal	6/26 to 9/14	Base = 8.06 in; Base -50% = 4.03 in; Base+50% = 12.09 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5c (Span 2)
Exp. Design	Cotton
Soil Type	

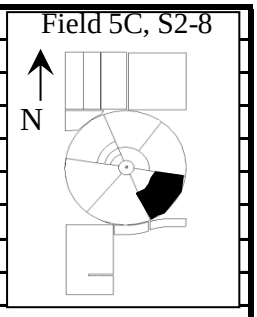
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/20/2012	Paratil
	1/25/2013	Lister (Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	30 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 seed/ac Span 2
	5/14/2013	FM 2482 B2RF at 54,000 seed/ac Span 3,4 (8 Row Skip)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac Span 3,4 (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	Glystar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.73 in
Seasonal	6/3 to 9/13	7.50 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5c (Spans 3-8)
Exp. Design	Cotton
Soil Type	

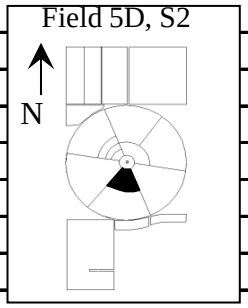
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/20/2012	Paratil
	1/25/2013	Lister (Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 seed/ac (overhang 16 rows)
	5/14/2013	FM2482 B2RF at 54,000 seed/ac Span 5-8 (8 Row skip)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac Span 5-8 (Skipped 8 Rows)
	5/16/2013	Syngenta Test Span 8 (32 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	GlyStar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.73 in
Seasonal	6/3 to 9/13	Base = 7.50 in; Base-50% = 4.00 in; Base+50% = 11.00 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5d(east) (Span 2)
Exp. Design	Cotton
Soil Type	

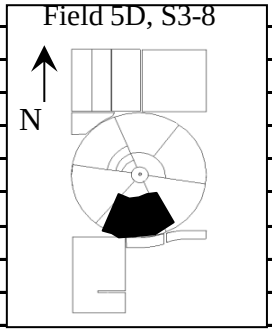
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/17/2012	Paratil
	1/25/2013	Lister(Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 seed/ac Span 2
	5/14/2013	FM 2484 B2RF at 54,000 seed/ac Span 3,4 (8 Row Skip)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac Span 3,4 (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	GlyStar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.57 in
Seasonal	6/3 to 9/13	7.50 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5d(east) (Spans 3-8)
Exp. Design	Cotton
Soil Type	

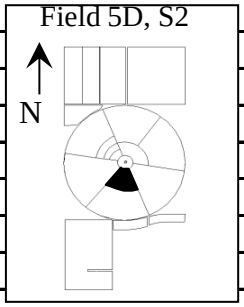
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/17/2012	Paratil
	1/25/2013	Lister (Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac +35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr Preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 2484 B2RF at 54,000 seed/ac (8 Row Skip)
	5/14/2013	FM 9180 B2F at 54,000 seed/ac (Overhang)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	GlyStar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.57 in
Seasonal	6/3 to 9/13	Base = 7.50 in; Base-50% = 4.00 in; Base+50% = 11.00 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5d(west) (Span 2)
Exp. Design	Cotton
Soil Type	

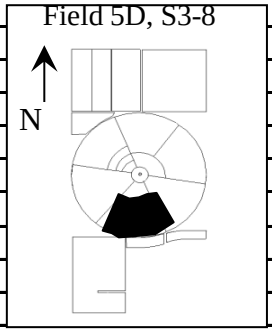
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/17/2012	Paratil
	1/25/2013	Lister(Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 seed/ac Span 2
	5/14/2013	FM 2484 B2RF at 54,000 seed/ac Span 3,4 (8 Row Skip)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac Span 3,4 (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	GlyStar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.57 in
Seasonal	6/3 to 9/13	6.94 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5d(west) (Spans 3-8)
Exp. Design	Cotton
Soil Type	

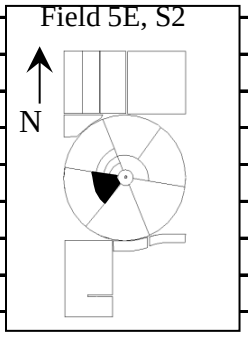
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/17/2012	Paratil
	1/25/2013	Lister (Roller & Bed Conditioners)
	3/4/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/24/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac +35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr Preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 2484 B2RF at 54,000 seed/ac (8 Row Skip)
	5/14/2013	FM 9180 B2F at 54,000 seed/ac (Overhang)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/3/2013	Weather Max 28oz/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/12/2013	GlyStar Gold 48oz/ac
	7/12/2013	Weather Max 32oz/ac with Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/8 to 5/23	4.57 in
Seasonal	6/3 to 9/13	Base = 6.94 in; Base-50% = 3.72 in; Base+50% = 10.16 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5e (Span 2)
Exp. Design	Cotton
Soil Type	

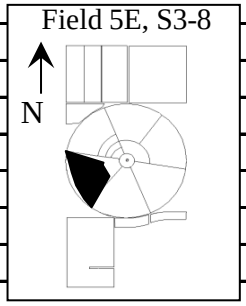
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	12/18/2012	Paratil
	1/28/2013	Lister (Roller & Bed Conditioners)
	3/5/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/25/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	4/24/2013	Woodard Plot Test Span 2 (Early Plant)
	5/14/2013	Woodard Plot Test Span 2 (Regular Plant)
	5/14/2013	FM 2484 B2RF at 54,000 seed/ac (8 Row Skip) Span 3,4
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac (Skipped 8 Rows) Span 3,4
	6/7/2013	Woodard Plot Test Span 2 (Late Plant)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/13/2013	GlyStar Gold 48oz/ac
	7/23/2013	Weathermax 32oz/ac and Medal II EC 1pt/ac
	7/24/2013	GlyStar Gold 32oz/ac (Span 2)
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/9 to 5/23	4.57 in
Seasonal	5/29 to 9/13	7.50 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5e (Span 3-8)
Exp. Design	Cotton
Soil Type	

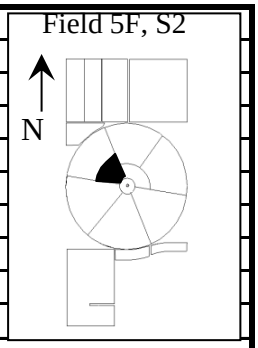
Field Operations	Date	Activity
Tillage	12/6/2013	Shredder
	12/18/2013	Paratil
	1/28/2013	Lister (Roller & Bed Conditioners)
	3/5/2013	Cultivate & Dike
	5/24/2013	Rotary Hoe
	6/25/2013	Cultivate & Dike
Fertility	3/19/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig Low Irr preplant)
	3/20/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig High Irr preplant)
	4/1/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig Med Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig High Irr)
	6/27/2013	31 lbs N/ac (applied thru coulter rig Med Irr)
Planting	5/14/2013	Fibermax 9180 B2F at 54,000 seed/ac (Overhang)
	5/14/2013	Wheeler Plot Test Span 6,7 (16 Rows)
	5/14/2013	FM 2484 B2RF at 54,000 seed/ac (8 Row Skip)
	5/15/2013	DP 1219 B2RF at 52,000 seed/ac (Skipped 8 Rows)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/13/2013	GlyStar Gold 48oz/ac
	7/23/2013	Weathermax 32oz/ac and Medal II EC 1pt/ac
	7/29/2013	Mepiquat 16oz/ac High Water only
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/9 to 5/23	4.57 in
Seasonal	5/29 to 9/13	Base = 7.50 in; Base-50% = 4.00 in; Base+50% = 11.00 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5f (Span 2)
Exp. Design	Cotton
Soil Type	

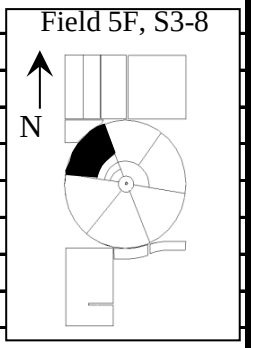
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	1/7/2013	Paratil
	1/28/2013	Lister (Roller & Bed Conditioners)
	3/5/2013	Cultivate & Dike
	6/25/2013	Cultivate & Dike
Fertility	4/3/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	4/3/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	4/3/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/28/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 seed/ac Span 2
	5/16/2013	FM 9180 B2RF at 52,000 seed/ac Span 3,4
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/13/2013	GlyStar Gold 48oz/ac
	7/23/2013	Weathermax 32oz/ac and Medal II EC 1pt/ac
	7/24/2013	GlyStar Gold 32oz/ac (Span 2)
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/9 to 5/23	4.52 in
Seasonal	5/29 to 9/14	7.50 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 5f (Spans 5-8)
Exp. Design	Cotton
Soil Type	

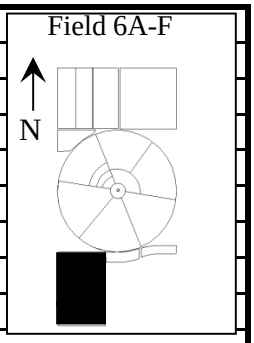
Field Operations	Date	Activity
Tillage	12/6/2012	Shredder
	1/7/2013	Paratil
	1/28/2013	Lister (Roller & Bed Conditioners)
	3/5/2013	Cultivates & Dike
	6/25/2013	Cultivates & Dike
Fertility	4/3/2013	80 lbs N/ac + 28 lbs P/ac (applied thru coulter rig on Low Irr preplant)
	4/3/2013	83 lbs N/ac + 30 lbs P/ac (applied thru coulter rig on Med Irr preplant)
	4/3/2013	98 lbs N/ac + 35 lbs P/ac (applied thru coulter rig on High Irr preplant)
	6/26/2013	58 lbs N/ac (applied thru coulter rig on High Irr)
	6/28/2013	31 lbs N/ac (applied thru coulter rig on Med Irr)
Planting	5/14/2013	FM 9180 B2RF at 54,000 Seed/ac (overhang)
	5/15/2013	Bayor Cap Trials Mixed Varieties (Span 5-8)
Herbicide/Growth Regulator	4/8/2013	Stealth 3pt/ac
	5/13/2013	Helosate Plus 28oz/ac
	5/17/2013	Caporal 3pt/ac
	6/13/2013	GlyStar Gold 48oz/ac
	7/23/2013	Weathermax 32oz/ac and Medal II EC 1pt/ac
Insecticide	6/3/2013	Acephate 4oz/ac
	6/10/2013	Acephate 4oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/9 to 5/23	4.52 in
Seasonal	5/29 to 9/14	Base = 7.50 in; Base-50% = 4.00 in; Base+50% = 11.00 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 6 - Zone A-F
Exp. Design	Cotton
Soil Type	

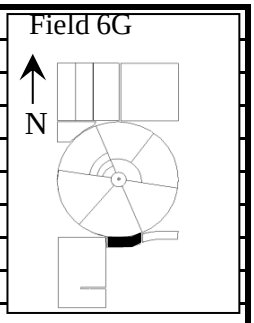
Field Operations	Date	Activity
Tillage	12/13/2012	Shredder
	3/19/2013	Stalk Puller
	3/23/2013	Rotary Hoe
	6/14/2013	Cultivate 30" Rows
	6/19/2013	Rotary Hoe Zone C-F
	6/20/2013	Cultivate 60" Rows
	7/12/2013	Cultivate Dow Regualated Zone A,B
Fertility	3/12/2013	52 lbs N/ac + 18 lbs P/ac (applied thru coulter rig)
	7/10 to 31	52 lbs N/ac (32-0-0 applied thru drip lines)
Planting	5/17/2013	FM 9250 GL 54,000 seed/ac 24 Row Skip 30" Rows Zone C-F
	5/22/2013	FM 9250 GL 56,000 seed/ac 24 Row Skip 60" Rows Zone C-F
	5/22	Dow Regulated Test in Zone A,B with Phy 357WRF Border 52,000 seed/ac
Herbicide/Growth Regulator	4/15/2013	Prowl H2O 3pt/ac with Weather Max 32oz/ac
	5/8/2013	Weather Max 48oz/ac Zone A
	5/23/2013	Caparol 3 pt/ac with Weather Max 48oz/ac
	5/28/2013	Weather Max 48oz/ac Zone A,B
	7/2/2013	GlyStar Gold 32oz/ac Zone A,B Dow Border
	7/23/2013	Liberty 32oz/ac Zone C-F
	7/29	Mepiquat 16oz/ac 60" Rows Zone C-F
	8/9	Mepiquat 16oz/ac 60" Rows Zone C-F
Insecticide	5/31/2013	Acephate 4 oz/ac Zone C-F
	6/10/2013	Acephate 4 oz/ac Zone A-F
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/24 to 5/31	7.98 in
Seasonal	6/18 to 9/7	10.10 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 6 - Zone G
Exp. Design	Cotton Drip Irrigated Nitrogen Level Effects on Insects Parajulee
Soil Type	

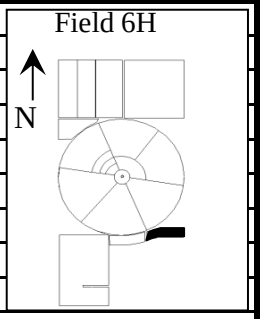
Field Operations	Date	Activity
Tillage	12/7/2012	Shredder
	3/22/2013	Stalk Puller
	3/23/2013	Rotary Hoe
	6/13/2013	Cultivate
	6/19/2013	Rotary Hoe
	7/22/2013	Cultivate and Dike
Fertility	7/11/2013	32-0-0 liquid (applied thru coulter rig at mixed rates)
Planting	5/23/2013	Fibermax 9063 B2F at 54,000 seed/ac
Herbicide/Growth Regulator	4/15/2013	Prowl H2O 3pt/ac With
	5/8/2013	Weather Max 48oz/ac
	5/23/2013	Caparol 3 pt/ac with Weather Max 48oz/ac
	7/10/2013	Weather Max 48oz/ac
Insecticide		
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1 oz/ac
Irrigation Amt.		
PrePlant & Planting	4/24 to 5/31	7.30 in
Seasonal	6/18 to 9/7	8.73 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 6 - Zone H
Exp. Design	Cotton Drip Irrigated
Soil Type	

Field Operations	Date	Activity
Tillage	12/7/2012	Shredder
	3/23/2013	Stalk Puller
	3/23/2013	Rotary Hoe
	6/13/2013	Cultivate
	6/19/2013	Rotary Hoe
	7/22/2013	Cultivate and Dike
Fertility	3/6/2013	90 lbs N/ac + 32 lbs P/ac (applied thru coulter rig)
Planting	5/23/2013	FM 9250 GL at 54,000 seed/ac
Herbicide/Growth Regulator	4/15/2013	Prowl H20 3pt/ac with Weather Max 32oz/ac
	5/8/2013	Weather Max 48oz/ac
	5/23/2013	Caparol 3 pt/ac with Weather Max 48oz/ac
	7/23/2013	Liberty 32oz/ac
Insecticide	5/31/2013	Acephate 4 oz/ac
	6/10/2013	Acephate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4/24 to 5/31	7.64 in
Seasonal	6/18 to 9/7	10.85 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in



Operations Summary

Year	2013
Farm	Helm
Field ID	Field 10
Exp. Design	Cotton
Soil Type	

Field Operations	Date	Activity
Tillage	12/7/2012	Shredder
	3/22/2013	Stalk Puller
	3/24/2013	Rotary Hoe
	6/12/2013	Cultivate
	7/22/2013	Cultivate and Dike
Fertility	3/12/2013	74 lbs N/ac +26 lbs P/ac (applied thru coulter rig)
Planting	5/23/2013	FM 9250 GL at 54,000 seed/ac
Herbicide/Growth Regulator	4/15/2013	Prowl H2O 3pt/ac with Weather Max 32oz/ac
	5/23/2013	Caparol 3 pt/ac with Weather Max 48oz/ac
	7/23/2013	Liberty 32oz/ac
	7/29/2013	Mepiquat 16oz/ac
Insecticide	6/10/2013	Acephate 4 oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	5/28 to 6/6	3.81 in
Seasonal	7/24 to 9/10	8.79 in
Rainfall		
PrePlant & Planting	1/9 to 3/8	2.87 in
Seasonal	6/3 to 9/28	10.35 in