TEXAS A&M AGRILIFE RESEARCH

Improving Life Through Science and Technology

Lubbock-Pecos-Halfway

Helm Research Farm

Summary Report

2023

Technical Report
24-3

Texas AgriLife Research / Dr. Cliff Lamb, 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 purpose of conducting large scale research and extension programs to enhance produce 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 (SDI) and pivot irrigation. Other research projects include weed and insect control, plant breeding and yield trails for several commodities and production systems projects. During the past year, 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 6 wells, 320 to 340 feet deep, pumping at rates of 100 to 200 gallons per minute each.

Texas AgriLife Research - Texas AgriLife Extension
Lubbock / Halfway
Research Participants

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Cotton Response to Irrigation Quantity using Subsurface Drip Irrigation (SDI) (Field 2)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, cotton fiber quality, and seasonal water use efficiency for DeltaPine 1822 XF cotton using three different irrigation treatments.

Methodology: This study was conducted on a 12-acre field irrigated by subsurface drip irrigation with 30-inch dripline spacing and 10 irrigation zones. The field was divided into three blocks with three irrigation zones within each block, and a dryland check zone on the east side of the field. The irrigation treatments were designated as T1, T2, and T3. The test was originally planted on May 17th at a rate of 44,000 seeds/ac using DeltaPine 1822 XF: however, due to heavy rain at the end of May, the field was replanted on June 9th, at a rate of 42,000 seeds/ac. The irrigation amounts, field operations, pesticides, and nutrient applications for 2023 are listed in the appendix.

Figure 1. Harvesting cotton from subsurface drip irrigated treatments at Helms Research Farm, 2023.

Results: Annual rainfall for 2023 through September was 16.51 inches and the combined preplant and seasonal irrigation quantities for the three respective irrigation treatments were 5.61, 6.73, and 7.59 inches. As seasonal irrigation quantities increased there was a significant increase in cotton lint yields. However, T2 showed a non-significant decrease in seasonal irrigation water use efficiency (SIWUE) as the irrigation quantity increased from T1. Cotton lint yields ranged from 319 lb/ac in the dryland to 988 lb/ac in T3. The cotton lint loan value of the dryland was 0.552 $/lb, while the irrigated treatments had a lint loan value of 0.543 $/lb, 0.561 $/lb, and 0.500 $/lb respectively.

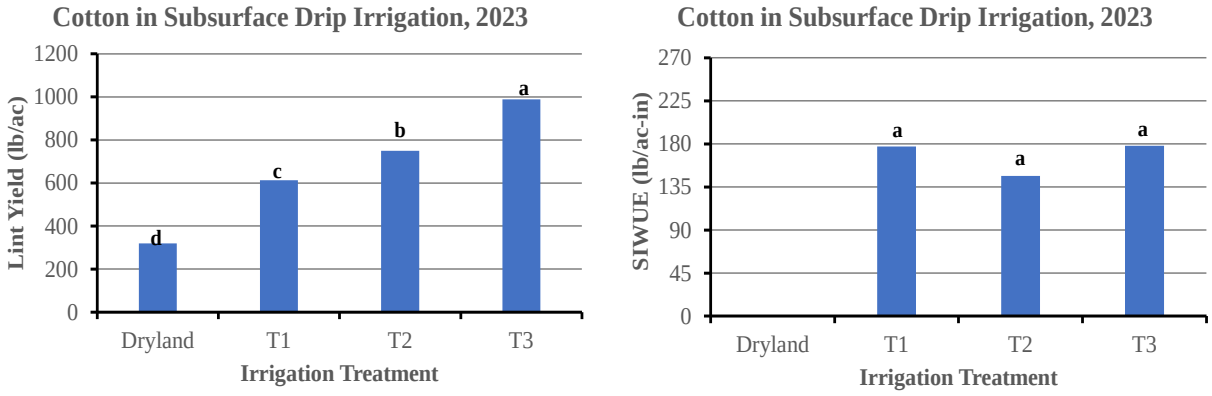

Figure 2. Cotton lint yield and seasonal irrigation water use efficiency (SIWUE) of replanted cotton in subsurface drip irrigation at Helms Research Farm, 2023. SIWUE means with the same letter are not significantly different (P<0.5, Tukey).

Response of Cotton to Irrigation Quantities using Subsurface Drip Irrigation (Field 3)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, fiber quality, and seasonal water use efficiency of cotton using subsurface drip irrigation (SDI).

Methodology: This study was conducted on a 16-acre test field irrigated by subsurface drip irrigation (SDI) with 60-inch dripline spacing. The field was divided into three blocks with six different irrigation zones within each block, and two dryland check zones on the outside perimeter of the field. The irrigation zones were designated as T1, T2, T3, T4, T5, and T6. On May 16th, NexGen 3406 B2XF was planted at a rate of 44,000 seeds/ac, however due to heavy rainfall at the end of May, the field was replanted with DeltaPine 1909 XF at a rate of 42,000 seeds/ac on June 9th. The irrigation quantities, field operations, varieties, pesticides, and nutrient applications for 2023 are listed in the appendix.

Results: Annual rainfall through September was 16.51 inches, and the combined preseason and seasonal irrigation quantities ranged from 2.62 inches to 7.41 inches. Cotton lint yields ranged from 271 to 809 lb/ac (Table 1) As the seasonal irrigation quantities increased, the seasonal irrigation water use efficiency (SIWUE) decreased. Fiber quality, as reflected in the lint loan value, ranged from 0.544 to 0.550 $/lb for the irrigated cotton (Table 2). Increasing seasonal irrigation quantities did not result in a significant change in fiber quality.

Table 1. Seasonal irrigation amounts, cotton lint yields, and seasonal irrigation water use efficiency of irrigation treatments using subsurface drip at Helms Research Farm, 2023.

Treatment	Seasonal Irrigation (in)	Lint Yield (lb/ac)		SIWUE (lb/ac-in)	
Dryland		271	e*		
T4	1.71	617	c	202	a
T2	1.80	567	d	164	b
T3	2.91	748	b	164	b
T5	3.00	765	ab	165	b
T1	3.97	871	a	151	b
T6	3.98	809	ab	135	b

* Yield and SIWUE means followed by the same letter are not significantly different (p<0.5, Tukey)

Table 2. Cotton fiber quality characteristics and lint loan values of irrigation treatments using subsurface drip irrigation at Helms Research Farm, 2023. Where Mic is micromaire, Unif. is uniformity, Elon. is elongation, Rd and +b represents the grayness and yellowness of the sample respectively, and CGRD represents the overall color grade.

Treatment	Mic	Length	Unif.	Strength	Elon.	Rd	+b	CGRD	Leaf	Loan Value (¢/lb)
Dryland	5.05	1.00	76.8	24.7	5.7	80.6	7.5	31-1	3.0	44.2
T4	4.76	1.10	80.5	29.5	5.9	82.2	7.6	21-1	3.0	55.0
T2	4.73	1.10	80.8	29.5	5.9	83.3	7.3	21-1	3.0	55.0
T3	4.74	1.09	81.3	29.2	6.0	82.9	7.5	21-1	2.0	55.0
T5	4.72	1.10	80.1	28.9	6.1	82.5	7.1	21-2	2.0	54.9
T1	4.71	1.11	79.6	28.0	6.0	82.8	7.4	21-1	3.0	54.4
T6	3.48	1.11	80.7	29.6	5.9	83.5	7.6	11-2	2.0	55.0

Cotton Response to Tillage and Irrigation Levels (Field 5b)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton irrigated at three levels under conventional and reduced tillage systems.

Methodology: These results were part of a comprehensive crop rotation-tillage-irrigation study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA). In this 22-acre test area, cotton was planted using DeltaPine 1822 XF at a rate of 42,000 seeds/acre on June 10th. Two tillage systems, conventional tillage (even spans) and reduced tillage (odd spans) were used, with both even and odd spans having listed rows with 30-inch spacing. In addition, each span was split into three sections with each section delivering different irrigation quantities. The irrigation treatments were designated as base irrigation rate (1.0 BI), 50% base irrigation rate (0.5 BI), and 150% base irrigation rate (1.5 BI). Field operations, irrigation amounts, and nutrient applications are listed in the appendix.

Figure 1. Planting cotton in listed rows, under different irrigation treatments at Helms Research Farm, 2023

Results: Annual rainfall through September was 16.51 inches, and preplant and seasonal irrigation quantities in the three irrigation treatments were 6.15, 7.70, and 9.25 inches respectively. In both tillage systems, as the seasonal irrigation quantities increased the cotton lint yield increased (Figure 2). However, irrigation above the 1.0 BI rate resulted in decreasing seasonal irrigation water use efficiency (SIWUE). Conventional tillage showed an increase in lint yield, water productivity, and fiber quality over reduced tillage at all irrigation levels. As BI increased, conventional tillage showed a 7.4%, a 10.4% and a 10.8% increase in cotton lint yield respectively, over corresponding reduced tillage treatments. The different irrigation treatments did not show a significant change in fiber quality, as reflected in the lint loan value, between the two tillage systems.

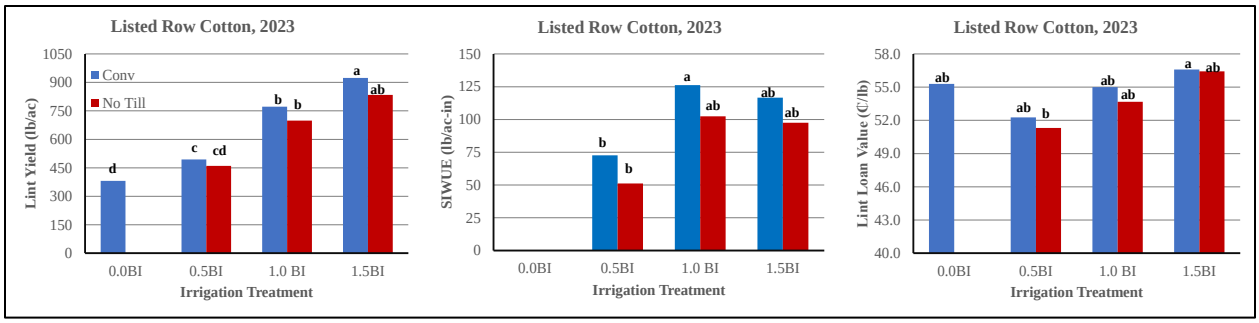

Figure 2. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value from treatments having two tillage systems and three irrigation levels at Helms Research Farm, 2023

Response of Cotton / Wheat Rotation to Tillage and Irrigation Levels (Field 5c)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton following a wheat cover / fallow period the previous year with cotton irrigated at three levels under conventional and reduced tillage systems.

Methodology: This study is part of a crop rotation-tillage-irrigation study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA). In this 22-acre test area, cotton was planted following a wheat cover / fallow period in 2022. Cotton was planted using DeltaPine 1822 XF at a rate of 42,000 seeds/acre. Two tillage systems, conventional tillage (even spans) and reduced tillage (odd spans) were used. In addition, each span was split into three sections with each section delivering different irrigation amounts. The irrigation amounts were designated as base irrigation rate (1.0 BI), 50% base irrigation rate (0.5 BI), and 150% base irrigation rate (1.5 BI). Field operations, irrigation amounts, and nutrient applications are listed in the appendix.

Results: The annual rainfall through September was 16.51 inches and the combined preplant and seasonal irrigation amounts 7.86, 9.41 and 10.96 inches for the respective irrigation treatments. As seasonal irrigation amounts increased, cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and fiber quality increased as well (Figure 1). Reduced tillage resulted in a non-significant 2.0%, and a 1.8% increase in lint yields in the 0.5 BI, and 1.0 BI treatments when compared to the corresponding conventional tillage plots. While conventional tilled cotton resulted in a non-significant 4.5% increase in cotton lint yield when compared to the reduced tillage cotton at the 1.5 BI rate. The different tillage systems did not result in a significant change in fiber quality, as reflected in the lint loan value, at any irrigation treatment level.

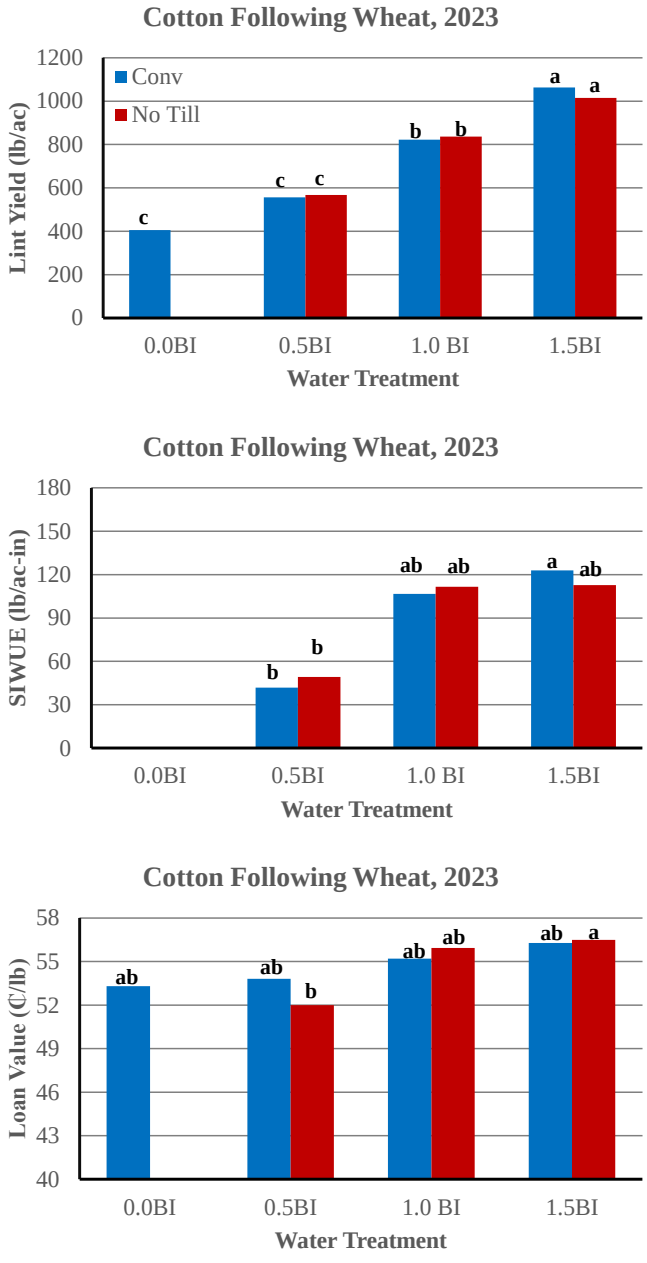

Figure 1. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value of cotton planted into cotton stalks at Helms Research Farm, 2023.

Response of Cotton in Terminated Wheat Grain to Tillage and Irrigation Levels (Field 5d)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton planted into a terminated rye grain cover crop irrigated at three levels under conventional and reduced tillage systems.

Methodology: These results are part of a comprehensive crop rotation-tillage-irrigation study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA) irrigation. In this 22-acre test area, cotton was planted into a terminated winter rye cover crop. Two tillage systems, conventional tillage (even spans) and reduced tillage (odd spans) were used. In addition, each span was split into three sections with each section delivering different irrigation amounts. The irrigation amounts were designated as base irrigation rate (1.0 BI), 50% base irrigation rate (0.5 BI), and 150% base irrigation rate (1.5 BI). On June 10th, cotton was planted using DeltaPine 1822 XF at a rate of 42,000 seeds/acre. Field operations, irrigation amounts, and nutrient applications are listed in the appendix.

Results: Annual rainfall for 2023 through September was 16.51 inches, and the combined preplant and seasonal irrigations in the three respective irrigation treatments were 6.55, 8.10 and 9.65 inches. In both tillage systems, cotton lint yield and seasonal irrigation water use efficiency (SIWUE) increased as irrigation quantities increased (Figure 1). Reduced tilled cotton resulted in a non-significant 11.4%, and a 2.6% increase in cotton lint yield at the 0.5 BI and the 1.5 BI rates respectively when compared to the conventional tilled cotton. Conventional tilled cotton resulted in a non-significant 7.2% increase in cotton lint yield at the 1.0 BI rate when compared to the reduced tilled cotton. Fiber quality, as reflected in the lint loan value, showed no significant change due to tillage at any irrigation level.

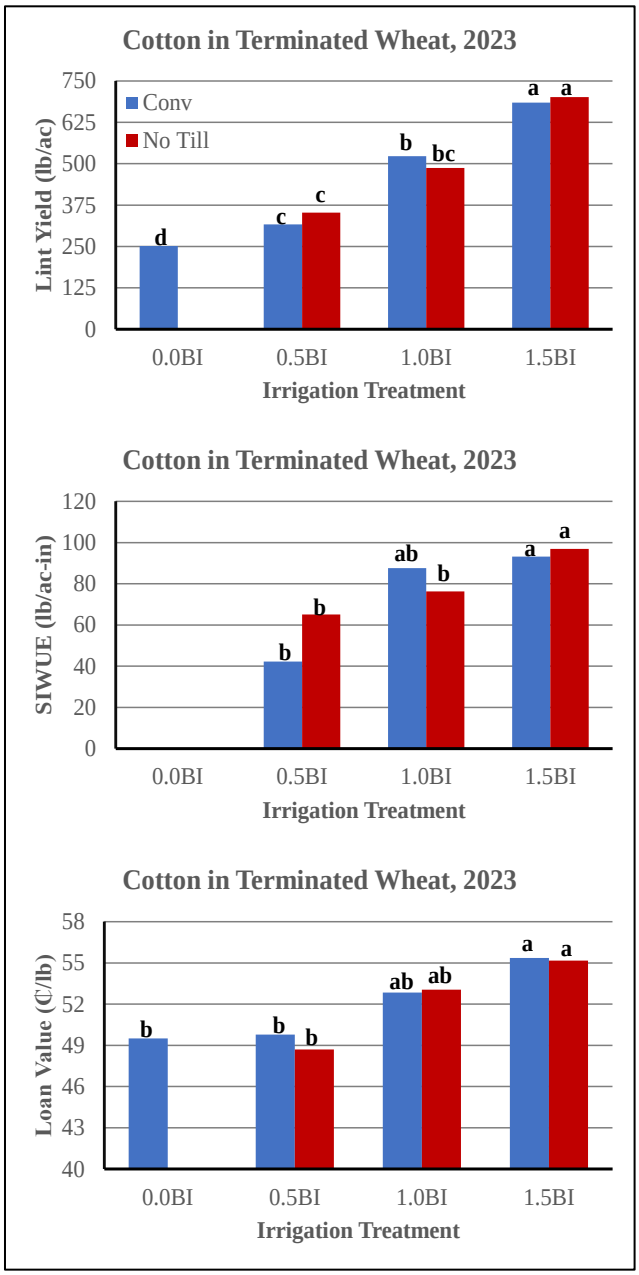

Figure 1. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value from cotton planted into terminated wheat plots having 2 tillage systems and three irrigation levels at Helms Research Farm, 2023.

TITLE: Nutrient Accumulation and Requirements of Modern Cotton Cultivars in the Southern High Plains of Texas (Project #18-124TX)

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PRIN. INVESTIGATOR: Dr. Katie L. Lewis
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INTRODUCTION:

Modern cotton cultivars have changed how they allocate or partition carbon and nutrient resources to different plant parts throughout the growing cycle. Cotton yield potential has also increased due to improved plant genetics and management practices over the past few decades. It is assumed that an increase in yield requires an increase in nutrient requirements, but recent studies show that the requirements per production unit (nutrient uptake index) are less than the standard recommendations from the 1990s (Pabuayon et al., 2020; Pabuayon et al., 2021). Therefore, it is necessary to re-evaluate the partitioning patterns and nutrient uptake index of new and soon-to-be released cotton cultivars to optimize the nutrient inputs for farmers and producers. Understanding the variations in biomass partitioning among varieties with different fruiting habits can provide valuable insights into their physiological characteristics. Through a comprehensive analysis of these varieties, this study aims to shed light on the intricate mechanisms underlying biomass partitioning and its implications for plant productivity and resilience.

The expected results from this project are determined values of nutrient total uptake and nutrient uptake index specific for each cultivar, partitioning patterns of nutrients throughout the growth cycle of each cultivar, and new fertilizer management strategies for each cotton cultivar based on the nutrient uptake indices developed in the study.

OBJECTIVE:

The primary objective of this research is to reevaluate the partitioning patterns and nutrient uptake index of new and soon-to-be released cotton cultivars to optimize the nutrient inputs for cotton producers.

PROJECT SUMMARY:

At Helms farm, six cotton cultivars were planted with 4 replications and 5 different irrigation treatments (Table 1). Three soil samples per treatment were collected with depths ranging from 0-90 cm with 15-30 cm increments. The soil samples were submitted for standard analyses (P, K, Ca, Mg, S, Na, Fe, Zn, Mn, Cu, B, pH, electrical conductivity) to Ward Laboratory (Kearney, NE), and were processed for NH_4^+ and $NO3^-$ (in-house analyses). Early season measurements like stand establishment were done two weeks after emergence.

Table 1. Summary of Irrigation treatments in Helms Farm, Halfway TX

Treatment	Inches/Day			
	P1	P2	P3	P4
LLL	0.0	0.0	0.0	0.0
LMM	0.0	0.1	0.1	0.1
MMM	0.1	0.1	0.1	0.1
LHH	0.0	0.2	0.2	0.1
MHH	0.1	0.2	0.2	0.1
P1 = Germination - ~850HU				
P2 = ~850HU - ~1300HU				
P3 = ~1300HU - ~1900HU				
P4 = > ~1900HU				

The Helm Farm location had 3 plant sampling dates at major growth stages (35, 67, and 116 days after planting, DAP). The collected samples from both farms were separated by plant part (leaves, stem, squares, flowers, immature bolls, mature seeds, and lint). The fresh weight and dry weight of plant samples were measured after every sampling. The oven-dried samples are being processed for total N and mineral (P, K, Ca, Mg, S, Na, Fe, Zn, Mn, Cu, and B) analyses. All separated plant tissue samples, except for lint, were submitted for macronutrient and micronutrient analysis (Ward Laboratory, Kearney, NE). End-of-season measurements also include yield and fiber quality determination.

KEY FINDINGS:

Texas AgriLife Research Center Helms Farm, near Halfway TX

Biomass Partitioning

Figure 1 compares biomass partitioning and fruiting patterns across three key stages (35, 67, and 116 DAP), treatments, and cultivars. The treatments, categorized as LLL, LMM, MMM, LHH, and MHH, exhibited varied impacts on plant growth, influencing factors such as boll initiation, proportional changes in plant parts, and the eventual development of fully matured bolls. The chosen cultivars, including DP 2335 B3XF, DP 2317 B3TXF, ST 4993 B3XF, ST 4595 B3XF, NG 3930 B3XF, and NG 3500 XF, demonstrated unique responses at different DAP stages, showcasing the diversity in their growth characteristics. Notably, the 116 DAP stage revealed a convergence towards fully developed bolls across treatments and cultivars, suggesting a key milestone in cotton plant maturation. This nuanced understanding of the interplay between treatments, cultivars, and developmental stages provides valuable insights for optimizing cultivation practices and achieving desirable outcomes in cotton production.

Lint Yield

There are noticeable differences in lint yield among cultivars, as reported in Figure 2. DP 2335 B3 consistently exhibits greater lint yield across all irrigation levels than other cultivars. ST4595B3 and ST4993B3 also demonstrate competitive lint yields, while NG3500XF and NG3930B3 tend to have slightly lower yields. Irrigation treatments had a significant impact on lint yield. The trend is evident across all cultivars, indicating the positive influence of adequate water supply on cotton lint production. The letters denoting statistical significance highlight differences between means. For instance, in the LHH treatment, DP2335B3 had a significantly greater lint yield than other cultivars. Similarly, in the LMM treatment, ST4595B3 stands out as statistically significant. These distinctions emphasize the importance of considering cultivar and irrigation strategies in interpreting lint yield results. Interaction effects were also observed, indicating that the impact of irrigation levels on lint yield may vary depending on the cultivar. The statistical significance highlights specific cases where one cultivar outperforms others under certain irrigation conditions. This information is valuable for making decisions in cotton cultivation practices.

Figure 1. Biomass partitioning and fruiting patterns of six cotton cultivars being evaluated under different irrigation regimes.

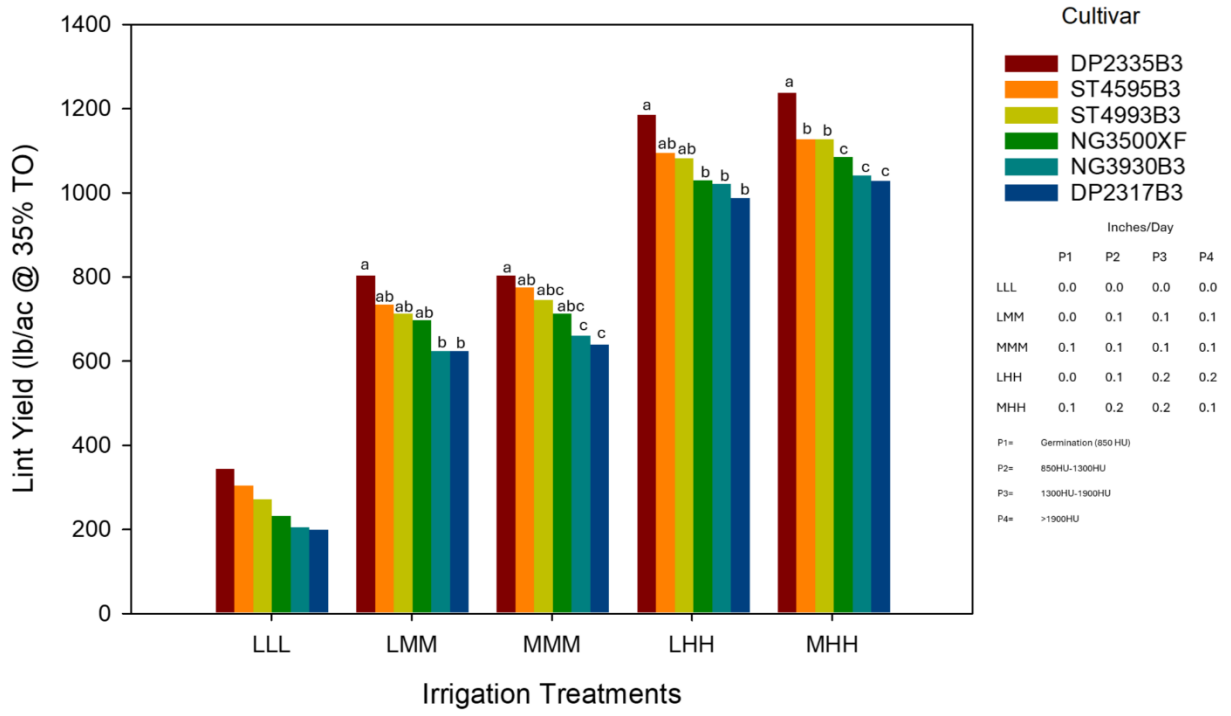


Figure 2. Lint yield of six cotton cultivars under different irrigation treatments.

CONCLUSIONS:

The presented data represent preliminary results investigating modern cotton cultivar growth, development, and productivity. Plant nutrient uptake and partitioning will be used to develop fertilizer management strategies based on irrigation strategies and cultivar decisions.

REFERENCES:

Pabuayon, I. L. B., Lewis, K. L., & Ritchie, G. L. (2020). Dry matter and nutrient partitioning changes for the past 30 years of cotton production. Agronomy Journal, 112(5), 4373-4385.

Pabuayon, I. L. B., Lewis, K. L., & Ritchie, G. L. (2021). Hidden fractions: Another look at micronutrient and sodium partitioning in modern cotton cultivars. Crop Science, 61(5), 3623-3636.

TITLE:

Performance of PhytoGen varieties as affected by low-energy precision application (LEPA) irrigation levels at Halfway, TX, 2023.

AUTHORS:

Wayne Keeling – Professor
Ray White – Research Scientist
Justin Spradley – Research Assistant

MATERIALS AND METHODS:

Plot Size: 4 rows by 32 feet, 4 replications

Planting Date: June 13

Varieties:

DP 2044 B3XF	PX 1122A214-04 W3FE
FM 2498 GLT	PX 1124B236-04 W3FE
NG 3930 B3XF	PX 1124D252-03 W3E1
PHY 136 W3E1	PX 1125B234-04 W3FE
PHY 137 W3E1	PX 1125D251-03 W3E1
PHY 205 W3FE	PX 1127D245-04 W3FE
PHY 210 W3FE	PX 1130D303-04 W3FE
PHY 250 W3FE	PX 1140D326-03 W3E1
PHY 332 W3FE	PX 1140D328-04 W3FE
PHY 400 W3FE	
PHY 411 W3FE	

Herbicides:

flumioxazin 2 oz/A	April 10
glyphosate 42 oz/A	May 2
glyphosate 42 oz/A	June 11
Direx 1.5 pt/A	June 3
Medal EC 1.3 pt/A	July 13

Fertilizer: 35-0-0

Irrigation: LEPA

	Dry	Low	Base	High
Preplant/Emergence	7.9”	8.1”	8.1”	8.1”
In-season	0.0”	2.4”	4.8”	6.2”
Total	7.9”	10.5”	12.9”	14.3”

Harvest Date: November 21

RESULTS AND DISCUSSION:

Commercial and experimental Phytogen varieties, as well as competitive varieties were compared under dryland and three levels of LEPA irrigation. Due to continued rainfall in late May and early June, plots were not planted until June 13. Despite the late planting date, both cotton lint yields and fiber quality were surprisingly good. Dryland yields averaged 268 lbs lint/A while average irrigated yields increased to 890 lb/A with the high irrigation treatment.

When averaged across irrigation levels, yield ranged from 551 to 720 lbs/A (Table 1). Loan values averaged 49 ¢/lb for dryland and were 53.54 – 53.88 ¢/lb for the base and high irrigation levels (Table 2). Similar gross revenues ($/A) were produced among varieties within dryland and low-irrigation levels. Differences in gross revenues did occur among varieties in the base and high irrigation levels and increased as irrigation level increased (Table 3).

Table 1. Effects of variety and irrigation level on cotton lint yield (lbs/A).

	In-season Irrigation Levels (inches)				
Variety	**Dry (0.0)**	**Low (2.4)**	**Base (4.8)**	**High (6.2)**	**Average**
	---------- lbs/A----------				
DP 2044 B3XF	279	645	687	808	**605**
FM 2498 GLT	291	673	815	1100	**720**
NG 3930 B3XF	276	765	667	830	**635**
PHY 136 W3E1	285	648	893	963	**697**
PHY 137 W3E1	260	617	758	942	**644**
PHY 205 W3FE	247	748	776	902	**668**
PHY 210 W3FE	265	580	665	861	**593**
PHY 250 W3FE	229	518	721	749	**554**
PHY 332 W3FE	233	555	615	896	**575**
PHY 400 W3FE	290	750	747	942	**682**
PHY 411 W3FE	299	655	889	992	**709**
PX 1122A214-04 W3FE	275	630	873	1011	**697**
PX 1124B236-04 W3FE	263	613	783	908	**642**
PX 1124D252-03 W3E1	289	654	849	855	**662**
PX 1125B234-04 W3FE	261	637	827	997	**681**
PX 1125D251-03 W3E1	290	648	691	856	**621**
PX 1127D245-04 W3FE	273	564	699	852	**597**
PX 1130D303-04 W3FE	260	667	711	803	**610**
PX 1140D326-03 W3E1	261	565	655	794	**569**
PX 1140D328-04 W3FE	240	670	561	731	**551**
Average	**268**	**640**	**744**	**890**	**--**
LSD	**ns**	**ns**	**60**	**80**	

Table 2. Effects of variety and irrigation level on loan value (¢/lb).

Variety	In-season Irrigation Levels (inches)				
	Dry (0.0)	Low (2.4)	Base (4.8)	High (6.2)	Average
	----------¢/lb----------				
DP 2044 B3XF	53.73	55.43	53.78	55.48	**54.61**
FM 2498 GLT	47.33	47.23	51.50	52.80	**49.72**
NG 3930 B3XF	51.98	50.23	53.30	54.53	**52.51**
PHY 136 W3E1	51.48	53.50	56.38	56.03	**54.35**
PHY 137 W3E1	50.53	53.48	57.30	52.43	**53.44**
PHY 205 W3FE	44.68	48.90	51.45	50.75	**48.95**
PHY 210 W3FE	49.03	49.25	53.10	54.80	**51.55**
PHY 250 W3FE	49.38	50.83	54.78	53.83	**52.21**
PHY 332 W3FE	52.43	51.33	56.58	54.63	**53.74**
PHY 400 W3FE	48.05	52.68	54.38	54.40	**52.38**
PHY 411 W3FE	43.68	47.90	50.45	52.95	**48.75**
PX 1122A214-04 W3FE	45.63	50.38	55.10	53.10	**51.05**
PX 1124B236-04 W3FE	48.98	51.10	54.88	55.10	**52.52**
PX 1124D252-03 W3E1	50.55	52.33	55.40	51.45	**52.43**
PX 1125B234-04 W3FE	46.02	47.23	51.90	50.78	**48.98**
PX 1125D251-03 W3E1	51.90	52.93	54.28	55.70	**53.70**
PX 1127D245-04 W3FE	53.28	55.00	54.53	55.48	**54.57**
PX 1130D303-04 W3FE	47.15	49.65	51.65	50.60	**49.76**
PX 1140D326-03 W3E1	46.28	49.58	52.10	52.03	**50.00**
PX 1140D328-04 W3FE	47.85	53.83	54.80	53.90	**52.60**
Average	**49.00**	**51.14**	**53.88**	**53.54**	--
LSD					

Table 3. Effects of variety and irrigation level on gross revenue ($/A).

Variety	In-season Irrigation Levels (inches)				
	Dry (0.0)	**Low (2.4)**	**Base (4.8)**	**High (6.2)**	**Average**
		----------$/A----------			
DP 2044 B3XF	150	357	369	448	**331**
FM 2498 GLT	138	318	420	581	**364**
NG 3930 B3XF	144	384	356	453	**334**
PHY 136 W3E1	147	347	503	540	**384**
PHY 137 W3E1	131	330	434	494	**347**
PHY 205 W3FE	111	366	399	458	**334**
PHY 210 W3FE	130	286	353	472	**310**
PHY 250 W3FE	113	263	395	403	**293**
PHY 332 W3FE	122	285	348	490	**311**
PHY 400 W3FE	140	396	406	513	**364**
PHY 411 W3FE	131	313	449	525	**354**
PX 1122A214-04 W3FE	125	318	481	537	**365**
PX 1124B236-04 W3FE	129	313	430	500	**343**
PX 1124D252-03 W3E1	146	342	470	440	**350**
PX 1125B234-04 W3FE	121	301	429	507	**340**
PX 1125D251-03 W3E1	151	343	375	477	**337**
PX 1127D245-04 W3FE	145	310	381	472	**327**
PX 1130D303-04 W3FE	123	331	367	407	**307**
PX 1140D326-03 W3E1	121	280	341	413	**289**
PX 1140D328-04 W3FE	115	360	307	394	**294**
Average	**131**	**327**	**401**	**476**	**--**
LSD	**10**	**ns**	**47**	**47**	

TITLE:

Performance of FiberMax and Stoneville varieties as affected by low-energy precision application (LEPA) irrigation levels at Halfway, TX, 2023.

AUTHORS:

Wayne Keeling – Professor
Ray White – Research Scientist
Justin Spradley – Research Assistant

MATERIALS AND METHODS:

Plot Size: 4 rows by 35 feet, 3 replications

Planting Date: June 13

Varieties:

BX 2359 AXTP	FM 2498 GLT
BX 2362 AXTP	FM 823 AXTP
BX 2451 AXTP	FM 868 AXTP
FM 1621 GL	ST 6000 AXTP
FM 1730 GLTP	ST 4990 B3XF
FM 2398 GLTP	ST 4993 B3XF

Herbicides:

flumioxazin 2 oz/A	April 10
glyphosate 42 oz/A	May 2
glyphosate 42 oz/A	June 11
Direx 1.5 pt/A	June 3
Medal EC 1.3 pt/A	July 13

Fertilizer: 35-0-0

Irrigation:

	Dry	Low	Base	High
Preplant/Emergence	7.9”	8.1”	8.1”	8.1”
In-season	0.0”	2.4”	4.8”	6.2”
Total	7.9”	10.5”	12.9”	14.3”

Harvest Date: November 17

RESULTS AND DISCUSSION:

Twelve FiberMax and Stoneville varieties including both commercial and experimental varieties were evaluated under three levels of LEPA irrigation. Persistent rains in May and early June delayed planting until June 13. Considering both the late planting date and hot, dry conditions during July and August, both lint yields and fiber quality were surprisingly good. When averaged across varieties yields ranged from 673 to 875 lbs lint/A as irrigation level increased (Table 1). When averaged across irrigation levels, yields ranged from 593 to 766 lbs/A. Lint quality as measured by loan value, was highest with the base and high irrigation treatments, and lowest for dryland (Table 2). Gross revenue ($/A) increased with increased irrigation but was similar for base and high irrigation treatments (Table 3). When averaged across irrigation treatments, highest gross revenues were produced with three experimental and three commercial varieties. Three AxantFlex varieties (FM 868 AXTP, FM 823 AXTP, and ST 6000 AXTP) are new for 2024. These varieties include tolerance to Axant herbicide, as well as dicamba, glufosinate, and glyphosate.

Table 1. Effects of FiberMax and Stoneville varieties and subsurface drip irrigation level on cotton lint yield (lbs/A), loan value (¢/lb), and gross revenue ($/A).

	In-season Irrigation Levels (inches)				
Variety	**Dry (0.0)**	**Low (2.4)**	**Base (4.8)**	**High (6.2)**	**Average**
			lbs/A		
BX 2359 AXTP	253	756	983	952	**736 AB**
BX 2362 AXTP	248	654	853	725	**620 CD**
BX 2451 AXTP	326	710	779	791	**651 BCD**
FM 1621 GL	300	585	889	931	**676 ABCD**
FM 1730 GLTP	302	564	1017	827	**677 ABCD**
FM 2398 GLTP	275	698	847	811	**658 BCD**
FM 2498 GLT	289	708	852	968	**704 ABC**
FM 823 AXTP	305	723	1054	932	**754 AB**
FM 868 AXTP	282	743	981	1057	**766 A**
ST 6000 AXTP	267	607	826	672	**593 D**
ST 4990 B3XF	286	578	980	932	**694 ABCD**
ST 4993 B3XF	320	751	887	910	**717 ABC**
Average	**288 C**	**673 B**	**912 A**	**875 A**	--
			¢/lb		
BX 2359 AXTP	52.77	55.25	56.35	57.58	**55.49 AB**
BX 2362 AXTP	53.90	55.25	56.32	57.52	**55.75 AB**
BX 2451 AXTP	52.55	54.03	55.20	53.73	**53.88 CD**
FM 1621 GL	44.82	44.18	48.63	49.28	**46.73 G**
FM 1730 GLTP	49.97	52.25	56.92	53.83	**53.24 DE**
FM 2398 GLTP	49.22	50.60	54.22	53.07	**51.78 F**
FM 2498 GLT	47.83	50.30	50.82	54.98	**50.98 F**
FM 823 AXTP	50.63	54.48	56.98	56.60	**54.68 BC**
FM 868 AXTP	52.05	54.67	57.15	57.43	**55.33 AB**
ST 6000 AXTP	55.52	57.23	57.00	56.50	**56.56 A**
ST 4990 B3XF	56.17	54.58	57.78	57.95	**56.62 A**
ST 4993 B3XF	50.42	51.32	52.40	53.43	**51.89 EF**
Average	**51.32 C**	**52.85 B**	**54.98 A**	**55.16 A**	--
			$/A		
BX 2359 AXTP	134	417	554	548	**413 ABC**
BX 2362 AXTP	134	362	479	417	**348 DE**
BX 2451 AXTP	171	388	429	426	**354 CDE**
FM 1621 GL	134	259	432	467	**323 E**
FM 1730 GLTP	151	296	580	452	**370 ABCDE**
FM 2398 GLTP	136	355	460	433	**346 DE**
FM 2498 GLT	138	357	433	532	**365 BCDE**
FM 823 AXTP	154	397	603	528	**421 AB**
FM 868 AXTP	146	407	562	606	**430 A**
ST 6000 AXTP	148	347	471	381	**337 DE**
ST 4990 B3XF	161	317	567	540	**396 ABCD**
ST 4993 B3XF	161	390	465	487	**376 ABCDE**
Average	**147 C**	**358 B**	**503 A**	**485 A**	--

The Influence of Irrigation, Crop Rotation, Tillage on Verticillium wilt of Cotton at Helm Farm

By Terry Wheeler, Texas A&M AgriLife Research, Lubbock

The Helm farm first showed symptoms of Verticillium wilt in September of 2007 (Fig. 1). Verticillium wilt is a soil-borne fungus that survives in the soil with a structure called microsclerotia. These structures will germinate and infect cotton roots. The higher the density of microsclerotia, the more Verticillium wilt is present (assuming constant temperature, irrigation/rain, etc). The measurements taken from 2008 through 2023 included soil sampling in January/February to measure the soil density of microsclerotia and measuring Verticillium wilt incidence in the last 10 days of August. This report will summarize the impact of these various treatments on the microsclerotia levels in the soil, Verticillium wilt incidence, and lint yield.

Figure 1. Verticillium wilt symptoms in cotton.

At that time, the large plot treatments consisted of two varieties differing in their susceptibility to Verticillium wilt; crop rotation, where continuous cotton was compared with two years of cotton, followed by sorghum, and three irrigation rates (base = 1.0, +/- 50% of base rate [0.5, 1.5]). Until 2010, the base rate was approximately 80% of the evapotranspiration rate (ET) required by cotton. There were four wedges involved with this experiment: Wedge E was in continuous cotton; Wedges B, C, and D were in the 2-year cotton/1 year sorghum rotation. Wedges A and F were most frequently in cotton but used for other trials. Initially, the crop

rotation was very effective at reducing Verticillium wilt in the subsequent cotton crops at the 1.0 and 1.5 irrigation rates than continuous cotton (Table 1). This rotation continued through 2013, but the ET target for the base (1.0) irrigation rate dropped to 60% ET after 2009.

Table 1. Incidence in Verticillium wilt at three irrigation rates, and in rotated cotton compared to continuous cotton in 2008-2009.

Irrigation rate	2-yr cotton[a]/ 1-yr sorghum % Wilt	Continuous Cotton % Wilt
0.5	0.8 b	5.6 b
1.0	2.6 ab	18.0 ab
1.5	8.8 a	33.8 a

[a]Wedges B, C, and D were in the cotton/cotton/sorghum rotation. Wedge E was continuous cotton.

Verticillium wilt continued to be a problem in subsequent years, with the highest wilt damage seen in the 1.5 irrigation rate. Under the 1.5 irrigation rate the lower pumping capacity (60% ET for base rate) resulted in higher yields for 2010-2013 (not including 2011), than the higher pumping capacity (80% ET, base rate) in the earlier years of 2007-2009 (Table 2). This was the result of Verticillium wilt being so much worse under the higher irrigation applications. The benefit of crop rotation and variety tolerance to Verticillium wilt also continued to impact cotton yields (Table 2). However, the combination of continuous cotton and 1.5 irrigation rate resulted in both resistant and susceptible varieties performing the same (Table 2). The resistance could not hold up when Verticillium wilt was at it's worst, due to overwatering and continuous cotton. Crop rotation resulted in a slower buildup of microsclerotia, so less Verticillium wilt.

Table 2. The effect of irrigation rate (IR), crop rotation, evapotranspiration rate (ET) and cultivars differing in their susceptibility to Verticillium wilt on cotton lint yield (lbs/acre), at Helm farm in wedges B, C, D, and E.

	ET=60%		ET=80%		Rotated cotton		Continuous cotton	
IR	R[1]	S	R	S	R	S	R	S
0.5	749cZ[2]	773bZ	835bZ	882bZ	859bY	961bZ	814aZ	809aZ
1.0	1,194bZ	1,144aZ	1,264aZ	1,127aY	1,365aZ	1,252aY	1,167aZ	1,006aZ
1.5	1,416aZ	1,203aY	1,277aZ	1,036aY	1,441aZ	1,168bY	1,127aZ	1,183aZ

[1]R is a recommended variety with some resistance to Verticillium wilt, S is a more susceptible variety to Verticillium wilt.

[2]The letters a,b,c are indicating significant differences within a column between the irrigation rates (*P*=0.05). The letters Y,Z indicate significant differences between the resistant and susceptible variety for that attribute (ET, Rotated or continuous cotton).

In 2014, there was a major change in the cropping systems at Helm Farm. The irrigation rates remained the same in the new system (0.5, 1.0=60% ET, 1.5). Wedge A and wedge D were placed in continuous cotton, where A had no cover crop and D had a terminated wheat cover crop. Wedge B and C were rotated with cotton/winter wheat/summer fallow. Wedge E and F were rotated between cotton and sorghum. Spans 3, 5, and 7 were placed in a minimum tillage system, with no beds (flat ground), and splatter irrigation. Spans 4, 6, and 8 were kept in beds with LEPA irrigation and conventional tillage. After 2021, wedges E and F were placed in continuous cotton along with wedges A and D. Wedges A and F were given a reduced irrigation rate relative to the other wedges.

In general, the higher the irrigation rate within a wedge, the higher the density of microsclerotia (Fig. 2). There was no significant difference between the two tillage systems with regards to microsclerotia density. There was a shift in the microsclerotia density from 2015-2019 (early time frame) compared to 2020-2023 (late time frame) with regards to wedges B and E. The other wedges did not show significant changes in density over time. With wedge B, which was in the cotton/winter wheat/summer fallow rotation, microsclerotia density increased at the

1.0 and 1.5 irrigation rates during the 2020-2023 seasons compared to the earlier seasons (Fig. 2). With wedge E, which was in continuous cotton until 2014, then was in a cotton/sorghum rotation from 2014-2021, the microsclerotia density was lower when comparing the most recent years (2020-2023) to the earlier years (2015-2019). It took some time, but by rotating out of cotton every other year with sorghum, it did appear to be effective in reducing microsclerotia density at all three irrigation rates in wedge E.

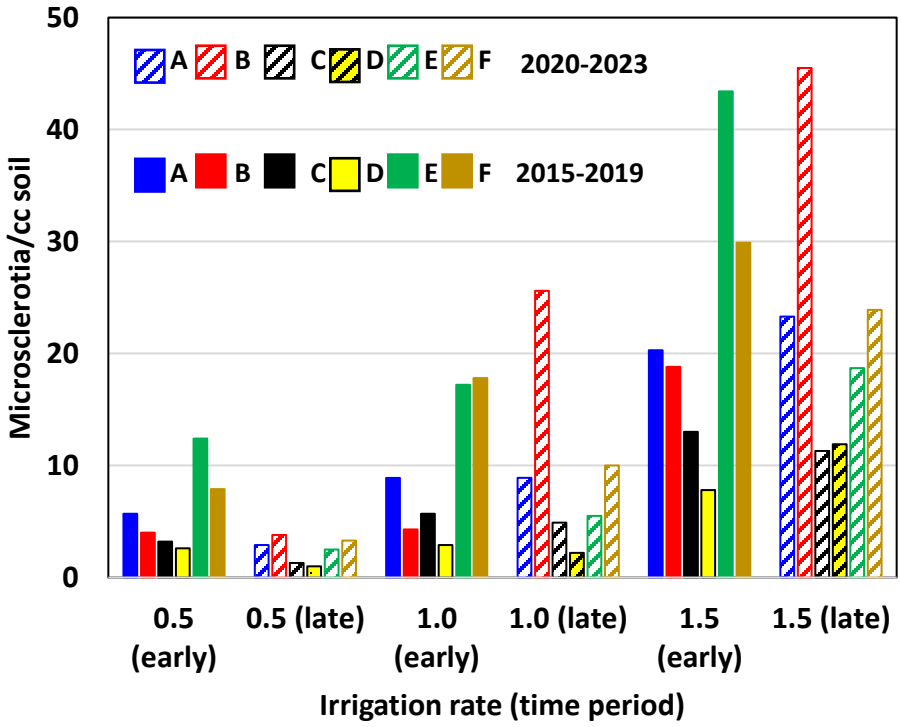


Figure 2. Influence of irrigation rate and time period on microsclerotia density. A, B, C, D, E, and F are the wedges of the circle. The irrigation rates were 0.5, 1.0, and 1.5. Early is for 2015-2019, and late is for 2020-2023.

Incidence of Verticillium wilt was generally low during 2015-2023 compared to earlier years, though it did differ substantially between wedges. A Verticillium resistant variety is recommended when fields historically have 20% wilt incidence or higher. Otherwise, most susceptible varieties may outyield or yield similar to the limited number of recommended resistant varieties. Only wedge B and wedge F at the 1.0 and 1.5 irrigation rates averaged over 20% incidence of Verticillium wilt (Fig. 3). The level of microsclerotia in wedge B and wedge F at the 1.0 irrigation rate was still high enough to trigger Verticillium wilt problems. At the high irrigation rate (1.5), all wedges still had sufficient Verticillium inoculum in the soil to cause

disease problems. However, the wilt incidence in recent years has been low for all wedges. It is possible that the combination of high summer temperatures in August and early September and reduced pumping capacity has driven Verticillium wilt below 20% incidence.

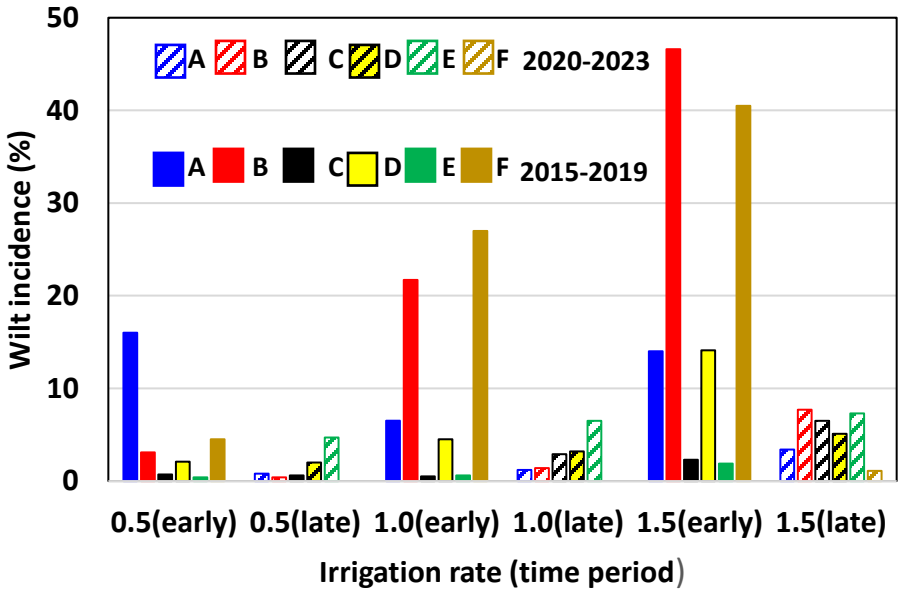


Figure 3. Influence of irrigation rate and time period on Verticillium wilt incidence. A, B, C, D, E, and F are the wedges of the circle. The irrigation rates were 0.5, 1.0, and 1.5. Early is for 2015-2019, and late is for 2020-2023.

Average cotton lint yields were much lower in 2020-2023 compared to 2015-2019 (Figure 4). The 0.5, 1.0, and 1.5 irrigation rates across wedges B, C, D, and E averaged 68%, 51%, and 33% lower yields in 2020-2023 than in 2015-2019, respectively for each irrigation rate. Wedge A has historically had the poorest yields in the circle and that has not changed over time, though its yields were not available for 2023. Wedge B has consistently been in the top yielding group for most irrigation rates over 2015-2023. Wedge C has performed better relative to the other wedges in 2020-2023. Wedge D performed better in 2015-2019 at the 1.0 and 1.5 irrigation rates than it has relative to other wedges in 2020-2023. In the earlier years at the 1.0 and 1.5 irrigation rates, the minimum tillage system had better yields than the conventional tillage system. However, there are no yield differences between these tillage treatments in 2020-2023 in any wedges.

The total irrigation applied (1.0 base level) for wedges B, C, D, and E when cotton was planted averaged 8.1 for 2015-2019, and 8.0 for 2020 – 2022 (full irrigation values aren't available yet for 2023) (Table 3). So, the irrigation appears comparable between the years, however, in 2018, over 14 inches was applied to the cotton. Given the current pumping capacity of the pivot, when the cotton needs 14 inches to maintain 60% ET, it is unlikely that much water can be pumped currently. The yield decline seen in recent years has nothing to do with Verticillium wilt and is likely due to limited water and tough environmental conditions during the growing season.

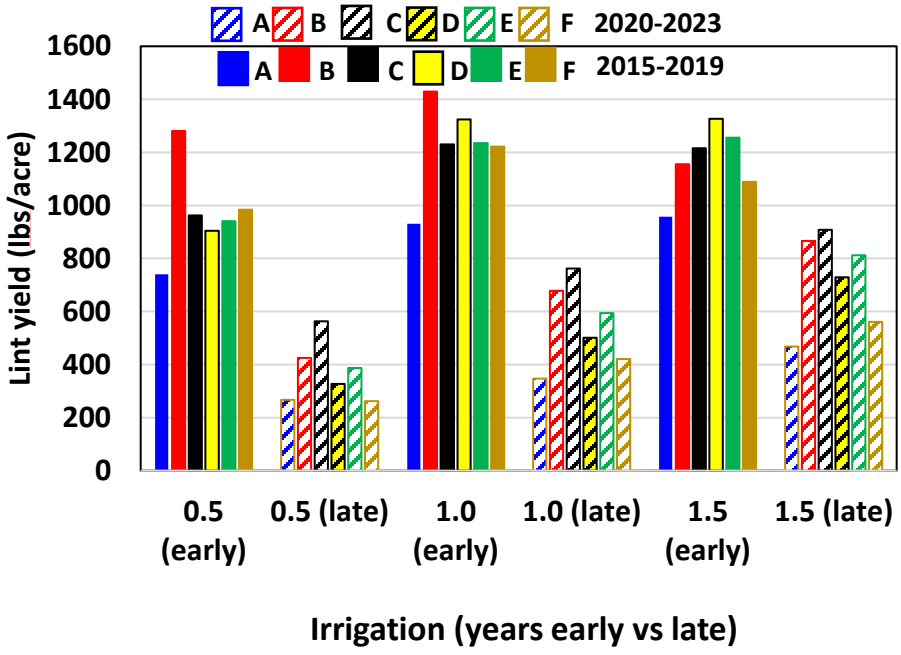


Figure 4. Influence of irrigation rate and time period on Cotton lint yield. A, B, C, D, E, and F are the wedges of the circle. The irrigation rates were 0.5, 1.0, and 1.5. Early is for 2015-2019 and late is for 2020-2023. Wedge A and F yields were not available in 2023.

Table 3. Total irrigation water (inches) applied for each cotton wedge in 2015-2023.

Wedge	2015	2016	2017	2018	2019	2020	2021	2022	2023[b]
A	4.6	5.6	5.9	13.2	8.9	5.5	5.8	4.7	?
B	W/F[a]	9.4	W/F	14.3	W/F	9.2	W/F	8.6	3.1
C	4.3	W/F	5.8	W/F	8.6	W/F	7.0	W/F	3.1
D	4.6	9.4	6.2	14.5	8.6	9.0	6.7	8.4	3.1
E	4.4	S	6.3	S	8.6	S	6.7	8.2	?
F	S	9.5	S	13.8	S	6.3	S	5.3	?

[a]W/F indicates the wedge was in winter wheat followed by a summer fallow; S indicates the wedge was in sorghum.

[b]Only seasonal water for three wedges was available.

Appendix

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)

Date			Rainfall (in)		Field 2 Irrigation (Drip)										Field 3 Irrigation (Drip)							Field 7 Irrigation (Drip)				
					Zones (Treatment)										Zones							Zones				
					1 (T1)	2 (T3)	3 (T2)	4 (T3)	5 (T2)	6 (T1)	7 (T3)	8 (T1)	9 (T2)	10 (Dry)	1	2	3	4	5	6	7	D	E	F	G	H
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Crop: Cotton										Crop: Cotton							Crop: Cotton				
2	14	2023	0.04	0.18																						
3	1	2023			1.34	1.52							0.17									0.98				
3	2	2023					1.47	1.49															0.86			
3	3	2023							1.48	1.53														0.87		
3	4	2023									1.48	1.38													2.37	
3	5	2023											1.41	1.55												2.26
3	7	2023													1.44	1.45										
3	8	2023															0.77	0.79				0.95				
3	9	2023																	0.79	0.81			0.87			
3	10	2023																			1.10			0.94		
3	11	2023															0.55	0.56								
3	12	2023			0.15	0.16	0.17	0.15	0.23	0.34	0.31	0.20	0.15	0.16												
3	13	2023			0.22							0.11							0.53	0.54	0.23	0.49	0.77	0.77	0.31	0.31
3	21	2023			0.16	0.17	0.17	0.17	0.20	0.17	0.18	0.19	0.18	0.18	0.12	0.12	0.12	0.13	0.14	0.12	0.07	0.17	0.25	0.25	0.30	0.31
3	22	2023			0.14	0.15	0.15	0.15	0.15	0.17	0.14	0.15	0.15	0.16	0.12	0.12	0.12	0.13	0.14	0.13	0.07	0.15	0.25	0.26	0.14	0.15
3	23	2023			0.14	0.15	0.15	0.15	0.15	0.17	0.16	0.15	0.15	0.16	0.12	0.12	0.12	0.13	0.14	0.13	0.07	0.15	0.25	0.25	0.15	0.15
3	28	2023													0.14	0.14	0.13	0.13	0.15	0.14	0.07	0.16	0.27	0.27	0.14	0.15
3	29	2023													0.14	0.14	0.15	0.13	0.14	0.14	0.07	0.16	0.27	0.27	0.13	0.15
3	30	2023			0.14	0.15	0.15	0.15	0.18	0.17	0.15	0.15	0.15	0.16	0.12	0.12	0.10	0.13	0.13	0.13	0.07	0.16	0.25	0.25	0.16	0.15
3	31	2023			0.14	0.15	0.15	0.15	0.14	0.17	0.15	0.15	0.15	0.16	0.12	0.12	0.11	0.13	0.12	0.13	0.07	0.16	0.25	0.25	0.12	0.15
5	2	2023																								
5	3	2023	0.86	0.45																						
5	4	2023	0.12	0.15	0.34	0.3	0.3	0.33	0.3	0.34	0.3	0.31	0.29	0.27	0.28	0.24	0.25	0.25	0.28	0.25	0.13	0.39	0.50	0.48	0.27	0.30
5	5	2023			0.14	0.15	0.15	0.16	0.24	0.34	0.17	0.15	0.14	0.2	0.12	0.12	0.16	0.23	0.13	0.13	0.01	0.16	0.25	0.25	0.24	0.23
5	8	2023			0.43	0.44	0.45	0.43	0.3	0.34	0.42	0.45	0.43	0.47	0.36	0.36	0.28	0.26	0.39	0.37	0.20	0.48	0.75	0.71	0.27	0.36
5	9	2023			0.14	0.15	0.15	0.15	0.15	0.17	0.15	0.15	0.14	0.16	0.12	0.12	0.12	0.12	0.13	0.13	0.07	0.16	0.25	0.28	0.13	0.15
5	10	2023			0.14	0.15	0.15	0.18	0.24	0.17	0.15	0.15	0.14	0.16	0.12	0.12	0.18	0.12	0.13	0.13	0.07	0.16	0.25	0.25	0.17	0.14
5	11	2023	0.15	0.16	0.14	0.15	0.15	0.15	0.07	0.17	0.15	0.15	0.14	0.16	0.12	0.12	0.21	0.12	0.13	0.13	0.07	0.16	0.25	0.24	0.09	0.15
5	13	2023	1.21	0.86																						
5	16	2023	0.13	0.13																						
5	19	2023	0.78	0.68																						
5	22	2023	0.68	0.80																						
5	24	2023	0.34	0.05																						
5	25	2023	1.09	0.97																						
5	26	2023	1.42	2.47																						
5	27	2023	0.82	0.99																						
5	31	2023	0.04	0.10																						
6	1	2023	0.62	0.44																						
6	4	2023	1.77	1.69																						
6	23	2023	0.62	0.47																						
7	2	2023	0.66	1.58																						
7	6	2023	1.19	0.80																						
7	8	2023	0.26	0.00																						
7	13	2023	0.33	0.61																						
7	16	2023	0.36	0.34																						
7	23	2023	0.85	0.84																						
7	28	2023			0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.01	0.02	0.04	0.02	0.02	0.02	0.25					
8	1	2023						0.03	0.47	0.31	0.55				0.30				0.10	0.37		0.52	0.23	0.21		0.19
8	2	2023			0.27	0.29					0.09	0.30	0.46		0.06	0.17	0.26	0.16	0.18			0.06	0.21	0.23	0.41	0.15

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)

Date			Rainfall (in)		Field 2 Irrigation (Drip)										Field 3 Irrigation (Drip)							Field 7 Irrigation (Drip)				
					Zones (Treatment)										Zones							Zones				
					1 (T1)	2 (T3)	3 (T2)	4 (T3)	5 (T2)	6 (T1)	7 (T3)	8 (T1)	9 (T2)	10 (Dry)	1	2	3	4	5	6	7	D	E	F	G	H
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Crop: Cotton										Crop: Cotton							Crop:				
																						Cotton	Cotton	Fallow	Cotton	Cotton
8	3	2023				0.40	0.55	0.56							0.25	0.09	0.16	0.09	0.16	0.25		0.20	0.22	0.22	0.24	0.20
8	5	2023																								
8	8	2023			0.28	0.29		0.06			0.08	0.29	0.46		0.14	0.16	0.26	0.07	0.15			0.20	0.21	0.21	0.17	0.22
8	9	2023				0.40	0.48	0.57							0.29				0.13	0.37		0.20	0.20	0.20	0.18	0.15
8	10	2023						0.12	0.48	0.31	0.59				0.08	0.18	0.25	0.26	0.17			0.20	0.20	0.20	0.16	0.23
8	11	2023													0.33				0.12	0.41		0.20	0.22	0.22	0.16	0.18
8	12	2023	0.15	0.00																						
8	15	2023				0.39	0.48	0.62							0.32				0.12	0.37		0.22	0.24	0.24	0.11	0.14
8	16	2023						0.07	0.48	0.31	0.54				0.05	0.18	0.25	0.16	0.13			0.22	0.24	0.24	0.11	0.08
8	17	2023			0.27	0.30					0.12	0.30	0.47		0.31				0.16	0.37		0.22	0.24	0.24	0.11	0.17
8	18	2023													0.05	0.17	0.26	0.17	0.17			0.22	0.25	0.26	0.11	0.12
8	22	2023							0.48	0.31	0.57				0.07	0.17	0.25	0.16	0.15			0.22	0.24	0.24	0.11	0.14
8	23	2023			0.27	0.29		0.10			0.09	0.30	0.47		0.31				0.13	0.37		0.22	0.24	0.24	0.11	0.13
8	24	2023			0.08	0.40	0.48	0.60			0.11		0.10		0.06	0.18	0.25	0.16	0.15			0.22	0.24	0.24	0.11	0.12
8	25	2023													0.32				0.13	0.40						
8	27	2023	0.49	0.43																						
8	29	2023			0.27	0.33					0.07	0.30	0.47		0.34		0.05		0.12	0.38		0.43	0.50	0.51	0.22	0.30
8	30	2023				0.36	0.48	0.61							0.04	0.18	0.25	0.16	0.16			0.22	0.24	0.24	0.11	0.11
8	31	2023						0.07	0.48	0.31	0.58				0.31				0.12	0.37		0.22	0.23	0.24	0.11	0.12
9	1	2023													0.06	0.17	0.26	0.17	0.16			0.22	0.26	0.26	0.11	0.12
9	7	2023			0.12	0.14	0.14	0.14	0.16	0.15	0.13	0.14	0.13		0.13	0.13	0.14	0.13	0.13	0.15		0.23	0.26	0.24	0.11	0.14
9	8	2023				0.13	0.32	0.15	0.12				0.13		0.14		0.12		0.14	0.15		0.21	0.26	0.26	0.11	0.12
9	11	2023							0.22		0.22		0.21				0.11									
9	14	2023	0.29	0.35																						
9	15	2023	0.53	0.25																						
9	16	2023	0.77	0.76																						
Pre & At Plant			10.69	10.59	3.76	3.79	3.76	3.81	3.83	4.25	3.91	3.84	3.79	3.95	3.44	3.41	3.37	3.36	3.47	3.41	2.37	5.04	6.54	6.59	4.99	5.11
Seasonal			5.88	5.96	1.60	3.76	2.97	3.74	2.92	1.73	3.77	1.65	2.93	0.03	3.97	1.80	2.91	1.71	3.00	3.98	0.25	4.65	4.93	4.94	2.86	3.13
Totals			16.57	16.55	5.36	7.55	6.73	7.55	6.75	5.98	7.68	5.49	6.72	3.98	7.41	5.21	6.28	5.07	6.47	7.39	2.62	9.69	11.47	11.53	7.85	8.24

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)

Date			Rainfall (in)		Field 6 Irrigation (Drip)																		
					Zones (Treatment)																		
					1 (T4)	2 (T1)	3 (T2)	4 (T5)	5 (T3)	6 (T1)	7 (T2)	8 (T4)	9 (T5)	10 (T3)	11 (T1)	12 (T4)	13 (T2)	14 (T3	15 (T5)	16 (T2)	17 (T1)	18 (T4)	19 (T5)	20 (T3)
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Crop:																		
					Cotton																		
1	9	2023			0.69	0.66	0.69	0.65	0.60	0.60	0.64	0.60	0.61	0.62									
1	10	2023													0.57	0.56	0.57	0.56	0.57	0.55	0.58	0.59	0.57	0.54
1	11	2023			0.53	0.48	0.54	0.51	0.52	0.51	0.53	0.50	0.51	0.50	0.50	0.50	0.51	0.48	0.50	0.50				
1	12	2023			0.52	0.51	0.53	0.51	0.52	0.51	0.52	0.26									0.51	0.51	0.50	0.48
1	13	2023			0.12	0.06	0.00					0.24	0.50	0.49	0.50	0.50	0.25	0.24	0.49	0.50	0.51	0.51	0.50	0.43
2	14	2023	0.04	0.14																				
3	21	2023			0.52	0.53	0.53	0.51	0.53	0.52	0.51	0.49	0.49	0.46	0.50	0.24								
3	22	2023			0.51	0.52	0.52									0.23	0.49	0.48	0.48	0.48	0.50	0.49	0.50	0.48
3	23	2023						0.51	0.52	0.51	0.51	0.50	0.51	0.48	0.50	0.49	0.51	0.48	0.49	0.48	0.51	0.40	0.43	0.32
3	27	2023			0.05	0.18	0.08	0.23	0.23	0.25	0.21	0.30	0.30	0.33	0.35	0.39	0.57	0.65	0.37	0.39	0.30	0.41	0.40	0.60
4	14	2023			0.51	0.50	0.47	0.47	0.50	0.43	0.47	0.44	0.46	0.45	0.39	0.47	0.46	0.43	0.43	0.45	0.42	0.44	0.46	0.49
5	3	2023	0.86	0.45																				
5	4	2023	0.12	0.15																				
5	9	2023			0.50	0.51	0.50	0.50	0.52	0.51	0.58	0.51	0.51	0.50	0.49	0.50								
5	10	2023															0.52	0.50	0.49	0.50	0.51	0.52	0.50	0.48
5	11	2023	0.15	0.16																				
5	13	2023	1.21	0.86																				
5	16	2023	0.13	0.13																				
5	19	2023	0.78	0.68																				
5	22	2023	0.68	0.80																				
5	24	2023	0.34	0.05																				
5	25	2023	1.09	0.97																				
5	26	2023	1.42	2.47																				
5	27	2023	0.82	0.99																				
5	31	2023	0.04	0.10																				
6	1	2023	0.62	0.44																				
6	4	2023	1.77	1.69																				
6	23	2023	0.62	0.47	0.50	0.51	0.51	0.51	0.53	0.50														
6	27	2023									0.58	0.50	0.51	0.49	0.48	0.48	0.51	0.48	0.49	0.50	0.51	0.51	0.51	0.47
7	2	2023	0.66	1.58																				
7	6	2023	1.19	0.80																				
7	8	2023	0.26																					
7	13	2023	0.33	0.61				0.39																
7	14	2023						0.10	0.52				0.48	0.47				0.48	0.49				0.50	0.50
7	16	2023	0.36	0.34																				
7	20	2023						0.46	0.50				0.49	0.48				0.48	0.48				0.48	0.46
7	23	2023	0.85	0.84																				
7	31	2023			0.54		0.32	0.50	0.25		0.25	0.49	0.50	0.24		0.49	0.26	0.25	0.50	0.26				
8	1	2023			0.45		0.19	0.48	0.25		0.25	0.49	0.49	0.24		0.48	0.25	0.25	0.49	0.24		1.00	0.98	0.47
8	7	2023			0.46		0.24	0.48	0.29		0.25	0.54	0.49	0.24		0.49	0.25	0.24	0.49	0.26		0.51	0.51	0.28
8	8	2023														0.12	0.31	0.44	0.52	0.24		0.69	0.61	0.20
8	10	2023			0.51		0.24	0.49	0.24		0.26	0.51	0.51	0.25		0.36								
8	12	2023	0.15																					
8	14	2023			0.49		0.24	0.51	0.28		0.25	0.64	0.50	0.24		0.50	0.25	0.24	0.49	0.24		0.52	0.50	0.27
8	15	2023			0.50		0.26	0.50	0.25		0.25	0.42	0.50	0.24		0.55	0.25	0.25	0.50	0.24		0.51	0.47	0.18
8	21	2023							0.26			0.56	0.57	0.32		0.58	0.26	0.21	0.56	0.28		0.48	0.49	0.36
8	22	2023			1.18		0.53	1.12	0.26		0.50	0.51	0.54	0.32		0.57	0.25	0.22	0.57	0.27		0.48	0.48	0.30
8	23	2023			0.06							0.05				0.04								0.05
8	27	2023	0.49	0.43																				
8	28	2023			0.50		0.25	0.50	0.25		0.25	0.50	0.50	0.24		0.50	0.25	0.25	0.51	0.24		0.51	0.49	0.23
8	29	2023			0.51		0.25	0.51	0.26		0.25	0.51	0.50	0.24		0.51	0.25	0.25	0.51	0.23		0.51	0.49	0.24
9	5	2023			0.26		0.26	0.26	0.26		0.25	0.25	0.25	0.24		0.25	0.24	0.25	0.25	0.24		0.26	0.24	0.24
9	6	2023			0.27		0.25	0.25	0.25		0.25	0.25	0.25	0.24		0.24	0.26	0.25	0.25	0.23		0.26	0.26	0.25

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)

Date			Rainfall (in)		Field 6 Irrigation (Drip)																		
					Zones (Treatment)																		
					1 (T4)	2 (T1)	3 (T2)	4 (T5)	5 (T3)	6 (T1)	7 (T2)	8 (T4)	9 (T5)	10 (T3)	11 (T1)	12 (T4)	13 (T2)	14 (T3	15 (T5)	16 (T2)	17 (T1)	18 (T4)	19 (T5)	20 (T3)
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Crop:																		
					Cotton																		
9	14	2023	0.29	0.35	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
9	15	2023	0.53	0.25																			
9	16	2023	0.77	0.76																			
Pre & At Plant			10.69	10.55	4.44	4.45	4.37	4.37	4.46	4.34	4.55	4.35	4.38	4.33	4.26	4.34	4.39	4.30	4.30	4.35	4.33	4.38	4.38	4.29
Seasonal			5.88	5.96	5.73	0.04	3.06	6.59	4.17	0.03	3.05	5.73	6.62	4.05	0.03	5.71	3.10	4.11	6.63	3.01	0.03	5.75	6.53	4.04
Totals			16.57	16.51	10.17	4.49	7.43	10.96	8.63	4.38	7.60	10.08	11.01	8.37	4.30	10.05	7.49	8.41	10.93	7.36	4.36	10.13	10.91	8.33

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in) L = LEPA Irrigation S = Spray Irrigation

Date			Rainfall (in)		Field: 5 Wedge: A [Crop: Cotton]					Field: 5 Wedge: B [Crop: Cotton]					Field: 5 Wedge: C [Crop: Wheat]					Field: 5 Wedge: D (East) [Crop: Cotton]					Field: 5 Wedge: E [Crop: Cotton]					Field: 5 Wedge: F [Crop: Sorghum]				
					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level				
					Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8			
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System
2	14	2023	0.04	0.14																													
2	20	2023													0.50	0.50	0.50	0.50	S														
2	21	2023																		0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S
2	22	2023			0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S																			
2	23	2023													0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S					
2	24	2023			0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S																0.25	0.25	0.25	0.25	S
2	25	2023													0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S					
2	26	2023			0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S																0.25	0.25	0.25	0.25	S
2	27	2023													0.20	0.20	0.20	0.20	S														
2	28	2023			0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S						0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
3	1	2023			0.20	0.20	0.20	0.20	S						0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
3	2	2023								0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
3	3	2023			0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S																			
3	13	2023			0.20	0.20	0.20	0.20	S						0.07	0.07	0.07	0.07	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
3	14	2023								0.20	0.20	0.20	0.20	S	0.07	0.07	0.07	0.07	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
4	1	2023			0.20	0.20	0.20	0.20	S						0.06	0.06	0.06	0.06	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
4	2	2023								0.20	0.20	0.20	0.20	S	0.06	0.06	0.06	0.06	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S
4	3	2023			0.20	0.20	0.20	0.20	S																								
4	5	2023													0.75	0.75	0.75	0.75	S														
4	6	2023																		0.75	0.75	0.75	0.75	S									
4	7	2023																							0.75	0.75	0.75	0.75	S					
4	8	2023																												0.75	0.75	0.75	0.75	S
4	9	2023			0.75	0.75	0.75	0.75	S																								
4	10	2023								0.75	0.75	0.75	0.75	S																			
4	24	2023													1.00	1.00	1.00	1.00	S														
4	25	2023																		0.30	0.30	0.30	0.30	S									
4	26	2023																							0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S
4	27	2023			0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S	1.00	1.00	1.00	1.00	S														
4	28	2023																		0.30	0.30	0.30	0.30	S									
4	29	2023																							0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S
4	30	2023			0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S																			
5	2	2023													0.75	0.75	0.75	0.75	S														
5	3	2023	0.86	0.45																													
5	4	2023	0.12	0.15																													
5	5	2023																		0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S	0.15	0.15	0.15	0.15	S
5	6	2023			0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S															
5	7	2023																		0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S	0.15	0.15	0.15	0.15	S
5	8	2023			0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S																			
5	11	2023	0.15	0.16																													
5	13	2023	1.21	0.86	0.07	0.07	0.07	0.07	S	0.35	0.35	0.35	0.35	S	0.35	0.35	0.35	0.35	S															
5	14	2023																		0.35	0.35	0.35	0.35	S	0.35	0.35	0.35	0.35	S					
5	15	2023																												0.35	0.35	0.35	0.35	S
5	16	2023	0.13	0.13																													
5	19	2023	0.78	0.68																													
5	21	2023			0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S																			
5	22	2023	0.68	0.80											0.30	0.30	0.30	0.30	S	0.30	0.30	0.30	0.30	S										
5	23	2023																							0.30	0.30	0.30	0.30	S					

2023 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

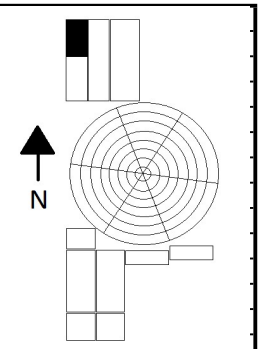
Helms Irrigation Amounts (in) L = LEPA Irrigation S = Spray Irrigation

Date			Rainfall (in)		Field: 5 Wedge: A [Crop: Cotton]					Field: 5 Wedge: B [Crop: Cotton]					Field: 5 Wedge: C [Crop: Wheat]					Field: 5 Wedge: D (East) [Crop: Cotton]					Field: 5 Wedge: E [Crop: Cotton]					Field: 5 Wedge: F [Crop: Sorghum]				
					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level					Irrigation Level				
					Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8				Span 2	Span 3 - Span 8			
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System	Base	Base	Base - 50%	Base + 50%	System
5	24	2023	0.34	0.05																													
5	25	2023	1.09	0.97																													
5	26	2023	1.42	2.47																													
5	27	2023	0.82	0.99																													
5	31	2023	0.04	0.10																													
6	1	2023	0.62	0.44																													
6	4	2023	1.77	1.69																													
6	23	2023	0.62	0.47																													
7	2	2023	0.66	1.58																													
7	6	2023	1.19	0.80																													
7	8	2023	0.26	0.00																													
7	13	2023	0.33	0.61																													
7	16	2023	0.36	0.34																													
7	23	2023	0.85	0.84																													
7	26	2023			0.10		0.10	0.10	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L										
7	27	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.25	0.13	0.13	0.25		0.18	0.09	0.09	0.18	
7	28	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.13	0.13		0.13		0.09	0.09		0.09	
8	2	2023			0.13		0.13	0.13	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L					L										
8	3	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.40	0.20	0.20	0.40	L	0.13		0.13	0.13		0.09		0.09	0.09	
8	4	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.25	0.25		0.25		0.18	0.18		0.18	
8	10	2023			0.13		0.13	0.13	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L	.									
8	11	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.25	0.13	0.13	0.25		0.18	0.09	0.09	0.18	
8	12	2023	0.15	0.00	0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.13	0.13		0.13		0.09	0.09		0.09	
8	16	2023			0.13		0.13	0.13	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L	0.20		0.20	0.20	L	0.13		0.13	0.13						
8	17	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.13	0.13		0.13		0.18	0.09	0.09	0.18	
8	18	2023			0.13	0.13		0.13	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.20	0.20		0.20	L	0.13	0.13		0.13		0.09	0.09		0.09	
8	23	2023			0.13		0.13	0.13	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L															
8	24	2023			0.13	0.13		0.13	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25		0.25	0.25	L	0.13		0.13	0.13		0.09		0.09	0.09	
8	25	2023			0.13	0.13		0.13	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.13	0.13		0.13		0.09	0.09		0.09	
8	26	2023																		0.25	0.25		0.25	L	0.13	0.13		0.13						
8	27	2023	0.49	0.43																													
8	30	2023			0.13		0.13	0.13	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L															
8	31	2023			0.13	0.13		0.13	L	0.25	0.25		0.25	L						0.25		0.25	0.25	L	0.13		0.13	0.13		0.09		0.09	0.09	
9	1	2023			0.13	0.13		0.13	L						0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.13	0.13		0.13		0.09	0.09		0.09	
9	2	2023								0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.13	0.13		0.13		0.09	0.09		0.09	
9	7	2023			0.13		0.13	0.13	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L										
9	8	2023			0.13	0.13		0.13	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.13		0.13	0.13		0.09		0.09	0.09	
9	9	2023			0.13	0.13		0.13	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.25	0.25		0.25		0.09	0.09		0.09	
9	14	2023	0.29	0.35																													
9	15	2023	0.53	0.25																													
9	16	2023	0.77	0.76																													
Pre & At Plant			10.69	10.55	4.52	4.52	4.52	4.52		4.60	4.60	4.60	4.60		6.31	6.31	6.31	6.31		5.00	5.00	5.00	5.00		5.00	5.00	5.00	5.00		4.40	4.40	4.40	4.40	
Seasonal			5.88	5.96	2.70	1.82	0.88	2.70		4.65	3.10	1.55	4.65		4.65	3.10	1.55	4.65		4.65	3.10	1.55	4.65		2.69	1.80	0.91	2.69		1.71	1.08	0.63	1.71	
Totals			16.57	16.51	7.22	6.34	5.40	7.22		9.25	7.70	6.15	9.25		10.96	9.41	7.86	10.96		9.65	8.10	6.55	9.65		7.69	6.80	5.91	7.69		6.11	5.48	5.03	6.11	

Operations Summary

Year	2023
Farm	Helm
Field ID	Field 1 North
Exp. Design	Corn
Soil Type	Pullman Clay Loam

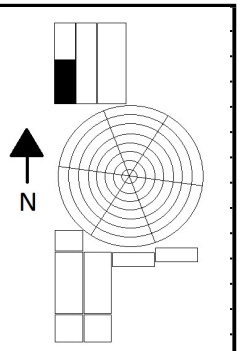
Field Operations	Date	Activity
Tillage	7/18/2022	Disk
	8/10/2022	Disk
	9/9/2022	List 30"
	2/15/2023	List 30"
	3/29/2023	Roller and Bed Conditioners
	6/9/2023	Cultivate
	6/14/2023	Cultivate
	6/20/2023	Cultivate
Fertility	3/28/2023	Liquid 32-0-0 200lb/ac
	6/14/2023	Liquid 32-0-0 150lb/ac
	6/14/2023	Liquid 10-34-0 80lb/ac
Planting / Harvest	5/12/2023	Plant Corn Plots
Herbicide / Growth Regulator	4/10/2023	Zaltus SC 2oz/ac, Clash 12oz/ac
	5/12/2023	Acuron 1.3qt/ac, Solera 32oz/ac, Induce 1%
	6/20/2023	Acuron 1.3qt/ac, Impact 1.5oz/ac, Dyne-Amic 1%
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting	1/1 - 6-25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 1 South
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

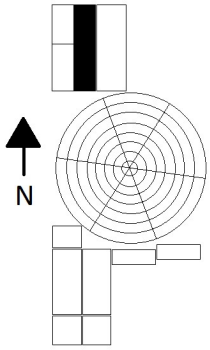
Field Operations	Date	Activity
Tillage	9/30/2022	Shred
	9/30/2022	Disk
	10/14/2022	Disk
	10/19/2022	Disk
	11/21/2022	Disk
	1/5/2023	Field Cultivator
	6/9/2023	Rotary Hoe
	6/14/2023	Rotary Hoe
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/18/2023	Planted Rye 15 lb/ac
	5/23/2023	Planted DeltaPine 2123 B3XF 34,000 seeds/ac
	6/7/2023	Planted DeltaPine 2123 B3XF 34,000 seeds/ac
Herbicide / Growth Regulator	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/23/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	6/10/2023	Gramozone 32oz/ac, Induce 1%
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigiliance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigiliance 12.8oz/ac
	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting	1/1 - 6-25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 2
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

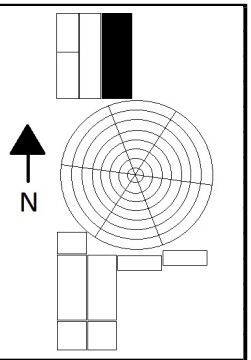
Field Operations	Date	Activity
Tillage	11/22/2022	Shred
	1/3/2023	Disk
	1/5/2023	Field Cultivator
	1/11/2023	Float
	1/11/2023	Field Cultivator
	1/12/2023	List 30"
	4/3/2023	Roller and Bed Conditioners
	6/26/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/7/2023	Rotary Hoe
	7/10/2023	Cultivate
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/13/2023	Planted Rye 15 lb/ac
	5/17/2023	Planted DeltaPine 1822 XF 44,000 seeds/ac
	6/9/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/4/2023	Harvested all cotton
Herbicide / Growth Regulator	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	5/17/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	6/10/2023	Gramoxone 32oz/ac, Induce 0.5%
	7/8/2023	Enginia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigiliance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethepthon 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	1 = 3.76in, 2 = 3.79in, 3 = 3.76in, 4 = 3.81in, 5 = 3.83in, 6 = 4.25in, 7 = 3.91in, 8 = 3.84in, 9 = 3.79in, 10 = 3.95in
Seasonal	6/26 - 9/30	1 = 1.60in, 2= 3.76in, 3 = 2.94in, 4 = 3.74in, 5 = 2.92in, 6 = 1.73in, 7 = 3.77in, 8 = 1.65in, 9 = 2.93in, 10 = 0.00in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 3
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

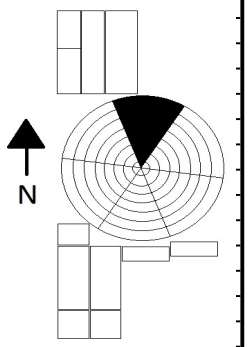
Field Operations	Date	Activity
Tillage	11/22/2022	Shred
	1/3/2023	Disk
	1/4/2023	Field Cultivator
	1/11/2023	Float
	1/11/2023	Field Cultivator
	1/13/2023	List 30"
	4/3/2023	Roller and Bed Conditioners
	7/28/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/7/2023	Rotary Hoe
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/13/2023	Planted Rye 15 lb/ac
	5/16/2023	Planted NexGen 3406 B2XF 44,000 seeds/ac
	6/9/2023	Planted DeltaPine 1909 XF 42,000 seeds/ac
	11/4/2023	Harvested all cotton
Herbicide / Growth Regulator	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	5/17/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	6/10/2023	Gramoxone 32oz/ac, Induce 0.5%
	7/8/2023	Enginia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigiliance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethepthon 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	1 = 3.44in, 2= 3.41in, 3 = 3.37in, 4 = 3.36in, 5 = 3.47in, 6 = 3.41in, 7 = 2.37in
Seasonal	6/26 - 9/30	1 = 3.97in, 2 = 1.80in, 3 = 2.91in, 4 = 1.71in, 5 = 3.00in, 6 = 3.98in, 7 = 0.25in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5A (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

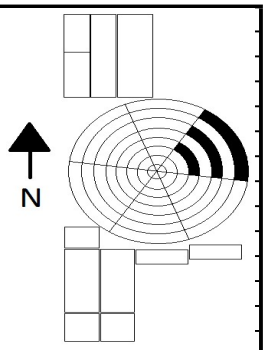
Field Operations	Date	Activity
Tillage	12/2/2022	Shred
	12/13/2022	Field Cultivator
	1/3/2023	Field Cultivator
	1/10/2023	Float
	1/10/2023	Field Cultivator
	1/11/2023	List 30"
	3/16/2023	Rotary Hoe
	3/28/2023	Roller and Bed conditioners
	6/11/2023	Rotary Hoe
	6/26/2023	Rotary Hoe
	7/7/2023	Rotary Hoe
	7/10/2023	Cultivate
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/17/2023	Planted Rye 15 lb/ac
	5/24/2023	Planted NexGen 3406 B2XF 34,000 seeds/ac
	11/5/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	5/24/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.52in, Base - 50% = 4.52in, Base + 50% = 4.52in
Seasonal	6/26 - 9/30	Base = 1.82in, Base - 50% = .88in, Base + 50% = 2.70in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5B (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

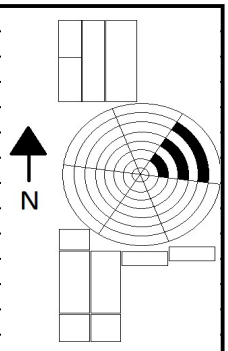
Field Operations	Date	Activity
Tillage	12/2/2022	Shred
	12/16/2022	Field Cultivator
	1/3/2023	Field Cultivator
	1/12/2023	List 30"
	3/16/2023	Rotary Hoe
	3/28/2023	Roller and Bed conditioners
	6/26/2023	Rotary Hoe
	7/5/2026	Rotary Hoe
	7/10/2023	Cultivate
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/17/2023	Planted Rye 15 lb/ac
	6/10/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/7/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.60in, Base - 50% = 4.60in, Base + 50% = 4.60in
Seasonal	6/26 - 9/30	Base = 3.10in, Base - 50% = 1.55in, Base + 50% = 4.65in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5B (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

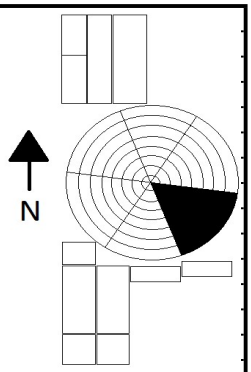
Field Operations	Date	Activity
Tillage	12/2/2022	Shred
	12/16/2022	Field Cultivator
	1/3/2023	Field Cultivator
	1/12/2023	List 30"
	3/16/2023	Rotary Hoe
	3/28/2023	Roller and Bed conditioners
	6/26/2023	Rotary Hoe
	7/5/2026	Rotary Hoe
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/17/2023	Planted Rye 15 lb/ac
	6/10/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/7/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.60in, Base - 50% = 4.60in, Base + 50% = 4.60in
Seasonal	6/26 - 9/30	Base = 3.10in, Base - 50% = 1.55in, Base + 50% = 4.65in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5C (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

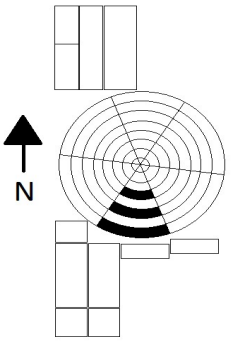
Field Operations	Date	Activity
Tillage	7/13/2022	Shred
	7/15/2022	Disk
	8/2/2022	Disk
	9/6/2022	Field Cultivator
	9/6/2022	Float
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	9/16/2022	Planted TAMU 204 15 lb/ac
	6/10/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/7/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	4/11/2023	Credit Extra 41 32oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 6.31in, Base - 50% = 6.31in, Base + 50% = 6.31in
Seasonal	6/26 - 9/30	Base = 3.10in, Base - 50% = 1.55in, Base + 50% = 4.65in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5D (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

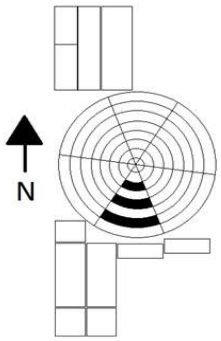
Field Operations	Date	Activity
Tillage	12/5/2022	Shred
	12/16/2022	Field Cultivator
	1/4/2023	Field Cultivator
	3/16/2023	Rotary Hoe
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/9/2023	Planted Rye 15 lb/ac
	6/10/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/7/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.00in, Base - 50% = 5.00in, Base + 50% = 5.00in
Seasonal	6/26 - 9/30	Base = 3.10in, Base - 50% = 1.55in, Base + 50% = 4.65in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5D (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

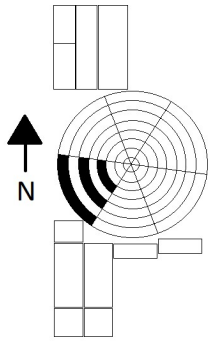
Field Operations	Date	Activity
Tillage	12/5/2022	Shred
	12/16/2022	Field Cultivator
	1/4/2023	Field Cultivator
	3/16/2023	Rotary Hoe
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/9/2023	Planted Rye 15 lb/ac
	6/10/2023	Planted DeltaPine 1822 XF 42,000 seeds/ac
	11/7/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.00in, Base - 50% = 5.00in, Base + 50% = 5.00in
Seasonal	6/26 - 9/30	Base = 3.10in, Base - 50% = 1.55in, Base + 50% = 4.65in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5E (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

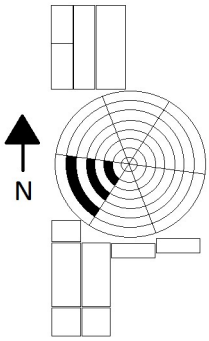
Field Operations	Date	Activity
Tillage	12/5/2022	Shred
	12/13/2022	Field Cultivator
	1/4/2023	Field Cultivator
	2/15/2023	List 30"
	3/20/2023	Roller and Bed conditioners
	6/26/2023	Rotary Hoe
	7/10/2023	Cultivate
	7/5/2026	Rotary Hoe
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/9/2023	Planted Rye 15 lb/ac
	6/11/2023	Planted DeltaPine 1820 B3XF 34,000 seeds/ac
	11/5/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.00in, Base - 50% = 5.00in, Base + 50% = 5.00in
Seasonal	6/26 - 9/30	Base = 1.80in, Base - 50% = 0.91in, Base + 50% = 2.69in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5E (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

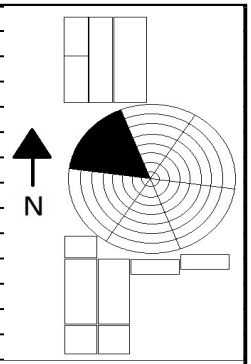
Field Operations	Date	Activity
Tillage	12/5/2022	Shred
	12/13/2022	Field Cultivator
	1/4/2023	Field Cultivator
	3/16/2023	Rotary Hoe
Fertility	7/11/2023	Liquid 32-0-0 35 lb/ac
Planting / Harvest	1/9/2023	Planted Rye 15 lb/ac
	6/11/2023	Planted DeltaPine 1820 B3XF 34,000 seeds/ac
	11/5/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	6/10/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/8/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.00in, Base - 50% = 5.00in, Base + 50% = 5.00in
Seasonal	6/26 - 9/30	Base = 1.80in, Base - 50% = 0.91in, Base + 50% = 2.69in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 5F (All Spans)
Exp. Design	Rye
Soil Type	Pullman Clay Loam

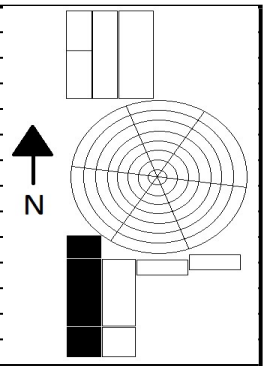
Field Operations	Date	Activity
Tillage	12/2/2022	Shred
	12/13/2022	Field Cultivator
	1/3/2023	Field Cultivator
	1/9/2023	Float
	1/10/2023	Field Cultivator
	3/16/2023	Rotary Hoe
	3/29/2022	Rotary Hoe
	5/27/2022	Rotary Hoe
Fertility		
Planting / Harvest	1/10/2023	Planted Rye 15 lb/ac
Herbicide /	4/5/2023	Zaltus 2oz/ac, Clash 12oz/ac
Growth Regulator	6/13/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.40in, Base - 50% = 4.40in, Base + 50% = 4.40in
Seasonal	6/26 - 9/30	Base = 1.08in, Base - 50% = 0.63in, Base + 50% = 1.71in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 6
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

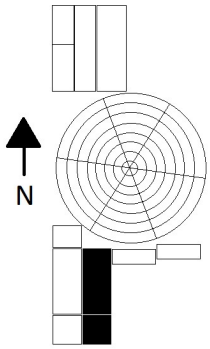
Field Operations	Date	Activity
Tillage	12/1/2022	Shred
	1/4/2023	Disk
	1/5/2023	Field Cultivator
	6/26/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/11/2023	Cultivate
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/6/2023	Planted Rye 15 lb/ac
	5/18/2023	Planted XF Test Varieties 44,000 lb/ac
	6/12/2023	Replanted XF Test Varieties 44,000 lb/ac
	11/6/2023	Harvested all cotton
Herbicide / Growth Regulator	4/5/2023	Clash 12oz/ac
	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
	4/20/2023	Credit Extra 41 32oz/ac, Dyne-Amic 1%
	5/21/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	6/10/2023	Gramoxone 32oz/ac, Induce 1%
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/16/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	T1 = 4.35in, T2 = 4.41in, T3 = 4.35in, T4 = 4.38in, T5 = 4.36in
Seasonal	6/25 - 9/30	T1 = 0.03in, T2 = 3.06in, T3 = 4.09in, T4 = 5.73in, T5 = 6.59in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/25 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 7
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

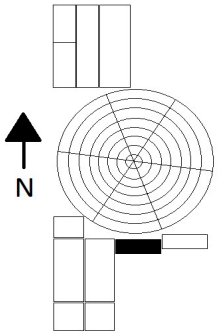
Field Operations	Date	Activity
Tillage	11/28/2022	Shred
	1/5/2023	Disk
	1/10/2023	Float
	1/10/2023	Field Cultivator
	1/13/2023	List 30"
	4/4/2023	Roller and Bed Conditioners
	7/28/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/7/2023	Rotary Hoe
	7/11/2023	Cultivate
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/18/2023	Planted Rye 15 lb/ac
	5/17/2023	Planted Nex Gen 3406 B2XF 44,000 seed/ac
	6/9/2023	Replanted DeltaPine 1909 XF 42,000 seeds/ac
	11/4/2023	Harvested all cotton
Herbicide /	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
Growth Regulator	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	5/17/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	6/10/2023	Gramoxone 32oz/ac, Induce 0.5%
	7/8/2023	Enginia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigiliance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethepthon 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	D = 5.04in, E = 6.54in, F =6.59in
Seasonal	6/26 - 9/30	D = 4.65in, E = 4.93in, F = 4.94in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 8
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

Field Operations	Date	Activity
Tillage	11/28/2022	Shred
	1/6/2023	Disk
	1/10/2023	Float
	1/10/2023	List 30"
	4/4/2023	Roller and Bed Conditioners
	6/26/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/7/2023	Cultivate
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/11/2023	Planted Rye 15 lb/ac
	5/16/2023	Planted DeltaPine 1820 B2XF 44,000 seeds/ac
	5/31/2032	Planted StoneVille 5707 B2XF 40,000 seeds/ac
	11/3/2023	Harvested all cotton
Herbicide / Growth Regulator	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal II EC 1.5pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	4.99in
Seasonal	6/26 - 9/30	2.86in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in



Operations Summary

Year	2023
Farm	Helm
Field ID	Field 9
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

Field Operations	Date	Activity
Tillage	11/28/2022	Shred
	1/6/2023	Disk
	1/10/2023	Float
	1/10/2023	List 30"
	4/4/2023	Roller and Bed Conditioners
	6/9/2023	Rotary Hoe
	6/26/2023	Rotary Hoe
	7/5/2023	Rotary Hoe
	7/10/2023	Cultivate
Fertility	7/13/2023	Liquid 32-0-0 35lb/ac
Planting / Harvest	1/11/2023	Planted Rye 15 lb/ac
	5/17/2023	Planted DeltaPine Varieties 44,000 seeds/ac
	5/31/2023	Replanted DeltaPine Varities 44,000 seeds/ac
	11/8/2023	Harvested all cotton
Herbicide /	4/10/2023	Zaltus 2oz/ac, Clash 12oz/ac
Growth Regulator	5/2/2023	Honcho K6 42oz/ac, Clash 8oz/ac, Dyne-Amic 1%
	5/17/2023	Diuron 1.5pt/ac, Honcho K6 42oz/ac
	7/8/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
	7/13/2023	Medal EC II 1.3pt/ac
	7/29/2023	Engenia 12.8oz/ac, Glystar K Plus 32oz/ac, Vigilance 12.8oz/ac
Insecticide		
Harvest aid	10/9/2023	Ethephon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/19/2023	Gramoxone 24oz/ac, Induce 0.5%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	5.11in
Seasonal	6/26 - 9/30	3.13in
Rainfall		
PrePlant & Planting	1/1 - 6/25	10.59in
Seasonal	6/26 - 9/30	5.96in