Improving Life Through Science and Technology

Lubbock-Pecos-Halfway

Helm Research Farm

Summary Report

2024

Technical Report
25-3

Texas AgriLife Research / Dr. Cliff Lamb, Director
The Texas A&M University System / College Station, Texas

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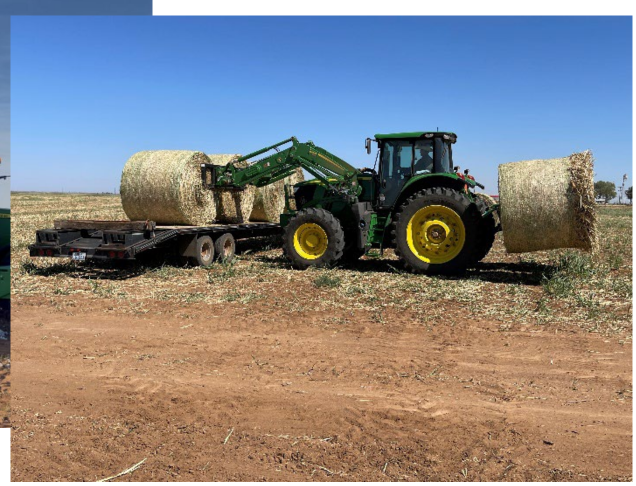
Introduction:

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
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Cotton Response to Irrigation Quantity using Subsurface Drip Irrigation (Field 2)

Hope Nakabuye, Casey Hardin, Scott Jordan and Joe Mustian

Objective: Determine cotton lint yield and water productivity of DeltaPine DP 1822XF irrigated with Subsurface Drip Irrigation (SDI)

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 test 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 T1, T2, and T3. The field was planted on May 20th with DeltaPine DP1822 XF at a rate of 42,000 seeds/ac. The irrigation amounts, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Figure 1. Cotton planted in subsurface drip irrigation, Helms Research Farm, 2024

Results: Annual rainfall for 2024 through September was 13.45 inches and the combined preplant and seasonal irrigation quantities for the three respective irrigation treatments were 6.51, 7.36, and 10.09 inches. Cotton lint yields ranged from 173 lb/ac in the dryland to 1208 lb/ac in T3. Increasing seasonal irrigation quantities resulted in a significant increase in lint yield. T3 resulted in an increase in the lint yield of 83.6% over T1 and 55.5% over T2. T3 showed a significant increase in fiber quality of 11.4% over T1, and 9.7% over T2, data not shown.

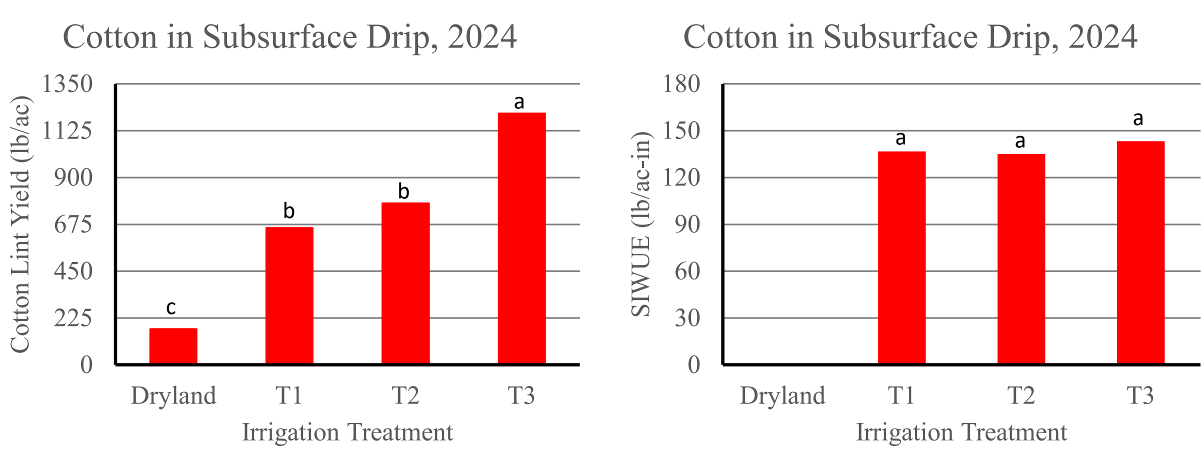


Figure 2. Cotton lint yield and seasonal irrigation water use efficiency (SIWUE) of cotton planted in subsurface drip irrigation, Helms Research Farm, 2024. Means with the same letter are not significantly different (P<0.5, Tukey).

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

Objective: Determine cotton lint yield, fiber quality, and seasonal irrigation water use efficiency (SIWUE) of DeltaPine DP 1822 XF 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 four 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. T1, T3, and T5 were designated as high irrigation zones; while T2, T4, and T6 were designated as low irrigation zones. The high irrigation zones put out the base irrigation rate (1.0 BI), while the low irrigation zones put out 50% the base irrigation rate (0.50 BI). On May 20th, DeltaPine DP 1822 XF was planted at a rate of 42,000 seeds/ac. Irrigation quantities, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Methodology: Annual rainfall through September was 13.45 inches and the combined preseason and seasonal irrigation quantities ranged from 5.32 to 8.91 inches. Cotton lint yields ranged from 218 lb/ac in the dryland to 1016 lb/ac in T5. Cotton lint loan values ranged from \$0.44/lb to \$0.53/lb. Increasing seasonal irrigation resulted in a significant increase in cotton lint yield and fiber quality. However, an increase in seasonal irrigation did not have a significant impact on the seasonal irrigation water use efficiency (SIWUE). The base irrigation rate zones resulted in a significant increase in fiber quality, as reflected in the lint loan value, compared to the low irrigation rate zones.

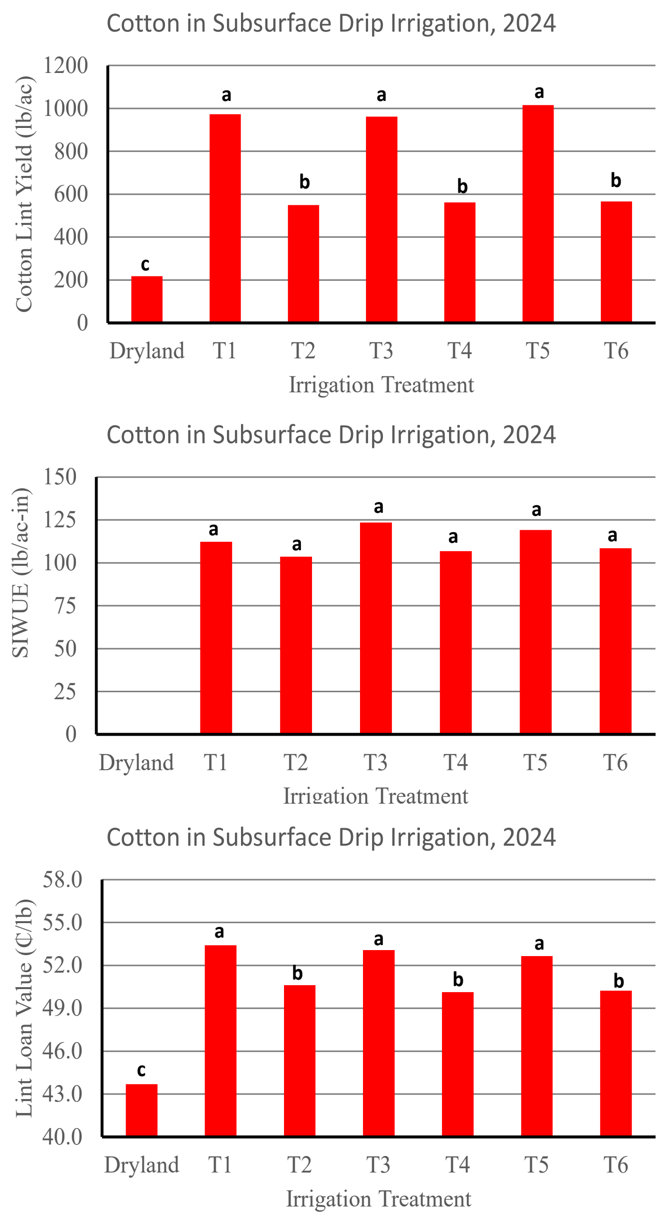


Figure 1. Cotton lint yields, seasonal irrigation water use efficiency (SIWUE), and lint loan values for cotton planted in subsurface drip irrigation Helms Research Farm, 2024. Means with the same letter are not significantly different (P<0.5, Tukey).

Haygrazer Irrigated with a Center Pivot (Field 5a, 5b, and 5c)
Hope Nakabuye, Casey Hardin, Scott Jordan and Joe Mustian

Objective: Determine the bulk yield of Sorghum Sudan Champ II planted under a pivot at two irrigation levels.

Methodology: These results are from the first year of a new crop rotation study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA) irrigation. In Wedges A, B, and C haygrazer was planted using Sorghum Sudangrass Hybrid Champ II on May 29th. The pivot was divided into two irrigation levels, the even spans were assigned base irrigation while the odd spans were assigned low irrigation. The irrigation treatments were designated as the base irrigation rate (BI), and low irrigation rate (LI), which was 75 % of base irrigation. Irrigation amounts, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Figure 1. Collecting hay bales to determine plot harvest weights, Helms Research Farm, 2024.

Results: The haygrazer was cut on July 25th and baled on August 15th. The total preplant and seasonal irrigation quantities were 6.80 and 7.73 inches respectively, while seasonal rainfall through July 25th was 8.63 inches. Due to an inconsistent stand, the harvest yields between wedges and spans varied considerably. The inconsistent stand was due to lingering effects from the tillage study that had been conducted over the previous several years, and work on getting the field flat after some early tillage before the current study was initiated. Additional testing will be conducted over the coming years to test the effects of haygrazer/cotton crop rotation on soil health, water productivity and harvest yields.

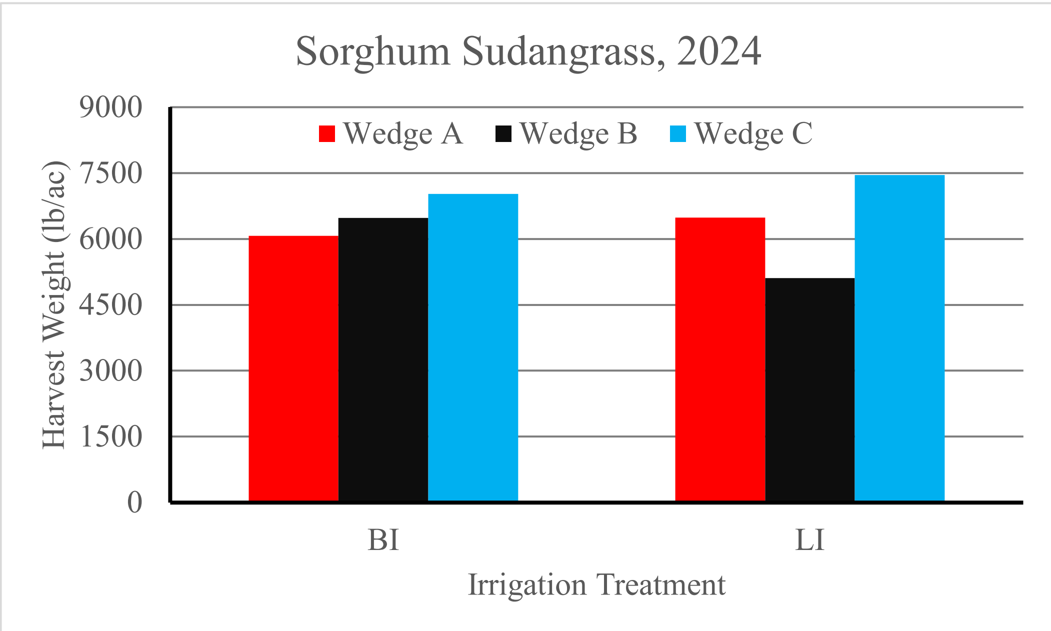


Figure 1. Harvest Weight of Sorghum Sudangrass planted at Helms Research Farm, 2024.

Cotton Variety Trial in Continuous Cotton (Field 5d)

Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield and fiber quality of three DeltaPine varieties planted in a continuous cotton field.

Methodology: The study was conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA) irrigation. In this 22-acre test area, cotton has been planted over the previous several years into a terminated winter rye cover crop. Two irrigation quantities were used, base irrigation (even spans) and low irrigation (odd spans). The irrigation quantities were designated as the base irrigation rate (1.0 BI), and the low irrigation rate (0.75 BI). On May 22nd, cotton was planted using DeltaPine DP 1820 B3XF, DeltaPine DP 1822 XF, and DeltaPine DP 2012 B3XF at a rate of 42,000 seeds/acre. Irrigation amounts, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Figure 1. Collecting plot harvest weights at Helms Research Farm, 2024.

Results: Annual rainfall for 2024 through September was 13.45 inches, and the combined preplant and seasonal irrigations in the two irrigation treatments were 8.86 and 10.85 inches respectively. Increasing seasonal irrigation resulted in a significant increase in cotton lint yield for the three cotton varieties. Cotton lint yields ranged from 553 to 849 lb/ac. Although nonsignificant DeltaPine DP 1820 B3XF resulted in the highest cotton lint yield at the base irrigation rate, while DeltaPine DP 1822 XF had the highest lint yield at the low irrigation rate. DeltaPine DP 1822 XF had higher fiber quality, as reflected in the lint loan value, at both irrigation rates, while DeltaPine DP 2012 B3XF had the lowest fiber quality and lint yields at both irrigation rates.

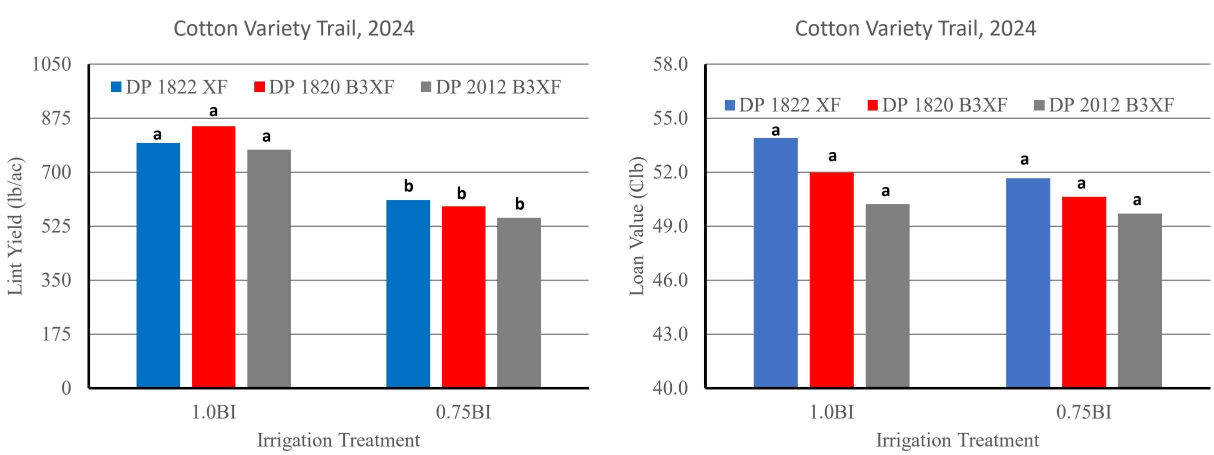


Figure 1. Cotton lint yield, lint loan value from three cotton varieties irrigated at two irrigation levels at Helms Research Farm, 2024

Cotton Variety Trial Planted in Terminated Cover Crop (Field 5e)
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, and fiber quality of three cotton varieties planted in a terminated rye cover crop irrigated at two levels.

Methodology: These results are from the first year of a new crop rotation study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA) irrigation. The pivot was divided into two irrigation levels, the even spans were considered base irrigation while the odd spans were considered low irrigation. The irrigation treatments were designated as the base irrigation rate (BI) and the low irrigation rate (LI); which was 75% of the base irrigation rate. On May 22nd, DeltaPine DP 1820 B3XF, DeltaPine DP 1822 XF, and DeltaPine DP 2012 B3XF were planted at a rate of 42,000 seeds/acre. Irrigation amounts, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.


Figure 1. Cotton variety trial planted at Helms Research Farm, 2024.

Results: Annual rainfall for 2024 through September was 13.45 inches, and the combined preplant and seasonal irrigation for the two irrigation treatments were 8.86 and 10.85 inches respectively. Cotton lint yield between the two irrigation levels ranged from 535 to 841 lb/ac. DeltaPine DP 1820 B3XF had the highest yield and fiber quality, as reflected in the lint loan value, in the base irrigation rate; while DeltaPine DP 1822 XF had the highest yield and fiber quality in the low irrigation rate.

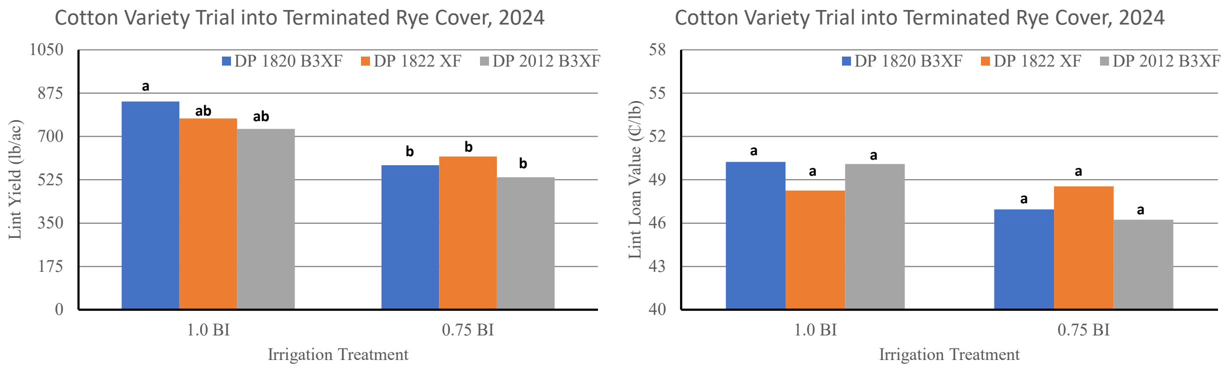


Figure 2. Cotton lint yield and lint loan value of three cotton varieties with two irrigation levels at Helms Research Farm, 2024. Means with the same letter are not significantly different (p<0.5, Tukey).

Cotton Variety Trial Planted Following a Fallow Period (Field 5f)

Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield and fiber quality of three cotton varieties planted following a fallow period in 2023, irrigated at two irrigation levels.

Methodology: These results are part of a study conducted on a 125-acre pivot irrigated by Low Energy Precision Application (LEPA) irrigation. The pivot wedge was divided into two irrigation levels, the even spans were considered base irrigation while the odd spans were considered low irrigation. The irrigation treatments were designated as the base irrigation rate (1.0 BI), and the low irrigation rate (0.75 BI); which was 75% of the base irrigation rate. On May 22nd DeltaPine DP 1820 B3XF, DeltaPine DP 1822 XF, and DeltaPine DP 2012 B3XF were planted at a rate of 42,000 seeds/acre. Irrigation amounts, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Figure 1. Planting cotton variety trial at Helms Research Farm, 2024.

Results: Annual rainfall for 2024 through September was 13.45 inches, and the combined preplant and seasonal irrigation for the two irrigation treatments were 8.86 and 10.85 inches, respectively. Cotton lint yield ranged from 511 to 724 lb/ac. DeltaPine DP 1822 XF saw numerically higher lint yields at both irrigation levels (Figure 2). Although again nonsignificant DeltaPine DP 1822 XF had the highest fiber quality, as reflected in the lint loan value, at the base irrigation rate; while DeltaPine DP 2012 B3XF had the highest fiber quality in the low irrigation rate.

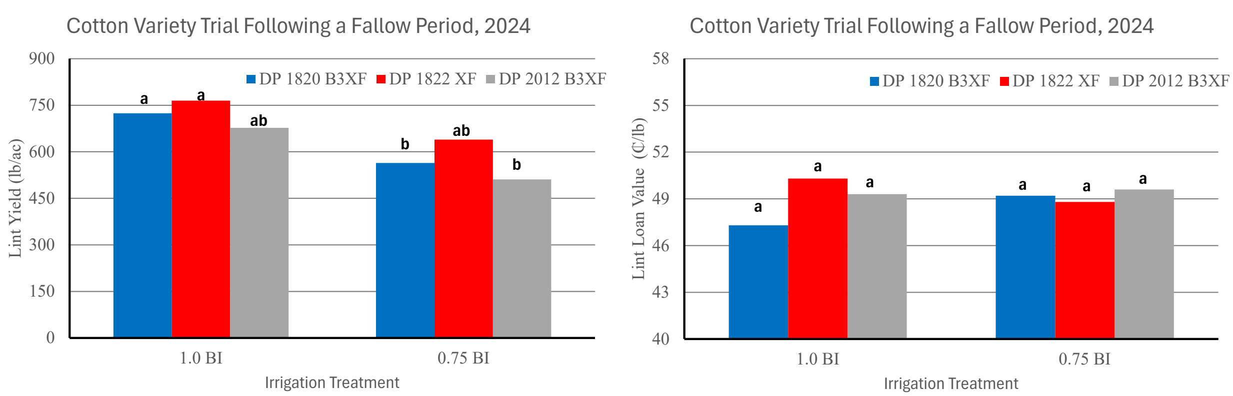


Figure 2. Cotton lint yield and lint loan value of three cotton varieties planted following a fallow period irrigated with two irrigation levels, Helms Research Farm, 2024.

TITLE: Nutrient Accumulation and Requirements of Modern Cotton Cultivars in the Southern High Plains of Texas

Katie Lewis, Katie Cason, Joseph Burke, Scott Jordan, and Casey Hardin

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. 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 to 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 cotton cultivars to optimize nutrient inputs across irrigation regimes.

PROJECT SUMMARY:

The location of the project field trial was at the Texas A&M AgriLife Research Center Helms Farm at Halfway, TX, which is equipped with a subsurface drip irrigation system.

Six cotton cultivars were planted with 4 replications and 5 different irrigation treatments (Table 1). Three soil samples per treatment were collected 36 inch depth. 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 NO_3^- (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				

Destructive plant sampling was conducted throughout the growing season at major growth stages (45, 90, and 120 days after planting, DAP). The collected samples 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:

Lint Yield

There are noticeable differences in lint yield among cultivars, as reported in Figure 1. DP 2335 B3XF consistently exhibits greater lint yield across all irrigation levels than other cultivars. ST 4595 B3XF and ST 4993 B3XF also demonstrate competitive lint yields, while NG 3500 XF and NG 3930 B3XF 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 irrigation regime means. The two irrigation regimes with higher ‘H’ amounts applied later in the season resulted in greater lint production than those with low ‘L’ or medium ‘M’ irrigation later in the season. 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.

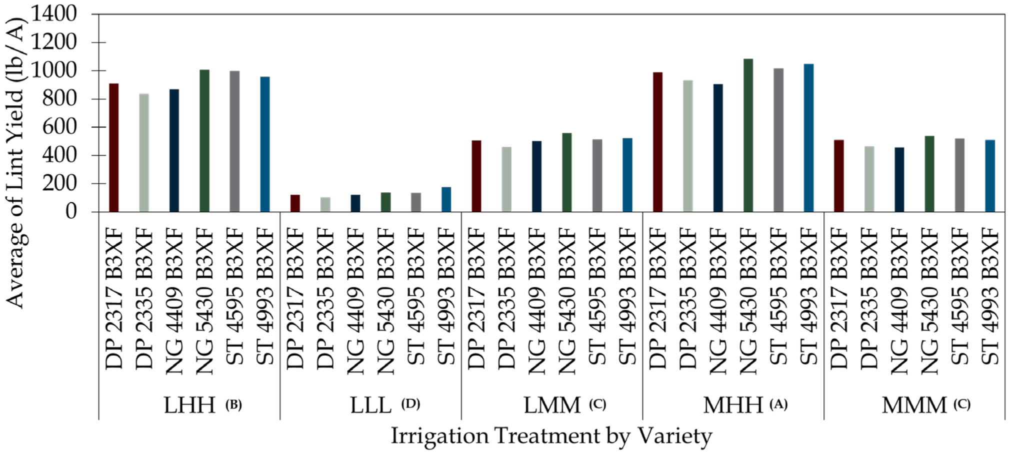


Figure 1. Cotton lint yield affected by variety per irrigation treatment at Texas A&M AgriLife Research Center Helms Farm at Halfway, TX, in 2024. LSD letters in parentheses next to irrigation regimes that are similar are not different.

SUMMARY:

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

Cotton Variety Trial Using Subsurface Drip Irrigation (Field 7)

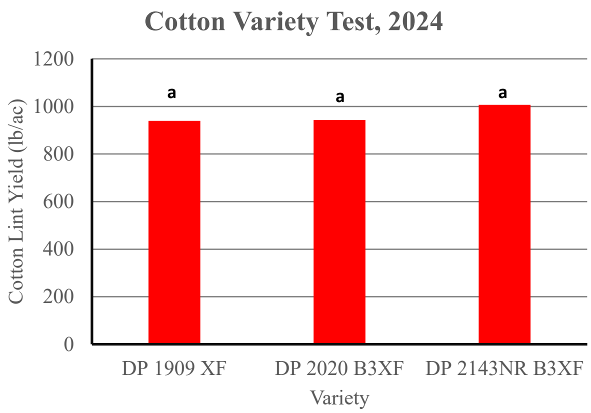
Scott Jordan, Hope Nakabuye, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield and fiber quality of three DeltaPine cotton varieties using Subsurface Drip Irrigation (SDI).

Methodology: This study was conducted on a 19-acre plot irrigated by subsurface drip irrigation (SDI) with 60-inch dripline spacing. The field was divided into three irrigation zones, with each zone supplying similar irrigation quantities. On May 20th, DeltaPine DP 1909 XF, DeltaPine DP 2020 B3XF, and DeltaPine DP 2143NR B3XF were planted in the field at a rate of 42,000 seeds/ac. The irrigation quantities, rainfall, field operations, pesticide applications, and nutrient applications for 2024 are listed in the appendix.

Figure 1. Harvesting cotton variety trials at Helms Research Farm, 2024

Results: Annual rainfall through September was 13.45 inches and the seasonal irrigation quantity was 6.07, 6.09, and 6.22 in the three irrigation zones. Cotton lint yields ranged from 939 to 1007 lb/ac, with DeltaPine DP 2143NR B3XF having the numerically highest yields. Fiber quality, as shown in the cotton lint loan value ranged from \$0.523/lb to \$0.540/lb. There was no significant increase in lint yield or fiber quality depending on the variety.



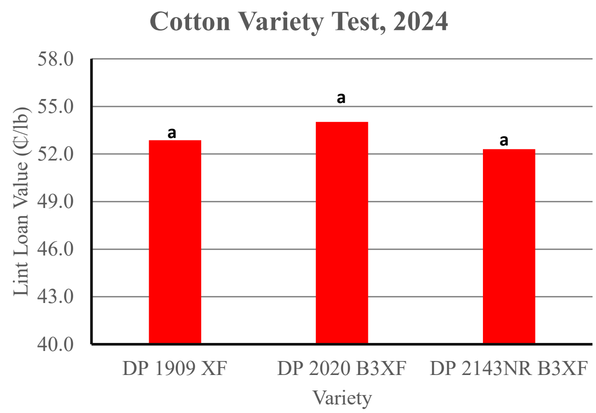


Figure 2. Cotton Lint Yield and Lint Loan Value for three cotton varieties planted at Helms Research Farm, 2024. Means with the same letter are not significantly different (P<0.5, Tukey).

EFFECT OF NITROGEN FERTILITY ON COTTON CROP RESPONSE TO SIMULATED COTTON FLEAHOPPER AND LYGUS DAMAGE

Megha N. Parajulee, Raju Sapkota, Surendra Gautam, and Katie L. Lewis

Objective: Evaluate the effect of artificial removal of cotton squares and bolls mimicking cotton fleahopper and *Lygus* injury under five nitrogen application rates on cotton lint yield and quality.

Methodology: Cotton cultivar, DP1820B3XF, was planted on June 4, 2024. The experiment was laid out in a split-plot randomized block design with five nitrogen rate treatments (0, 50, 100, 150, and 200 lb N/acre) applied for 22 years as main plots (16-row plots) and four fruit loss treatments (artificial removal of cotton squares mimicking acute cotton fleahopper infestation, 20% boll removal treatment to mimic late-season Lygus infestation, simulated cotton fleahopper injury followed by late-season Lygus injury, and control) as sub-plots with four replications (80 plots). The main-plot treatments included pre-bloom applications of five rates of N augmentation using a soil applicator injection rig on July 10. Pre-treatment soil samples (two 0 to 12 and 12 to 24-inch depth soil cores) were collected from each of the 20 main plots on July 9. Ten leaves per plot were collected three times (July 17, August 17, September 17) for leaf dry weight and nitrogen analysis. Within each main plot, four 6.5-ft. sections of uniform cotton were flagged in the middle two rows, one section each receiving hand removal of 100% cotton squares three weeks into squaring (July 23), 20% bolls removed from top canopy of the plants at crop cut-out (August 23), square removal on July 23 followed by boll removal on August 23, and control (no square or boll removal). Treatment plots were hand-harvested on October 29 for lint yield.

Results: Lint yields were similar across the three lower N rates (0, 50, and 100 lb/A). The yield increased significantly at 150 lb/A treatment and then slightly declined at 200 lb/A (Fig. 1). Simulated insect infestation treatments showed inconsistent patterns across the range of N

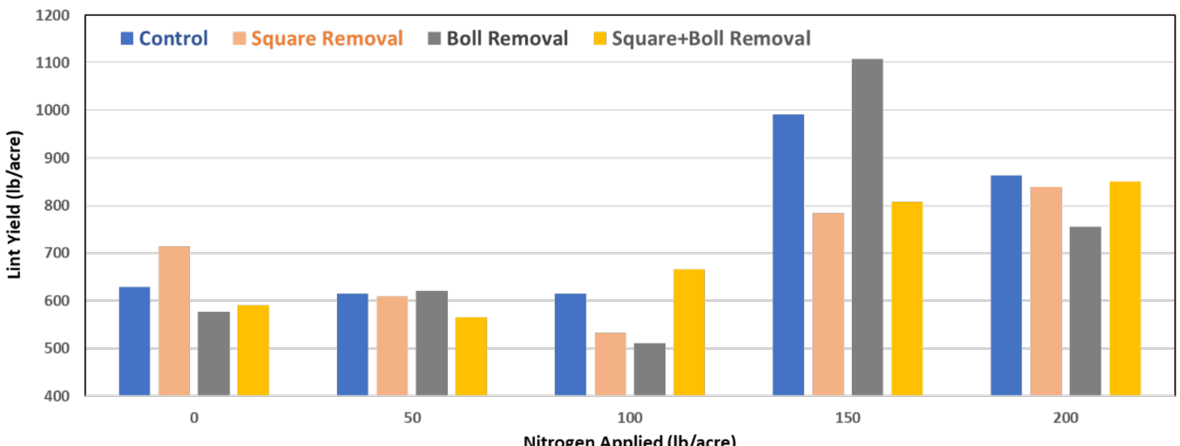


Fig. 1. Lint yield (lb/A) affected by simulated cotton fleahopper and Lygus damage across five variable N rates.

application rates. However, at high lint yield (150 lb/A N treatment) situation, removal of 100% squares at 1st flower stage significantly reduced lint yield. Interestingly, and somewhat expected, the late-stage boll removal slightly increased the lint yield due to the removal of young bolls at crop cut-out that allowed plants to allocate more energy on maturing harvestable bolls. The sequential removal of squares during the pre-flower stage and boll removal at crop cut-out resulted in reduced lint yield, indicating the stronger effect of pre-flower square loss than the late-season boll loss. Residual N and fiber quality data are pending which will be presented at the Plains Cotton Improvement Program annual meeting.

Appendix

2024 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
					Crop:										Crop:							Crop:				
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1	Cotton										Cotton							Cotton	Cotton	Cotton	Cotton	Cotton
1	4	2024	0.22	0.20																						
1	24	2024	0.28	0.26																						
1	26	2024	0.35	0.36																						
2	12	2024	0.12	0.00																						
3	15	2024	0.33	0.29																						
4	9	2024	1.87	1.64																						
4	19	2024			0.03	0.05	0.06	0.05	0.05	0.07	0.07	0.06	0.06	0.07	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.09	0.04	0.04
4	23	2024			0.09	1.57	1.59	1.60	1.47																	
4	24	2024			1.26						1.61	1.57	1.46													
4	25	2024								1.59				1.46	0.77						0.77					
4	30	2024														0.79	0.79	0.79								
5	1	2024			0.12														0.81	0.98		0.93				
5	2	2024																					0.95			
5	3	2024																						1.01	0.23	0.24
5	7	2024													0.82	0.78									0.15	1.09
5	8	2024															0.79	0.78							1.02	
5	9	2024																	0.79	0.81	0.22	0.89				
5	10	2024											1.43	1.45									0.84	0.20		
5	11	2024									0.43	0.41									0.25					
5	13	2024																			0.37					
5	14	2024							1.42	1.51	0.46	0.45										0.69		0.46		
5	15	2024	0.43	0.82	1.31	1.13	1.15	1.17			0.43	0.42														
5	16	2024	1.02	0.32											0.57		0.58		0.60		0.48					
5	21	2024														0.42								0.60		
5	22	2024																0.27					0.33			
5	23	2024																0.27		0.62		0.65	0.32			
5	24	2024														0.12		0.12							1.72	1.58
5	28	2024	0.54	0.92																						
6	1	2024	0.20	0.16																						
6	6	2024	0.20	0.22																						
6	10	2024	0.45	0.68																						
6	11	2024	1.10	1.06																						
6	15	2024	0.42	0.32																						
6	27	2024	0.82	0.43																						
6	30	2024																				0.18	0.14	0.09	0.09	0.18
7	1	2024			0.09	0.08	0.05	0.03	0.03	0.10	0.03	0.07	0.05	0.05	0.02	0.03	0.02	0.04			0.16					
7	2	2024																	0.04	0.03				0.01	0.20	0.06
7	3	2024	0.40	0.32																						
7	8	2024																				0.04	0.05	0.11		
7	16	2024									0.01						0.02	0.02	0.01	0.01		0.10			0.05	
7	17	2024				1.03		1.02			1.16															
7	18	2024			0.41		0.67		0.64	0.48		0.51	0.67													0.39
7	19	2024													0.91							0.27	0.25	0.25	0.21	
7	20	2024													0.25	0.47						0.34	0.25	0.25	0.21	
7	21	2024															0.77									
7	22	2024	0.50	0.63														0.47	0.24			0.53	0.51	0.50	0.41	
7	23	2024																	0.83			0.22	0.25	0.25	0.21	
7	24	2024																		0.49		0.24	0.21	0.21	0.17	0.14
7	25	2024			0.41	1.03	0.68	1.03	0.64	0.50	1.16	0.54	0.68				0.10		0.44							

2024 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)

Date			Rainfall (in)		Field 2 Irrigation (Drip) Zones (Treatment)										Field 3 Irrigation (Drip) Zones							Field 7 Irrigation (Drip) 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
					Crop: Cotton										Crop: Cotton							Crop:				
Mo	Da	Year	Halfway @ Buildling	Helms @ Well 1																		Cotton	Cotton	Fallow	Cotton	Cotton
7	26	2024															0.43		0.55							
7	29	2024													1.03	0.46		0.46		0.48		0.69	0.66	0.63	0.50	0.45
8	1	2024				0.99	0.67	1.04	0.66		1.12		0.67													
8	2	2024			0.65	0.24		0.11		0.51		0.53														
8	5	2024													1.02	0.46	1.03	0.47	0.97	0.48		0.69	0.66	0.63	0.50	0.47
8	6	2024																				0.23	0.22	0.21	0.17	0.13
8	7	2024																				0.23	0.22	0.21	0.17	0.16
8	8	2024				0.99	0.65	1.07	0.65		1.09		0.66													
8	9	2024	0.40	0.28	0.44					0.50		0.53														
8	12	2024													1.00	0.46	1.03	0.46	0.99	0.48		0.39	0.46	0.46	0.33	0.26
8	13	2024																				0.19	0.24	0.23	0.06	0.09
8	14	2024																				0.19	0.24	0.23	0.13	0.18
8	15	2024				0.99	0.67	1.07	0.66		1.08		0.67													
8	16	2024	0.05	0.32	0.58	0.22		0.19	0.13	0.51		0.53														
8	19	2024													1.00	0.46	1.03	0.46	1.02	0.48		0.39	0.46	0.17	0.17	0.18
8	22	2024				1.02	0.66	1.07	0.66		1.09		0.67													
8	23	2024			0.55					0.61		0.53														
8	27	2024			0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03		0.99	0.46	1.04	0.46	1.09	0.48		0.96	1.17	1.40	0.81	0.64
8	28	2024																								
8	29	2024			0.34	0.46	0.33	0.54	0.33	0.27	0.53	0.27	0.34									0.21	0.23	0.23	0.08	0.14
8	30	2024	1.50	1.20													0.49		0.48							
9	2	2024	0.16	0.14																						
9	4	2024													0.23	0.23	0.01	0.24	0.01	0.25						
9	5	2024			0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.25	0.16	0.02	0.11	0.02	0.01	0.02					
9	6	2024	0.30	1.13																						
9	22	2024	2.50	1.75																						
Pre & At Plant			8.35	7.68	2.81	2.75	2.80	2.82	2.94	3.17	3.00	2.91	2.95	2.98	2.18	2.13	2.18	2.25	2.22	2.43	2.11	3.19	2.47	2.36	3.16	2.95
Seasonal			5.81	5.77	3.53	7.12	4.45	7.24	4.46	3.55	7.33	3.57	4.47	0.08	6.70	3.19	5.99	3.19	6.69	3.19	0.18	6.09	6.22	6.07	4.47	3.47
Totals			14.16	13.45	6.34	9.87	7.25	10.06	7.40	6.72	10.33	6.48	7.42	3.06	8.88	5.32	8.17	5.44	8.91	5.62	2.29	9.28	8.69	8.43	7.63	6.42

2024 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	4	2024	0.22	0.20																				
1	24	2024	0.28	0.26																				
1	26	2024	0.35	0.36																				
2	12	2024	0.12																					
3	15	2024	0.33	0.29																				
4	9	2024	1.87	1.64																				
4	16	2024									0.04	0.06	0.08	0.11	0.13	0.11	0.11	0.12	0.12	0.12	0.12	0.13	0.15	0.12
4	17	2024			0.04	0.04	0.07	0.06	0.06	0.04	0.02	0.03	0.04	0.05	0.06	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.06
4	22	2024											0.51	0.50	0.50	0.49	0.51	0.51	0.49	0.49	0.50	0.51	0.51	0.49
4	23	2024			0.61	0.55	0.58	0.57	0.63	0.52	0.51	0.48												
4	24	2024									0.51	0.49	0.51	0.49	0.49	0.50	0.51	0.50	0.50	0.49	0.51	0.51	0.51	0.55
4	25	2024			0.56	0.50	0.53	0.51	0.56	0.51														
4	29	2024											0.51	0.50	0.50	0.49	0.51	0.51	0.50	0.50	0.50	0.51	0.50	0.50
4	30	2024			0.62	0.64	0.69	0.53	0.58	0.50	0.51	0.50							0.49	0.49	0.51	0.51	0.51	0.57
5	1	2024						0.39	0.56	0.51	0.51	0.50	0.50	0.49	0.50	0.52	0.50	0.50						
5	7	2024			0.57	0.57	0.58	0.54	0.56	0.51	0.52	0.50	0.51	0.49	0.49	0.52	0.51	0.51	0.50	0.49	0.50	0.52	0.52	0.52
5	9	2024			0.63	0.75	0.62	0.49	0.17	0.46	0.48	0.48	0.46	0.41	0.40	0.42	0.42	0.33	0.42	0.47	0.40	0.35	0.29	0.29
5	15	2024	0.43	0.82																				
5	16	2024	1.02	0.32																				
5	28	2024	0.54	0.92																				
6	1	2024	0.20	0.16																				
6	6	2024	0.20	0.22																				
6	10	2024	0.45	0.68																				
6	11	2024	1.10	1.06																				
6	15	2024	0.42	0.32																				
6	26	2024						0.50	0.51				0.49	0.49				0.48	0.51				0.49	0.50
6	27	2024	0.82	0.43																				
6	29	2024																						
6	30	2024																						
7	1	2024						0.50	0.51				0.49	0.49				0.48	0.50				0.49	0.49
7	3	2024	0.40	0.32																				
7	9	2024				0.07	0.26	0.49	0.24	0.07	0.24	0.50	0.48	0.24	0.07	0.48	0.26	0.23	0.50	0.24	0.07	0.49	0.48	0.25
7	10	2024			0.52			0.49	0.25		0.24	0.24	0.48	0.24		0.48	0.24	0.24	0.50	0.23		0.48	0.48	0.25
7	11	2024			0.55		0.27	0.51				0.29												
7	15	2024					0.27	0.52	0.25		0.24	0.50	0.48	0.25		0.48	0.24	0.24	0.51	0.24		0.49	0.48	0.25
7	16	2024			1.04		0.28	0.49	0.25		0.24	0.50	0.50	0.24		0.51	0.25	0.24	0.51	0.26		0.49	0.50	0.27
7	22	2024	0.50	0.63																				
7	29	2024			0.51		0.26	0.50	0.24		0.24	0.53	0.48	0.24		0.47	0.24	0.24	0.50	0.24		0.49	0.49	0.25
7	30	2024							0.25		0.25	0.25	0.24	0.24		0.49	0.24	0.25	0.51	0.25		0.50	0.53	0.26
7	31	2024			0.50		0.27	0.50				0.23	0.26											
8	6	2024			0.51		0.26	0.50	0.24		0.24	0.51	0.48	0.24		0.48	0.24	0.24	0.49	0.24		0.48	0.48	0.25
8	7	2024			0.51		0.12	0.52	0.25		0.24	0.49	0.52	0.24		0.48	0.24	0.24	0.50	0.24		0.48	0.48	0.25
8	9	2024	0.40	0.28																				
8	12	2024			0.52		0.26	0.51	0.24		0.24	0.50	0.48	0.24		0.51	0.24	0.24	0.49	0.25		0.49	0.48	0.25
8	13	2024			0.52		0.27	0.50	0.25		0.24	0.50	0.50	0.24		0.50	0.24	0.25	0.49	0.24		0.48	0.48	0.27
8	16	2024	0.05	0.32																				
8	19	2024															0.51	0.50		0.50		1.01	1.01	0.50

2024 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																			
8	20	2024			1.01		0.50	1.01	0.51		0.51	1.01	1.01	0.51		1.00			1.02					
8	27	2024							0.51		0.51	1.01	1.02	0.51		1.00	0.51	0.51	1.03	0.51		1.01	1.01	0.50
8	28	2024			1.01		0.54	0.99			0.06	0.13	0.59	0.12		0.32		0.17	0.46			0.29	0.61	0.08
8	30	2024	1.50	1.20																				
9	2	2024	0.16	0.14																				
9	6	2024	0.30	1.13																				
9	22	2024	2.50	1.75																				
Pre & At Plant			7.53	7.25	3.03	3.05	3.07	3.09	3.12	3.05	3.10	3.04	3.12	3.04	3.07	3.10	3.12	3.04	3.08	3.11	3.10	3.10	3.06	3.10
Seasonal			6.63	6.20	7.20	0.07	3.56	8.53	4.50	0.07	3.49	7.19	8.50	4.53	0.07	7.20	3.45	4.55	8.52	3.44	0.07	7.18	8.49	4.62
Totals			14.16	13.45	10.23	3.12	6.63	11.62	7.62	3.12	6.59	10.23	11.62	7.57	3.14	10.30	6.57	7.59	11.60	6.55	3.17	10.28	11.55	7.72

2024 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: Sorghum]				Field: 5 Wedge: B [Crop: Sorghum]				Field: 5 Wedge: C [Crop: Sorghum]				Field: 5 Wedge: D [Crop: Cotton]				Field: 5 Wedge: E [Crop: Cotton]				Field: 5 Wedge: F [Crop: Cotton]			
						Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System
						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 @ Building	Helms @ Well 1		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base	
1	4	2024	0.22	0.20																									
1	24	2024	0.28	0.26																									
1	26	2024	0.35	0.36																									
2	12	2024	0.12	0.00		0.50	0.50	0.50																					
2	13	2024								0.50	0.50	0.50																	
2	14	2024												0.50	0.50	0.50													
2	15	2024																0.50	0.50	0.50		0.50	0.50	0.50					
2	16	2024																								0.50	0.50	0.50	
2	21	2024				0.50	0.50	0.50																					
2	22	2024								0.50	0.50	0.50																	
2	23	2024												0.50	0.50	0.50													
3	15	2024	0.33	0.29																									
4	9	2024	1.87	1.64																									
4	26	2024																1.00	1.00	1.00									
4	27	2024																				1.00	1.00	1.00					
4	28	2024																								1.00	1.00	1.00	
4	30	2024				1.00	1.00	1.00																					
5	1	2024								1.00	1.00	1.00																	
5	3	2024												1.00	1.00	1.00													
5	7	2024																0.50	0.50	0.50									
5	8	2024																				0.50	0.50	0.50		0.50	0.50	0.50	
5	9	2024				0.50	0.50	0.50																					
5	10	2024								0.50	0.50	0.50																	
5	11	2024												0.50	0.50	0.50													
5	15	2024	0.43	0.82																									
5	16	2024	1.02	0.32																									
5	23	2024																0.50	0.50	0.50									
5	24	2024																				0.50	0.50	0.50					
5	25	2024				0.50	0.50	0.50																		0.50	0.50	0.50	
5	26	2024								0.50	0.50	0.50																	
5	27	2024								0.50	0.50	0.50		0.50	0.50	0.50													
5	28	2024	0.54	0.92																									
6	1	2024	0.20	0.16																									
6	5	2024												0.50	0.50	0.50													
6	6	2024	0.20	0.22						0.50	0.50	0.50																	
6	7	2024				0.50	0.50	0.50																					

2024 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: Sorghum]				Field: 5 Wedge: B [Crop: Sorghum]				Field: 5 Wedge: C [Crop: Sorghum]				Field: 5 Wedge: D [Crop: Cotton]				Field: 5 Wedge: E [Crop: Cotton]				Field: 5 Wedge: F [Crop: Cotton]			
						Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System
						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	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base	
6	8	2024				0.50	0.50	0.50		0.50	0.50	0.50																	
6	10	2024	0.45	0.68																									
6	11	2024	1.10	1.06																									
6	15	2024	0.42	0.32																									
6	23	2024												0.50	0.50	0.50													
6	24	2024																0.40	0.40	0.40		0.40	0.40	0.40					
6	25	2024																								0.40	0.40	0.40	
6	26	2024				1.33	1.33	1.00																					
6	27	2024	0.82	0.43																									
6	29	2024								1.33	1.33	1.00																	
6	30	2024																											
7	1	2024												1.33	1.33	1.00													
7	2	2024																											
7	3	2024	0.40	0.32														0.25	0.25	0.19		0.25	0.25	0.19					
7	4	2024																								0.25	0.25	0.19	
7	8	2024				0.35	0.35	0.26		0.35	0.35	0.26																	
7	9	2024												0.70	0.70	0.53													
7	10	2024				0.35	0.35	0.26		0.35	0.35	0.26																	
7	11	2024																				0.35	0.35	0.26		0.35	0.35	0.26	
7	12	2024																0.35	0.35	0.26									
7	13	2024																0.35	0.35	0.26		0.35	0.35	0.26					
7	14	2024				0.35	0.35	0.26		0.35	0.35	0.26														0.35	0.35	0.26	
7	15	2024												0.70	0.70	0.53													
7	16	2024				0.35	0.35	0.26		0.35	0.35	0.26																	
7	18	2024																								1.00	1.00	0.75	
7	19	2024																				1.00	1.00	0.75					
7	20	2024																1.00	1.00	0.75									
7	22	2024	0.50	0.63																									
7	26	2024																1.00	1.00	0.75									
7	27	2024																				1.00	1.00	0.75					
7	29	2024																								1.00	1.00	0.75	
7	31	2024																								1.00	1.00	0.75	
8	1	2024																				1.00	1.00	0.75					
8	2	2024																1.00	1.00	0.75									
8	6	2024																1.00	1.00	0.75									
8	7	2024																				1.00	1.00	0.75					

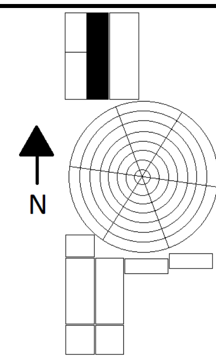
2024 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

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

Date			Rainfall (in)			Field: 5 Wedge: A [Crop: Sorghum]				Field: 5 Wedge: B [Crop: Sorghum]				Field: 5 Wedge: C [Crop: Sorghum]				Field: 5 Wedge: D [Crop: Cotton]				Field: 5 Wedge: E [Crop: Cotton]				Field: 5 Wedge: F [Crop: Cotton]			
						Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System	Irrigation Level			System
						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 @ Building	Helms @ Well 1		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base		Base	Base	75% Base	
8	8	2024																								1.00	1.00	0.75	
8	9	2024	0.40	0.28																									
8	13	2024																								1.00	1.00	0.75	
8	14	2024																				1.00	1.00	0.75					
8	15	2024																1.00	1.00	0.75									
8	16	2024	0.05	0.32																									
8	20	2024																1.00	1.00	0.75									
8	21	2024																				1.00	1.00	0.75					
8	22	2024																								1.00	1.00	0.75	
8	27	2024																								1.00	1.00	0.75	
8	28	2024																				1.00	1.00	0.75					
8	30	2024	1.50	1.20																									
9	2	2024	0.16	0.14																									
9	4	2024																1.00	1.00	0.75									
9	5	2024																											
9	6	2024	0.30	1.13																									
9	17	2024												0.50	0.50	0.38													
9	18	2024				0.50	0.50	0.38		0.50	0.50	0.38																	
9	19	2024				0.50	0.50	0.38		0.50	0.50	0.38																	
9	20	2024												0.50	0.50	0.38													
9	22	2024	2.50	1.75																									
Pre & At Plant			7.53	7.25		4.00	4.00	4.00		4.50	4.50	4.50		4.00	4.00	4.00		2.90	2.90	2.90		2.90	2.90	2.90		2.90	2.90	2.90	
Seasonal			6.63	6.20		3.73	3.73	2.80		3.73	3.73	2.80		3.73	3.73	2.82		7.95	7.95	5.96		7.95	7.95	5.96		7.95	7.95	5.96	
Totals			14.16	13.45		7.73	7.73	6.80		8.23	8.23	7.30		7.73	7.73	6.82		10.85	10.85	8.86		10.85	10.85	8.86		10.85	10.85	8.86	

Operations Summary

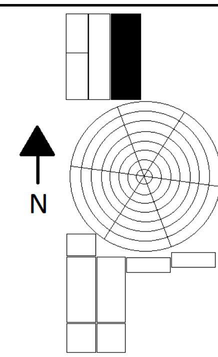
Year	2024
Farm	Helm
Field ID	Field 2
Exp. Design	Cotton
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/15/2023	Shred
	12/6/2023	Disk
	12/7/2023	Field Cultivator
	12/7/2023	List
	3/26/2024	Roller & Bed Conditioners
Fertility	4/4/2024	Liquid 32-0-0 10 lb/ac
	4/4/2024	Liquid 10-34-0 15 lb/ac
Planting / Harvest	12/8/2023	Planted Rye 15 lb/ac
	5/20/2024	Planted DeltaPine 1822 XF 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/20/2024	Diuron 1.5pt/ac
	6/3/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/27	1 = 2.81in, 2 = 2.75in, 3 = 2.80in, 4 = 2.82in, 5 = 2.94in, 6 = 3.17in, 7 = 3.00in, 8 = 2.91in, 9 = 2.95in, 10 = 2.98in
Seasonal	6/28 - 9/30	1 = 3.53in, 2 = 7.12in, 3 = 4.45in, 4 = 7.24in, 5 = 4.46in, 6 = 3.55in, 7 = 7.33in, 8 = 3.57in, 9 = 4.47in, 10 = 0.08in
Rainfall		
PrePlant & Planting	1/1 - 6/27	7.68in
Seasonal	6/28 - 9/30	5.77in

Operations Summary

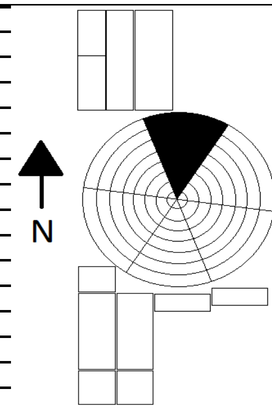
Year	2024
Farm	Helm
Field ID	Field 3
Exp. Design	Cotton
Soil Type	Pullman Clay Loam



Field Operations	**Date**	**Activity**
Tillage	11/15/2023	Shred
	12/6/2023	Disk
	12/7/2023	Field Cultivator
	12/7/2023	List
	3/26/2024	Roller & Bed Conditioners
Fertility	4/4/2024	Liquid 32-0-0 40 lb/ac
	4/4/2024	Liquid 10-34-0 25 lb/ac
Planting / Harvest	12/8/2023	Planted Rye 15 lb/ac
	5/20/2024	Planted DeltaPine 1822 XF 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/20/2024	Diuron 1.5pt/ac
	6/3/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/27	1 = 2.18in, 2 = 2.13in, 3 = 2.18in, 4 = 2.25in, 5 = 2.22in, 6 = 2.43in, 7 = 2.11in
Seasonal	6/28 - 9/30	1 = 2.18in, 2 = 2.13in, 3 = 2.18in, 4 = 2.25in, 5 = 2.22in, 6 = 2.43in, 7 = 2.11in
Rainfall		
PrePlant & Planting	1/1 - 6/27	7.68in
Seasonal	6/28 - 9/30	5.77in

Operations Summary

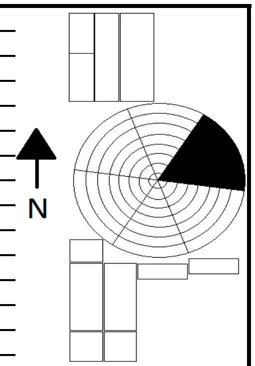
Year	2024
Farm	Helm
Field ID	Field 5A (All Spans)
Exp. Design	Sorghum
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/13/2023	Shred
	11/13/2023	Disk
	11/29/2023	Disk
	12/4/2023	Field Cultivator
	1/2/2024	Field Cultivator
	3/27/2024	Roller & Bed Conditioner
	8/5/2024	Stalk Chopper
Fertility		
Planting / Harvest	1/3/2024	Planted Rye 15 lb/ac
	5/29/2024	Planted Sorghum Sudan Champ II 37 lb/ac
Herbicide /	4/4/2024	Clash 8oz/ac
Growth Regulator	4/7/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	4/29/2024	Atrazine 1.3pt/ac, Medal 1.3pt/ac
	8/27/2024	Metalis 1.3pt/ac
Harvest Aid		
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.00in, 75% Base = 4.00in
Seasonal	6/26 - 9/30	Base = 3.73in, 75% Base = 2.80in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

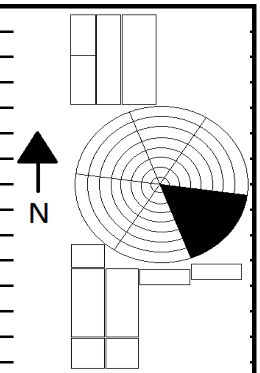
Year	2024
Farm	Helm
Field ID	Field 5B (All Spans)
Exp. Design	Sorghum
Soil Type	Pullman Clay Loam



Field Operations	**Date**	**Activity**
Tillage	11/13/2023	Shred
	11/13/2023	Disk
	11/29/2023	Disk
	12/4/2023	Field Cultivator
	12/11/2023	List
	1/2/2024	Field Cultivator
	3/27/2024	Roller & Bed Conditioner
	8/5/2024	Stalk Chopper
Fertility		
Planting / Harvest	1/3/2024	Planted Rye 15 lb/ac
	5/29/2024	Planted Sorghum Sudan Champ II 37 lb/ac
Herbicide / Growth Regulator	4/4/2024	Clash 8oz/ac
	4/7/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	4/29/2024	Atrazine 1.3pt/ac, Medal 1.3pt/ac
	8/27/2024	Metalis 1.3pt/ac
Harvest Aid		
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.50in, 75% Base = 4.50in
Seasonal	6/26 - 9/30	Base = 3.73in, 75% Base = 2.80in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

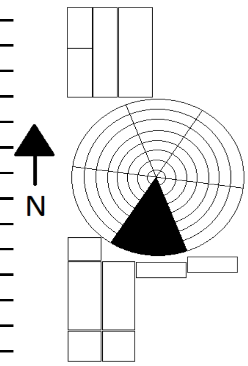
Year	2024
Farm	Helm
Field ID	Field 5C (All Spans)
Exp. Design	Sorghum
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/14/2023	Shred
	11/14/2023	Disk
	11/30/2023	Disk
	12/5/2023	Field Cultivator
	1/2/2024	Field Cultivator
	3/27/2024	Roller & Bed Conditioner
	8/5/2024	Stalk Chopper
Fertility		
Planting / Harvest	1/3/2024	Planted Rye 15 lb/ac
	5/29/2024	Planted Sorghum Sudan Champ II 37 lb/ac
Herbicide / Growth Regulator	4/4/2024	Clash 8oz/ac
	4/7/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	4/29/2024	Atrazine 1.3pt/ac, Medal 1.3pt/ac
	8/27/2024	Metalis 1.3pt/ac
Harvest Aid		
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 4.00in, 75% Base = 4.00in
Seasonal	6/26 - 9/30	Base = 3.73in, 75% Base = 2.82in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

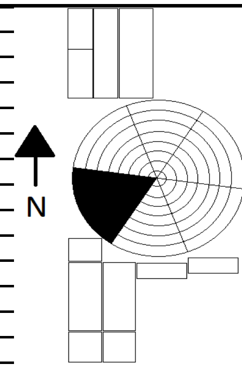
Year	2024
Farm	Helm
Field ID	Field 5D (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/14/2023	Shred
	11/14/2023	Disk
	11/30/2023	Disk
	12/5/2023	Field Cultivator
	1/3/2024	Field Cultivator
	4/2/2024	Roller & Bed Conditioner
Fertility	4/3/2024	Liquid 32-0-0 40 lb/ac
	4/3/2024	Liquid 10-34-0 30 lb/ac
Planting / Harvest	1/3/2024	Planted Rye 15 lb/ac
	5/22/2024	Planted DeltaPine Varieities 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumioxazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/22/2024	Diuron 1.5pt/ac
	6/19/2024	Medal EC 1.3pt/ac
	6/23/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 2.90in, 75% Base = 2.90in
Seasonal	6/26 - 9/30	Base = 7.95in, 75% Base = 5.96in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

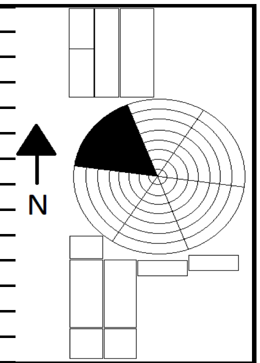
Year	2024
Farm	Helm
Field ID	Field 5E (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/14/2023	Shred
	11/14/2023	Disk
	12/1/2023	Disk
	12/5/2023	Field Cultivator
	1/3/2024	Field Cultivator
	4/2/2024	Roller & Bed Conditioner
Fertility	4/3/2024	Liquid 32-0-0 40 lb/ac
	4/3/2024	Liquid 10-34-0 30 lb/ac
Planting / Harvest	1/3/2024	Planted Rye 15 lb/ac
	5/22/2024	Planted DeltaPine Varieities 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumioxazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/22/2024	Diuron 1.5pt/ac
	6/19/2024	Medal EC 1.3pt/ac
	6/23/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 2.90in, 75% Base = 2.90in
Seasonal	6/26 - 9/30	Base = 7.95in, 75% Base = 5.96in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

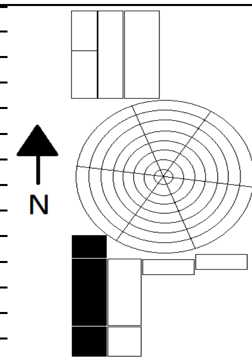
Year	2024
Farm	Helm
Field ID	Field 5F (All Spans)
Exp. Design	Rye
Soil Type	Pullman Clay Loam



Field Operations	**Date**	**Activity**
Tillage	9/8/2023	Shred
	2/6/2024	Stalk Puller
Fertility	4/3/2024	Liquid 32-0-0 40 lb/ac
	4/3/2024	Liquid 10-34-0 30 lb/ac
Planting / Harvest	9/28/2023	Planted Rye 15 lb/ac
	5/22/2024	Planted DeltaPine Varieties 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumioxazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/22/2024	Diuron 1.5pt/ac
	6/19/2024	Medal EC 1.3pt/ac
	6/23/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 2.90in, 75% Base = 2.90in
Seasonal	6/26 - 9/30	Base = 7.95in, 75% Base = 5.96in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

Year	2024
Farm	Helm
Field ID	Field 6
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

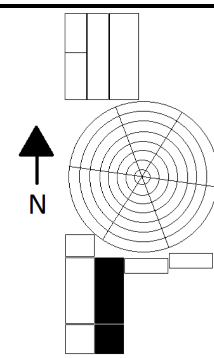


Field Operations	Date	Activity
Tillage	11/16/2023	Shred
	12/7/2023	Disk
	12/8/2023	Field Cultivator
	12/12/2023	Field Cultivator
	3/29/2024	Roller & Bed Conditioner
Fertility	4/5/2024	Liquid 32-0-0 20 lb/ac
Planting / Harvest	12/11/2023	Planted Rye 15lb/ac
	5/21/2024	Planted XF Test Varieties 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/22/2024	Diuron 1.5pt/ac
	6/3/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	1 = 3.07in, 2 = 3.10in, 3 = 3.08in, 4 = 3.07in, 5 = 3.09in
Seasonal	6/26 - 9/30	1 = 0.07in, 2 = 3.49in, 3 = 4.55in, 4 = 7.19in, 5 = 8.51in
Rainfall		
PrePlant & Planting	1/1 - 6/25	7.25in
Seasonal	6/26 - 9/30	6.20in

Operations Summary

Year	2024
Farm	Helm
Field ID	Field 7
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

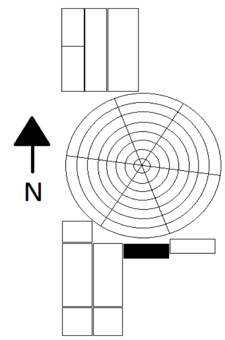
Field Operations	**Date**	**Activity**
Tillage	11/16/2023	Shred
	12/8/2023	Disk
	12/11/2023	Disk
	12/12/2023	Field Cultivator
	12/12/2023	List
	3/26/2024	Roller & Bed Conditioners
Fertility	4/4/2024	Liquid 32-0-0 25 lb/ac
	4/4/2024	Liquid 10-34-0 20 lb/ac
Planting / Harvest	12/12/2023	Planted Rye 15 lb/ac
	5/20/2024	Planted XF Test Varieties 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/20/2024	Diuron 1.5pt/ac
	6/3/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/27	1 = 3.19in, 2 = 2.47in, 3 = 2.36
Seasonal	6/28 - 9/30	1 = 6.09in, 2 = 6.22in, 3 = 6.07in
Rainfall		
PrePlant & Planting	1/7 - 6/27	7.68
Seasonal	6/28 - 9/30	5.77



Operations Summary

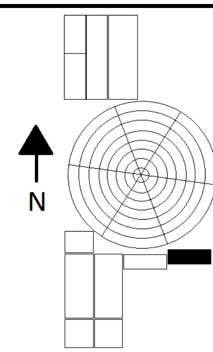
Year	2024
Farm	Helm
Field ID	Field 8
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

Field Operations	**Date**	**Activity**
Tillage	11/20/2023	Shred
	12/11/2023	Disk
	12/12/2023	List
	3/26/2024	Roller & Bed Conditioners
	5/30/2024	Rotary Hoe
	7/14/2024	Rotary Hoe
	8/10/2024	Field Cultivator
Fertility		
Planting / Harvest	12/19/2023	Planted Rye 15 lb/ac
	5/20/2024	Planted DeltaPine 1822 XF 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/20/2024	Diuron 1.5pt/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	9/30/2024	Epthepon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
	10/14/2024	Paraquat 24oz/ac, Induce 0.50%
	10/22/2024	ET 2oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/27	3.16in
Seasonal	6/28 - 9/30	4.47in
Rainfall		
PrePlant & Planting	1/1 - 6/27	7.68in
Seasonal	6/28 - 9/30	5.77in



Operations Summary

Year	2024
Farm	Helm
Field ID	Field 9
Exp. Design	Cotton
Soil Type	Pullman Clay Loam



Field Operations	Date	Activity
Tillage	11/20/2023	Shred
	12/11/2023	Disk
	12/12/2023	Field Cultivator
	3/29/2024	Roller & Bed Conditioners
Fertility	4/4/2024	Liquid 32-0-0 25 lb/ac
	4/4/2024	Liquid 10-34-0 20 lb/ac
Planting / Harvest	12/12/2023	Planted Rye 15 lb/ac
	5/21/2024	Planted DeltaPine Varieties 42,000 seeds/ac
	6/14/2024	RePlanted DeltaPine Varieities 42,000 seeds/ac
Herbicide / Growth Regulator	4/4/2024	Clash 12oz/ac
	4/8/2024	Flumiozazin 4SC 2oz/ac
	4/29/2024	Honcho K6 36oz/ac, Cling 24oz/ac
	5/22/2024	Diuron 1.5pt/ac
	6/19/2024	Medal EC 1.3pt/ac
	7/17/2024	Hamper 1.3pt/ac
	7/24/2024	Engenia 12.8oz/ac, Honcho K6 32oz/ac, Vigilance 12.8oz/ac, K Leaf 16oz/ac
Harvest Aid	10/14/2024	ETX 1.25oz/ac, Paraquat 12oz/ac, Induce 1%
	10/27/2024	Paraquat 24oz/ac, Induce 0.50%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/27	2.95in
Seasonal	6/28 - 9/30	3.47in
Rainfall		
PrePlant & Planting	1/1 - 6/27	7.68in
Seasonal	6/28 - 9/30	5.77in