



*Improving Life Through Science and Technology
Lubbock-Pecos-Halfway*

Helm Research Farm

Summary Report

2022

Technical Report 23-3

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

Name	Specialty	Association	E-mail Address
Jaroy Moore	Resident Director	AgriLife Research	j-moore@tamu.edu
Jane Dever	Associate Director	AgriLife Research	jdever@tamu.edu
Robert Ballesteros	Plant Pathology	AgriLife Research	robert.ballesteros.ag.tamu.edu
Joseph Burke	Soil Chemistry and Fertility	AgriLife Research	joseph.burke@ag.tamu.edu
Dol Dhakal	Cotton Entomology	AgriLife Research	dol.dhakal@ag.tamu.edu
Casey Hardin	Research Farm Manager	AgriLife Research-Halfway	cwhardin@ag.tamu.edu
Jay Hodge	Plant Pathology	AgriLife Research	jay.hodge@ag.tamu.edu
Scott Jordan	Ag. Engineering-Irrigation	AgriLife Research-Halfway	scott.jordan@ag.tamu.edu
Wayne Keeling	Agronomy-Weed Science	AgriLife Research	w-keeling@tamu.edu
Marcus Labay	Plant Pathology	AgriLife Research	marcus.labay@tamu.edu
Katie Lewis	Soil Chemistry and Fertility	AgriLife Research	katie.lewis@ag.tamu.edu
Joe Mustian	Ag. Engineering-Irrigation	AgriLife Research-Halfway	jmustian@tamu.edu
Megha Parajulee	Cotton Entomology	AgriLife Research	mparajul@ag.tamu.edu
Justin Spradley	Agronomy-Weed Science	AgriLife Research	jlspradley@ag.tamu.edu
Hector Valencia	Soil Chemistry and Fertility	AgriLife Research	hector.valencia@ag.tamu.edu
Terry Wheeler	Plant Pathology	AgriLife Research	twheeler@ag.tamu.edu
Ray White	Agronomy-Weed Science	AgriLife Research	ray.white@ag.tamu.edu

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

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, cotton fiber quality, and seasonal water use efficiency for NexGen 3406 B2XF cotton using three irrigation timing 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 different irrigation zones within each block, and a dryland check treatment at the edge of the field. The irrigation treatments were designated as T1, T2, and T3. The test was planted on May 23rd, at 47,000 seeds/ac of NexGen 3406 B2XF. The irrigation amounts, field operations, pesticides, and nutrient applications for 2022 are listed in the appendix.



Figure 1: Harvesting cotton from subsurface drip irrigated treatments at Helms Research Farm, 2022

Results: Annual rainfall for 2022 was 8.93 inches and the combined preplant and seasonal irrigation in the three respective irrigation treatments were 10.11, 11.33, and 12.65 inches. Due to an insufficient amount of preseason rainfall quantity, preplant irrigation quantities increased, and due to large rainfall events in the middle of August, seasonal irrigation was terminated early. Cotton lint yields ranged from 390 lb/ac in the dryland to 1210 lb/ac in T3. As seasonal irrigation increased, cotton lint yields and seasonal irrigation water use efficiency (SIWUE) increased. The cotton lint loan value of the dryland was 0.497 \$/lb, while the irrigated treatments had a lint loan value of 0.5427 \$/lb, 0.558 \$/lb, and 0.558\$/lb respectively.

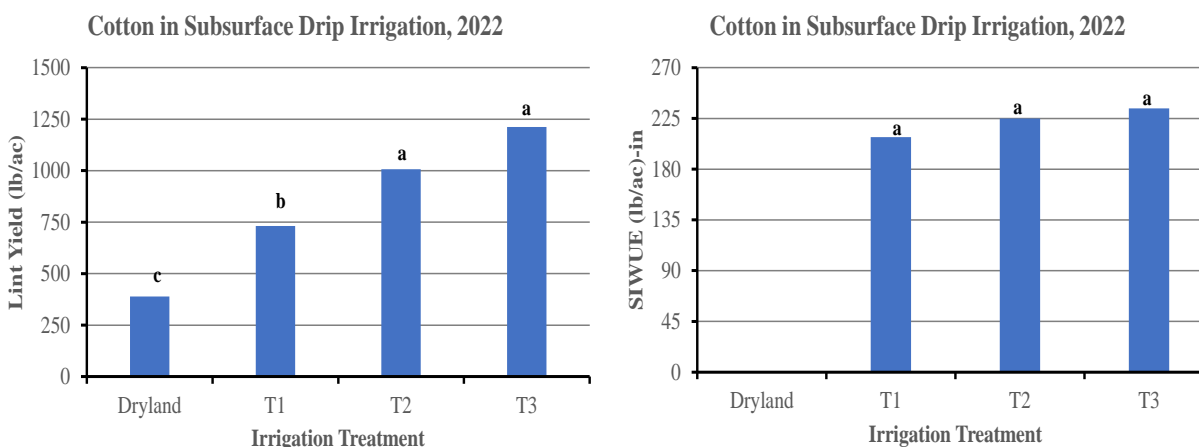


Figure 2. Cotton lint yield and seasonal irrigation water use efficiency (SIWUE) of cotton planted in subsurface drip irrigation at Helms Research Farm, 2022.

Response of Cotton to Irrigation Quantities using Subsurface Drip Irrigation (SDI) (Field 3)

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, fiber quality, and water productivity of DeltaPine 1822 XF using subsurface drip irrigation (SDI).

Methodology: This study was conducted on a 16-acre test area 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. The irrigation quantities, field operations, varieties, pesticides, and nutrient applications for 2022 are listed in the appendix.

Results: On May 27th, cotton was planted using DeltaPine 1822 XF at a rate of 47,000 seeds/ac. Annual rainfall through September was 8.93 inches, and the combined preplant and seasonal irrigation quantities ranged from 5.73 to 12.47 inches. Due to insufficient preseason rainfall amounts, preplant irrigation amounts were increased. Cotton lint yields ranged from 241 to 1073 lb/ac (Table 1). Except for T3, increased seasonal irrigation quantities resulted in increased cotton lint yields. Fiber quality, as reflected in the lint loan value, ranged from 0.526 to 0.570 \$/lb (Table 2). There was no significant increase to fiber quality as seasonal irrigation quantities increased.

Table 1. Seasonal irrigation amounts, cotton lint yields, and seasonal irrigation water use efficiency of irrigation treatments using subsurface drip at Helms Research Farm, 2022.

Treatment	Seasonal Irrigation (in)	Lint Yield (lb/ac)	SIWUE (lb/ac-in)		
Dryland		241	c*		
T2	2.38	594	b	187	b
T4	2.41	606	b	223	ab
T5	3.62	937	a	295	a
T3	3.65	885	ab	260	ab
T1	4.98	1003	a	202	b
T6	5.23	1073	a	214	ab

* 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, 2022.

Treatment	Mic	Length	Unif.	Strength	Elon.	Rd	+b	CGRD	Leaf	Loan Value (¢/lb)
Dryland	4.99	1.08	80.2	29.0	6.3	75.7	7.7	41-1	4.0	52.6
T2	4.52	1.18	82.0	31.2	6.4	79.1	7.7	31-1	2.0	56.9
T4	4.38	1.17	83.2	30.2	6.3	79.0	7.7	31-1	2.0	56.7
T5	4.04	1.18	81.0	30.3	6.6	80.3	7.8	31-1	2.0	56.8
T3	4.36	1.16	82.3	31.4	6.2	79.9	7.6	31-1	2.0	56.8
T1	4.20	1.18	82.4	32.6	6.3	79.3	7.7	31-1	2.0	57.0
T6	3.96	1.19	82.0	31.7	6.3	80.2	7.5	31-1	2.0	57.0

Response of Cotton / Wheat Grain Rotation to Tillage and Irrigation Levels (Field 5b)

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton following a wheat cover / fallow period with 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 LEPA. In this 22-acre test area, cotton was planted in 2022 following a wheat cover / fallow period in 2021. 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). In the 1.5 BI rate, the plot was split in half where the inside half received an extra application of fertilizer on July 6th (1.5 BI (1)) and the outside half received the extra application of fertilizer on August 3rd (1.5 BI (2)). Field operations, irrigation amounts, and nutrient applications are listed in the appendix.



Figure 1. Cotton planted following a wheat cover / fallow period at Helms Research Farm, 2022.

Results: Annual rainfall through September was 8.93 inches, and preplant and seasonal irrigations in the three irrigation treatments were 8.70, 10.20, and 11.95 inches. In both tillage systems, as the irrigation quantity increased so did cotton lint yield and seasonal irrigation water use efficiency (SIWUE). Conventional tillage increased cotton lint yields by 12.5%, 7.5%, and 5.3% in the 1.0 BI, 1.5 BI (1), and 1.5 BI (2) respectively, over corresponding reduced tilled treatments. Waiting to apply an extra application of fertilizer resulted in an increase of 6.8% and 9.1% in cotton lint yield in the conventional tilled and reduced tilled plots respectively compared to applying extra fertilizer early. Reduced tillage resulted in a 4.3% and 4.2% increase in fiber quality, as reflected in the lint loan value, in the 1.5 BI (1) and 1.5 BI (2) treatments respectively, over the corresponding conventional tillage treatment.

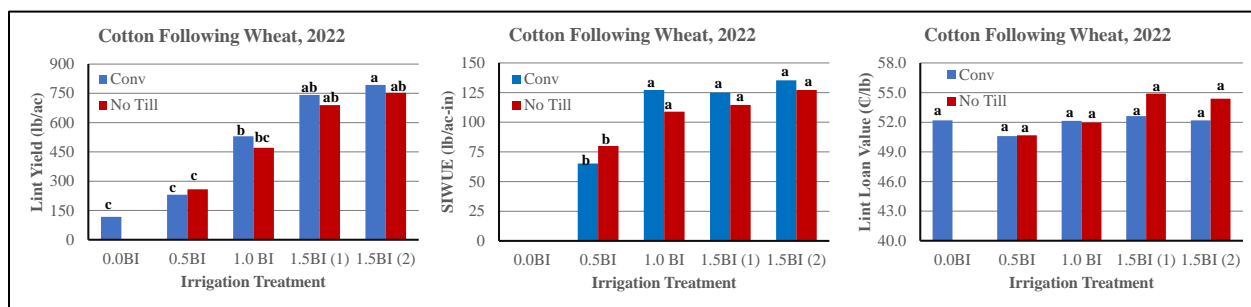


Figure 2. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value from treatments having two tillage systems and three irrigation levels at Helms Research Farm, 2022.

Response of Cotton in Terminated Wheat Grain to Tillage and Irrigation Levels (Field 5d)

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton planted into a terminated wheat 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 wheat 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). Field operations, irrigation amounts, and nutrient applications are listed in the appendix.

Results: Annual rainfall for 2022 through September was 8.93 inches, and the combined preplant and seasonal irrigations in the three respective irrigation treatments were 8.40, 10.15, and 11.90 inches. Due to low preplant and early seasonal rainfall amounts yields were lower than in previous years. In both tillage systems, cotton lint yield and seasonal irrigation water use efficiency (SIWUE) increased as irrigation quantities increased. Conventional tilled cotton resulted in increased lint yields, water productivity, and fiber quality, over the corresponding reduced tillage treatments. Cotton lint yields were increased by 127.2%, 54.7%, and 41.4% in the 0.5 BI, 1.0 BI, and the 1.5 BI water treatments respectively, in the conventional tillage plots compared to the reduced tillage. Reduced tillage resulted in an 18.1% decrease in fiber quality, as reflected in the lint loan value at the 0.5 BI treatment level, while no significant changes were seen in the other irrigation levels with respect to tillage system.

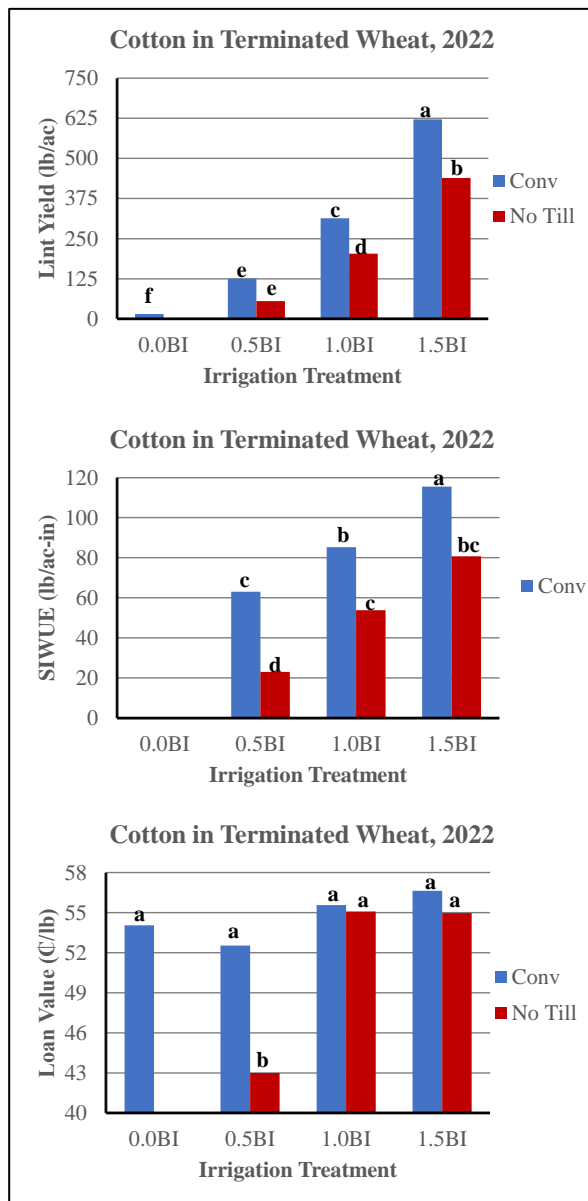


Figure 1. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value from cotton planted into terminated wheat plots having 2 tillage systems and three irrigation levels at Helms Research Farm, 2022.

Response of Cotton Planted into Cotton Stalks to Tillage and Irrigation Levels (Field 5e)

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, water productivity, and fiber quality of cotton planted into cotton stalks left in the field from 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 LEPA. In this 22-acre test area, cotton was planted into the cotton stalks left in the field from 2021. 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). The 1.5 BI plots were divided in half, where the inside half received an additional application of fertilizer on July 6th (1.5 BI (1)), and the outside half received the extra application of fertilizer on August 3rd (1.5 BI (2)). Field operations, irrigation amounts, and nutrient applications are listed in the appendix.

Results: The annual rainfall through September was 8.93 inches and the combined preplant and seasonal irrigation amounts 8.87, 10.53, and 12.28 inches for the respective irrigation treatments. As seasonal irrigation amounts increased, cotton lint yield and seasonal irrigation water use efficiency increased as well. Reduced tillage resulted in 18.2%, 6.3%, and 24.7% increased lint yields in the 1.0 BI, 1.5 BI (1), and 1.5 BI (2) treatments when compared to the corresponding conventional tillage plots. Conventional tillage resulted in non-significant increased fiber quality, as reflected in the lint loan value, over the corresponding reduced tillage treatments. Postponing the additional application of fertilizer (treatment 1.5 BI (2)) resulted in increased lint yield and fiber quality under both tillage systems, then the earlier application of fertilizer (treatment 1.5 BI (1)).

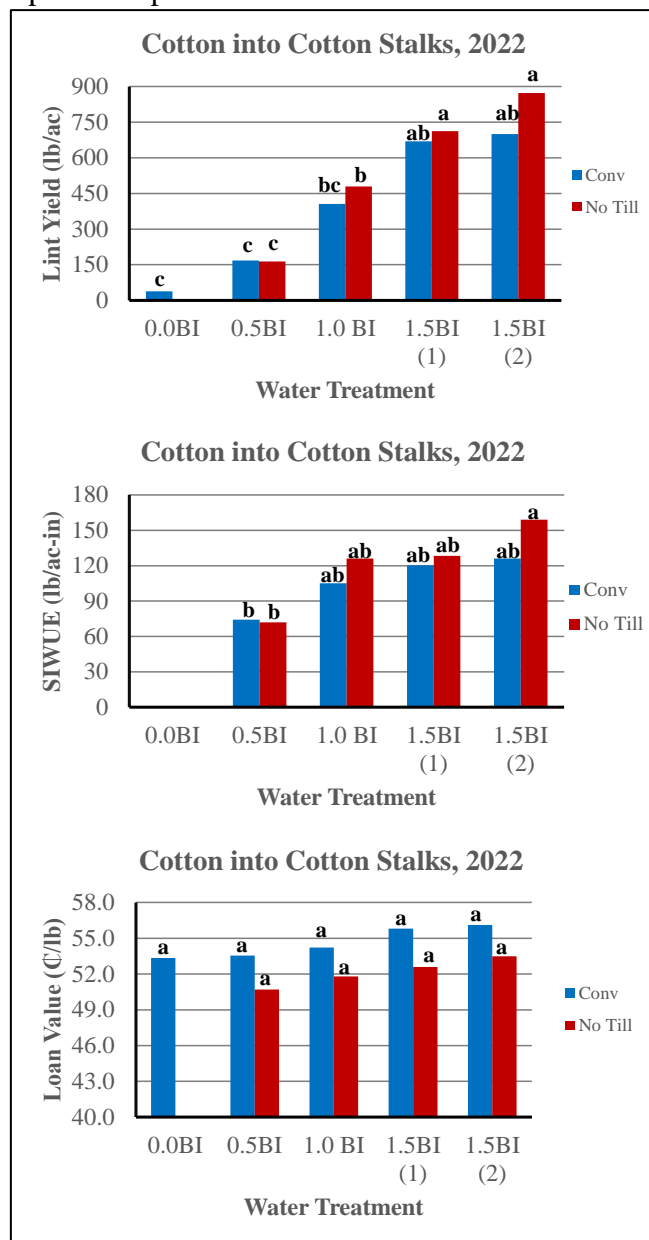


Figure 1. Cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and lint loan value of cotton planted into cotton stalks at Helms Research Farm, 2022.

Cotton Variety Trial at Different Irrigation Levels Using SDI (Field 6)

Scott Jordan, Casey Hardin, and Joe Mustian

Objective: Determine cotton lint yield, seasonal irrigation water use efficiency (SIWUE), and fiber quality of six different cotton varieties irrigated at five different levels using subsurface drip irrigation (SDI).

Methodology: This test was conducted on a 17-acre field irrigated by SDI with 30-inch spacing. All cotton varieties were planted on May 31st, at a rate of 47,000 seeds/ac. The field was divided into four blocks, and within each block there were five different irrigation treatments. Irrigation amounts, field operations, and nutrient applications are provided in the appendix.

Table 1. Irrigation quantities for cotton variety trial at Helms Research Farm, 2022

Treatment	Irrigation Quantities (in/day)		
	Period 1	Period 2	Period 3
LLL	0.0	0.0	0.0
LMM	0.0	0.1	0.1
MMM	0.1	0.1	0.1
LHH	0.0	0.2	0.2
MHH	0.1	0.2	0.2

Results: Annual rainfall through September was 8.93 inches and the total preplant and seasonal irrigation amounts ranged from 6.30 to 12.38 inches. Late irrigation (Period 3) was terminated early due to large rainfall events in mid-August. Lint yields ranged from 180 to 1420 lbs/ac (Figure 1), while cotton lint loan values ranged from 0.437 to 0.569 \$/ac (data not shown). The NexGen 3406 B2XF variety consistently resulted in one of the highest numerical lint yields and seasonal irrigation water use efficiency (SIWUE), while the DeltaPine 1822 XF variety consistently had the highest fiber quality, as reflected in the lint loan value, across the irrigation treatments.

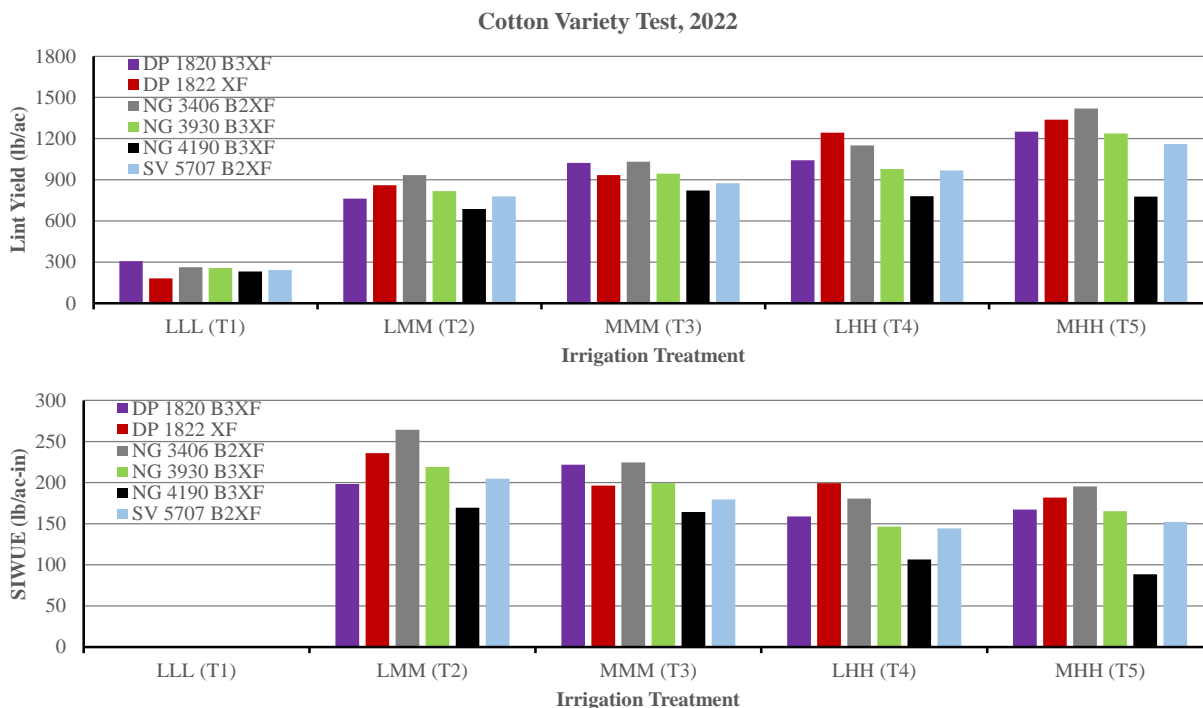


Figure 1. Cotton lint yield and seasonal irrigation water use efficiency (SIWUE) values of six different cotton varieties at five different irrigation levels, Helms Research Farm, 2022.

TITLE:

Performance of PhytoGen varieties as affected by low-energy precision application (LEPA) irrigation levels at AG-CARES, Halfway, TX, 2022.

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: May 17

Varieties:	DP 2044 B3XF	PX 1122A214-04 W3FE
	FM 2498 GLT	PX 1124B236-04 W3FE
	NG 3930 B3XF	PX 1125B234-04 W3FE
	PHY 205 W3FE	PX 1130B333-04 W3FE
	PHY 210 W3FE	PX 1140A385-04 W3FE
	PHY 250 W3FE	PX 1140B373-04 W3FE
	PHY 332 W3FE	
	PHY 390 W3FE	
	PHY 400 W3FE	
	PHY 411 W3FE	
	PHY 415 W3FE	

Herbicides: Zaltus SC (flumioxazin) 2 oz/A
glyphosate 42 oz/A
Diuron 1 qt/A
Outlook 12.8 oz/A + glyphosate 32 oz/A
Medal EC 1.5 qt/A + glyphosate 32 oz/A

Fertilizer: 50-0-0

Irrigation: LEPA

	Dry	Low	Base	High
Preplant/Emergence	8.7"	8.7"	8.7"	8.7"
In-season	0.0"	3.8"	5.4"	7.0"
Total	8.7"	12.5"	14.1"	15.7"

Harvest Date: November 30

RESULTS AND DISCUSSION:

PhytoGen commercial and experimental varieties and three competitive standards were compared under three levels of center-pivot irrigation in 2022. Yields across all irrigation levels were much below average due to hot, dry conditions throughout the growing season. When averaged across varieties, cotton lint yields ranged from 132 to 449 lbs/A (Table 1). When averaged across irrigation levels, the highest yielding group included PHY 411 W3FE and PX

1140A385-04 W3FE. Loan values varied by irrigation level and were highest with FM 2498 GLT, PHY 205 W3FE, and two experimentals (Table 2). Gross returns were highest with PHY 411 W3FE and the experimental PX 1140A385-04 W3FE (Table 3).

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

Variety	In-season Irrigation Levels (inches)				Average
	Dry (0.0)	Low (3.8)	Base (5.4)	High (7.0)	
	----- lbs/A-----				
DP2044B3XF	174	148	345	406	268 BCD
FM2498GLT	85	81	272	469	226 D-G
NG3930B3XF	126	143	240	452	240 C-F
PHY205W3FE	150	140	208	373	217 EFG
PHY210W3FE	114	147	286	532	269 BCD
PHY250W3FE	110	100	239	316	191 G
PHY332W3FE	108	103	276	441	231 D-G
PHY390W3FE	126	102	282	415	231 D-G
PHY400W3FE	128	163	281	444	253 CDE
PHY411W3FE	144	177	359	570	312 AB
PHY415W3FE	136	124	266	301	206 FG
PX1122A214-04W3FE	126	166	325	502	279 BC
PX1124B236-04W3FE	181	71	171	373	199 FG
PX1125B234-04W3FE	158	107	237	427	232 D-G
PX1130B333-04W3FE	155	142	296	483	268 BCD
PX1140A385-04W3FE	175	191	358	662	346 A
PX1140B373-04W3FE	168	144	285	475	267 BCD
Average	139 C	132 C	278 B	449 A	--

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

Variety	In-season Irrigation Levels (inches)				Average
	Dry (0.0)	Low (3.8)	Base (5.4)	High (7.0)	
	-----¢/lb-----				
DP2044B3XF	52.15	48.88	50.45	51.25	50.68 G
FM2498GLT	56.75	56.80	56.75	56.80	56.77 AB
NG3930B3XF	56.83	47.13	54.23	53.40	52.89 EF
PHY205W3FE	56.53	56.50	56.98	56.98	56.74 AB
PHY210W3FE	56.73	51.03	54.58	54.43	54.18 D
PHY250W3FE	56.70	50.73	53.60	56.60	54.40 D
PHY332W3FE	53.55	52.10	54.38	56.98	54.25 D
PHY390W3FE	56.90	53.13	56.63	56.83	55.86 BC
PHY400W3FE	56.95	54.33	54.35	56.65	55.56 C
PHY411W3FE	56.75	53.05	55.98	56.33	55.52 C
PHY415W3FE	56.80	48.68	50.28	54.55	52.57 F
PX1122A214-04W3FE	56.53	57.05	57.03	57.00	56.9 A
PX1124B236-04W3FE	57.08	47.33	45.01	53.63	50.75 G
PX1125B234-04W3FE	56.90	50.98	50.45	56.68	53.75 DE
PX1130B333-04W3FE	54.55	48.78	51.80	56.95	53.01 EF
PX1140A385-04W3FE	56.93	54.45	56.83	56.98	56.29 ABC
PX1140B373-04W3FE	56.93	48.88	50.15	56.90	53.21 EF
Average	56.21 A	51.75 C	53.50 B	55.82 A	--

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

Variety	In-season Irrigation Levels (inches)				Average
	Dry (0.0)	Low (3.8)	Base (5.4)	High (7.0)	
	-----\$/A-----				
DP2044B3XF	91	73	174	208	136 CD
FM2498GLT	48	46	154	267	128 DEF
NG3930B3XF	72	70	130	239	127 DEF
PHY205W3FE	85	79	119	212	123 DEF
PHY210W3FE	64	75	155	289	146 CD
PHY250W3FE	63	51	128	179	105 EF
PHY332W3FE	59	54	150	251	128 DEF
PHY390W3FE	72	55	160	236	130 DE
PHY400W3FE	73	89	153	251	141 CD
PHY411W3FE	81	94	201	321	174 AB
PHY415W3FE	77	60	134	164	108 EF
PX1122A214-04W3FE	71	95	185	286	159 BC
PX1124B236-04W3FE	103	34	77	201	103 F
PX1125B234-04W3FE	90	55	120	242	126 DEF
PX1130B333-04W3FE	85	69	154	275	145 CD
PX1140A385-04W3FE	99	104	204	377	195 A
PX1140B373-04W3FE	95	70	143	270	144 CD
Average	78 C	69 C	149 B	251 A	--

TITLE:

Performance of FiberMax and Stoneville varieties as affected by low-energy precision application (LEPA) irrigation levels at Halfway, TX, 2022.

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: May 17

Varieties:	BX 2392 B3XF	FM 2398 GLTP
	BX 2394 B3XF	FM 2498 GLT
	BX 2396 B3XF	ST 4595 B3XF
	BX 2398 B3XF	ST 4993 B3XF
	FM 1621 GL	ST 5600B2XF
	FM 2022 GLT	ST 5707 B2XF

Herbicides: Zaltus SC (flumioxazin) 2 oz/A
glyphosate 42 oz/A
Diuron 1 qt/A
Outlook 12.8 oz/A + glyphosate 32 oz/A
Medal EC 1.5 qt/A + glyphosate 32 oz/A

Fertilizer: 50-0-0

Irrigation:

	Dry	Low	Base	High
Preplant/Emergence	8.7"	8.7"	8.7"	8.7"
In-season	0.0"	3.8"	5.4"	7.0"
Total	8.7"	12.5"	14.1"	15.7"

Harvest Date: November 30

RESULTS AND DISCUSSION:

Twelve commercial and experimental FiberMax and Stoneville varieties were planted under dryland (preplant only) and three levels of center-pivot irrigation in 2022. When averaged across varieties, cotton lint yields ranged from 191 lbs/A to 425 lbs/A at the highest irrigation level (Table 1). Overall yields were much less than average due to hot, dry conditions prior to planting and throughout most of the growing season. When averaged across irrigation levels, the highest yielding varieties included BX 2394 B3XF and ST 4595 B3XF. Loan values were highest in the high irrigation level (Table 2). When averaged across irrigation levels, varieties with highest loan values included BX 2392 B3XF, BX 2394 B3XF, FM 2398 GLTP, ST 4993 B3XF, and ST 5600 B2XF. Gross revenues increased with higher irrigation levels (Table 3). When averaged across irrigation levels, highest net revenues were achieved with BX 2392 B3XF, BX 2394 B3XF, and ST 4595 B3XF.

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).

Variety	In-season Irrigation Levels (inches)				Average
	Dry (0.0)	Low (3.8)	Base (5.4)	High (7.0)	
	----- lbs/A -----				
BX 2392 B3XF	126	189	271	516	276 B
BX 2394 B3XF	147	276	337	425	296 AB
BX 2396 B3XF	176	173	299	322	243 B
BX 2398 B3XF	123	206	292	380	250 B
FM 1621 GL	103	179	407	422	287 B
FM 2202 GL	115	210	314	481	280 B
FM 2398 GLTP	124	160	332	430	262 B
FM 2498 GLT	73	96	166	292	157 C
ST 4595 B3XF	183	273	470	475	350 A
ST 4993 B3XF	122	185	311	452	267 B
ST 5600 B2XF	148	156	330	447	280 B
ST 5707 B2XF	135	167	374	465	285 B
Average	131 D	191 C	325 B	425 A	--
	----- ¢/lb -----				
BX 2392 B3XF	56.46	55.69	54.70	56.52	55.84 A
BX 2394 B3XF	54.94	55.72	51.18	55.17	54.25 ABC
BX 2396 B3XF	55.74	49.41	53.57	51.57	52.57 CDE
BX 2398 B3XF	54.86	53.68	49.85	53.69	53.02 BCD
FM 1621 GL	50.41	52.75	49.76	49.52	50.61 F
FM 2202 GL	52.27	50.12	49.48	54.18	51.51 DEF
FM 2398 GLTP	52.90	54.60	53.11	56.21	54.20 ABC
FM 2498 GLT	53.60	49.31	48.96	51.55	50.85 EF
ST 4595 B3XF	52.72	52.07	53.15	54.23	53.04 BCD
ST 4993 B3XF	54.40	52.88	55.75	56.25	54.82 AB
ST 5600 B2XF	54.42	52.25	53.59	55.95	54.22 ABC
ST 5707 B2XF	52.58	51.23	53.38	55.65	53.21 BCD
Average	53.78 A	52.48 B	52.21 B	54.21 A	--
	----- \$/A -----				
BX 2392 B3XF	71	105	149	292	154 AB
BX 2394 B3XF	81	154	171	234	160 AB
BX 2396 B3XF	98	86	162	167	128 B
BX 2398 B3XF	68	111	150	205	133 B
FM 1621 GL	52	91	203	209	143 B
FM 2202 GL	60	105	157	260	146 B
FM 2398 GLTP	66	88	179	241	143 B
FM 2498 GLT	39	47	81	151	80 C
ST 4595 B3XF	97	141	250	257	186 A
ST 4993 B3XF	67	97	173	256	148 B
ST 5600 B2XF	81	83	179	250	154 B
ST 5707 B2XF	71	86	200	259	154 B
Average	71 C	100 C	171 B	232 A	--

Nitrate-N and Ammonium-N in Soil Samples Collected from Halfway, TX, 2022

Katie Lewis, Hector Valencia, and Joseph Burke

Objective: Evaluate soil samples collected from cropping systems at a 1.5 base irrigation level for nitrate-N and ammonium-N levels.

Methodology: Soil samples were collected at depth (0-6", 6-12", 12-18" and 18-24") on July 14th 2022 from cropping systems (continuous cotton, conventional tillage, CC,CT; continuous cotton, no-till, CC, NT; cotton, cover crop, no-till, CC, CC, NT; and cotton-wheat-fallow, no-till, C-W-F, NT) at a 1.5 base irrigation level. Extractable NH_4^+ -N was analyzed by the Berthelot reaction involving salicylate, and NO_3^- -N by cadmium reduction following extraction with 2 N KCl using a 1:10 soil to KCl solution ratio (4 g soil:40 mL 2 N KCl), followed by analysis using flow injection spectrometry (FIALab 2600, FIALab Instruments Inc., Bellevue, WA; Keeney and Nelson, 1982).

Results: Nitrate-N was greatest in the cotton-wheat-fallow at 0-6" although not significantly different from other systems (Fig.1 A). Nitrate-N was greatest in the continuous cotton, conventional tillage system at all lower depths (6-12", 12-18", and 18-24") and significantly different from all other cropping systems. Ammonium-N was not significantly different between cropping systems at any depth (Fig 1. B). At 0-6" and 18-24" cotton-wheat-fallow had the greatest amounts of ammonium-N with continuous cotton, conventional tillage having the greatest amounts at 6-12" and 12-18" compared to other cropping systems.

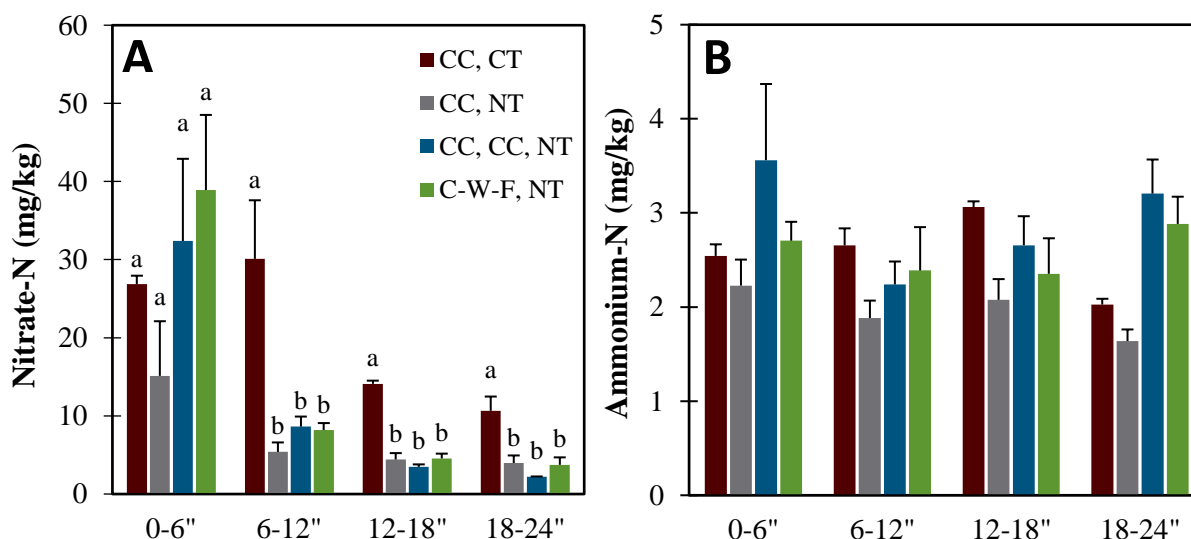


Figure 1. A) Nitrate-N and **B)** Ammonium-N at depth as affected by cropping system: continuous cotton, conventional tillage (CC, CT); continuous cotton, no-till (CC, NT); cotton, cover crop, no-till (CC, CC, NT); and cotton-wheat-fallow, no-till (C-W-F, NT). Different letters within depth represent significant differences between cropping systems at an alpha = 0.05. Error bars represent standard error of the sample mean.

Effect of Nitrogen Fertility on Cotton Crop Response to Simulated Cotton Fleahopper and *Lygus* Damage (Field 8)

M.N. Parajulee, D. P. Dhakal, and K. L. Lewis

Objective: The study was designed to evaluate the effect of artificial injury to cotton squares and bolls mimicking acute cotton fleahopper and *Lygus* damages, respectively, under variable nitrogen application rates on cotton fiber yield and quality.

Methodology: A high-yielding cotton cultivar, DP1820B3XF, was planted at a targeted rate of 47,000 seeds/acre on May 26, 2022. The experiment was laid out in a split-plot randomized block

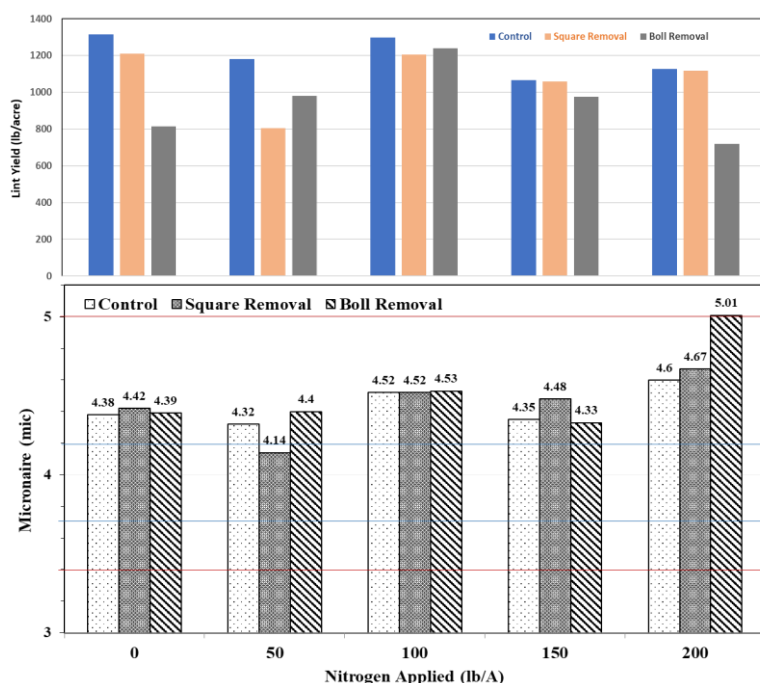


Fig. 1. Lint yield and micronaire values affected by simulated cotton fleahopper and *Lygus* damage across variable N rates.

design with five nitrogen fertility rate treatments (0, 50, 100, 150, and 200 lb N/acre) applied for 21 years as main plots (16-row plots) and three fruit loss treatments (artificial cotton square injury treatment mimicking acute cotton fleahopper infestation, 20% boll removal treatment to mimic late-season *Lygus* infestation, and control) as sub-plots with four replications (total 60 experimental units). Within each of the five main-plot treatments included pre-bloom side-dress applications of N augmentation using a soil applicator injection rig on July 6, 2022. Pre-treatment soil samples (consisting of three 0 to 12 and 12 to 24-inch depth soil cores each) were collected from each of the 20 main-plots on April 14, 2022. Ten leaves per plot were collected twice (August 13 and September 14) for leaf dry weight and nitrogen analysis. Within each main-plot, three 10-ft. sections of uniform cotton were flagged in the middle two rows, each receiving hand removal of 100% cotton squares three weeks into squaring, 20% bolls removed from top canopy of the plants at crop cut-out or control (no square or boll removal). Treatment plots were hand-harvested on November 2 for lint yield and fiber analysis.

Results: Significantly higher soil residual nitrogen was recorded from plots that received high rates of soil N augmentation (150 and 200 lb/acre) in preceding 21 years than control plots. Lint yield did not significantly vary across simulated insect treatments or N augmentation treatments, owing to considerable variation in data due to poor stand establishment and excessive drought during the growing season. Nevertheless, simulated *Lygus* damage reduced lint yield at zero- and 200 N treatments compared to other N treatments. Similarly, the lint quality, measured in terms of micronaire values, did not generally vary with the simulated cotton fleahopper or *Lygus* damage. Micronaire values were mostly on the base range (Fig. 1).

Effect of Tillage on Incidence of Verticillium Wilt at the High Irrigation Rate

Terry Wheeler, Jay Hodge, Robert Ballesteros, and Marcus Labay

Verticillium wilt, which is caused by the fungus *Verticillium dahliae*, is most damaging in years where the air temperatures are cooler and rainfall higher during the flowering and boll filling times (mid July – mid September). The disease is generally associated with cotton that has historically had higher irrigations amounts. At the Helm farm, there have been three irrigation rates applied since 2007 within the same rows annually. The base irrigation rate was originally set at 80% of evapotranspiration rate (ET), when pumping capacity was adequate, and the high irrigation rate was 50% above the base rate, once stands had been established (uniform irrigation for stand establishment). As pumping capacity declined, the base rate was reduced to 60% of ET starting in 2010. Verticillium wilt was first seen at the Helm center pivot in late 2007 and has continued to be present in most years. We have been monitoring the incidence of wilt in that circle since 2008. In 2014, the cropping systems was changed from previous years, to include two tillage systems, conventional tillage on beds, with LEPA irrigation, and then reduced (or no tillage some years) on flat ground with splatter irrigation. The average incidence of Verticillium wilt under the high irrigation rate is presented in Figure 1 for the two tillage systems.

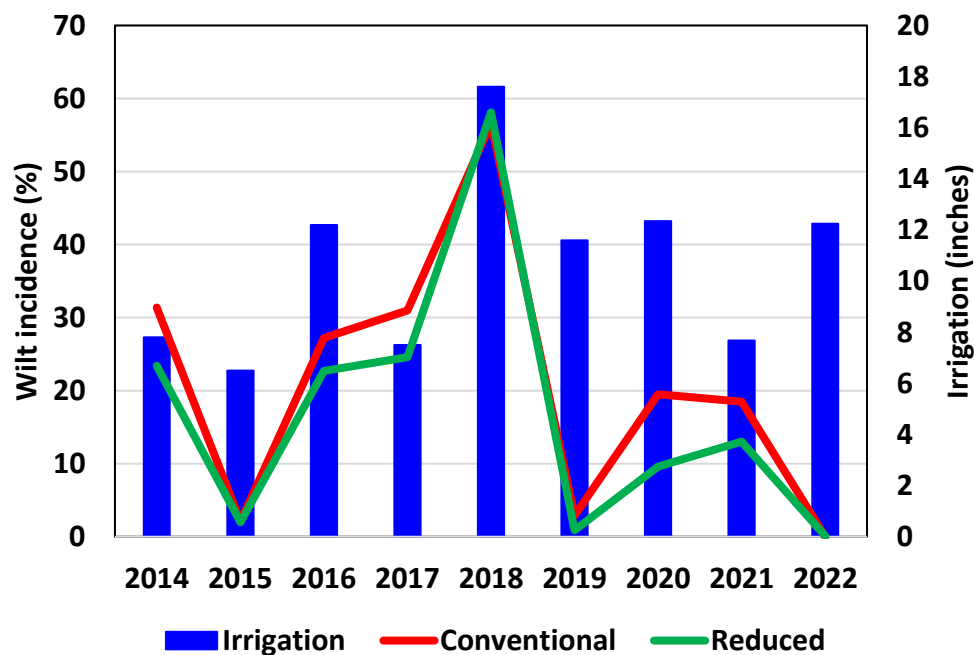


Figure 1. Average incidence of Verticillium wilt at the Helm pivot under high irrigation from 2014 to 2022 for conventional and reduced tillage. The irrigation applied each year for the high rate is shown with the blue bars, and the wilt incidence is the red and green lines.

In years where Verticillium wilt is close to 0 (2015, 2019, 2022), the tillage systems behave similarly. In the one year with unusually high Verticillium wilt (2018), the tillage systems again behaved similarly. However, in all the other years, the incidence of wilt trended higher in the conventional tillage system compared with the reduced tillage system.

Appendix

2022 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 @ Building	Helms @ Well 1	Crop:										Crop:							Crop:					
					Cotton										Cotton							Cotton	Cotton	Cotton	Cotton	Cotton	
1	2	2022	0.25	0.18																							
3	2	2022			1.28	1.40	1.43	1.44	0.27																1.16		
3	3	2022							1.21		1.52	1.46	1.40											0.98			
3	4	2022								0.36				1.56	0.75	0.75						0.70	1.02	0.95		1.17	
3	7	2022			1.39	1.38	1.37	1.41	1.42	2.49	1.37	1.30	1.34	1.22			0.66	0.67	0.69	0.70				0.96			
3	8	2022													0.79	0.79	0.77				0.62		0.87				
3	9	2022																0.84	0.86	0.88							
3	10	2022													0.82	0.82	0.80	0.07	0.08	0.08	0.68						
3	15	2022																0.24	0.77	0.79	0.50				1.34	0.96	
3	16	2022													0.78	0.78	0.76							0.50	1.03		
3	17	2022			0.14	0.15	0.15	0.16	0.15									0.68	0.69	0.71		0.60		0.80	0.01	0.31	
3	18	2022								0.15	0.15	0.14	0.13	0.15								0.95	0.60	0.04			
3	21	2022	0.20	0.20																							
3	23	2022																				1.83	1.91	0.25			
3	25	2022			0.14	0.16	0.01	0.16	0.16	0.17	0.13	0.16	0.17	0.16												1.19	
3	26	2022																								0.19	
3	27	2022			0.07	0.32	0.47	0.31	0.29	0.17	0.28	0.31	0.30	0.32	0.26	0.26	0.24	0.03	0.26	0.26	0.44						
3	29	2022																								1.13	
3	30	2022			0.35	0.15	0.15	0.11	0.15	0.16	0.15	0.15	0.15	0.16													
3	31	2022			0.14	0.15	0.15	0.21	0.18	0.16	0.15	0.15	0.15	0.16	0.12	0.12	0.15	0.12	0.12	0.12	0.11					1.29	
4	1	2022			0.14	0.16	0.16	0.13	0.07		0.14	0.16	0.15	0.16	0.13	0.13	0.09	0.01	0.13	0.13	0.11					0.93	
4	2	2022																									
4	4	2022			0.28	0.31	0.32	0.34	0.33	0.46	0.43	0.31	0.30	0.32	0.25	0.25	0.26	0.22	0.31	0.26	0.22				0.97		
4	5	2022																									
4	6	2022																				0.33	0.24				
4	7	2022																					0.94				
4	8	2022																									
4	11	2022			0.42	0.47	0.49	0.47	0.61	0.62	0.58	0.46	0.45	0.49	0.38	0.39	0.42	0.11	0.45	0.40	0.33						
4	19	2022			0.14	0.16	0.16	0.17	0.18	0.17	0.15	0.15	0.15	0.15	0.13	0.13	0.14	0.01	0.13	0.13	0.11						
4	20	2022							0.07								0.04								0.88		
4	21	2022																					0.85				
4	22	2022																				0.68		0.24			
4	23	2022																				0.02	0.71	1.15			
4	26	2022																				0.10	0.12	0.06	1.16	1.05	
4	27	2022			0.13	0.13	0.13	0.14	0.14	0.07	0.04	0.14	0.14	0.15	0.11	0.11	0.10	0.05	0.07	0.11	0.09						
4	28	2022			0.12	0.13	0.13	0.13		0.07	0.14	0.14	0.14	0.14	0.10	0.10	0.05	0.05	0.11	0.11	0.09						
4	29	2022																									
4	30	2022																									
5	4	2022																							1.07	0.97	
5	6	2022			0.28	0.31	0.34	0.3	0.31	0.34	0.34	0.32	0.29	0.32	0.25	0.26	0.24	0.25	0.30	0.27	0.22	0.11	0.04	0.08	0.06	0.06	
5	11	2022	0.27	0.30																							
5	24	2022	1.40	1.80																							
5	26	2022													0.75	0.76	0.72				0.70						
5	27	2022													0.60				0.71	0.58					1.26		
5	28	2022														0.74	0.71									0.97	
5	29	2022			1.17	1.30	1.31	1.35	1.32																		
5	30	2022								1.32	1.36	1.33	1.33	1.37													
5	31	2022	0.11	0.39														1.42	1.46				0.88				
6	1	2022																		0.86					0.95		

2022 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 @ Building	Helms @ Well 1	Crop: Cotton										Crop: Cotton							Crop: Cotton				
6	7	2022			1.09	1.20	1.21	1.24	1.23																	
6	8	2022							1.23	1.26	1.24	1.09	1.27													
6	9	2022												0.76	0.76	0.74					0.70	1.78	0.73			
6	10	2022														0.70	0.72	0.73				0.33			1.07	
7	7	2022	0.29	0.27																						
7	8	2022			0.30	0.33					0.32	0.47		0.02	0.17	0.26	0.18	0.16			0.22	0.25	0.32	0.18	0.19	
7	11	2022				0.30	0.50	0.66	0.48	0.36	0.63	0.02		0.63	0.17	0.26	0.18	0.37	0.82		0.67	0.49	0.49	0.55	0.54	
7	12	2022												0.23	0.19	0.26	0.18	0.21	0.09		0.22	0.27	0.21	0.18	0.18	
7	13	2022						0.24	0.34	0.64											0.20	0.22	0.20	0.18	0.18	
7	14	2022			0.29	0.20					0.01	0.30	0.47								0.20	0.17	0.17	0.18	0.17	
7	15	2022				0.49	0.56	0.68													0.20	0.34	0.29	0.18	0.17	
7	19	2022			0.10			0.07	0.69	0.34	0.65	0.04		0.36				0.11	0.38		0.20	0.30	0.33	0.18	0.18	
7	20	2022			0.28	0.28						0.26	0.47			0.16	0.26	0.17	0.14		0.20	0.14	0.21	0.18	0.17	
7	21	2022				0.39	0.56	0.60													0.20	0.27	0.23	0.18	0.18	
7	25	2022												0.75	0.35	0.53	0.34	0.56	0.81		0.81	0.87	0.91	0.73	0.69	
7	26	2022			0.28	0.27					0.09	0.29	0.46	0.06	0.16	0.26	0.17	0.13			0.20	0.21	0.21	0.18	0.17	
7	27	2022				0.37	0.52	0.57						0.29				0.12	0.38		0.20	0.20	0.21	0.18	0.17	
7	28	2022						0.10	0.46	0.34	0.57			0.07	0.16	0.26	0.17	0.14		0.20	0.32	0.22	0.18	0.17		
7	29	2022												0.33				0.13	0.41		0.20	0.15	0.23	0.18	0.17	
8	2	2022				0.35	0.51	0.55						0.28				0.11	0.38		0.20	0.18	0.21	0.18	0.18	
8	3	2022						0.12	0.46	0.34	0.51			0.08	0.16	0.26	0.17	0.11		0.20	0.20	0.21	0.18	0.18		
8	4	2022	0.20		0.28	0.25					0.14	0.29	0.46	0.30				0.15	0.38		0.20	0.23	0.21	0.18	0.17	
8	5	2022												0.07	0.18	0.26	0.17	0.16		0.20	0.24	0.23	0.18	0.17		
8	9	2022					0.15	0.47	0.34	0.60				0.10	0.18	0.26	0.17	0.17								
8	11	2022			0.28	0.67	0.54	0.56			0.05	0.30	0.46	0.38	0.18	0.26	0.17	0.25	0.41							
8	12	2022												0.30				0.06	0.40		0.20	0.30	0.25	0.18	0.18	
8	16	2022			0.27	0.53					0.09	0.30	0.47	0.36	0.08			0.15	0.39		0.20	0.21	0.17	0.18	0.18	
8	17	2022				0.11	0.51	0.56							0.07	0.26	0.17	0.12			0.20	0.12	0.12	0.18	0.18	
8	18	2022			0.29			0.10	0.47	0.33	0.56	0.32		0.30				0.13	0.38		0.20	0.22	0.21	0.18	0.17	
8	19	2022												0.07	0.17	0.26	0.17	0.14		0.20	0.18	0.05	0.18	0.17		
8	21	2022	3.60	3.88																						
8	29	2022	0.34	0.36																						
8	31	2022	0.80	1.31																						
Pre & At Plant			1.98	2.69	4.61	5.10	5.18	5.22	5.19	5.09	5.30	5.16	4.94	5.32	5.74	6.91	7.75	7.77	10.58	10.79	10.23	7.34	7.02	6.25	5.78	7.97
Seasonal			5.23	5.82	2.37	4.54	3.70	4.72	3.27	2.39	4.54	2.44	3.26		4.98	2.38	3.65	2.41	3.62	5.23		5.72	6.08	5.89	5.06	4.91
Totals			7.21	8.51	6.98	9.64	8.88	9.94	8.46	7.48	9.84	7.60	8.20	5.32	10.72	9.29	11.40	10.18	14.20	16.02	10.23	13.06	13.10	12.14	10.84	12.88
Totals			21.37	18.65	5.93	7.09	6.76	7.22	6.61	6.20	7.01	6.09	6.63	5.42	7.39	6.72	6.85	6.45	6.93	7.39	4.68	9.71	9.09	8.84	8.34	7.12

2022 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: Cotton]					
					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									
Mo	Da	Year	Halfway @ Building	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	
1	2	2022	0.25	0.18																															
2	8	2022			0.65	0.65	0.65	0.65	S																										
2	9	2022																																	
2	10	2022																						0.65	0.65	0.65	0.65	S		0.65	0.65	0.65	0.65	S	
2	11	2022													0.65	0.65	0.65	0.65	S	0.65	0.65	0.65	0.65	S											
2	12	2022								0.65	0.65	0.65	0.65	S																					
2	13	2022			0.65	0.65	0.65	0.65	S																										
2	14	2022																																	
2	15	2022																		0.65	0.65	0.65	0.65	S		0.65	0.65	0.65	0.65	S					
2	16	2022													0.65	0.65	0.65	0.65	S																
2	18	2022			0.35	0.35	0.35	0.35	S	1.00	1.00	1.00	1.00	S																					
2	20	2022																						0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S		
2	21	2022																		0.50	0.50	0.50	0.50	S											
3	21	2022	0.20	0.20																															
3	24	2022			0.50	0.50	0.50	0.50	S																										
3	25	2022																																	
3	26	2022													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	0.50	0.50	0.50	0.50	S
3	27	2022			0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S																					
3	28	2022																																	
3	29	2022																		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
4	1	2022								0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S																
4	2	2022			0.30	0.30	0.30	0.30	S																					0.30	0.30	0.30	0.30	S	
4	3	2022																		0.30	0.30	0.30	0.30	S		0.30	0.30	0.30	0.30	S					
4	4	2022													0.30	0.30	0.30	0.30	S																
4	6	2022								1.00	1.00	1.00	1.00	S																					
4	7	2022			0.30	0.30	0.30	0.30	S																					0.30	0.30	0.30	0.30	S	
4	8	2022													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						
4	9	2022			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	
4	10	2022													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						
4	11	2022			0.40	0.40	0.40	0.40	S	0.30	0.30	0.30	0.30	S																					
4	18	2022													0.75	0.75	0.75	0.75	S																
4	19	2022																		0.75	0.75	0.75	0.75	S											
4	20	2022																							0.75	0.75	0.75	0.75	S						
4	21	2022																												0.75	0.75	0.75	0.75	S	
4	22	2022			0.75	0.75	0.75	0.75	S	1.00	1.00	1.00	1.00	S																					
4	23	2022								0.50	0.50	0.50	0.50	S																					
4	26	2022																											0.50	0.50	0.50	0.50	S		
4	27	2022																		0.50	0.50	0.50	0.50	S	0.25	0.25	0.25	0.25	S						
4	28	2022			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																
4	29	2022																							0.25	0.25	0.25	0.25	S	0.50	0.50	0.50	0.50	S	
5	2	2022																		0.50	0.50	0.50	0.50	S											
5	3	2022								0.25	0.25	0.25	0.25	S	0.25	0.25	0.25	0.25	S																
5	4	2022			0.25	0.25	0.25	0.25	S																				0.50	0.50	0.50	0.50	S		
5	5	2022																		0.50	0.50	0.50	0.50	S	0.25	0.25	0.25	0.25	S						
5	6	2022																																	
5	11	2022	0.27	0.30											0.50	0.50	0.50	0.50	S																
5	20	2022																							0.75	0.75	0.75	0.75	S						

2022 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: Cotton]					
					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									
Mo	Da	Year	Halfway @ Building	Helms @ Well 1	Base	Base	Base - 50%	Base + 50%		Base	Base	Base - 50%	Base + 50%		Base	Base	Base - 50%	Base + 50%		Base	Base	Base - 50%	Base + 50%		Base	Base	Base - 50%	Base + 50%		Base	Base	Base - 50%	Base + 50%		
5	21	2022																																	
5	24	2022	1.40	1.80																															
5	29	2022			0.20	0.20	0.20	0.20	S	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	
5	30	2022			0.20	0.20	0.20	0.20	S	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	
5	31	2022	0.11	0.39																															
6	6	2022																																	
6	7	2022								0.30	0.30	0.30	0.30	S	0.07	0.07	0.07	0.07	S	0.30	0.30	0.30	0.30	S											
6	8	2022			0.30	0.30	0.30	0.30	S																										
7	7	2022	0.29	0.27	0.07		0.07	0.07	L											0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
7	8	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	9	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	12	2022			0.07		0.07		L						0.07		0.07		L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
7	13	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	14	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	15	2022								0.25	0.25		0.25	L																					
7	20	2022			0.07		0.07	0.07	L						0.07		0.07	0.07		0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
7	21	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	22	2022			0.07	0.07		0.07	L	0.50	0.50		0.50	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	27	2022			0.07		0.07	0.07	L						0.07		0.07	0.07	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
7	28	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	29	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
7	30	2022								0.25	0.25		0.25	L																					
8	3	2022			0.07		0.07	0.07							0.07		0.07	0.07	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
8	4	2022	0.20	0.00	0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	5	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	6	2022							L	0.25	0.25		0.25	L																					
8	10	2022			0.07		0.07	0.07							0.07		0.07	0.07	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
8	11	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	12	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	13	2022							L	0.25	0.25		0.25	L																					
8	17	2022			0.07		0.07	0.07							0.07		0.07	0.07	L	0.25		0.25	0.25	L	0.25		0.25	0.25	L	0.07		0.07	0.07	L	
8	18	2022			0.07	0.07		0.07	L	0.25		0.25	0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	19	2022			0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	0.25	0.25		0.25	L	0.25	0.25		0.25	L	0.07	0.07		0.07	L	
8	20	2022								0.25	0.25		0.25	L																					
8	21	2022	3.60	3.88																															
8	29	2022	0.34	0.60																															
8	31	2021	0.80	1.31																															
Pre & At Plant			0.27	0.30	3.05	3.05	3.05	3.05		4.60	4.60	4.60	4.60		3.65	3.65	3.65	3.65		4.15	4.15	4.15	4.15		3.65	3.65	3.65	3.65		3.65	3.65	3.65	3.65		
Seasonal			6.74	8.25	2.17	1.68	1.19	2.17		5.70	3.95	2.45	5.70		1.61	1.12	0.70	1.61		5.95	4.20	2.45	5.95		6.33	4.58	2.83	6.33		2.17	1.68	1.19	2.17		
Totals			7.01	8.55	5.22	4.73	4.24	5.22		10.30	8.55	7.05	10.30		5.26	4.77	4.35	5.26		10.10	8.35	6.60	10.10		9.98	8.23	6.48	9.98		5.82	5.33	4.84	5.82		

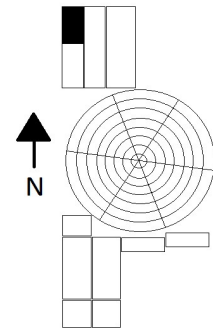
2022 Rain and Irrigation Amounts At Helms Research Farm, Halfway, TX

Helms Irrigation Amounts (in)																						
Date			Rainfall (in)		Field 6 Irrigation (Drip)																	
					Zones (Treatment)																	
Mo	Da	Year	Halfway @ Building	Helms @ Well 1	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)
					Cotton																	
1	2	2022	0.25	0.18																		
3	21	2022	0.20	0.20																		
3	28	2022			1.09	1.05	1.00	0.45														
4	2	2022						1.15	2.10	2.03	2.03	2.02	2.12	2.13	1.99	2.05	2.06	2.03				
4	4	2022			1.02	1.07	1.04	0.50										1.99	2.04	2.03	2.06	1.97
4	5	2022			2.01	2.07																
4	6	2022					1.99	2.01	2.06	2.00	1.01											
4	8	2022									1.02	1.93	1.96	1.76	1.91	2.01	0.98					
4	9	2022														1.04	2.01	2.00	2.05	2.04	0.98	
4	10	2022							0.16			0.15		0.15	0.15	0.05	0.04			0.10	1.18	1.97
4	26	2022			0.50	0.52	0.51	0.49	0.52	0.52	0.51	0.51	0.51	0.49	0.49	0.51	0.51	0.50				
4	27	2022																0.50	0.50	0.50	0.51	0.50
4	28	2022			0.73	0.64	0.81	0.71	0.67	0.64	0.81	0.74	0.72	0.79								
4	29	2022													0.79	0.71	0.74	0.74	0.48	0.51	0.50	0.49
5	11	2022	0.27	0.30																		
5	24	2022	1.40	1.80																		
5	31	2022	0.11	0.39																		
6	9	2022			0.45	0.46																
6	10	2022					0.50	0.45	0.46	0.46	0.54	0.50	0.49	0.49	0.48	0.49	0.50					
6	12	2022			0.46	0.48	0.52	0.50	0.51	0.49	0.51	0.50	0.49	0.50	0.49	0.48	0.50	0.98	1.34	1.25	1.17	1.15
6	29	2022					0.48	0.50					0.49	0.49				0.48	0.52			1.32
7	7	2022	0.29	0.27																		1.12
7	11	2022					0.49	0.51					0.49	0.48				0.48	0.56			0.36
7	19	2022			0.93		0.43	0.90	0.50		0.50	0.87	0.99	0.48		0.89	0.44	0.43	0.90	0.61		0.76
7	26	2022			0.99		0.50	1.01	0.51		0.51	0.98	1.01	0.50		0.98	0.51	0.48	0.98	0.49		0.88
8	2	2022			1.09		0.60	1.08	0.52		0.52	0.99	1.02	0.54		1.04	0.57	0.57	0.98	0.57		0.44
8	4	2022	0.20																			0.49
8	9	2022			1.06		0.64	1.10	0.52		0.58	1.08	1.07	0.54		1.01	0.60	0.54	1.01	0.48		0.82
8	16	2022			1.01		0.52	1.00	0.52		0.51	0.98	1.02	0.50		0.97	0.50	0.50	0.99	0.48		0.50
8	21	2022	3.60	3.88																		
8	29	2022	0.34	0.60																		
8	31	2022	0.80	1.31																		
Pre & At Plant			2.23	2.87	6.26	6.29	6.37	6.26	6.32	6.30	6.43	6.35	6.29	6.31	6.30	6.30	6.33	6.30	6.31	6.35	6.34	6.37
Seasonal			5.23	6.06	5.08	2.69	6.06	3.58			2.62	4.90	6.09	3.53		4.89	2.62	3.48	5.94	2.63	4.99	6.01
Totals			7.46	8.93	11.34	6.29	9.06	12.32	9.90	6.30	9.05	11.25	12.38	9.84	6.30	11.19	8.95	9.78	12.25	8.98	6.34	11.36

Operations Summary

Year	2022
Farm	Helm
Field ID	Field 1 North
Exp. Design	Corn
Soil Type	Pullman Clay Loam

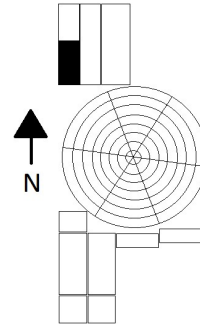
Field Operations	Date	Activity
Tillage	11/18/2021	Shred
	11/19/2021	Disk
	11/23/2021	Disk
	12/2/2021	List
	7/18/2022	Disk
	8/10/2022	Disk
Fertility		
Planting / Harvest	1/6/2022	Triticale 25 lb/ac
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting	1/1 - 6-25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 1 South
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

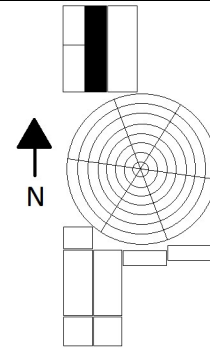
Field Operations	Date	Activity
Tillage	11/18/2021	Shred
	11/19/2021	Disk
	11/23/2021	Disk
	3/8/2022	List
	6/7/2022	Cultivate
Fertility	3/17/2022	Liquid 32-0-0 100lb/ac
	6/16/2022	Liquid 32-0-0 100lb/ac
	6/16/2022	Liquid 10-34-0 80lb/ac
Planting / Harvest	5/12/2022	Planted Plots
	9/26/2022	Harvest corn plots
Herbicide / Growth Regulator	3/16/2022	Atrazine 1qt/ac
	5/13/2022	Showdown 42oz/ac, Me Too Lachlor 1.5pt/ac
	6/18/2022	Impact 1oz/ac, Atrazine 2pt/ac, MSO 1%, AMS 2%
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting	1/1 - 6-25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 2
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

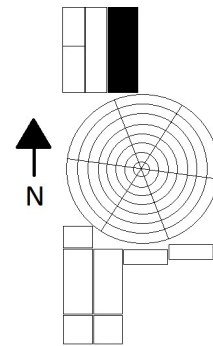
Field Operations	Date	Activity
Tillage	11/16/2021	Shred
	11/19/2021	Disk
	11/23/2021	Disk
	12/3/2021	Float
	12/8/2021	List
	5/18/2022	Bed Packer
	5/23/2022	Bed Packer
	6/6/2022	Rotary Hoe
	6/23/2022	Cultivate
Fertility	5/10/2022	Liquid 32-0-0 58lb/ac
Planting / Harvest	1/5/2022	Planted Triticale 25 lb/ac
	5/23/2022	Planted NexGen 3406 B2XF 47,000 seed/ac
	11/2/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/19/2022	Showdown 42oz/ac, Dicamba 708 14oz/ac
	5/23/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/22/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/25/2022	Outlook 12.8oz/ac
	7/26/2022	Medal II EC 1.5pt/ac
	7/28/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/12/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	1 = 7.28in, 2 = 7.88in, 3 = 7.98in, 4 = 8.07in, 5 = 8.09in, 6 = 7.94in, 7 = 8.19in, 8 = 7.92in, 9 = 7.68in, 10 = 8.10in
Seasonal	6/26 - 9/30	1 = 2.37in, 2 = 4.54in, 3 = 3.70in, 4 = 4.72in, 5 = 3.27in, 6 = 2.39in, 7 = 4.54in, 8 = 2.44in, 9 = 3.26in, 10 = 0.00in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 3
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

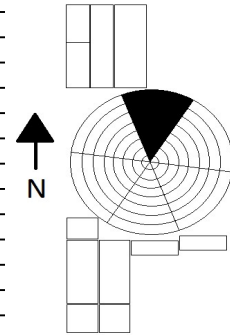
Field Operations	Date	Activity
Tillage	11/16/2021	Shred
	11/19/2021	Disk
	11/23/2021	Disk
	12/3/2021	Float
	12/8/2021	List
	5/19/2022	Bed Packer
	5/27/2022	Bed Packer
	6/6/2022	Rotary Hoe
	7/7/2022	Cultivate
Fertility	3/26/2021	Liquid 32-0-0 59lbs/ac
	4/2/2021	Liquid 32-0-0 18lbs/ac
	4/2/2021	Liquid 10-34-0 63lbs/ac
Planting / Harvest	1/5/2022	Planted Triticale 25 lb/ac
	5/27/2022	Planted DeltaPine 1822 XF 47,000 seeds/ac
	11/2/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/30/2022	Diuron 1qt/ac, Showdown 42oz/ac, Dicamba 708 14oz/ac
	6/22/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, Kleaf 16oz/ac, Point Blank 4oz/100gal
	6/25/2022	Outlook 12.8oz/ac
	7/26/2022	Medall II EC 1.5pt/ac
	7/28/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, Kleaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/12/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	1 = 7.10in, 2 = 7.27in, 3 = 6.98in, 4 = 5.59in, 5 = 7.98in, 6 = 7.24in, 7 = 5.73in
Seasonal	6/26 - 9/30	1 = 4.98in, 2 = 2.38in, 3 = 3.65in, 4 = 2.41in, 5 = 3.62in, 6 = 5.23in, 7 = 0.00in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5A (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

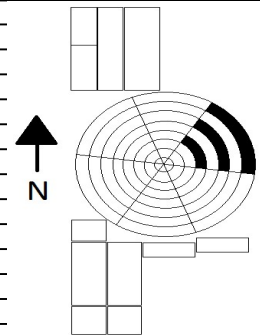
Field Operations	Date	Activity
Tillage	11/19/2021	Shred
	11/29/2021	Disk
	11/30/2021	Disk
	12/1/2021	Float
	12/3/2021	Chisel
	12/8/2021	Float
	12/9/2021	List
	3/29/2022	Rotary Hoe
	5/18/2022	Bed Packer
	5/27/2022	Rotary Hoe (Span 8 Only)
Fertility	5/9/2022	Liquid 32-0-0 58 lb/ac
Planting / Harvest	12/16/2021	Planted Triticale 15 lb/ac (cover crop)
	5/20/2022	Planted NexGen 3406 B2XF 37,000 seeds/ac
	11/17/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/20/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/19/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.90in, Base - 50% = 5.90in, Base + 50% = 5.90in
Seasonal	6/26 - 9/30	Base = 0.98in, Base - 50% = 0.49in, Base + 50% = 1.47in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5B (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

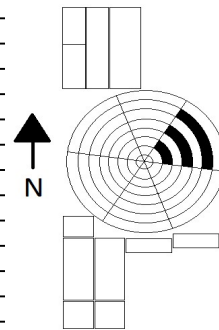
Field Operations	Date	Activity
Tillage	7/22/2021	Shred
	8/12/2021	Disk (x3)
	8/23/2021	Field Cultivator
	8/23/2021	Float
	8/25/2021	Field Cultivator
	8/30/2021	List
	2/9/2022	Stalk Puller
Fertility	5/5/2022	Liquid 32-0-0 58 lb/ac
Planting / Harvest	8/30/2021	Planted Triticale 25 lb/ac
	5/17/2022	Planted DeltaPine 1822XF 47,000 seed/ac
	11/15/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/20/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/19/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.90in, Base - 50% = 5.90in, Base + 50% = 5.90in
Seasonal	6/26 - 9/30	Base = 3.25in, Base - 50% = 1.75in, Base + 50% = 5.00in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5B (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

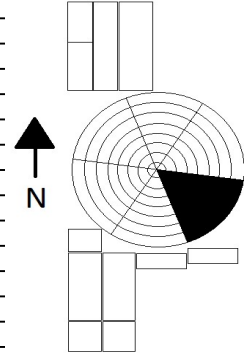
Field Operations	Date	Activity
Tillage	11/19/2021	Shred
	11/29/2021	Disk
	12/1/2021	Disk
	12/7/2021	Chisel
	12/10/2021	Float
	12/21/2021	Chisel
	12/22/2021	List
	3/29/2022	Rotary Hoe
	7/13/2021	Shred
	7/15/2022	Dik
	8/2/2022	Disk
	9/6/2022	Field Cultivator
	9/6/2022	Float
Fertility		
Planting / Harvest	8/30/2021	Planted Triticale 25 lb/ac
	5/17/2022	Planted DeltaPine 1822XF 47,000 seed/ac
	11/15/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/20/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/19/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.90in, Base - 50% = 5.90in, Base + 50% = 5.90in
Seasonal	6/26 - 9/30	Base = 3.25in, Base - 50% = 1.75in, Base + 50% = 5.00in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5C (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

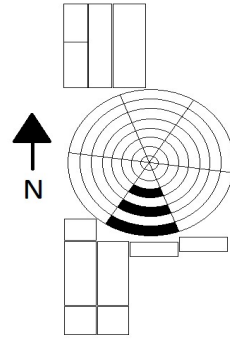
Field Operations	Date	Activity
Tillage	7/13/2022	Shred
	7/15/2022	Disk
	8/2/2022	Disk
	9/6/2022	Field Cultivator
	9/6/2022	Float
Fertility		
Planting / Harvest	1/7/2022	Planted Triticale 25 lb/ac
	9/16/2022	Planted TAMU 204 15 lb/ac
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	6/14/2022	Diuron 1qt/ac, Clash 12oz/ac
Insecticide		
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 5.16in, Base - 50% = 5.16in, Base + 50% = 5.16in
Seasonal	6/26 - 9/30	Base = 0.91in, Base - 50% = 0.49in, Base + 50% = 1.40in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5D (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

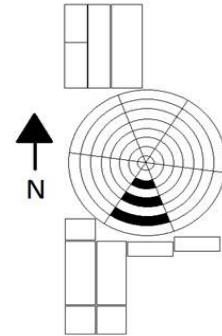
Field Operations	Date	Activity
Tillage	11/19/2021	Shred
	11/29/2021	Disk
	12/1/2021	Disk
	12/7/2021	Chisel
	12/9/2021	Float
	12/21/2021	Chisel
	12/22/2021	List
	3/29/2022	Rotary Hoe
	5/17/2022	Bed Packer
	5/27/2022	Rotary Hoe
	6/21/2022	Field Cultivator
Fertility	5/6/2022	Liquid 32-0-0 58 lb/ac
Planting / Harvest	1/7/2022	Planted Triticale 25 lb/ac (cover crop)
	5/18/2022	Planted DeltaPine 1822 XF 47,000 seeds/ac
	11/16/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus CS 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/19/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/20/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 6.65in, Base - 50% = 6.65in, Base + 50% = 6.65in
Seasonal	6/26 - 9/30	Base = 3.50in, Base - 50% = 1.75in, Base + 50% = 5.25in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5D (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

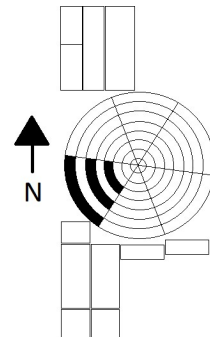
Field Operations	Date	Activity
Tillage		
Fertility	5/6/2022	Liquid 32-0-0 58 lb/ac
Planting / Harvest	1/7/2022	Planted Triticale 25 lb/ac (cover crop)
	5/18/2022	Planted DeltaPine 1822 XF 47,000 seeds/ac
	11/16/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus CS 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/19/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/20/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid		
10/13/2022		Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 6.65in, Base - 50% = 6.65in, Base + 50% = 6.65in
Seasonal	6/26 - 9/30	Base = 3.50in, Base - 50% = 1.75in, Base + 50% = 5.25in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5E (Even Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

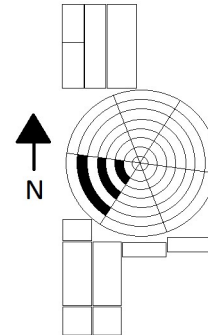
Field Operations	Date	Activity
Tillage	11/19/2021	Shred
	11/29/2021	Disk
	12/1/2021	Disk
	12/6/2021	Chisel
	12/10/2021	Float
	1/18/2022	Float
	1/19/2022	Field Cultivator
	3/15/2022	Field Cultivator
	3/17/2022	List
	3/29/2022	Rotary Hoe
	5/17/2022	Bed Packer
	5/27/2022	Rotary Hoe
	6/14/2022	Field Cultivator
Fertility	5/6/2022	Liquid 32-0-0 58lb/ac
Planting / Harvest	5/18/2022	Planted DeltaPine 1822 XF 47,000 seeds/ac
	11/16/2022	Harvested all cotton
Herbicide / Growth Regulator	3/15/2022	Trifluralin 4 EC 32oz/ac
	5/19/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/10/2022	Engenia 12.8oz/ac, Glystar Plus 32oz/ac, KLeaf 16 oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Glystar Plus 32oz/ac, KLeaf 16 oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 7.03in, Base - 50% = 7.03in, Base + 50% = 7.03in
Seasonal	6/26 - 9/30	Base = 3.50in, Base - 50% = 1.75in, Base + 50% = 5.25in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5E (Odd Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

Field Operations	Date	Activity
Tillage		
Fertility	5/6/2022	Liquid 32-0-0 58lb/ac
Planting / Harvest	5/18/2022	Planted DeltaPine 1822 XF 47,000 seeds/ac
	11/16/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/19/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/10/2022	Engenia 12.8oz/ac, Glystar Plus 32oz/ac, KLeaf 16 oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Glystar Plus 32oz/ac, KLeaf 16 oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 7.03in, Base - 50% = 7.03in, Base + 50% = 7.03in
Seasonal	6/26 - 9/30	Base = 3.50in, Base - 50% = 1.75in, Base + 50% = 5.25in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in



Operations Summary

Year	2022
Farm	Helm
Field ID	Field 5F (All Spans)
Exp. Design	Cotton
Soil Type	Pullman Clay Loam

Field Operations	Date	Activity
Tillage	11/19/2021	Shred
	11/29/2021	Disk
	12/1/2021	Disk
	12/6/2021	Chisel
	12/10/2021	Float
	1/18/2022	Float
	3/29/2022	Rotary Hoe
	5/27/2022	Rotary Hoe
Fertility	5/9/2022	Liquid 32-0-0 58lb/ac
Planting / Harvest	1/21/2022	Planted Tritiacle 25 lb/ac
	5/19/2022	Planted NexGen 3406 B2XF
	11/17/2022	Harvested all cotton
Herbicide / Growth Regulator	4/14/2022	Zaltus SC 2oz/ac, Dicamba 708 10oz/ac
	5/13/2022	Showdown 42oz/ac
	5/20/2022	Diuron 1qt/ac, Dicamba 708 14oz/ac
	6/19/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
	6/20/2022	Outlook 12.8oz/ac
	7/25/2022	Medal II EC 1.5pt/ac
	7/26/2022	Engenia 12.8oz/ac, Roundup Power Max 32oz/ac, KLeaf 16oz/ac, Point Blank 4oz/100gal
Insecticide		
Harvest aid	10/13/2022	Epathon 6 32oz/ac, ETX 1.25oz/ac, Dyne-Amic 1%
Irrigation Amt.		
PrePlant & Planting	1/1 - 6/25	Base = 6.65in, Base - 50% = 6.65in, Base + 50% = 6.65in
Seasonal	6/26 - 9/30	Base = 0.98in, Base - 50% = 0.49in, Base + 50% = 1.47in
Rainfall		
PrePlant & Planting	1/1 - 6/25	2.87in
Seasonal	6/26 - 9/30	6.06in

