



*Improving Life Through Science and Technology*

*Lubbock-Pecos-Halfway*

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# Helm Research Farm

## Summary Report

### 2015

Technical Report  
16-3

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

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## Introduction

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

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

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



## Cotton Irrigation Timing Using Subsurface Drip Irrigation (SDI) (Field 2).

James Bordovsky, Joe Mustian, and Casey Hardin

**Objective:** Determine cotton lint yield, water use efficiency and relative water value of three irrigation timing treatments using subsurface drip irrigation.

**Methodology:** The primary research question relates to efficiency of soil profile irrigation storage when subsurface drip irrigation (SDI) is applied early in the growing season at times when irrigation capacity is greater than crop ET. This field study was irrigated with SDI having 30-in. dripline spacing and focused on three irrigation timing treatments replicated in a RCB design. Treatments were: T1 - minimal irrigation for plant establishment, no irrigation during vegetative period, 0.15 in/day rate during reproductive and maturation periods; T2 - irrigation at 0.15 in/day rate during preplant for up to 30 days, no irrigation during vegetative period, 0.15 in/day rate during reproductive and maturation periods; and T3 - minimal irrigation for plant establishment, 0.15 in/day rate during vegetative, reproductive, and maturation periods. A treatment having sufficient irrigation for plant establishment with no further seasonal irrigation (dryland) was also included. Cotton was grown and tests harvested with commercial harvesting equipment. Yields, fiber quality, and water productivity from the different treatments were determined.



Figure 1. Installation of subsurface drip irrigation for experiments at the Helm Research Farm, Halfway, TX.

**Results:** On June 2, following hail and wind events that destroyed the first planting, cotton was replanted with DeltaPine 1219 B2RF at 54,000 seeds/ac. Annual rainfall was higher than normal up to the second planting (> 16 inches) which masked the effects of preplant irrigations of T2. Additional rain during the vegetative period prevented irrigation during that period in T1, therefore T1 and T3 became identical treatments. Treatments resulted in low cotton yields ranging from 791 to 889 lb/ac with no significant differences (Table 1). Irrigation WUE was greater for T1 and T3 where preplant irrigation was not applied than for T2.

Table 1. Yield, irrigation water use efficiency, relative water value, and lint quality parameters resulting from irrigation timing treatments using subsurface drip irrigation, 2015.

	Irr. Used (in)	Yield (lb/ac)	IWUE (lb/ac-in)	Water Value (\$/ac-in)	Mic	Length	Unif.	Streng.	Elon.	Rd	+b	Leaf	Loan (\$/lb)
Dryland	0	610			3.6	1.06	79.6	29.3	7.3	75.1	9.8	3.0	0.5075
T1	3.05	889	91	47	3.2	1.13	78.9	30.5	7.2	76.9	9.1	3.3	0.5220
T2	5.34	838	43	22	3.3	1.14	79.5	31.2	7.2	77.2	8.9	3.7	0.5242
T3	3.02	791	60	31	3.1	1.13	79.1	31.2	7.0	77.0	9.3	3.7	0.5122



## Cotton Response to Pre-plant and Early Season Irrigation Amounts with SDI (Field 3).

James Bordovsky, Joe Mustian and Casey Hardin

**Objective:** Determine cotton lint yield and water use efficiency of pre-plant and early season irrigation treatments using SDI.

**Methodology:** The proposed study quantifies differences in water productivity of SDI cotton during irrigation periods having the highest evaporation losses in the Texas South Plains. Treatment factors included pre-plant irrigation quantity and early season irrigation capacity resulting in six treatments in addition to a "pre-plant only" check (Table 1). SDI laterals were spaced 60 in. apart with each irrigating 2 30-in. crop rows. Due to poor plant stands caused by heavy rains and hail, cotton was replanted on 2 June.



**Results:** Continued rain in June and July eliminated the need for irrigation during the vegetative and much of the reproductive periods and reduced or eliminated planned irrigations. Treatment T1 was modified to provide 3.6 inches of seasonal irrigation, treatments T2 and T3 were irrigated identically using 2.3 inches of irrigation, and treatments T4, T5 and T6 were irrigated identically using 4 inches of irrigation (Table 1). Hail and heavy rain on 28 August resulted in the termination of additional irrigations. Results are in Table 2. The only significant treatment difference occurred in the yields of the T0 treatment (no irrigation, 590 lb/ac) compared to treatments receiving seasonal irrigation (766 - 829 lb/ac); and in the seasonal irrigation water use efficiencies (SIWUE) where treatments receiving lower seasonal irrigations (T2 and T3) resulted in higher SIWUEs compared to other treatments. This experiment will be repeated next year.

Table 1. Irrigation treatment numbers, their planned application rates, and the actual irrigation amount applied in various cotton growth periods in 2015.

Treat. No.	Proposed Irrigation Rate (in/day)				Actual Irrigation Amount (in)				
	Pre-plant	Reproduc			Pre-plant	Reproduc			Total
		Vegetative Period	tive Period	Maturation Period		Vegetative Period	tive Period	Maturation Period	
T0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
T2	0.1	0.0	0.2	0.2	0.0	0.0	1.4	1.0	2.4
T5	0.1	0.1	0.2	0.2	0.0	0.0	2.6	1.5	4.1
T6	0.1	0.2	0.2	0.2	0.0	0.0	2.6	1.4	4.0
T1	0.2	0.1	0.2	0.2	0.0	0.0	1.8	1.8	3.6
T3	0.2	0.0	0.2	0.2	0.0	0.0	1.4	0.9	2.2
T4	0.2	0.2	0.2	0.2	0.0	0.0	2.8	1.3	4.2

Table 2. Cotton yield, seasonal irrigation water use efficiency and fiber characteristics, and lint loan value of irrigation timing treatments, 2015.

Treat No	Yield (lb/ac)	SIWUE (lb/ac-in)	Mic	Length	Unif.	Streng.	Loan (\$/lb)
T0	590 b		3.7 a	1.09 b	80.9 a	30.6 a	0.5238 a
T1	804 a	66 b	3.2 b	1.12 a	78.7 a	31.0 a	0.5009 a
T2	817 a	114 a	3.1 b	1.12 a	78.9 a	30.0 a	0.5018 a
T3	834 a	119 a	3.2 b	1.13 a	79.0 a	30.3 a	0.5114 a
T4	766 a	48 b	3.1 b	1.13 a	79.2 a	30.3 a	0.4794 a
T5	764 a	48 b	3.2 b	1.12 a	78.8 a	30.1 a	0.4995 a
T6	829 a	66 b	3.3 b	1.13 a	78.9 a	30.5 a	0.5120 a

## Effects of Crop Rotation, Tillage, and Irrigation on Soil Aggregate Distribution (Field 5aef)

Katie Lewis, Dustin Kelley, Joseph Burke, and James Bordovsky

**Objective:** Evaluate the cumulative effects of crop rotation, tillage, and irrigation level on soil bulk density and aggregate formation.

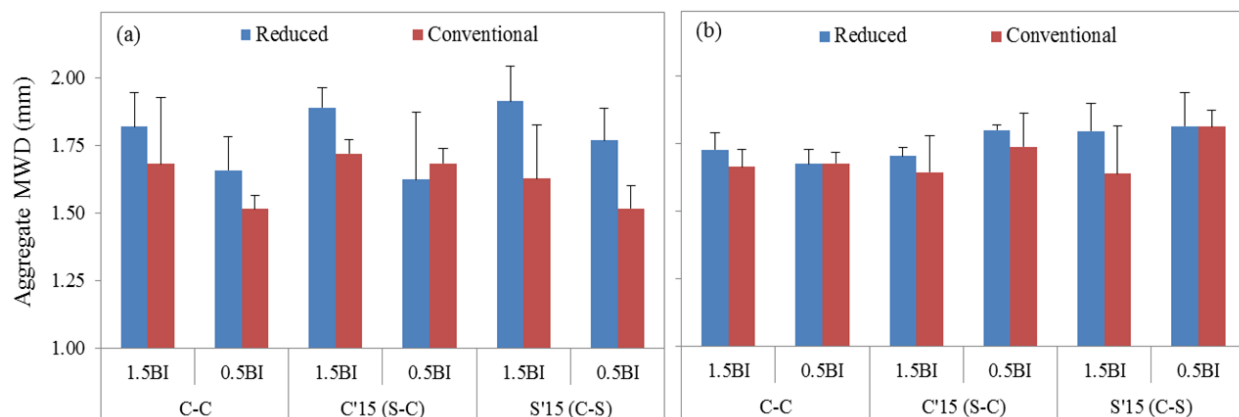


**Methodology:** Soil samples were collected at depth (0-6, 6-12, and 12-24 inches) in January 2016 from cropping systems (continuous cotton, sorghum following cotton, and cotton following sorghum) under reduced and conventional tillage and irrigation levels of 1.5\*base irrigation (BI) and 0.5\*BI. Soil samples were dried at 105°C for 72 hours. Dry weights were recorded. An aliquot (100 g) of each sample was separated into size fractions, including large macroaggregates (4 mm - 2

mm), small macroaggregates (2 mm - 0.25 mm), microaggregates (0.25 mm - 0.053 mm), and silt and clay (<0.053 mm). After sieving fraction weights were recorded and used to calculate aggregate mean weight diameter (MWD).

**Results:** The mean weight diameter is commonly used to express aggregate stability as it determines the size distribution of aggregates and is essentially a measure of macro-aggregate stability as affected by soil management practices. Within the 0-6" soil depth, MWD was generally greater under reduced tillage regardless of crop rotation or irrigation level (Fig. 1a). The lower irrigation level consistently resulted in smaller MWD. This is most likely due to less biomass produced both above- and below-ground and reduced microbial activity. Similar trends were observed at 6-12" (Fig. 1b); however, MWD differences between reduced and conventional tillage were not as great at the deeper soil depth.

Figure 1. Mean weight diameter (MWD) of soil aggregates as affected by crop rotation [continuous cotton (C-C), cotton following sorghum (C'15, S-C), and sorghum following cotton (S'15, C-S)], irrigation level (1.5BI and 0.5BI), and tillage (reduced and conventional) at soil depths of 0-6" (a) and 6-12" (b).



## The Effect of Crop Rotation, Irrigation Rate, and Tillage on Verticillium Wilt (Field 5acde)

Terry Wheeler, James Bordovsky, and Wayne Keeling, Texas A&M AgriLife Research

**Objective:** Evaluate the effects of crop rotations, irrigation levels, and tillage on Verticillium Wilt.

**Methodology:** A large scale cropping systems/irrigation project was initiated in 2001. Verticillium wilt was found at the test site in 2007 and has continued to impact cotton yield since then. For 13 years, part of the circle was involved with a 2-yr cotton and 1-yr sorghum rotation (CCS), and part of the circle was in continuous cotton (CCC). There were three irrigation rates, a base (medium rate), and 50% above and below this base rate. In 2010, some areas in CCC were placed in a cotton/sorghum rotation (CS). Starting in 2014 and continuing in 2015, a new cotton rotation system was initiated (wheat/fallow rotated with cotton, WC), and compared against CS and CCC, with and without a wheat cover. However, the original CCC area was rotated to sorghum due to its high disease levels and terrible cotton yields, and two “new” CCC areas were designated (they had previously been in long-term CCS, and had relatively low levels of Verticillium wilt compared to the previous CCC wedge). In addition, a tillage system comparison was initiated with conventional tillage and beds versus reduced tillage and flat ground. Each year, soil samples were taken in the winter to monitor *Verticillium dahliae* (the fungus that causes Verticillium wilt) spore levels in the soil, and wilt incidence was measured during the growing season.

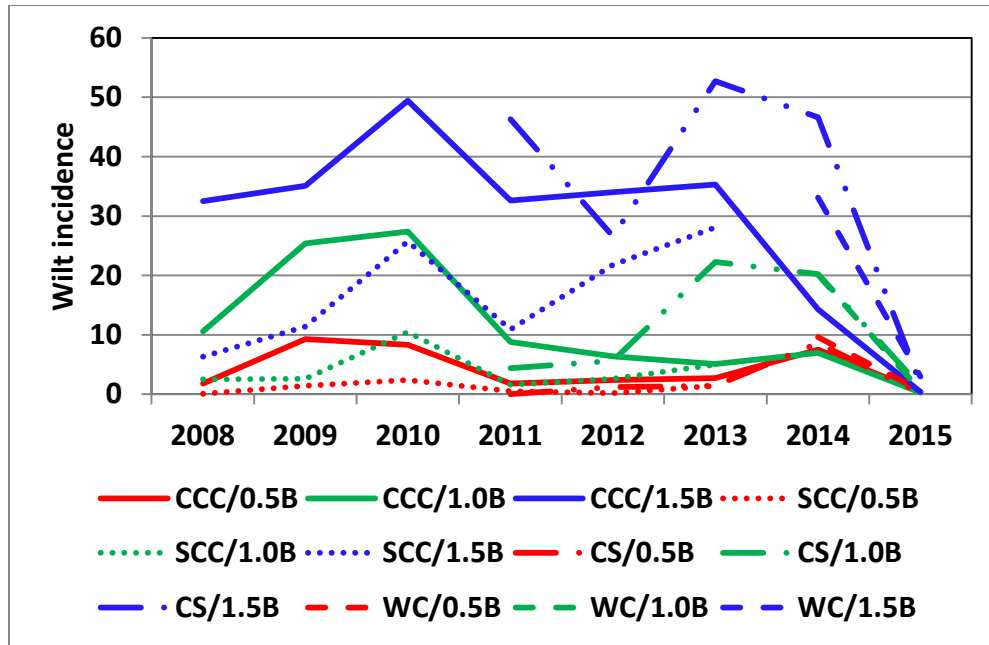
**Results:** There were moderate to high densities of *Verticillium dahliae* in the soil before planting in 2015, with the higher densities associated with the wedges that had originally been in a long-term cotton rotation (Table 1). However, Verticillium wilt was the lowest in all the years that it had been measured (Fig. 1). Though weather, particularly in August impacts how severe the disease is, it is not well understood why there was so little wilt in 2015. The temperature and soil moisture were not highly conducive for wilt, but they also weren't that limiting either. Figure 2 shows the temperature and moisture measured in various plots at the Helms field in 2014 (average wilt = 15%), and 2015 (average wilt = 1%).

Table 1. Effect of historic crop rotation on density of *Verticillium dahliae* microsclerotia (Ms).

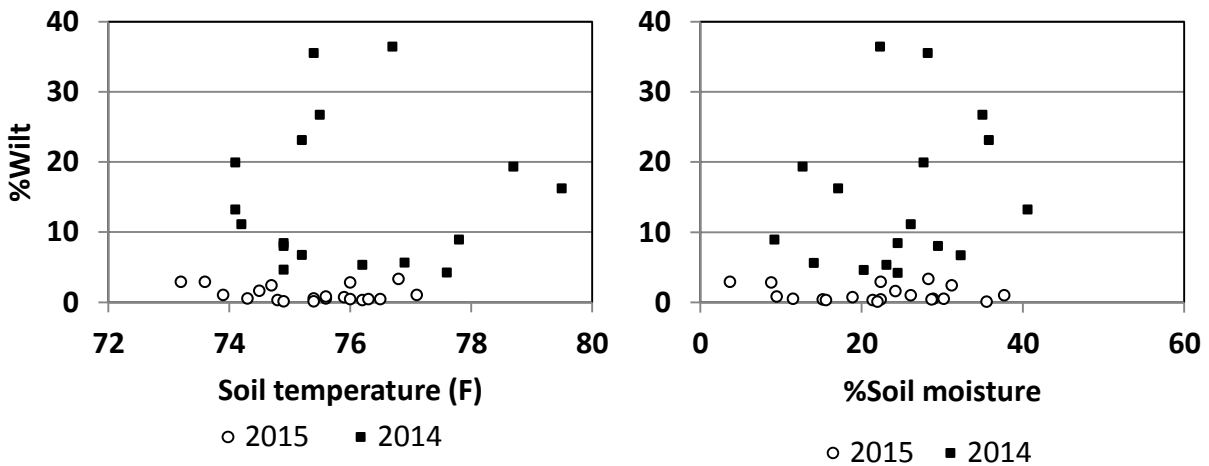
Wedge	MS/cm <sup>3</sup> soil	2014 crop	Rotation in 2010-2013	Rotation in 2001 - 2009
A	23 bc <sup>1</sup>	cotton	cotton/sorghum	cotton
B	14 cd	cotton	cotton/cotton/sorghum	cotton/cotton/sorghum
C	16 cd	wheat	cotton/cotton/sorghum	cotton/cotton/sorghum
D	12 d	cotton	cotton/cotton/sorghum	cotton/cotton/sorghum
E	58 a	sorghum	cotton	cotton
F	30 b	sorghum	cotton/sorghum	cotton

<sup>1</sup>Mean separation was for  $P=0.05$  and based on a square root transformation of microsclerotia density.





**Figure 1.** Incidence of Verticillium wilt from 2008 – 2015, as affected by crop rotation and irrigation rate. CCC=Continuous cotton, SCC = a Sorghum/Cotton/Cotton (3 year) rotation, CS = a Cotton/Sorghum (2 year) rotation, and WC = a Wheat/fallow/Cotton rotation. The irrigation rates were base (1.0B), and 50% above (1.5B) and 50% below (0.5B) the base rate. During the 2008 and 2009 growing seasons, the base rate targeted an evapotranspiration rate (ET) of 80% (when pumping capacity allowed), and from 2010 – 2015, 1.0B targeted a 60% ET.



## Continuous Cotton Response to Tillage and Irrigation Level (Field 5a)

James Bordovsky, Wayne Keeling, Casey Hardin and Joe Mustian

**Objective:** Determine yield and water productivity of continuous cotton at three irrigation levels under conventional and reduced tillage systems.

**Methodology:** These results are part of a comprehensive crop rotation-tillage-irrigation study being conducted on 125 acres irrigated by LEPA. In this 22-acre test area, continuous cotton has been grown since 2014. Two tillage systems, conventional tillage (in pivot spans 4, 6, and 8) and reduced tillage (in spans 3, 5, and 7), were used. Specific field operations for each tillage method are detailed in the attached appendix. In addition, each pivot span was divided into three sections with each section delivering one of three irrigation quantities (or levels) to the soil surface below. The irrigation levels were designate as base irrigation rate (1.0BI); 50% of base rate (0.5BI); and 150% of base rate (1.5BI). The pivot irrigation capacity at 1.0BI meets approximately 60% ET of cotton in years of average rainfall. Specific irrigations, cotton varieties, pesticides, and nutrient applications are listed in the appendix.



**Results:** 2015 annual rainfall exceed 36 inches, twice the long term average at this location. Cooler temperatures, blowing sand, and hail also occurred. Although cotton was not replanted, the crop was injured and developed slowly resulting in lower than average production and inconclusive results. Total seasonal irrigations were approximately 1.9, 3.6 and 5.3 inches in the three respective irrigation treatment areas of each pivot span. Cotton yields were greater ( $p < 0.05$ ) in the conventional than in the reduced tilled areas at the 0.5BI and 1.0BI irrigation levels (Figure 1). Conventionally tilled, irrigated yields were only slightly higher than non-irrigated yields. Fiber quality as reflected in the lint loan price resulted in no significant differences due to tillage treatments and generally declined with increased seasonal irrigation (Figure 2).

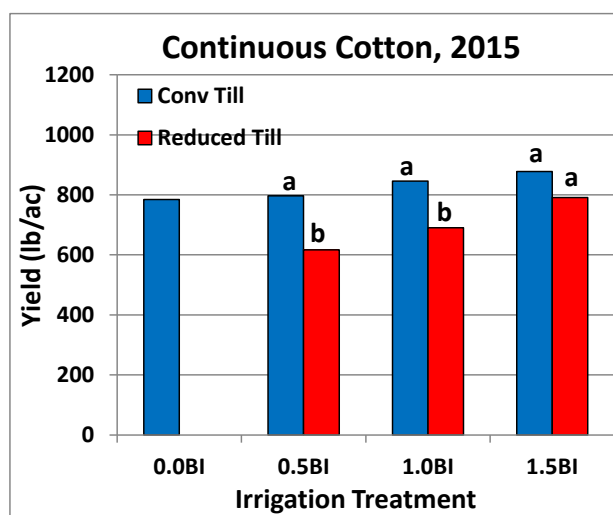


Figure 1. Cotton lint yield from areas of continuous cotton using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

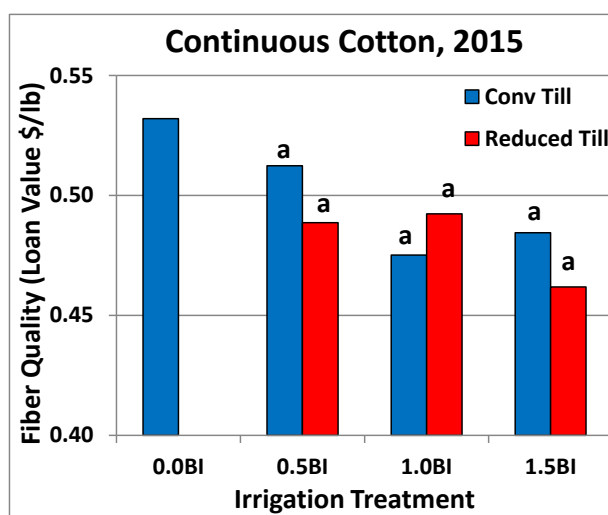


Figure 2. Lint loan values from cotton grown in areas of continuous cotton using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

## Cotton Following Wheat Grain Response to Tillage and Irrigation Levels (Field 5c)

James Bordovsky, Wayne Keeling, Casey Hardin and Joe Mustian

**Objective:** Determine yield and water productivity of cotton following a wheat/fallow period with cotton irrigated at three levels under conventional and reduced tillage systems.



**Methodology:** These results are part of a comprehensive crop rotation-tillage-irrigation study being conducted on 125 acres irrigated by LEPA. In this 22-acre test area, cotton has been planted (2015) following wheat harvested for grain and summer fallow period (2014). Two tillage systems, conventional tillage (in pivot spans 4, 6, and 8) and reduced tillage (in spans 3, 5, and 7), were used. Specific field operations for each tillage method are detailed in the attached appendix. In addition, each pivot span was divided into three sections with each section delivering

one of three irrigation quantities (or levels) to the soil surface below. The irrigation levels were designate as base irrigation rate (1.0BI); 50% of base rate (0.5BI); and 150% of base rate (1.5BI). The pivot irrigation capacity at 1.0BI meets approximately 60% ET of cotton in years of average rainfall. Specific irrigations, cotton varieties, pesticides, and nutrient applications are listed in the appendix.

**Results:** 2015 annual rainfall exceed 36 inches, twice the long term average at this location. Cooler temperatures, blowing sand, and hail also occurred. Although cotton was not replanted, the crop was injured and developed slowly resulting in lower than average production and inconclusive results. Total seasonal irrigations were approximately 1.8, 3.3 and 4.8 inches in the three respective irrigation treatment areas of each pivot span. Cotton yields were not significantly different ( $p < 0.05$ ) between conventional and reduced tilled systems at any irrigation level (Figure 1). Irrigated yields were only slightly higher than non-irrigated yields with little difference due to irrigation level. Fiber quality as reflected in the lint loan price resulted in no significant differences due to tillage treatments (Figure 2).

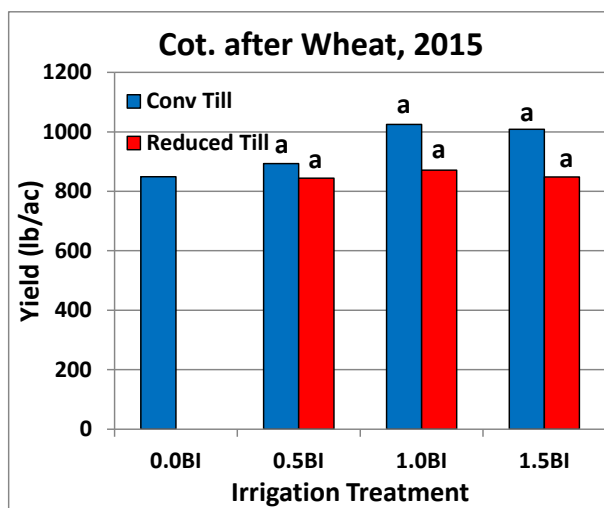


Figure 1. Cotton lint yield from areas of cotton following wheat and summer fallow using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

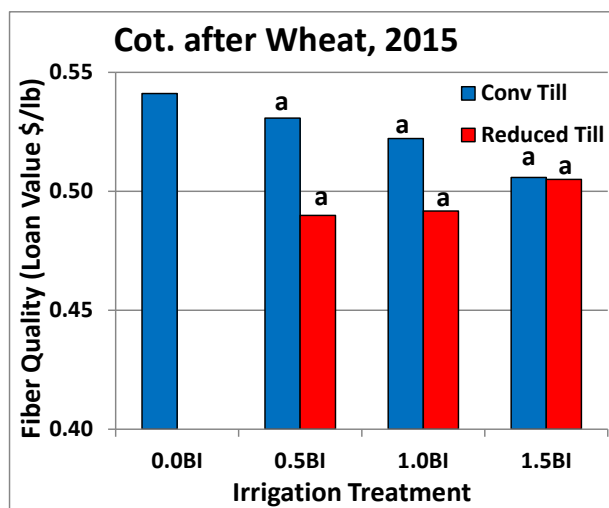


Figure 2. Lint loan values from cotton following wheat harvested for grain and summer fallow using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

## Cotton Planted into Terminated Wheat Response to Tillage and Irrigation Levels (Field 5d)

James Bordovsky, Wayne Keeling, Casey Hardin and Joe Mustian

**Objective:** Determine yield and water productivity of cotton planted into terminated wheat with cotton irrigated at three levels under conventional and reduced tillage systems.

**Methodology:** These results are part of a comprehensive crop rotation-tillage-irrigation study being conducted on 125 acres irrigated by LEPA. In this 22-acre test area, cotton was planted into terminated wheat in both 2014 and 2015. Two tillage systems, conventional tillage (in pivot spans 4, 6, and 8) and reduced tillage (in spans 3, 5, and 7), were used. Specific field operations for each tillage method are detailed in the attached appendix. In addition, each pivot span was divided into three sections with each section delivering one of three irrigation quantities (or levels)



to the soil surface below. The irrigation levels were designate as base irrigation rate (1.0BI); 50% of base rate (0.5BI); and 150% of base rate (1.5BI). The pivot irrigation capacity at 1.0BI meets approximately 60% ET of cotton in years of average rainfall. Specific irrigations, cotton varieties, pesticides, and nutrient applications for 2015 are listed in the appendix.

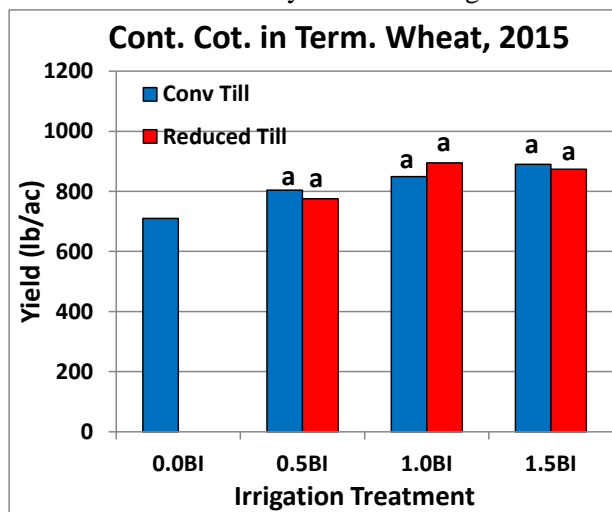


Figure 1. Cotton lint yield from areas of cotton following terminated wheat using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

treatment areas of each pivot span. Cotton yields were not significantly different ( $p < 0.05$ ) between conventional and reduced tilled systems at any irrigation level (Figure 1). Irrigated yields were no more than 100 lb/ac greater than non-irrigated, conventionally tilled treatment yields with differences due to irrigation levels ranging between 780 and 880 lb/ac. Fiber quality as reflected in the lint loan price resulted in no significant differences due to tillage treatments and consistently declined as seasonal irrigation levels increased (Figure 2).

**Results:** 2015 annual rainfall exceed 36 inches, twice the long term average at this location. Cooler temperatures, blowing sand, and hail also occurred. Although cotton was not replanted, the crop was injured and developed slowly resulting in lower than average production and inconclusive results. Total seasonal irrigations were approximately 1.9, 3.6 and 5.3 inches in the three respective irrigation

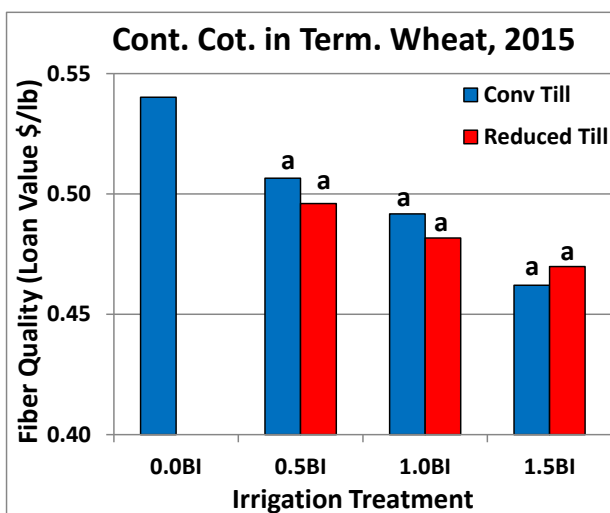


Figure 2. Lint loan values from cotton following terminated wheat using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.



## Cotton Following Sorghum Response to Tillage and Irrigation Levels (Field 5e)

James Bordovsky, Wayne Keeling, Casey Hardin and Joe Mustian

**Objective:** Determine yield and water productivity of cotton following grain sorghum in a two year rotation with cotton irrigated at three levels under conventional and reduced tillage systems.

**Methodology:** These results are part of a comprehensive crop rotation-tillage-irrigation study being conducted on 125 acres irrigated by LEPA. In this 22-acre test area, cotton was planted following grain sorghum in a two year rotation. Two tillage systems, conventional tillage (pivot spans 4, 6, and 8) and reduced tillage (spans 3, 5, and 7), were used. Specific

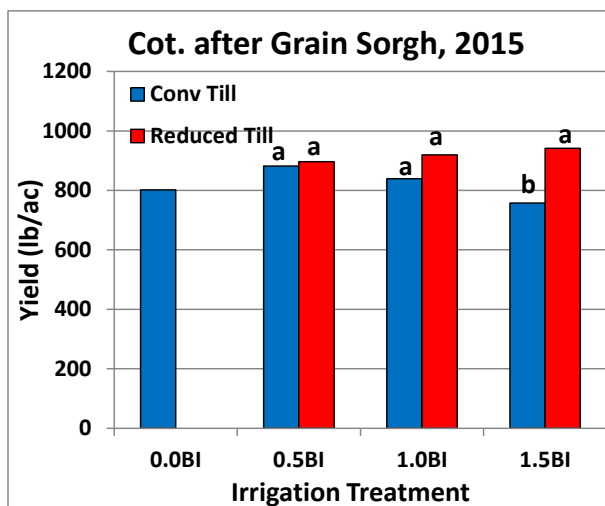


Figure 1. Cotton lint yield from areas of cotton following grain sorghum using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

field operations for each tillage method are detailed in the appendix. In addition, each pivot span was divided into three sections with each section delivering one of three irrigation quantities (or levels) to the soil surface below. The irrigation levels were designate as base irrigation rate (1.0BI); 50% of base rate (0.5BI); and 150% of base rate (1.5BI). The pivot irrigation capacity at 1.0BI typically meets 60% ET of cotton in years of average rainfall. Irrigation amounts, cotton varieties, pesticides, and nutrient applications for 2015 are listed in the appendix.

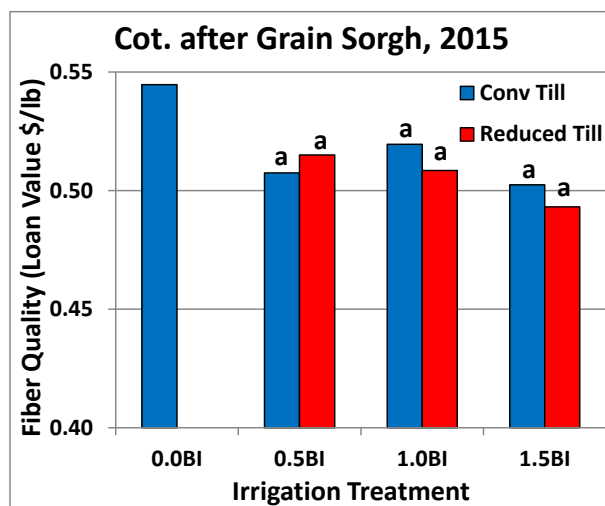


Figure 2. Lint loan values from cotton following grain sorghum using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

**Results:** 2015 annual rainfall exceed 36 inches, twice the long term average at this location. Cooler temperatures, blowing sand, and hail also occurred. Although cotton was not replanted, the crop was injured and developed slowly resulting in lower than average production and inconclusive results. Total seasonal irrigations were approximately 1.8, 3.4 and 4.9 inches in the three respective irrigation treatment areas of each pivot span. Cotton yields were numerically higher in the reduced tilled versus the conventionally tilled plots and were significantly higher ( $p < 0.05$ ) at the 1.5BI irrigation level (Figure 1). Most of the irrigated yields were only marginally higher than those in the non-irrigated, conventionally tilled treatment. Fiber quality, as reflected in the lint loan price, showed no significant difference due to tillage treatments in irrigated treatments and was consistently lower than that of the 0.0BI treatment (Figure 2).



## Grain Sorghum Following Cotton Response to Tillage and Irrigation Levels (Field 5f)

James Bordovsky, Wayne Keeling, Casey Hardin and Joe Mustian

**Objective:** Determine yield and water productivity of grain sorghum following cotton in a two year rotation with cotton irrigated at three levels under conventional and reduced tillage systems.



**Methodology:** These results are part of a comprehensive crop rotation-tillage-irrigation study being conducted on 125 acres irrigated by LEPA. In this 22-acre test area, grain sorghum was planted following cotton in a two year rotation. Two tillage systems, conventional tillage (pivot spans 4, 6, and 8) and reduced tillage (spans 3, 5, and 7), were used. Specific field operations for each tillage method are in the appendix. In addition, each pivot span was divided into three sections with each section delivering one of

three irrigation quantities (or levels) to the soil surface below. The irrigation levels were designate as the base irrigation rate (1.0BI); 50% of base rate (0.5BI); and 150% of base rate (1.5BI). The pivot irrigation capacity at 1.0BI typically meets 60% ET of grain sorghum in years of average rainfall. Irrigation amounts, sorghum hybrids, pesticides, and nutrient applications for 2015 are listed in the appendix.

**Results:** 2015 annual rainfall exceed 36 inches, twice the long term average at this location. Total seasonal irrigations were approximately 2.0, 4.0 and 6.2 inches in the three respective irrigation treatment areas of each pivot span. Sorghum yields for 2014 and 2015 are in Figures 1 and 2, respectively. Unlike 2014, the 2015 sorghum yields were higher in the reduced tilled versus the conventionally tilled plots in irrigation treatments of 1.0BI and 1.5BI. Non-irrigated yield in the conventionally tilled areas was high at 4200 lb/ac. Yields may have been impacted by infestations of sugar cane aphid which were sprayed twice in 2015. Tillage effects within this rotation will become more evident with time.

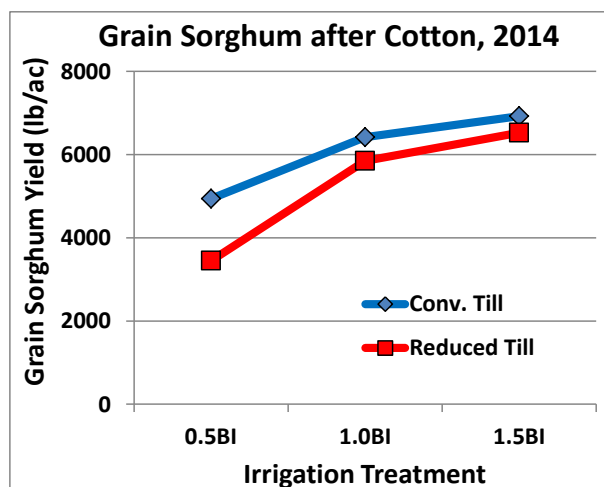


Figure 1. Grain sorghum yield from treatment areas following cotton using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2014.

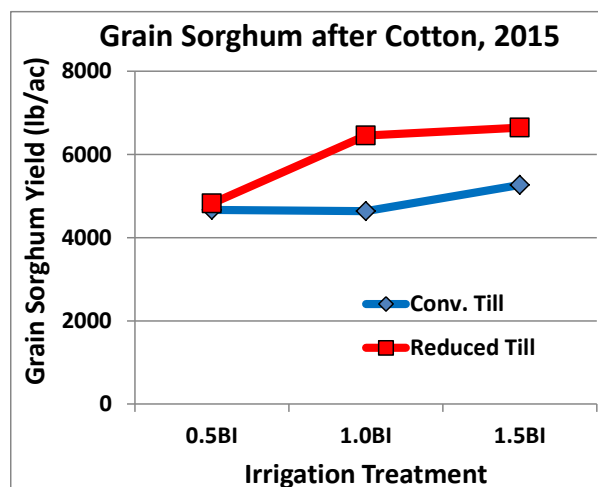


Figure 2. Grain sorghum yield from treatment areas following cotton using conventional and reduced tillage systems at three irrigation levels, Helm Farm 2015.

## Bayer Cotton Agronomic Performance Trial (Field 6)

Wayne Keeling, Martha Zwonitzer, Joel Webb, and Justin Spradley

**Objective:** Compare yield, fiber quality, and gross revenue as a function of Bayer CropScience experimental and commercial varieties and irrigation levels.

**Methodology:** Irrigations were at base (M), 1.5x base (H), and 0.5x base (L) levels. See appendix.

**Results:** Twelve FiberMax and Stoneville varieties including commercial and experimentals were planted under three levels of subsurface drip irrigation in 2015. Due to much above-average rainfall, in-season irrigation amounts were only 1.34, 1.95, and 2.59 "/A for the three irrigation levels, respectively. Excessive early-season rainfall resulted in less than ideal cotton stands, and slowed early-season growth. When averaged across varieties, yields ranged from 918 to 1346 lbs lint/A, with higher yields at each irrigation level. When averaged across irrigation level, yield differences were determined between varieties. The three experimentals produced yields similar to the highest yielding commercial variety. Irrigation level or variety did not affect loan value. Gross revenues increased with increased irrigation level, but was similar for all varieties, when averaged across irrigation level. Cotton lint yields, loan values, and gross revenues are summarized in Table 1.

Table 1. Effect of cultivar and irrigation level on cotton lint yield (lbs/A), loan value (cents/lb), and revenue (\$/A). Irrigation Levels

Cultivar	Low (1.34)	Base (1.95)	High (2.59)	Average
-----lbs/A-----				
ST 4747 GLB2	836	1074	1262	<b>1057 DE</b>
FM 2007 GLT	918	1035	1272	<b>1075 BCDE</b>
FM 1830 GLT	819	995	1391	<b>1068 CDE</b>
FM 1900 GLT	879	968	1287	<b>1045 E</b>
BX 1636 GLT	897	1079	1475	<b>1150 AB</b>
BX 1637 GLT	919	1095	1318	<b>1111 ABCDE</b>
FM 2334 GLT	889	979	1328	<b>1065 CDE</b>
FM 2322 GL	1000	1223	1324	<b>1182 A</b>
FM 2484 B2F	961	1096	1337	<b>1131 ABCD</b>
ST 4946 GLB2	1036	975	1430	<b>1147 AB</b>
FM 2011 GT	944	1101	1378	<b>1141 ABC</b>
FM 1911 GLT (BX 1635 GLT)	921	1136	1354	<b>1137 ABC</b>
	<b>918 C</b>	<b>1063 B</b>	<b>1346 A</b>	
-----cents/lb-----				
ST 4747 GLB2	54.26	58.95	56.03	<b>56.41 A</b>
FM 2007 GLT	56.25	53.67	56.74	<b>55.55 A</b>
FM 1830 GLT	56.95	56.49	56.68	<b>56.71 A</b>
FM 1900 GLT	56.73	58.32	57.00	<b>57.35 A</b>
BX 1636 GLT	56.62	56.75	55.36	<b>56.24 A</b>
BX 1637 GLT	55.92	55.41	54.56	<b>55.30 A</b>
FM 2334 GLT	56.82	54.60	56.88	<b>56.10 A</b>
FM 2322 GL	56.33	53.54	56.82	<b>55.57 A</b>
FM 2484 B2F	56.80	53.40	56.68	<b>55.63 A</b>
ST 4946 GLB2	56.01	57.25	56.72	<b>56.66 A</b>
FM 2011 GT	55.70	53.45	56.63	<b>55.25 A</b>
FM 1911 GLT (BX 1635 GLT)	55.59	57.73	56.62	<b>56.65 A</b>
	<b>56.16 A</b>	<b>55.80 A</b>	<b>56.39 A</b>	
-----\$/A-----				
ST 4747 GLB2	455	630	708	<b>597 A</b>
FM 2007 GLT	516	557	730	<b>601 A</b>
FM 1830 GLT	466	562	788	<b>605 A</b>
FM 1900 GLT	499	559	734	<b>597 A</b>
BX 1636 GLT	508	610	818	<b>645 A</b>
BX 1637 GLT	514	605	719	<b>613 A</b>
FM 2334 GLT	505	538	755	<b>599 A</b>
FM 2322 GL	564	632	752	<b>649 A</b>
FM 2484 B2F	546	588	758	<b>630 A</b>
ST 4946 GLB2	580	555	811	<b>649 A</b>
FM 2011 GT	527	591	780	<b>633 A</b>
FM 1911 GLT BX 1635 GLT)	512	652	767	<b>644 A</b>
	<b>516 C</b>	<b>590 B</b>	<b>760 A</b>	

## PhytoGen Variety Response to Irrigation Level (Field 6)

Wayne Keeling, Justin Spradley, Joel Webb, and Martha Zwonitzer

**Objective:** Compare yield, fiber quality, and gross revenue as a function of PhytoGen experimental and commercial varieties and irrigation levels.

**Methodology:** Irrigations were at base (M), 1.5x base (H), and 0.5x base (L) levels. See appendix.

**Results:** PhytoGen experimental and commercial varieties were evaluated under three irrigation levels. Due to above normal rainfall throughout the growing season, only limited amounts of irrigation were applied (1.34” – 2.59”/A in-season). When averaged across irrigation levels, yields ranged from 881 to 1229 lbs lint/A (Table 1). When averaged across varieties, yields for the twelve entries ranged from 920 – 1137 lbs lint/A. Irrigation level did not affect loan value, but increased irrigation increased total revenue (\$/A).

Table 1. Effect of cultivar and irrigation level on cotton lint yield (lbs/A), loan value (cents/lb), and revenue (\$/A).

Cultivar	Irrigation Levels			Average
	Low (1.34)	Base (1.95)	High (2.59)	
	----- lbs/A -----			
PHY 222 WRF	832	1089	1198	<b>1040 ABCDE</b>
PHY 312 WRF	886	1103	1328	<b>1105 AB</b>
PHY 333 WRF	886	993	1317	<b>1066 ABCD</b>
PHY 339 WRF	908	1115	1169	<b>1064 ABCD</b>
PHY 417 WRF	838	969	1161	<b>989 CDEF</b>
PHY 444 WRF	988	941	1334	<b>1087 ABC</b>
PHY 308 WRF (PX 2048-04)	789	890	1081	<b>920 F</b>
PHY 243 WRF (PX 2037-18)	967	992	1235	<b>1065 ABCD</b>
PHY 223 WRF (PX 2045-11)	818	928	1083	<b>943 EF</b>
PX 3003-04 WRF	818	940	1304	<b>1020 BCDE</b>
FM 2484 B2F	806	950	1204	<b>987 DEF</b>
FM 2011 GT	1042	1038	1332	<b>1137 A</b>
<b>Average</b>	<b>881 C</b>	<b>996 B</b>	<b>1229 A</b>	
	----- cents/lb -----			
PHY 222 WRF	50.21	52.06	49.88	<b>50.72 BCDE</b>
PHY 312 WRF	49.99	52.14	52.95	<b>51.69 BCD</b>
PHY 333 WRF	50.54	48.85	51.59	<b>50.33 CDE</b>
PHY 339 WRF	53.75	53.83	53.52	<b>53.70 A</b>
PHY 417 WRF	50.25	47.45	49.72	<b>49.14 E</b>
PHY 444 WRF	54.63	52.69	54.56	<b>53.96 A</b>
PHY 308 WRF (PX 2048-04)	50.08	47.78	52.51	<b>50.12 DE</b>
PHY 243 WRF (PX 2037-18)	51.18	49.82	52.76	<b>51.25 BCD</b>
PHY 223 WRF (PX 2045-11)	51.15	51.88	52.19	<b>51.74 BCD</b>
PX 3003-04 WRF	51.95	52.20	51.62	<b>51.93 BC</b>
FM 2484 B2F	52.38	51.44	53.16	<b>52.33 AB</b>
FM 2011 GT	52.79	49.34	49.99	<b>50.70 BCDE</b>
<b>Average</b>	<b>51.75 A</b>	<b>50.79 A</b>	<b>52.04 A</b>	
	----- \$/A -----			
PHY 222 WRF	417	567	597	<b>527 BCDE</b>
PHY 312 WRF	443	572	703	<b>572 AB</b>
PHY 333 WRF	448	485	686	<b>539 ABCD</b>
PHY 339 WRF	489	600	625	<b>571 AB</b>
PHY 417 WRF	421	460	575	<b>485 EF</b>
PHY 444 WRF	540	493	728	<b>587 A</b>
PHY 308 WRF (PX 2048-04)	395	425	565	<b>462 F</b>
PHY 243 WRF (PX 2037-18)	495	494	654	<b>548 ABC</b>
PHY 223 WRF (PX 2045-11)	419	482	566	<b>489 DEF</b>
PX 3003-04 WRF	425	490	672	<b>529 BCDE</b>
FM 2484 B2F	421	488	640	<b>516 CDE</b>
FM 2011 GT	549	511	665	<b>575 AB</b>
<b>Average</b>	<b>455 C</b>	<b>506 B</b>	<b>640 A</b>	

## Effect of Nitrogen Fertilizer On Cotton Fleahopper Damage Potential and Crop Response to Injury

M.N. Parajulee, A. Hakeem, C.K. Dhakal, S.D. Coyle, S.C. Carroll, J.P. Bordovsky

**Objective:** The objective was to evaluate the effect of nitrogen fertilizer application rates on cotton fleahopper damage potential and cotton's response to fleahopper injury.

**Methodology:** A high-yielding FiberMax cultivar, FM 9180B2F, was planted at a targeted rate of 54,000 seeds/acre on May 18, 2015. The experiment was a split-plot randomized block design with five nitrogen fertility rate treatments as main plot, two insect augmentation treatments as sub-plots, and five replications. The five main-plot treatments included pre-bloom side-dress applications of augmented nitrogen fertilizer rates of 0, 50, 100, 150, and 200 lbs N/acre using a soil applicator injection rig on July 16. Pre-treatment soil samples (consisting of three soil cores; 0 to 24-inch depth), were collected from each of the 25 experiment plots on June 26. Two 10-ft. sections of uniform cotton were flagged in the middle two rows of each 16-row main-plot that served as two insect treatment sub-plots. The sub-plot treatment included two cotton fleahopper treatments (5 adults per plant vs. no fleahopper as control), contained in multi-plant cages, within designated row sections applied to each of the five nitrogen rates two weeks into cotton squaring (July 21), the most critical phenological stage of cotton for fleahopper management in the Texas High Plains, to simulate an acute infestation of cotton fleahoppers. Crop growth and fruiting patterns were monitored during the crop season.

**Results:** Two weeks into squaring, experimental plants had approximately 9 squares per plant. Cotton fleahoppers induced ~25% square abscission across all N treatments (Fig. 1).

All N augmented plots had higher lint yields than on zero N plots, but the crop response to variation in N level was not well defined (Fig. 2). Combined over all N treatments, the acute infestation of fleahoppers rendered the lint yield reduction from 910 lb/acre in the control to 877 lb/acre in fleahopper plots. Lint yield was not significantly affected by ~25% fleahopper-induced square loss at both zero N and 200 lb/acre plots, either via pruning of undesirable fruit load (zero N) or compensation (200 lb N). On the other hand, lint yield was significantly lower in fleahopper augmented 100 lb/acre plots compared to that in uninfested plots, clearly suggesting that the plant response to cotton fleahopper injury is greatly influenced by the availability of nitrogen fertility.

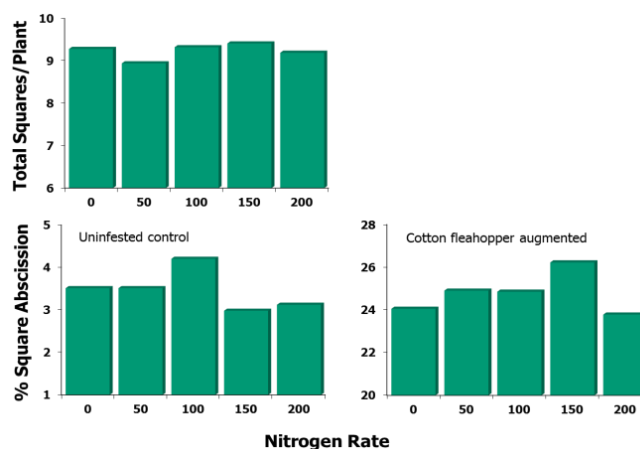


Fig. 1. Per plant square load at the time of cotton fleahopper augmentation (top panel) and percent square abscission (bottom panel) in control versus fleahopper augmented treatments, as influenced by variable rates of nitrogen application, 2015.

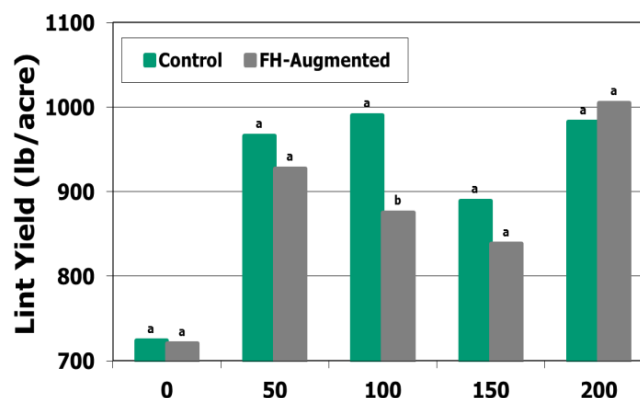


Fig. 2. Effect of nitrogen augmentation rates on lint yield following a single acute infestation of cotton fleahopper versus uninfested control, 2015.

## **APPENDIX**



**2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway**

Rainfall (inches)			Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																															
Date			Halfway @ Building	Helms @ Well 1	Field 2										Field 3							Field 5 - A span 2				Field 5 - B span 2				Field 5 - C span 2				
					Drip Irrigated Cotton										Drip Irrigated Cotton							Pivot Cotton	Pivot Cotton			Pivot Wheat	Pivot Wheat			Pivot Cotton				
					Zones										Zones																			
Mo	Da	Yr			1	2	3	4	5	6	7	8	9	10	system	1	2	3	4	5	6	7	system		Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system	
1	3	2015	0.31	0.44																														
1	21	2015	0.26	0.46																														
1	31	2015	0.68	0.71																														
		2015																																
		2015	0.02	0.02																														
		2015	0.09	0.09																														
2	23	2015	0.04	0.06																														
2	26	2015	0.05	0.07																														
2	27	2015	0.08	0.14																														
3	4	2015	0.10	0.13																														
3	19	2015	0.30	0.36																														
		2015																																
		2015																																
4	6	2015																										1.00	1.00	1.00	1.00	S	1.00	
4	8	2015																																
4	9	2015																																
4	10	2015																										1.00	1.00	1.00	1.00	S		
4	11	2015																																
4	12	2015																																
4	13	2015	0.89	0.80																														
4	14	2015																																
4	15	2015																																
4	16	2015	0.10	0.36																			0.50	0.50	0.50	0.50	S							
4	17	2015																																
4	18	2015				0.17		0.17					0.17		0.22		0.22	0.22					D											
4	19	2015															0.13	0.13	0.13				D											
4	20	2015				0.16		0.16					0.16		0.17		0.17	0.17					D											
4	21	2015				0.16		0.16					0.16		0.17		0.17	0.17					D					1.00	1.00	1.00	1.00	S		
4	22	2015	0.15	0.13		0.17		0.17					0.17		0.16		0.16	0.16					D	0.50	0.50	0.50	0.50	S						
4	23	2015				0.17		0.17					0.17		0.19		0.19	0.19					D											
4	24	2015				0.17		0.17					0.17		0.18		0.18	0.18					D											
4	25	2015				0.17		0.17					0.17		0.24		0.24	0.24					D											
4	26	2015	0.11	0.06											0.03		0.03	0.03					D											
4	27	2015	1.30	1.33		0.17		0.17					0.17		0.18		0.18	0.18					D											
4	28	2015				0.17		0.17					0.17		0.17		0.17	0.17					D											
4	29	2015				0.17		0.17					0.17		0.17		0.17	0.17					D											
4	30	2015				0.17		0.17					0.17		0.19		0.19	0.19					D											
5	1	2015				0.17		0.17					0.17		0.20		0.20	0.20					D					1.00	1.00	1.00	1.00	S		
5	2	2015				0.17		0.17					0.17		0.19		0.19	0.19					D											
5	3	2015				0.17		0.17					0.17		0.22		0.22	0.22					D											
5	4	2015																																
5	5	2015	2.61	2.64																														
5	6	2015																																
5	7	2015	0.54	0.76																														

**2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway**

Rainfall (inches)			Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																																
Date			Halfway @ Building Helms @ Well 1		Field 2										Field 3										Field 5 - A span 2 Field 5 - A spans 3-8				Field 5 - B span 2 Field 5 - B spans 3-8				Field 5 - C span 2		
					Drip Irrigated Cotton											Drip Irrigated Cotton										Pivot Cotton	Pivot Cotton			Pivot Wheat	Pivot Wheat			Pivot Cotton	
					Zones											Zones																			
Mo	Da	Yr			1	2	3	4	5	6	7	8	9	10	system	1	2	3	4	5	6	7	system		Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system		
5	8	2015	0.82	1.13																															
5	9	2015	0.22	0.31																															
5	10	2015																																	
5	11	2015																																	
5	12	2015																																	
5	13	2015	1.06	1.06																															
5	14	2015																																	
5	15	2015																																	
5	16	2015	0.82	0.46																															
5	17	2015																																	
5	18	2015																																	
5	19	2015	0.78	1.02																															
5	20	2015																																	
5	21	2015																																	
5	22	2015	0.29	0.34																															
5	23	2015																																	
5	24	2015																																	
5	25	2015																																	
5	26	2015																																	
5	27	2015	1.26	2.66																															
5	28	2015	0.16	0.16																															
5	29	2015	0.91	0.62																															
5	30	2015																																	
5	31	2015																																	
6	1	2015																																	
6	2	2015																																	
6	3	2015																																	
6	4	2015																															0.20		
6	5	2015																																	
6	6	2015																																	
6	7	2015																																	
6	8	2015	0.22	0.16																															
6	9	2015																																	
6	10	2015																																	
6	11	2015																																	
6	12	2015	0.75	0.75																															
6	13	2015	2.61	2.89																															
6	14	2015																																	
6	15	2015																																	
6	16	2015																																	
6	17	2015																																	
6	18	2015	0.52	0.47																															
6	19	2015	0.14	0.13																															
6	20	2015																																	

2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway

Rainfall (inches)			Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																																
Date			Halfway @ Building Helms @ Well 1		Field 2												Field 3									Field 5 - A span 2 Field 5 - A spans 3-8				Field 5 - B span 2 Field 5 - B spans 3-8		Field 5 - C span 2			
					Drip Irrigated Cotton												Drip Irrigated Cotton									Pivot Cotton Pivot Cotton				Pivot Wheat Pivot Wheat				Pivot Cotton	
					Zones												Zones																		
Mo	Da	Yr			1	2	3	4	5	6	7	8	9	10	system	1	2	3	4	5	6	7	system		Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system		
6	21	2015																																	
6	22	2015																																	
6	23	2015																																	
6	24	2015																																	
6	25	2015																																	
6	26	2015																																	
6	27	2015																																	
6	28	2015																																	
6	29	2015	0.60	0.43																															
6	30	2015																																	
7	1	2015																																	
7	2	2015																																	
7	3	2015	0.09	0.02																															
7	4	2015																																	
7	5	2015																																	
7	6	2015	0.41	0.38																															
7	7	2015	1.39	1.31																															
7	8	2015																																	
7	9	2015	1.01	0.90																															
7	10	2015	0.98	0.82																															
7	11	2015																																	
7	12	2015																																	
7	13	2015																																	
7	14	2015																																	
7	15	2015																																	
7	16	2015																																	
7	17	2015																																	
7	18	2015																																	
7	19	2015																																	
7	20	2015	1.18	0.87																															
7	21	2015																																	
7	22	2015																																	
7	23	2015																																	
7	24	2015																																	
7	25	2015																																	
7	26	2015																																	
7	27	2015																																	
7	28	2015																																	
7	29	2015																																	

**2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway**

Rainfall (inches)			Helms Irrigation Amounts (inches)														D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																									
			Halfway @ Building		Helms @ Well 1		Field 2								Field 3								Field 5 - A span 2				Field 5 - A spans 3-8				Field 5 - B span 2				Field 5 - B spans 3-8				Field 5 - C span 2			
Date							Drip Irrigated Cotton								Drip Irrigated Cotton								Pivot Cotton				Pivot Cotton				Pivot Wheat				Pivot Wheat				Pivot Cotton			
							Zones								Zones																											
Mo	Da	Yr			1	2	3	4	5	6	7	8	9	10	system	1	2	3	4	5	6	7	system		Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system									
8	4	2015			0.16	0.05	0.16	0.26	1.15	0.21	0.06	0.22	0.22		D	0.01	0.03	0.14	0.64	0.03	0.03		D																			
8	5	2015														0.06	0.06	0.06	0.13	1.10	0.13	0.05	D																			
8	6	2015							0.07	0.93	0.83	0.45			D		0.13	0.01			0.52		D	0.45	0.30	0.15	0.45	L						0.45								
8	7	2015											1.03		D	1.04	0.55	0.30					D	0.45	0.30	0.15	0.45	L														
8	8	2015														0.20			0.45		0.43		D	0.45	0.30	0.15	0.45	L						0.45								
8	9	2015	0.12	0.48	0.90	0.95	0.08								D				0.76	0.27	0.12		D										0.45									
8	10	2015					0.86	0.40				0.82			D				0.60	0.60			D	0.45	0.30	0.15	0.45	L						0.45								
8	11	2015						0.50	1.04	0.25					D		0.24		0.18	0.50	0.25		D																			
8	12	2015							0.75	0.45					D		0.35	0.14			0.54		D	0.45	0.30	0.15	0.45	L						0.45								
8	13	2015								0.97	0.53				D			0.23			0.03		D	0.45	0.30	0.15	0.45	L						0.45								
8	14	2015									0.07	0.97			D	0.44		0.43			0.45		D																			
8	15	2015														0.61			0.56	0.06	0.23		D																			
8	16	2015	0.25	0.30			0.81	0.02								0.22			0.77	0.21			D																			
8	17	2015			1.09		0.80	0.39				0.41			D					0.71			D	0.45	0.30	0.15	0.45	L														
8	18	2015						0.49	0.77	0.34					D		0.03	0.03		0.53	0.23		D										0.45									
8	19	2015	0.10	0.05				0.17		0.54	0.71	0.20			D		0.42	0.32			0.43		D	0.45	0.30	0.15	0.45	L					0.45									
8	20	2015										0.31	0.43		D	0.11	0.20	0.28			0.51		D	0.45	0.30	0.15	0.45	L					0.45									
8	21	2015	0.21	0.64		0.14							0.18		D	0.80	0.32	0.25					D																			
8	22	2015														0.05					0.01		D																			
8	23	2015																																								
8	24	2015			0.35	0.96	0.98	0.16							D																											
8	25	2015			0.56		0.02	0.72							D									0.30	0.20	0.10	0.30	L														
8	26	2015																															0.30									
8	27	2015																					0.30	0.20	0.10	0.30	L						0.30									
8	28	2015	2.21	2.19																			0.30	0.20	0.10	0.30	L						0.30									
8	29	2015																																								
8	30	2015																																								
8	31	2015																																								
9	1	2015																																								
9	2	2015																																								
9	3	2015																																								
9	4	2015																																								
9	23	2015	0.23	0.25																																						
9	24	2015	0.31	0.42																																						
10	5	2015	1.10	0.90																																						
10	8	2015	1.00	1.25																																						
10	20	2015	1.50	1.35																																						
10	21	2015	1.61	1.54																																						
10	22	2015	0.69	0.66																																						
Pre & At Plant			13.95	16.32	0.00	0.00	2.19	0.00	2.19	0.00	0.00	0.00	2.19	0.00		2.42	0.00	2.42	2.42	0.00	0.00	0.00		1.00	1.00	1.00	1.00						1.00									
Seasonal			19.76	20.09	3.11	2.94	3.09	3.09	3.02	3.02	3.01	3.02	2.83	0.00		3.56	2.37	2.24	4.16	4.08	3.96	0.05		5.40	3.60	1.95	5.25	4.00	4.00	4.00	4.00		4.95									
TOTALS			33.71	36.41	3.11	2.94	5.28	3.09	5.21	3.02	3.01	3.02	5.02	0.00		5.98	2.37	4.66	6.58	4.08	3.96	0.05		6.40	4.60	2.95	6.25	4.00	4.00	4.00	4.00		5.95									

**2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway**

Rainfall (inches)						Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA Irrigation, S = spray irrigation, F= furrow water																						
Date			Halfway @ Building	Helms @ Well 1	Field 5 - C spans 3-8				Field 5 - D span 2	Field 5 - D spans 3-8	Field 5 - E span 2				Field 5 - E spans 3-8	Field 5 - F span 2				Field 5 - F spans 3-8	Field 6 - A	Field 6 - B	Field 6 - C	Field 6 - D	Field 6 - E	Field 6 - F	Field 6 - G	Field 6 - H
					Pivot Cotton				Pivot Cotton	Pivot Cotton			Pivot Cotton	Pivot Cotton			Pivot Sorgh	Pivot Sorgh			Drip Cotton	Drip Cotton	Drip Cotton	Drip Cotton	Drip Cotton	Drip Fallow	Drip Cotton	Drip Cotton
Mo	Da	Yr			Base	Base - 50%	Base + 50%			Base	Base - 50%	Base + 50%		Base	Base- 50%	Base+ 50%		Base	Base- 50%	Base+ 50%								
1	3	2015	0.31	0.44																								
1	21	2015	0.26	0.46																								
1	31	2015	0.68	0.71																								
		2015																										
		2015	0.02	0.02																								
		2015	0.09	0.09																								
2	23	2015	0.04	0.08																								
2	26	2015	0.05	0.07																								
2	27	2015	0.08	0.14																								
3	4	2015	0.10	0.13																								
3	19	2015	0.30	0.36																								
		2015																										
		2015																										
4	6	2015			1.00	1.00	1.00	S																				
4	8	2015																										
4	9	2015																										
4	10	2015																										
4	11	2015																										
4	12	2015				1.00	1.00	1.00	1.00	S																		
4	13	2015	0.89	0.80						1.00	1.00	1.00	1.00	S														
4	14	2015																										
4	15	2015													1.00	1.00	1.00	1.00	S									
4	16	2015	0.10	0.36																								
4	17	2015																										
4	18	2015																								0.44	0.56	D
4	19	2015																								0.56	0.36	D
4	20	2015																								0.49	0.40	D
4	21	2015																				0.05	0.04	0.03	0.04			
4	22	2015	0.15	0.13																		0.34	0.15	0.25	0.32	0.32		D
4	23	2015																				0.32	0.47	0.33	0.31	0.32		D
4	24	2015																				0.32	0.33	0.30	0.31	0.31		D
4	25	2015																				0.32	0.45	0.46	0.34	0.32		D
4	26	2015	0.11	0.06																								
4	27	2015	1.30	1.33																		0.32	0.43	0.51	0.41	0.31		D
4	28	2015																										
4	29	2015																								0.93	0.90	D
4	30	2015																								0.58	0.56	D
5	1	2015																								0.61	0.56	D
5	2	2015																								0.53	0.57	D
5	3	2015																								0.52	0.72	D
5	4	2015																										
5	5	2015	2.61	2.64																								
5	6	2015																										
5	7	2015	0.54	0.76																								



2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway

Rainfall (inches)				Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																							
Date				Halfway @ Building	Helms @ Well 1	Field 5 - C spans 3-8			Field 5 - D span 2	Field 5 - D spans 3-8	Field 5 E span 2			Field 5 - E spans 3-8	Field 5 - F span 2	Field 5 - F spans 3-8	Field 6 A	Field 6 B	Field 6 C	Field 6 D	Field 6 E	Field 6 F	Field 6 G	Field 6 H			
Mo	Da	Yr			Pivot				Pivot	Pivot			Pivot	Pivot			Pivot	Pivot			Drip	Drip	Drip	Drip	Drip	Drip	Drip
					Cotton				Cotton	Cotton			Cotton	Cotton			Sorgh	Sorgh			Cotton	Cotton	Cotton	Cotton	Cotton	Fallow	Cotton
					Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system		Base	Base- 50%	Base+	system		Base	Base- 50%	Base+	system				
5	8	2015	0.82	1.13																							
5	9	2015	0.22	0.31																							
5	10	2015																									
5	11	2015																									
5	12	2015																									
5	13	2015	1.06	1.06																							
5	14	2015																									
5	15	2015																									
5	16	2015	0.82	0.46																							
5	17	2015																									
5	18	2015																									
5	19	2015	0.78	1.02																							
5	20	2015																									
5	21	2015																									
5	22	2015	0.29	0.34																							
5	23	2015																									
5	24	2015																									
5	25	2015																									
5	26	2015																									
5	27	2015	1.26	2.66																							
5	28	2015	0.16	0.16																							
5	29	2015	0.91	0.62																							
5	30	2015																									
5	31	2015																									
6	1	2015																									
6	2	2015																									
6	3	2015																									
6	4	2015			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									
6	5	2015																									
6	6	2015												0.20	0.20	0.20	0.20	S	0.25	0.25	0.25	0.25	S				
6	7	2015																									
6	8	2015	0.22	0.16																							
6	9	2015																									
6	10	2015																									
6	11	2015																									
6	12	2015	0.75	0.75																							
6	13	2015	2.61	2.89																							
6	14	2015																									
6	15	2015																									
6	16	2015																									
6	17	2015																									
6	18	2015	0.52	0.47																							
6	19	2015	0.14	0.13																							
6	20	2015																									

2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway

Rainfall (inches)			Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																								
Date			Halfway @ Building	Helms @ Well 1	Field 5 - C spans 3-8			Field 5 - D span 2	Field 5 - D spans 3-8			Field 5 - E span 2	Field 5 - E spans 3-8			Field 5 - F span 2	Field 5 - F spans 3-8			Field 6 - A	Field 6 - B	Field 6 - C	Field 6 - D	Field 6 - E	Field 6 - F	Field 6 - G	Field 6 - H
					Pivot			Pivot	Pivot			Pivot	Pivot			Pivot	Pivot			Drip	Drip	Drip	Drip	Drip	Drip	Drip	Drip
					Cotton			Cotton	Cotton			Cotton	Cotton			Sorgh	Sorgh			Cotton	Cotton	Cotton	Cotton	Cotton	Fallow	Cotton	Cotton
Mo	Da	Yr			Base	Base - 50%	Base + 50%	system		Base	Base - 50%	Base + 50%	system		Base	Base- 50%	Base+ 50%	system		Base	Base- 50%	Base+ 50%	system				system
6	21	2015																									
6	22	2015																									
6	23	2015																									
6	24	2015																									
6	25	2015																									
6	26	2015																									
6	27	2015																									
6	28	2015																									
6	29	2015	0.60	0.43																							
6	30	2015																									
7	1	2015																									
7	2	2015																									
7	3	2015	0.09	0.02																							
7	4	2015																									
7	5	2015																									
7	6	2015	0.41	0.38																							
7	7	2015	1.39	1.31																							
7	8	2015																									
7	9	2015	1.01	0.90																							
7	10	2015	0.98	0.82																							
7	11	2015																									
7	12	2015																									
7	13	2015																									
7	14	2015																									
7	15	2015																									
7	16	2015																									
7	17	2015																									
7	18	2015																									
7	19	2015																									
7	20	2015	1.18	0.87																							
7	21	2015																									
7	22	2015																									
7	23	2015																									
7	24	2015																									
7	25	2015																									
7	26	2015																									
7	27	2015																									
7	28	2015																									
7	29	2015																									
7	30	2015							0.45	0.30	0.30	0.30	S	0.45	0.30	0.30	0.30	S									
7	31	2015	0.04	0.04	0.30	0.30	0.30	S																			
8	1	2015																									
8	2	2015																									
8	3	2015	0.49	0.89																							

**2015 Rain and Irrigation Amounts At Helm Research Farm, Halfway**

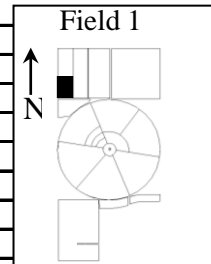
Rainfall (inches)				Helms Irrigation Amounts (inches) D= drip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water																											
Date				Halfway @ Building Helms @ Well 1		Field 5 - C spans 3-8			Field 5 - D span 2	Field 5 - D spans 3-8			Field 5 - E span 2	Field 5 - E spans 3-8			Field 5 - F span 2	Field 5 - F spans 3-8			Field 6 A	Field 6 B	Field 6 C	Field 6 D	Field 6 E	Field 6 F	Field 6 G	Field 6 H			
						Pivot			Pivot	Pivot			Pivot	Pivot			Pivot	Pivot			Drip	Drip	Drip	Drip	Drip	Drip	Drip	Drip	Drip		
						Cotton			Cotton	Cotton			Cotton	Cotton			Sorgh	Sorgh			Cotton	Cotton	Cotton	Cotton	Cotton	Fallow	Cotton	Cotton			
Mo	Da	Yr			Base	Base - 50%	Base + 50%		Base	Base - 50%	Base + 50%		Base	Base - 50%	Base + 50%		Base	Base - 50%	Base + 50%												
8	4	2015																													
8	5	2015															0.59	0.39	0.20	0.78	L	0.02	0.08					0.01	0.01		
8	6	2015			0.30	0.15	0.45	L													0.01		0.11	0.35	0.07		0.02	0.09	D		
8	7	2015							0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.14		0.14	0.08	0.12	0.12	D	
8	8	2015			0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.17	0.18	0.12	0.25	0.09	0.07	0.08	D
8	9	2015	0.12	0.48	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L		0.17	0.17	0.11	0.24	0.08		0.07	0.07	D			
8	10	2015															0.45	0.30	0.15	0.45	L	0.16	0.17	0.13	0.25	0.08		0.08	0.07	D	
8	11	2015							0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.17	0.17	0.34	0.28	0.08	0.07	0.08	D
8	12	2015			0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.17	0.15	0.03	0.22	0.08	0.07	0.07	D
8	13	2015			0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L		0.17	0.21	0.16	0.26	0.08		0.07	0.08	D			
8	14	2015																		0.12		0.13	0.24	0.08		0.07	0.08	D			
8	15	2015																					0.30	0.04					D		
8	16	2015	0.25	0.30																0.18	0.18	0.02	0.07	0.08		0.08	0.08	D			
8	17	2015															0.45	0.30	0.15	0.45	L	0.17	0.17	0.20	0.25	0.08		0.08	0.07	D	
8	18	2015			0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.17	0.18	0.17	0.26	0.09	0.07	0.08	D
8	19	2015	0.10	0.05	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L		0.17	0.18	0.10	0.26	0.09		0.07	0.08	D			
8	20	2015			0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.45	0.30	0.15	0.45	L	0.17	0.16	0.15	0.24	0.08	0.37	0.07	D
8	21	2015	0.21	0.64																	0.02	0.18	0.23	0.08		0.04	0.05	D			
8	22	2015																									0.37		D		
8	23	2015																													
8	24	2015																													
8	25	2015															0.30	0.20	0.10	0.30	L										
8	26	2015			0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L													
8	27	2015			0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L		0.30	0.20	0.10	0.30	L												
8	28	2015	2.21	2.19	0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L	0.30	0.20	0.10	0.30	L								
8	29	2015																													
8	30	2015																													
8	31	2015																													
9	1	2015																													
9	2	2015																													
9	3	2015															0.60	0.40	0.20	0.60	L										
9	4	2015															0.30	0.20	0.10	0.30	L										
9	23	2015	0.23	0.25																											
9	24	2015	0.31	0.42																											
10	5	2015	1.10	0.90																											
10	8	2015	1.00	1.25																											
10	20	2015	1.50	1.35																											
10	21	2015	1.61	1.54																											
10	22	2015	0.69	0.66																											
Pre & At Plant				13.95	16.32	1.00	1.00	1.00	1.00	1.00	#	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	#	1.62	1.88	1.89	1.72	1.62	0.00	4.66	4.63		
Seasonal				19.76	20.09	3.30	1.80	4.80	5.40	3.60	1.95	5.25	5.10	3.40	1.85	4.95	5.99	3.99	2.00	6.18	2.16	2.02	1.95	3.84	1.26	0.00	1.71	1.18			
TOTALS				33.71	36.41	4.30	2.80	5.80	6.40	4.60	2.95	6.25	6.10	4.40	2.85	5.95	6.99	4.99	3.00	7.18	3.78	3.90	3.84	5.56	2.88	0.00	6.37	5.81			

## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 1	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	11/18/2014	Shred F.1 South
	12/8/2014	Shred F.1 North
	12/22/2014	Disk 2 Trips F.1 North
	3/16/2015	List on 30" F.1 North
	5/11/2015	Rotary Hoe F.1 North
	5/24/2015	Rotary Hoe F.1 North
	6/12/2015	Cultivate F.1 North
	10/29/2015	Shred F.1 South
Fertility	4/9/2015	32-0-0 57.7 gal/ac North applied thru coulter rig
	4/9/2015	10-34-0 20.8 gal/ac North applied thru coulter rig
	6/8/2015	32-0-0 28.33 gal/ac North applied thru coulter rig
Planting	11/19/2014	VNS 45 lbs/ac cover crop F.1 South
	5/1/2015	Mixed Varieties of corn Dr. Xu's Plots F.1 North
	5/12/2015	FiberMax 2011 GT 56,000 seed/ac planted into cover crop F.1 South
	6/2/2015	DeltaPine 1219 B2RF 54,129 seeds/ac Replant F.1 South
Herbicide/Growth Regulator	4/2/2015	Makaze 48 oz/ac F.1 South
	5/1/2015	Atrazine 2.5 pt/ac Warrant 3 pt/ac Makaze 32 oz/ac F.1 North
	5/12/2015	Cotton Pro 3 pt/ac Warrant 3 pt/ac F.1 South
	6/5/2015	Fusilade 12 oz/ac Makaze 32 oz/ac F.1 South
	6/11/2015	Warrant 3 pt/ac Atrazine 1pt/ac F.1 North
	6/26/2015	Makaze 32 oz/ac Maximizer 1% F.1 South
	7/2/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1% F.1 South
	7/31/2015	Pentia 16 oz/ac F.1 South
	8/14/2015	Pentia 16 oz/ac F.1 South
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1% F.1 South
	10/29/2015	Helm Quat 1qt/ac Maximizer 1% F.1 South
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting		
Seasonal		

Field 1

↑ N

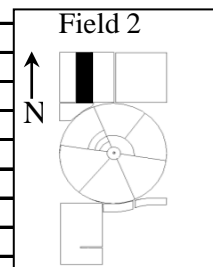


## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 2	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	12/8/2014	Shred
	2/10/2015	Disk
	2/12/2015	Field Cultivator
	3/30/2015	List on 60"
	4/30/2015	Rotary Hoe
	5/11/2015	Rotary Hoe
	5/18/2015	Rotary Hoe
	5/24/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/12/2015	Cultivate
	6/15/2015	Rotary Hoe
	6/26/2015	Cultivate
	7/15/2015	Cultivate (Red Bar)
Fertility	7/20/2015	Cultivate and Dike
	4/7/2015	32-0-0/10-34-0 25 gal/ac applied thru coulter rig
	4/20/2015	32-0-0 22.3 gal/ac applied thru coulter rig
	4/20/2015	Zinic 9 gal/ac applied through coulter rig
	8/4/2015	17.8 lbs of N/ac (32-0-0) for Zones 1,3,5,6,8,9 ( Injected into drip lines )
Planting	5/11/2015	NexGin 1511 B2RF 73,181 seeds/ac
	6/2/2015	DeltaPine 1219 B2RF 54,129 seeds/ac Replant
Herbicide/Growth Regulator	1/12/2015	Trifluralin HF 1qt/ac
	5/4/2015	Makaze 32 oz/ac
	5/11/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	7/1/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/28/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/18 to 5/3	Trt. 1 2.36 in.; Trt. 2 0.00 in.; Trt. 3 0.00 in.; Dry 0.00 in.
Seasonal	8/3 to 8/25	Avg. for Zones 1-9 = 3.01 in.; Dry = 0.00 in.
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.

Field 2

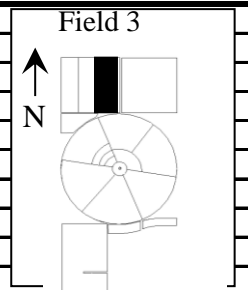
The diagram shows a circular field labeled 'Field 2'. A north arrow points upwards. A black vertical bar is located on the left side of the field. A circular track with a center point and radial lines is also shown, with a small rectangular box at the bottom right of the field.





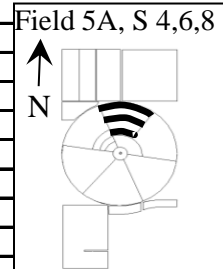
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 3	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	2/10/2015	Field Cultivator
	2/12/2015	Field Cultivator
	3/30/2015	List on 60"
	4/30/2015	Rotary Hoe
	5/11/2015	Rotary Hoe
	5/18/2015	Rotary Hoe
	5/24/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/26/2015	Cultivate
	7/23/2015	Cultivate and Dike
Fertility	4/17/2015	32-0-0/10-34-0 24.5 gal/ac applied thru coulter rig
	4/20/2015	32-0-0 10 gal/ac Applied through coulter rig
	8/5-7/15	17.8 lbs of N/ac (32-0-0) for all Zones ( Injected into drip lines )
Planting	5/11/2015	NexGin 1511 B2RF at 54,139 seed/ac West 16 Rows 73,181 seeds/ac
	6/2/2015	DeltaPine 1219 B2RF 54,129 Replant
Herbicide/Growth Regulator	1/12/2015	Trifluralin HF 1qt/ac
	5/4/2015	Makaze 32 oz/ac
	5/11/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	7/1/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/28/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/18 to 5/3	Zones 1,3,4 2.64 in ; Zones 2,5,6 0.00 in ; Border 0.00 in
Seasonal	8/3 to 8/22	1 = 3.56 in.; 2 = 2.37 in.; 3 = 2.24 in.; 4 = 4.16 in.; 5 = 4.08 in.; 6 = 3.96 in.; 7 = 0.05 in.
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.



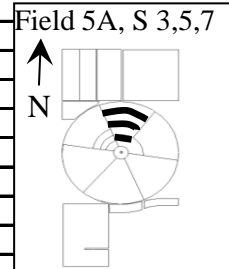
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5a Span 2,4,6,8	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	12/17/2014	Shred
	3/13/2015	StripTill
	3/16/2015	Field Cultivator
	3/24/2015	Field Cultivator
	3/26/2015	List on 30"
	4/10/2015	Dike
	5/2/2015	Rotary Hoe
	5/12/2015	Rotary Hoe Span 8 Only
	5/25/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
	6/25/2015	Cultivate
	6/27/2015	Cultivate and Dike
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/27/2015	32-0-0 14.37 High & Med. Water applied thru coulter rig
Planting	5/25/2015	FiberMax 2484B2F 54,129 seeds/ac
Herbicide/Growth Regulator	3/23/2015	Trifluralin HF 1pt/ac
	5/25/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/18/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	1/28/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/16 to 4/22	1.00 in Span 2 Only
	4/16 to 4/22	Base 1.00 in; Base -50% 1.00 in; Base +50% 1.00 in; Dry 1.00 in. Span 4,6,8 Only
Seasonal	7/31 to 8/27	3.60 in. Span 2 Only
	7/31 to 8/27	Base 3.60 in; Base -50% 1.95 in; Base+50% 5.25 in.; Dry 0.00 in. span 4,6,8 Only
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.



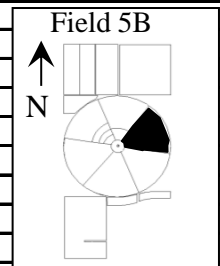
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5a Spans 3,5,7	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	5/12/2015	Rotary Hoe Span 7 Only
	6/4/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/27/2015	32-0-0 14.37 High & Med. Water applied thru coulter rig
Planting	5/25/2015	FiberMax 2484B2F 54,129 seeds/ac
Herbicide/Growth Regulator	3/26/2015	Salvo 1 pt/ac
	4/10/2015	Stealth 3 pt/ac
	5/25/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/18/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/28/2015	Helm Quat 1 pt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal		
	4/16 to 4/22	Base 1.00 in; Base -50% 1.00 in; Base +50% 1.00 in; Dry 1.00 in.
	7/31 to 8/27	Base 3.60 in; Base -50% 1.95 in; Base+50% 5.25 in.; Dry 0.00 in.
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.



## Operations Summary

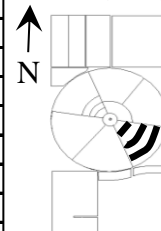
Year	2015	
Farm	Helm	
Field ID	Field 5b	
Exp. Design	Wheat	
Soil Type		
Field Operations	Date	Activity
Tillage		
Fertility	4/6/2015	32-0-0 16 gal/ac applied though coulter rig
Planting	11/26/2014	TAM 111 80 lbs/ac Yield
Herbicide/Growth Regulator	3/26/2015	Salvo 1 pt/ac
	8/14/2015	Salvo 1 pt/ac Makaze 32oz/ac Maximizer 1%
	10/15/2015	Makaze 32 oz/ac
Insecticide		
Harvest aid		
Irrigation Amt. PrePlant & Planting Seasonal		
	4/6 to 5/1	4.00 in.
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5c (Span 3,5,7)	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	9/5/2014	Strip Till
	6/1/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	5/26/2015	FiberMax 2484B2F 54,129 seeds/ac
	11/24/2015	TAM 111 80 lbs/ac Yield
Herbicide/Growth Regulator	3/26/2015	Salvo 1 pt/ac
	4/10/2015	Stealth 3 pt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/26/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/6/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in.
Seasonal	6/5 to 8/28	Base 3.30 in.; Base-50% 1.80 in.; Base+50% 4.80 in.; Dry 0.00 in.
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.

Field 5C, S 3,5,7

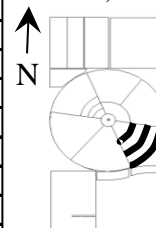




## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5c Spans 2,4,6,8	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	9/5/2014	Strip Till
	3/24/2015	Filed Cultivator
	3/27/2015	List on 30"
	4/9/2015	Dike
	5/2/2015	Rotary Hoe
	5/11/2015	Rotary Hoe Span 8 Only
	5/25/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/4/2015	Rotary Hoe Span 8 Only
	6/15/2015	Rotary Hoe
	6/23/2015	Cultivate
	6/28/2015	Cultivate and Dike
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	5/26/2015	FiberMax 2484B2F 54,129 seeds/ac
	11/24/2015	TAM 111 80 lbs/ac Yield
Herbicide/Growth Regulator	3/23/2015	Trifluralin HF 1 qt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/26/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/6/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in. Spans 4,6,8
	4/6/2015	1.00 in. Span 2 Only
Seasonal	6/5 to 8/28	Base 3.30 in.; Base-50% 1.80 in.; Base+50% 4.80 in.; Dry 0.00 in. Spans 4,6,8
	6/5 to 8/28	3.30 in. Span 2 Only
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.

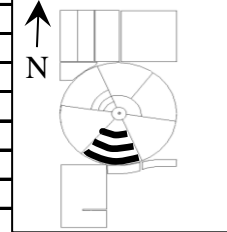
Field 5C, S 4,6,8



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5d	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	6/4/2015	Rotary Hoe Span 8 Only
	6/15/2015	Rotary Hoe Span 8 Only
	6/23/2015	Cultivate Spans 2,4,6,8 Only
	6/28/2015	Cultivate and Dike Spans 2,4,6,8 Only
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	11/19/2014	VNS 70 lbs/ac Cover Crop
	5/26/2015	FiberMax 2484B2F at 54,129 seed/ac Spans 3,4,5,6,7,8
	5/27/2015	FiberMax 2484B2F at 54,129 seed/ac Span 2
Herbicide/Growth Regulator	11/23/2015	VNS 80 lbs/ac Cover Crop
	4/2/2015	Makaze 48 oz/ac
	4/10/2015	Stealth 3 pt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/18/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
PrePlant & Planting	4/11/2015	1.00 in. Span 2 Only
	4/11/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in. Spans 3-8
Seasonal	6/5 to 8/28	3.60 in. Span 2 Only
	6/5 to 8/28	Base 3.60 in.; Base-50% 1.95 in.; Base+50% 5.25 in.; Dry 0.00 in. Spans 3-8
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.

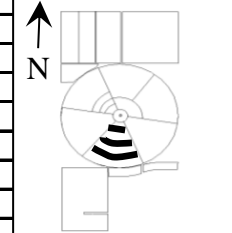
Field 5D, S 4,6,8



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5d East	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage		
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	11/19/2014	VNS 70 lbs/ac Cover Crop
	5/26/2015	FiberMax 2484B2F at 54,129 seed/ac Spans 3,4,5,6,7,8
	5/27/2015	FiberMax 2484B2F at 54,129 seed/ac Span 2
Herbicide/Growth Regulator	11/23/2015	VNS 80 lbs/ac Cover Crop
	4/2/2015	Makaze 48 oz/ac
	4/10/2015	Stealth 3 pt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/18/2015	Staple 3 oz/ac Makaze 22 oz/ac
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal		
	4/11/2015	1.00 in. Span 2 Only
	4/11/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in. Spans 3-8
	6/5 to 8/28	3.60 in. Span 2 Only
	6/5 to 8/28	Base 3.60 in.; Base-50% 1.95 in.; Base+50% 5.25 in.; Dry 0.00 in. Spans 3-8
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.

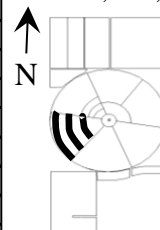
Field 5D, S 3,5,7



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5e (Span 2,4,6,8)	
Exp. Design	Cotton.	
Soil Type		
Field Operations	Date	Activity
Tillage	12/17/2014	Shred Spans 2,4,6,8 Only
	3/13/2015	StripTill Spans 2,4,6,8 Only
	3/16/2015	Field Cultivator spans 2,4,6,8 Only
	3/24/2015	Field Cultivator spans 2,4,6,8 Only
	3/25/2015	List on 30" Spans 2,4,6,8 Only
	4/10/2015	Dike Spans 2,4,6,8 Only
	6/4/2015	Rotary Hoe Span 8 Only
	6/17/2015	Rotary Hoe Spans 2,4,6,8 Only
	6/26/2015	Cultivate Spans 2,4,6,8 Only
	6/28/2015	Cultivate and Dike Spans 2,4,6,8 Only
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	5/27/2015	FiberMax 2484B2F 54,129 seeds/ac
Herbicide/Growth Regulator	3/23/2015	Trifluralin HF 1 qt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/9/2015	Makaze 32 oz/ac Maximizer 1%
	7/2/2015	Warrant 3pt/ac Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt.		
	PrePlant & Planting	4/13/2015 1.00 in. Span 2 Only
		4/13/2015 Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in. Spans 4,6,8
	Seasonal	6/4 to 8/28 3.40 in. Span 2 Only
		6/4 to 8/28 Base 3.40 in.; Base-50% 1.85 in.; Base+50% 4.95 in.; Dry 0.00 in. Spans 4,6,8
Rainfall		
	PrePlant & Planting	1/5 to 5/31 16.32 in.
	Seasonal	6-1 to 9/24 14.39 in.

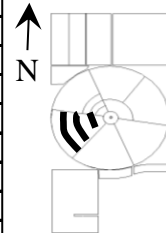
Field 5E, S 4,6,8



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5e (Spans 3,5,7)	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage		
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coultter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coultter rig
	4/8/2015	32-0-0/10-34-0/Sulfer 26.7 gal/ac High Water applied thru coultter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coultter rig
Planting	5/27/2015	FiberMax 2484B2F 54,129 seeds/ac
Herbicide/Growth Regulator	3/26/2015	Salvo 1 pt/ac
	4/10/2015	Stealth 3 pt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac
	6/9/2015	Makaze 32 oz/ac Maximizer 1%
	7/2/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 pt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal		
	4/13/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in.
	6/4 to 8/28	Base 3.40 in.; Base-50% 1.85 in.; Base+50% 4.95 in.; Dry 0.00 in.
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	0.45 in.
	6-1 to 9/24	14.39 in.

Field 5E, S 3,5,7

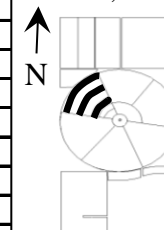




## Operations Summary

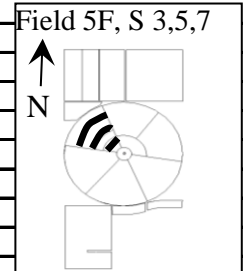
Year	2015	
Farm	Helm	
Field ID	Field 5f (Span 2,4,6,8)	
Exp. Design	Sorghum	
Soil Type		
Field Operations	Date	Activity
Tillage	12/17/2014	Shred
	2/20/2015	Strip Till Span 8 Only
	3/14/2015	Strip Till Span 2,4,6 Only
	3/16/2015	Field Cultivator
	3/25/2015	Field Cultivator
	3/26/2015	List on 30"
	4/10/2015	Dike
	5/2/2015	Rotary Hoe
	5/12/2015	Rotary Hoe span 8 Only
	5/25/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/4/2015	Rotary Hoe span 8 Only
	6/17/2015	Rotary Hoe
	6/24/2015	Cultivate
	7/15/2015	Cultivate and Dike
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfur 26.7 gal/ac High Water applied thru coulter rig
	7/14/2015	32-0-0 19.2 gal/ac High and Med. Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	6/3/2015	Dekalb DKS 49-45 Low 40,000/Med. 55,000/High 70,000
Herbicide/Growth Regulator	3/25/2015	Milo Pro 1 qt/ac
	5/27/2015	Milo Pro 1 qt/ac Warrant 3 pt/ac Makaze 32 oz/ac
	7/16/2015	Warrant 3 pt/ac
Insecticide	8/13/2015	Transform 1.2 oz/ac Ongar 10 oz/ac
	8/3/2015	Transform 1.2 oz/ac
Harvest aid		
Irrigation Amt.		
PrePlant & Planting	4/15/2015	1.00 in. Span 2 Only
	4/15/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in. Spans 4,6,8
Seasonal	6/6 to 9/4	3.99 in. Span 2 Only
	6/6 to 9/4	Base 3.99 in.; Base-50% 2.00 in.; Base+50% 6.18 in.; Dry 0.00 in. Spans 4,6,8
Rainfall		
PrePlant & Planting	1/5 to 5/31	16.32 in.
Seasonal	6-1 to 9/24	14.39 in.

Field 5F, S 4,6,8



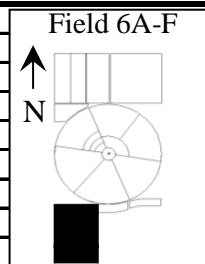
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 5f (Spans 3,5,7)	
Exp. Design	Sorghum	
Soil Type		
Field Operations	Date	Activity
Tillage	5/12/2015	Rotary Hoe Span 7 Only
	6/17/2015	Rotary Hoe
Fertility	4/6/2015	32-0-0/ 10-34-0 15.59 gal/ac Med. Water applied thru coulter rig
	4/6/2015	32-0-0/10-34-0 20 gal/ac Low Water applied thru coulter rig
	4/8/2015	32-0-0/10-34-0/Sulfer 26.7 gal/ac High Water applied thru coulter rig
	7/14/2015	32-0-0 19.2 gal/ac High and Med. Water applied thru coulter rig
	7/28/2015	32-0-0 14 gal/ac High & Med. Water applied thru coulter rig
Planting	6/3/2015	Dekalb DKS 49-45 Low 40,000/Med. 55,000/High 70,000
Herbicide/Growth Regulator	3/26/2015	Salvo 1 pt/ac
	4/10/2015	Milo Pro 1 qt/ac
	5/27/2015	Milo Pro 1 qt/ac warrant 3 pt/ac Makaze 32 oz/ac
	7/16/2015	Warrant 3 pt/ac
Insecticide	8/13/2015	Transform 1.2oz/ ac Onager 10 oz/ac
	8/3/2015	Transform 1.2 oz/ac
Harvest aid		
Irrigation Amt. PrePlant & Planting Seasonal		
	4/15/2015	Base 1.00 in.; Base-50% 1.00 in.; Base+50% 1.00 in.; Dry 1.00 in.
	6/6 to 9/4	Base 3.99 in.; Base-50% 2.00 in.; Base+50% 6.18 in.; Dry 0.00 in.
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.



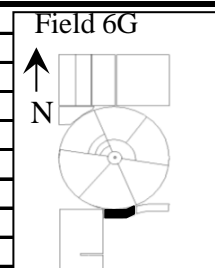
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 6 - Zone A-E	
Exp. Design	Cotton	
Soil Type		
Field Operations	Date	Activity
Tillage	12/11/2014	Shred
	2/11/2015	Field Cultivator
	2/13/2015	Field Cultivator
	3/27/2015	List on 60"
	4/30/2015	Rotary Hoe
	5/11/2015	Rotary Hoe
	5/18/2015	Rotary Hoe
	5/24/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
	7/1/2015	Cultivate (Filler Only)
Fertility	5/1/2015	32-0-0 22.3 gal/ac applied thru coulter rig
Planting	5/18/2015	PhytoGen 52,000 seeds/ac Border around DOW Test (Zone A&B)
	5/26/2015	FiberMax 2011 GT 54,129 seeds/ac Border around Wayne's Test (Zone C-E)
Herbicide/Growth Regulator	1/13/2015	Trifluralin HF 1qt/ac
	5/27/2015	Cotton Pro 3 pt/ac Makaze 32 oz/ac (zones B-E only)
	6/10/2015	Makaze 32 oz/ac
	7/2/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1%
	7/24/2015	Makaze 32 oz/ac Maximizer 1% Choice 4 pt/100 Gal
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/27/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	11/2/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal	4/21 to 4/27	Avg. for Zones A-E 1.75 in.
	8/5 to 8/21	ZoneA 2.16 in.; ZoneB 2.02 in.; ZoneC 1.95 in.; ZoneD 3.84 in.; ZoneE 1.26 in.
Rainfall PrePlant & Planting Seasonal	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.



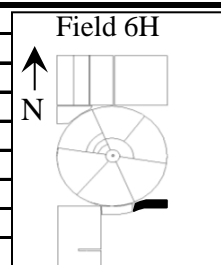
## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 6 - Zone G	
Exp. Design	Cotton Drip Irrigated Nitrogen Level Effects on Insects	Parajulee
Soil Type		
Field Operations	Date	Activity
Tillage	12/9/2014	Shred
	2/11/2015	Field Cultivator
	2/12/2015	Field Cultivator
	3/16/2015	List on 30"
	4/30/2015	Rotary Hoe
	5/11/2015	Rotary Hoe
	5/18/2015	Rotary Hoe
	5/24/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
	6/29/2015	Cultivate
Fertility		
Planting	5/18/2015	FiberMax 9180 B2F 56,000 seeds/ac
Herbicide/Growth Regulator	1/12/2015	Trifluralin HF 1 qt/ac
	5/4/2015	Makaze 32 oz/ac
	6/30/2015	Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm Quat 1 qt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal		
	4/18 to 5/3	4.66 in.
	8/5 to 8/22	1.71 in.
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.



## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Field 6 - Zone H	
Exp. Design	Cotton Drip Irrigated	
Soil Type		
Field Operations	Date	Activity
Tillage	12/9/2104	Shred
	2/10/2015	Disk
	3/31/2015	List on 60"
	4/30/2015	Rotary Hoe
	5/11/2015	Rotary Hoe
	5/18/2015	Rotary Hoe
	5/24/2015	Rotary Hoe
	6/1/2015	Rotary Hoe
	6/15/2015	Rotary Hoe
	6/29/2015	Cultivate
	7/20/2015	Cultivate and Dike
Fertility	4/2/2015	32-0-0 25.7 gal/ac applied thru coulter rig
Planting	5/12/2015	NexGin 1511 B2RF at 56,000/70,000/82,000 Skip Row on top of tape
	6/2/2015	DeltaPine 1219 B2RF 54,129 seeds/ac Replant (no skip row)
Herbicide/Growth Regulator	5/4/2015	Makaze 32 oz/ac
	5/12/2015	Cotton Pro 3 pt/ac Warrant 3 pt/ac
	6/30/2015	Makaze 32 oz/ac Maximizer 1%
	7/2/2015	Warrant 3 pt/ac Makaze 32 oz/ac Maximizer 1%
	7/29/2015	Warrant 3 pt/ac
Insecticide		
Harvest aid	10/14/2015	Boll Buster 32 oz/ac AIM 1 oz/ac Maximizer 1%
	10/29/2015	Helm quat 1 qt/ac Maximizer 1%
Irrigation Amt. PrePlant & Planting Seasonal	4/18 to 5/3	4.63 in.
	8/5 to 8/22	1.18 in.
Rainfall PrePlant & Planting Seasonal	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.





## Operations Summary

Year	2015	
Farm	Helm	
Field ID	Dryland	
Exp. Design	Fallow	
Soil Type		
Field Operations	Date	Activity
Tillage	4/1/2015	Shred
	7/15/2015	Cultivate and Dike
	8/24/2015	Field Cultivator on Corners
Fertility		
Planting	11/25/2014	VNS 45 lbs/ac Cover Crop
	6/4/2015	Dekalb KDS 49-45 40,000 seeds/ac
	8/25/2015	VNS 45,000 seeds/ac Planted in Corners
	10/19/2015	VNS 45 lbs/ac Cover Crop
Herbicide/Growth Regulator	4/21/2015	Makaze 48 oz/ac
	6/5/2015	Milo Pro 1 qt/ac Warrant 3 pt/ac Makaze 32 oz/ac
	6/8/2015	Atrazine 1.5 pt/ac
	6/17/2015	Atrazine 1 pt/ac Huskie 1 pt/ac Maximizer 1%
Insecticide	8/13/2015	Transform 1 oz/ac
Harvest aid		
Irrigation Amt. PrePlant & Planting Seasonal		
Rainfall PrePlant & Planting Seasonal		
	1/5 to 5/31	16.32 in.
	6-1 to 9/24	14.39 in.