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Texas AgriLife Research - Texas AgriLife Extension

Lubbock/ Halfway

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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 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 300 to 400 gallons per minute each.

Large plot irrigated grain sorghum study conducted on 130 acres equipped with a center pivot at Helm Research Farm, Halfway, TX.

Cotton is harvested with a modified John Deere 7445 stripper at Helm Research Farm, Halfway, TX. Bulk seed cotton weights and fiber data sub-samples are obtained from SDI treatments.

Subsurface Drip Irrigation Pre-plant Irrigation Timing Effects on Germination and Cotton Yield (Field 2).

James Bordovsky and Joe Mustian

Objective: To determine the effects on cotton lint yield of three pre-plant irrigation sequences using SDI.

Methodology: Plot size was 8 rows by 1300' with three replications. Treatment factors were pre-plant irrigation sequence and depth of planting. SDI laterals were spaced at 60 inches. Crop rows were spaced 30 inches apart with two rows planted on single 60 inch beds. All tillage and seedbed shaping occurred immediately following the previous year's harvest, therefore, the seedbeds were undisturbed from December until cotton planting in May. Three irrigation sequences were replicated (3x) in a complete randomized block design and are depicted graphically in Figure 1.

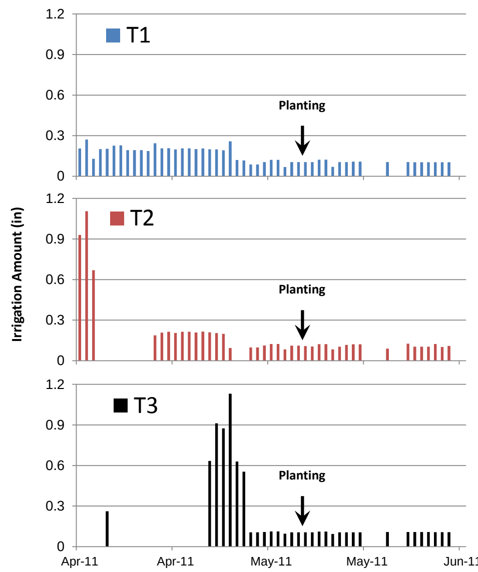

Figure 1. Pre-plant and early season irrigation sequences in germination study at the Texas AgriLife Research Center, Helm Farm, 2011-2012.

Figure 2. Subsurface drip irrigated cotton germination test plot. This picture was taken on July 6 during the record drought of 2011 at the Helms Research Farm.

Table 1. Yield and seasonal irrigation water use efficiency resulting from three pre-plant irrigation sequences, 2011-2012.

	Treatment	Year	
		2011	2012
Yield (lb/ac)	T1	902 a	1056 a
	T2	1021 a	1113 a
	T3	584 b	1156 a
SIWUE (lb/ac-in)	T1	61.7 a	75.4 a
	T2	70.3 a	81.2 a
	T3	32.6 b	84.8 a

Results: Rain during the months prior to planting in both 2011 and 2012 was below average. Germination was low and erratic in all treatments with final plant stands at less than 25% and 55% of initial seed drop in the two respective years (Figure 2). For a given year, all treatments were identically irrigated through the growing season at approximately 40% (2011) and 60% (2012) of ETc. Plots from each treatment and replicate were harvested by traditional methods. Although plant stands were extremely poor, average cotton lint yield of all treatments were 859 and 1108 lb/ac (Table 1) in respective years. Applying large pre-plant irrigations immediately prior to planting (T3) resulted in significantly less yield and lower water productivity than applying a sequence of smaller irrigations (T1 and T2) in 2011. However, yield and seasonal irrigation water use efficiency was not significantly affected by pre-plant irrigation timing in 2012.

Cotton Response to Irrigation Interval using Subsurface Drip Irrigation (Field 3)
James P. Bordovsky, Joe Mustian, David Winters and Casey Hardin

Objective: To determine SDI cotton yield response to irrigation intervals of 0.25-, 1 or 2-, and 7-days at two irrigation levels in a field with slopes common to the Texas South Plains.

Methodology: Two irrigation levels and three irrigation intervals were used to determine the effects of these parameters on cotton irrigated with subsurface drip irrigation from 2009 to 2012. The high irrigation level met ~ 80% of crop water needs using ET scheduling, low level irrigations were 50% of the high. Irrigation intervals were every 6 hours or 0.25-d, either 1 or 2-d , and 7-d. The intermediate irrigation interval was changed from 2 to 1 day in 2010 and in subsequent years. Six 8-row x 1300 ft treatment plots were established in each of four blocks within a field characterized by decreasing elevations from SW to NE, with rows oriented N-S. Cotton was planted by mid May in each year at ~ 54,000 ppa on 30-in rows. Lint yield was determined by harvesting 4 rows using a conventional cotton stripper (figure 1) and adjusting seed cotton weights from each plot using lint turnout percentages from multiple 1 to 2 lb sub-samples from each replicate. Irrigation quantities were approximately the same for all treatments within an irrigation level. Additional details are given in the appendix.

Figure 1. Cotton harvest from plots of the SDI irrigation interval study, 2009-2012.

Results: The four-year average cotton lint yield, seasonal water productivity and loan values increase as irrigation intervals increase at both the low and high irrigation levels (figure 2). At the low irrigation level, average yield increased from 1095 to 1136 lb/ac and at high irrigation, yields increased significantly from 1327 to 1539 lb/ac when irrigation intervals increased from every 0.25- to 7 days. Seasonal irrigation productivity was determined by subtracting yield of non-seasonally irrigated plots (dryland) from yields of irrigated plots and dividing that quantity by seasonal irrigation depth. WUE increased from 93.5 to 100.5 lb/ac-inch (low irrigation) and from 67.8 to 82.9 lb/ac-in (high irrigation) as irrigation intervals increased from 0.25 to 7 days. Loan values were also significantly higher at irrigation intervals of 7 days compared to those of 0.25 days at both low and high irrigation levels. It is hypothesized that by irrigating less frequently, the soil profile is wetted deeper and wider during each irrigation event. This should increase rooting volume and providing increased opportunity for cotton plants to utilize available water and nutrients from the larger volume of soil. Differences due to irrigation interval were more pronounced during the dry summers of 2011 and 2012 (data not shown) than during the summers of 2009 and 2010.

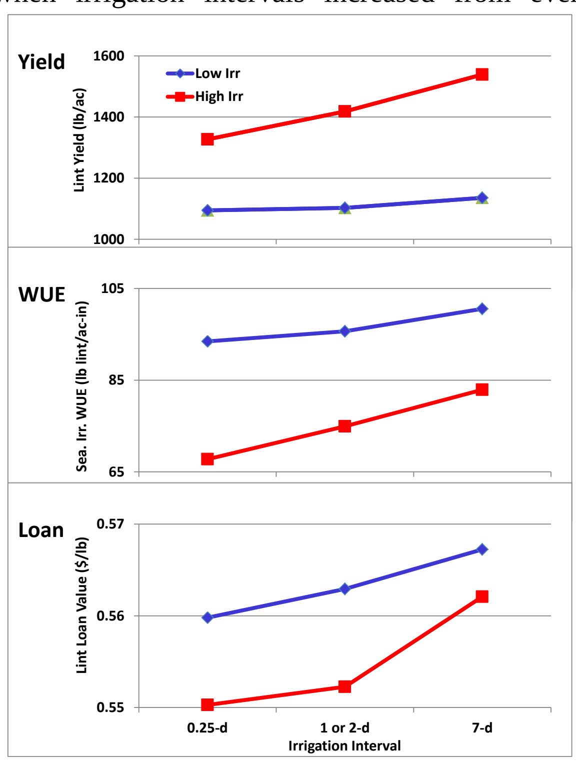

Figure 2. Average yield, seasonal irrigation water use efficiency, and cotton lint loan values from the SDI irrigation interval study, 2009-2012.

Bayer Cotton Agronomic Performance Trial (Field 5a)
Wayne Keeling, Jacob Reed, Justin Spradley, and Daniel Olivier

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

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

Results: When averaged across irrigation levels, highest yields were produced with FM 2484 B2F and FM 9170 B2F. When averaged across varieties, yields ranged from 655 to 1598 lbs./A. Compared to the base irrigation treatment, yields were reduced 51% at the low irrigation level and increased only 19% at the high irrigation level. When averaged across irrigation level, lint values were similar for all varieties but were reduced with the high irrigation treatment. When averaged across varieties, gross revenues were reduced 51% with the low irrigation level and increased only 7% with the high irrigation level. When averaged across irrigation levels, highest gross revenues were produced with FM 2484 B2F and FM 9170 B2F.

Table 1. Effects of B2RF variety and LEPA irrigation levels on cotton lint yields at Helms Farm, Halfway, TX, 2012.

	Low	Medium	High	Irrig. Avg.
Variety	-------	lbs/A	-------	-------
FM 9170B2F	698 a	1361 a	1654 ab	1238 AB
FM 1944GLB2	591 a	1258 a	1486 b	1111 C
FM 9250GL	632 a	1318 a	1579 ab	1176 BC
FM 2484B2F	697 a	1402 a	1869 a	1321 A
FM 2011GT	657 a	1394 a	1406 b	1153 BC
Avg.	655 C	1347 B	1598 A	
% change	(-51%)	(-----)	(+19%)	

Table 2. Effects of B2RF variety and LEPA irrigation levels on lint value at Helms Farm, Halfway, TX, 2012.

	Low	Medium	High	Irrig. Avg.
Variety	-------	¢/lb	-------	-------
FM 9170B2F	56.17 b	56.63 a	51.77 a	54.87 A
FM 1944GLB2	56.25 ab	55.98 a	50.42 a	54.19 A
FM 9250GL	56.45 ab	55.77 a	48.38 a	53.58 A
FM 2484B2F	57.22 a	56.62 a	50.43 a	54.74 A
FM 2011GT	56.70 ab	55.73 a	51.53 a	54.63 A
Avg.	56.54 A	56.15 A	50.52 B	

Table 3. Effects of B2RF variety and LEPA irrigation levels on gross revenues at Helms Farm, Halfway, TX, 2012.

	Low	Medium	High	Irrig. Avg.
Variety	-------	$/A	-------	-------
FM 9170B2F	392 a	772 a	856 ab	673 AB
FM 1944GLB2	349 a	704 a	749 ab	600 B
FM 9250GL	357 a	735 a	764 ab	619 B
FM 2484B2F	399 a	793 a	948 a	712 A
FM 2011GT	372 a	777 a	724 b	626 B
Avg.	373 B	756 A	808 A	
% change	(-51%)	(-----)	(+7)	

The Influence of Crop Rotation, Irrigation Rate, and Variety on Verticillium Wilt and Cotton Yield from 2007 – 2012 (Field 5b,c,d,e).

Terry Wheeler, Jim Bordovsky, and Wayne Keeling

Objective: To determine the influence of various management tools (crop rotation, irrigation rate, and variety) on severity of Verticillium wilt, population density of *Verticillium dahliae*, and yield.

Methodology: Three pies (B, C, D) of the Helms circle were in a 2 year-cotton/1 year-grain (primarily sorghum) from 2001 – 2012. One pie (E) was in continuous cotton over this time period. Three irrigation rates (Base (B), B+50% and B-50%) were used, where from 2007-2009, the Base rate was designed to match 80% of the evapotranspiration rate (ET) and from 2010 – 2012, the Base rate was designed to match 60% of ET, when pumping capacity was sufficient. In 2007 – 2009, the susceptible variety to Verticillium wilt was Stoneville 4554B2F and the partially resistant variety for two of those years was Deltapine (DP) 104B2RF. From 2010 – 2012, the susceptible variety to Verticillium wilt was DP 0912B2RF and the partially resistant variety was Fibermax 9180B2F. Soil samples were taken in January to monitor population density of *V. dahliae* spores (microsclerotia), and incidence of wilt was determined around 20th of August each year from 2008 – 2012. Yield was harvested from these large plots each year.

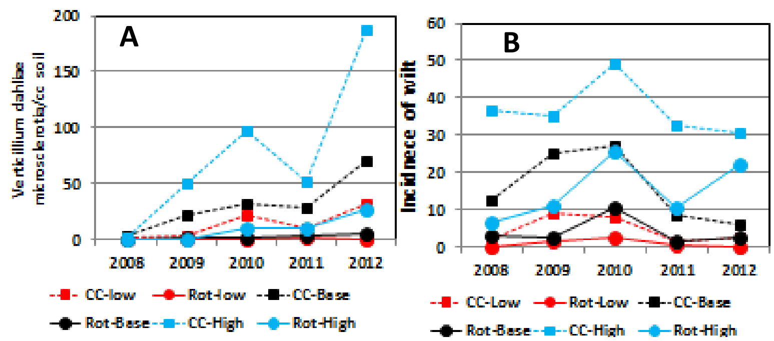

Figure 1. Effect of continuous cotton (CC) or cotton rotated with sorghum (Rot) and irrigation rate (Base, Low = Base-50%, High=Base+50%) on density of *Verticillium dahliae* microsclerotia/cm3 soil and Verticillium wilt incidence over time.

Results: The microsclerotia of the fungus generally increased over time, but at a much faster rate in the continuous cotton and higher irrigation rates (Fig. 1A). Incidence of wilt was highest in 2010 when the weather was especially conducive for disease (cool and wet in July) and has been much higher for the continuous cotton and B+50% irrigation rate than for the Base or B-50% irrigation rates and rotated cotton in all years (Fig. 1B). For cotton watered with the Base+50% irrigation rate (Fig. 2A), yields have been highest every year for the rotated cotton that was planted to a variety that was partially resistant to Verticillium wilt. The combination of rotated cotton and a susceptible variety, or continuous cotton and a partially resistant variety had intermediate yields at the Base+50% irrigation rate over the six years; and the worse yields in 2008-2010, and 2012 were with the combination of continuous cotton and a susceptible variety at the Base+50% irrigation rate. When cotton was irrigated with the Base irrigation rate (Fig. 2B), then using crop rotation resulted in the best cotton yields in all years except for 2011. The benefit of a partially resistant variety resulted in higher yields about ½ of the time if the land was rotated to sorghum once every 3 years. Generally yields were lower with continuous cotton compared to rotated cotton, and using a partially resistant variety resulted in much higher yields than a susceptible variety in 2 of the 6 years, or similar yields in 3 of 6 years. Since very little Verticillium wilt occurred at the Base-50% irrigation rate, data from these years are not presented.

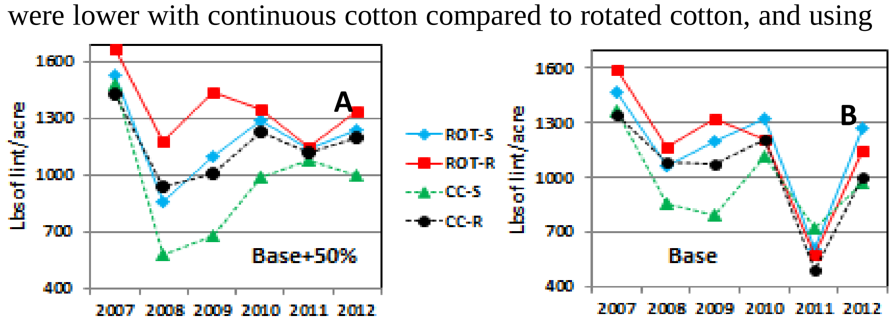

Figure 2. The effect of crop rotation (Rot = rotated cotton, CC=continuous cotton) and partially resistant (R) or susceptible (S) varieties to Verticillium wilt.

Cotton Variety Performance as Affected by Low-Energy Precision Application (LEPA) Irrigation Levels in a 3-year rotation following cotton (2011) and grain sorghum (2010) (Field 5b)
Wayne Keeling, Jim Bordovsky, Jacob Reed, Justin Spradley and Justin Cave

Objective: The objective was to compare yield, fiber quality, and gross revenue as a function of popular cotton varieties and water levels in a three-year crop rotation with this year's cotton following cotton.

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

Results: The results are contained in the following tables.

Table 1. Effects of cotton variety and LEPA irrigation levels on cotton lint yields at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	--------lbs/A--------			
DP 0912B2RF	558 a	1380 a	1340 a	1092 A
FM 9180B2F	450 b	1087 a	1337 a	958 A
NG 3348B2RF	441 b	1205 a	1201 a	949 A
ST 4288B2RF	609 a	1113 a	1572 a	1098 A
Avg.	514 B	1196 A	1362 A	
% change	(-57%)	(——)	(+12%)	

Table 2. Effects of cotton variety and LEPA irrigation levels on lint value at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	--------¢/lb--------			
DP 0912B2RF	55.83 a	54.24 b	51.53 a	53.87 B
FM 9180B2F	55.12 a	57.50 a	52.92 a	55.18 AB
NG 3348B2RF	54.27 a	55.84 ab	52.08 a	54.06 B
ST 4288B2RF	56.48 a	57.03 a	54.03 a	55.85 A
Avg.	55.42 A	56.15 A	52.64 B	

Table 3. Effects of cotton variety and LEPA irrigation levels on gross revenues at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	--------$/A--------			
DP 0912B2RF	311 a	705 a	691 a	584 A
FM 9180B2F	249 b	625 a	707 a	527 A
NG 3348B2RF	239 b	669 a	625 a	511 A
ST 4288B2RF	344 a	365 a	837 a	605 A
Avg.	286 B	670A	715 A	
% change	(-57%)	(——)	(+6%)	

Cotton Variety Performance as Affected by Low-Energy Precision Application (LEPA) Irrigation Levels in a 3-year rotation following sorghum (2011) and cotton (2010) (Field 5d).
Wayne Keeling, Jim Bordovsky, Jacob Reed, Justin Spradley and Justin Cave

Objective: The objective was to compare yield, fiber quality, and gross revenue as a function of popular cotton varieties and water levels in a three-year crop rotation with this year's cotton following sorghum.

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

Results: The results are contained in the following tables.

Table 1. Effects of cotton variety and LEPA irrigation levels on cotton lint yields at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	--lbs/A--			
DP 0912B2RF	556 ab	1174 ab	1164 b	965 BC
FM 9180B2F	468 b	1199 ab	1349 a	1005 B
NG 3348B2RF	442 b	1082 b	1239 ab	921 C
ST 4288B2RF	657 a	1279 a	1323 a	1086 A
Avg.	531 C	1183 B	1269 A	
% change	(-55%)	(——)	(+7%)	

Table 2. Effects of cotton variety and LEPA irrigation levels on lint value at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	--¢/lb--			
DP 0912B2RF	54.26 a	53.84 b	52.69 ab	53.60 B
FM 9180B2F	55.51 a	57.28 a	54.43 ab	55.74 A
NG 3348B2RF	53.90 a	55.79 a	52.08 b	53.92 B
ST 4288B2RF	54.59 a	57.23 a	56.73 a	56.18 A
Avg.	54.57 AB	56.03 A	53.98 B	

Table 3. Effects of cotton variety and LEPA irrigation levels on gross revenues at Helm Farm, Halfway, TX 2012.

Variety	L	M	H	Avg.
	--$/A--			
DP 0912B2RF	300 ab	632 b	615 b	516 C
FM 9180B2F	261 b	687 ab	735 a	561 B
NG 3348B2RF	239 b	604 b	642 b	495 C
ST 4288B2RF	359 a	732 a	751 a	614 A
Avg.	290 B	664 A	686 A	
% change	(-56%)	(——)	(+3%)	

Continuous Cotton Variety Performance as Affected by Low-Energy Precision Application (LEPA) Irrigation Levels (Field 5e)
Wayne Keeling, Jim Bordovsky, Jacob Reed, Justin Spradley and Justin Cave

Objective: The objective was to compare yield, fiber quality, and gross revenue as a function of popular cotton varieties and water levels in a cotton monoculture.

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

Results: The results are contained in the following tables.

Table 1. Effects of cotton variety and LEPA irrigation levels on cotton lint yields at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	lbs/A			
DP 0912B2RF	536 a	1058 a	1005 b	866 B
FM 9180B2F	437 a	997 a	1205 a	880 AB
NG 3348B2RF	443 a	997 a	1137 ab	859 B
ST 4288B2RF	537 a	1079 a	1254 a	956 A
Avg.	488 C	1033 B	1150 A	
% change	(-53%)	(-----)	(+10%)	

Table 2. Effects of cotton variety and LEPA irrigation levels on lint value at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	¢/lb			
DP 0912B2RF	54.14 a	55.44 a	51.33 b	53.63 BC
FM 9180B2F	55.25 a	57.01 a	52.73 ab	55.00 AB
NG 3348B2RF	54.20 a	55.90 a	49.18 b	53.09 C
ST 4288B2RF	55.10 a	56.16 a	55.34 a	55.53 A
Avg.	54.67 A	56.13 A	52.14 B	

Table 3. Effects of cotton variety and LEPA irrigation levels on gross revenues at Helm Farm, Halfway, TX, 2012.

Variety	L	M	H	Avg.
	$/A			
DP 0912B2RF	291 a	588 a	518 c	465 B
FM 9180B2F	243 a	569 a	636 ab	482 AB
NG 3348B2RF	241 a	558 a	560 bc	453 B
ST 4288B2RF	296 a	606 a	694 a	432 A
Avg.	268 B	580 A	602 A	
% change	(-54%)	(-----)	(+4%)	

Effects of Subsurface Drip Irrigation (SDI) Level, Nitrogen Rate and Harvest Method on Cotton Yield and Fiber Quality (Field 6a-f).

Wayne Keeling, James Bordovsky, Eric Hequet, and John Wanjura

Objective: To determine the effects on cotton production, particularly fiber quality, of excess nitrogen, harvest method, and variety at two irrigation levels.

Methodology: Plot size was 8 rows by 1600' with three replications. Treatment factors were irrigation level, cotton variety, nitrogen level and harvest method. Excess nitrogen was applied in appropriate plots prior to planting with the remainder applied during seasonal irrigations. Previous tests have indicated excess nitrogen lowered fiber quality. All treatments were irrigated with SDI. The *High* water level was irrigated at 100% ET, the *Low* level at 50% of the *High*. Four rows from each plot were harvested by either cotton picker (Oct 31) or stripper (Nov 8) with 200-lb samples to be analyzed at the Fiber and Biopolymer Research Lab at Texas Tech. Detailed agronomic information is contained in the appendix.

Table 1. Effects of SDI Irrigation level, nitrogen rate, and harvest method on cotton lint yield

Variety	Irrigation Level	Nitrogen Level (lb/A)		Yield (lb/A)(% turnout)		Lint Value (cents/LB)		Gross Return ($/A)	
				Harvest Method		Harvest Method		Harvest Method	
				Picker	Stripper	Picker	Stripper	Picker	Stripper
DP 0912B2RF	Low Irrigation								
		High N	147	820a (.379)	985a (.368)	52.17c	53.68a	428a	529a
		Low N	60	986a (.388)	1029a (.366)	53.70bc	52.90a	530a	544a
	High Irrigation								
		High N	153	1161a (.372)	1232a (.349)	56.52a	56.65a	669a	697a
		Low N	82	1129a (.378)	1158a (.349)	55.15ab	56.80a	612a	657a
		Average		1024 A (.379) A	1101A (.358)B	54.39A	55.01A	559A	606A
FM 9180 B2F	Low Irrigation								
		High N	147	837b (.367)	888b (.345)	56.83a	56.77a	476b	504b
		Low N	60	839b (.367)	897b (.343)	56.83a	56.27a	477b	504b
	High Irrigation								
		High N	153	1155a (.363)	1266a (.333)	57.27a	57.28a	661a	725a
		Low N	82	1147a (.362)	1245a (.333)	57.33a	57.18a	658a	712a
		Average		944 A (.364)A	1074A (.338)B	57.06A	56.88A	568A	611A

RESULTS:

Yields produced with DP 0912B2RF were not affected by irrigation or nitrogen level within a harvesting method, but overall yields trended higher with stripper harvesting (Table 1). Lint values were similar for both harvesting methods, while irrigation and nitrogen levels did influence quality within the picker harvested plots. Irrigation level, nitrogen level or harvesting method did not affect gross return for DP 0912B2RF. Irrigation levels increased yields for FM 9180B2F within both harvesting methods, and overall yields were higher with stripper harvesting. Irrigation level, nitrogen level, or harvesting method did not affect lint value for FM 9180B2F, but gross returns were increased with the high irrigation treatment. Percent lint turnout was increased with picker harvest for both varieties.

Comparison of Cotton Yield and Water Productivity Among SDI Fields with Different Lateral/Row Configurations (Fields 2, 3 and 6h).

James P. Bordovsky, Joe Mustian, David Winters, and Casey Hardin

Objective: To make general comparisons of germination and cotton yield resulting from SDI system/plant position strategies.

Methodology: Seed germination has been a major issue when irrigating with SDI, particularly in years with little rain during the planting period. Cotton was drip irrigated in three separate field experiments in 2011 and treatments were arranged in one replicated field in 2012. The "traditional" drip installation provided one drip lateral in alternate crop furrows. The "shallow" drip treatments had SDI laterals placed 8 inches below the level soil surface in an alternate furrow pattern. A "skip-row" planting pattern with cotton planted directly over the SDI laterals to increase the probability of seed germination was attempted in a June 14, 2011 planting, and was used as a replicated treatment in 2012. The 2012 test determined yield and water productivity of skip row versus traditional plantings with cotton planted at an optimum time.

Results: Yield and water productivity data is given in Table1. In 2011, the late planted skip row treatment resulted in a low, but very acceptable yield of 900 lb/acre compared to the yield from a test area where traditional SDI plantings resulted in poor cotton germination, poor plant stand, and yield of 859 lb/ac. Seasonal irrigation water use efficiency favored the skip row treatment in this excessively hot, dry growing season. In 2012, cotton was planted on May 3 with marginal soil water in the planted rows of the "traditional" plots and adequate soil water in rows of the "skip row" plantings. Rain events on May 10 and May 13 assisted in providing reasonable germination in the "traditional" treatments (figure 1). In 2012, the "traditional" treatment resulted in significantly higher lint yield (1957 vs. 1547 lb/ac), seasonal irrigation water use efficiency (135 vs. 103 lb/ac-in), and total irrigation use efficiency (95 vs. 75 lb/ac-in) than the skip row treatments. Future experiments will evaluate these treatments with planting date as a second factor.

Figure 1. "Skip-row drip" with 60-inch lateral spacing and 60-inch cotton rows planted directly above laterals (bottom) and "traditionally planted" cotton with 60-inch SDI laterals in alternate furrows between 30-in crop rows (top).

Table 1 Yield and water productivity data from subsurface drip irrigated cotton tests planted in different configurations, 2011-2012.

	2011			2012*		Average of 2011 & 2012	
	Traditionial Drip	Shallow Drip	Skip Row Drip	Traditionial Drip	Skip Row Drip	Traditionial Drip	Skip Row Drip
Planting Date	5/13/2011	5/13/2011	6/14/2011	5/3/2012	5/3/2012		
Pre & At Plant Irrigation (in)	8.6	7.3	13.7	7.0	7.0	7.8	10.4
Seasonal Irrigation (in)	10.8	15.4	9.3	13.1	13.1	11.9	11.2
Yield (lb/ac)	859	1540	900	1957	1547	1408	1224
Seasonal Irrigation WUE (lb/ac-in)	58	85	72	135	103	97	88
Total Irrigation Use Efficiency (lb/ac-in)	44	68	39	95	75	70	57

* 2012 yield, SIWUE, and total irrigation use efficiency were significantly higher for the traditional versus the skip-row treatments ($p<.05$, Tukey).

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

M.N. Parajulee, S.C. Carroll, R.B. Shrestha, J.P. Bordovsky

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

Methodology: A high-yielding FiberMax cultivar, FM 9063B2R, was planted at a targeted rate of 56,000 seeds/acre on May 17, 2012. The experiment consisted of a randomized block design with five treatments and five replications. Pre-treatment soil samples (consisting of three soil cores; 0 to 24-inch depth), were collected from each of the 25 experiment plots on June 1, 2012. The five side-dress N fertilizer application treatments at rates of 0, 50, 100, 150, and 200 lb N/acre were applied on July 6, 2012. Crop growth and insect activity were monitored during the crop season. Weekly during most of July and August, numerous plant variables were measured to evaluate the influence of residual soil nitrogen on early plant growth patterns. Examples of collected plant data variables included: 1) plant biomass weight, 2) plant height, 3) total leaf area, 4) percent leaf nitrogen, 5) number of 1st position cotton squares/plant, and 6) percent fruit shed.

Results: Higher levels of available residual soil N and augmented N applications significantly affected plant biomass and height. Both plant biomass and height increased continuously from 0 lb/acre up to the 150 lb/acre N applied plots. Plant biomass was significantly highest in the 150 lb/acre N applied treatment, but it decreased significantly when an additional 50 lb/acre N was applied (200 lb/acre N plots). Leaf chlorophyll content (SPAD reading) increased linearly from zero-N to 100 lb N treatment plots (Fig. 1), but the plots which received the three highest N application rates (100, 150, and 200 lb N/acre) exhibited relatively consistent leaf chlorophyll readings. Arthropod densities were low across all N fertility treatments during 2012. As a result, treatment effect on overall arthropod abundance was not detected. Nitrogen fertility level influenced fruiting profile and boll maturity. Plants ceased setting additional squares in zero and 50-lb N plots 2 wk into flowering while higher N plots were actively producing squares.

Zero-N applied plots produced the lowest yield and yield increased curvilinearly, with highest average yield occurring in the 150 and 200 lb N/acre treatments (Fig. 2).

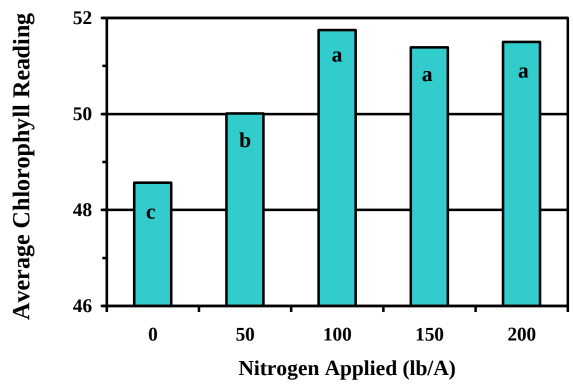

Fig. 1. Effect of nitrogen application rates on fifth mainstem leaf chlorophyll content, 2012.

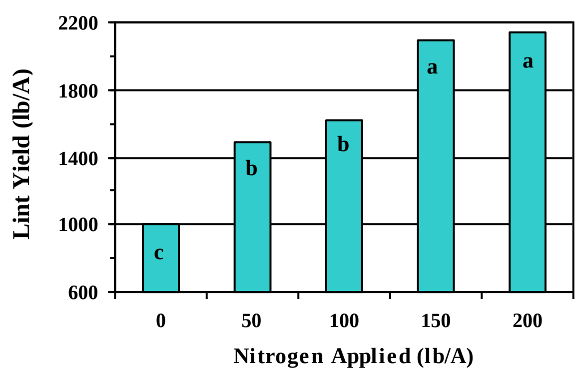

Fig. 2. Effect of N application rates on lint yield after 10 years of repetitive applications, 2012.

Farm Scale Yield Comparisons of Subsurface Drip Irrigation to Center Pivot Irrigation.
James P. Bordovsky, Casey Hardin, and Joe Mustian

Objective: Compare lint yields and irrigation quantities from farm scale cotton production irrigated by subsurface drip irrigation (SDI) and LEPA.

Methodology: Interest in subsurface drip continues as water availability decreases and opportunities for cost share assistance for water conserving irrigation equipment remains available. The question of cotton production using SDI verse pivot is continually asked. The Helms Research Farm at Halfway provides a unique, controlled environment that sheds light on this question. The problems not normally encountered in small plot research, such as limited irrigation water, inconsistent soils, and/or challenging topography, are reflected in results while irrigating with SDI and LEPA systems over past growing seasons. Details of SDI and LEPA irrigation experiments are contained elsewhere within the Helm Summary Report. This individual report contains average commercial cotton gin yields and irrigation amounts used to achieve those yields with respective irrigation systems.

Results: Lack of early season rainfall and typical high winds and low humidity at planting have caused cotton germination problems in SDI areas in some years. Excess drip irrigation to achieve germination also resulted in moving planter applied insecticides away from the seed drill resulting in foliar insecticide battles with thrip. In cool years, young cotton plants in all areas struggled resulting in slow early growth. Yields were low in 2003, 2005 and 2008 due to cool, wet weather at planting, hail, and short growing season, respectively. Yields were low due to extreme drought and the limited irrigation trials in 2011. Overall, cotton yields have been at or above county averages. For the years where data is available, SDI yields averaged 1270 lb/ac using 16.1 inches compared to LEPA yields of 1024 lb/ac using an average of 12.5 inches of total annual irrigation. Drip yields from various experiments in various years have ranged from 0 to over 2400 lb/acre. LEPA yields have ranged between 200 and 2000 lb/acre.

Table 1. Commercial cotton gin lint yield and total irrigation water delivered by SDI and LEPA irrigation systems at Helms, 2002-2011.

	SDI			LEPA		
	Area (ac)	Tot. Irr. (in)	Yld. (lb/ac)	Area (ac)	Tot. Irr. (in)	Yld. (lb/ac)
2002	71	18.47	1127	84	15.71	1209
2003	71	14.95	1086	103	12.86	1084
2004	71	14.00	1500	103	10.00	1100
2005	53.6	10.86	1041	60	3.05	828
2006	71	17.33	1566	100	16.73	1537
2007	55.3	8.95	1642	104	8.06	1232
2008	71.3	18.13	1335	93	15.13	909
2011	83.0	22.14	1016	68	16.00	467
2012	75.76	19.81	1114	75	15.20	850
Avg.		16.07	1270		12.5	1024

APPENDIX

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date			Rainfall: Halfway @ Building	Helms @ Well 1		Field 2 Drip Cot T 1	Field 2 Drip Cot T 2	Field 2 Drip Cot T 3	system	Field 3 Drip Cot T1	T2	T3	T4	T5	T6	Border	system	Field 5 - A spans 2-4 Pivot Cot	Field 5 - A spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - B spans 2-4 Pivot Cot	Field 5 - B spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - C spans 2-4 Pivot Sorg.	Field Pivot Sorg. Base
Mo	Da	Yr																											
4	9	2012	0.06	0.10		0.19	0.85		D																				
4	10	2012				0.19	0.80		D																				
4	11	2012				0.18	0.91		D																				
4	12	2012				0.22	0.03		D																				
4	13	2012				0.20			D																				
4	14	2012				0.23			D																				
4	15	2012				0.21			D																				
4	16	2012																											
4	17	2012				0.22			D																				
4	18	2012				0.24			D									0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.40	0.40
4	19	2012				0.17			D																				
4	20	2012				0.23			D									0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.40	0.40
4	21	2012				0.23			D																				
4	22	2012				0.16			D									0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30
4	23	2012	0.20	0.23		0.22	0.23		D														0.30	0.30	0.30	0.30	L	0.30	0.30
4	24	2012				0.19	0.19		D									0.30	0.30	0.30	0.30	L							
4	25	2012				0.20	0.19		D	0.13	0.13	0.13	0.13	0.13	0.13	0.10	D	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30
4	26	2012	0.15	0.70		0.19	0.20		D	0.11	0.11	0.11	0.11	0.11	0.11	0.10	D						0.30	0.30	0.30	0.30	L	0.30	0.30
4	27	2012				0.18	0.18		D	0.13	0.13	0.13	0.13	0.13	0.13	0.10	D	0.30	0.30	0.30	0.30	L							
4	28	2012				0.22	0.24		D	0.11	0.11	0.11	0.11	0.11	0.11	0.10	D												
4	29	2012	0.10	0.00		0.19	0.19		D	0.23	0.23	0.23	0.23	0.23	0.23	0.24	D												
4	30	2012				0.19	0.20	0.79	D	0.25	0.25	0.25	0.25	0.25	0.25	0.24	D												
5	1	2012				0.20	0.20	0.87	D	0.22	0.22	0.22	0.22	0.22	0.22	0.24	D												
5	2	2012				0.21	0.21	0.90	D	0.27	0.27	0.27	0.27	0.27	0.27	0.24	D												
5	3	2012				0.22	0.22	0.94	D	0.28	0.28	0.28	0.28	0.28	0.28	0.23	D												
5	4	2012				0.20	0.21	0.88	D	0.29	0.29	0.29	0.29	0.29	0.29	0.24	D	0.3	0.3	0.3	0.3	L	0.3	0.3	0.3	0.3	L	0.3	0.3
5	5	2012				0.24	0.24	1.03	D	0.23	0.23	0.23	0.23	0.23	0.23	0.24	D	0.3	0.3	0.3	0.3	L							
5	6	2012				0.19	0.20	0.21	D	0.24	0.24	0.24	0.24	0.24	0.24	0.23	D						0.3	0.3	0.3	0.3	L	0.3	0.3
5	7	2012				0.20	0.20	0.21	D	0.28	0.28	0.28	0.28	0.28	0.28	0.24	D												
5	8	2012				0.22	0.23	0.22	D																				
5	9	2012								0.22	0.22	0.22	0.22	0.22	0.22	0.23	D												
5	10	2012	0.10	0.10		0.19	0.19	0.21	D	0.30	0.30	0.30	0.30	0.30	0.30	0.25	D												
5	11	2012				0.23	0.23	0.23	D	0.31	0.31	0.31	0.31	0.31	0.31	0.25	D	0.5	0.5	0.5	0.5	S	0.5	0.5	0.5	0.5	S		

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date Mo	Da	Yr	Rainfall: Halfway @ Building	Helms @ Well 1	Field 2 Drip Cot T 1	Drip Cot T 2	Drip Cot T 3	system	Field 3 Drip Cot T1	T2	T3	T4	T5	T6	Border	system	Field 5 - A spans 2-4 Pivot Cot	Field 5 - A spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - B spans 2-4 Pivot Cot	Field 5 - B spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - C spans 2-4 Pivot Sorg.	Field Pivot Sorg. Base
5	12	2012			0.24	0.23	0.22	D	0.15	0.15	0.15	0.15	0.15	0.15	0.22	D											0.50	0.50
5	13	2012	0.24	0.39	0.14	0.15	0.18	D	0.25	0.25	0.25	0.25	0.25	0.25	0.24	D												
5	14	2012	0.03	0.03	0.20	0.20	0.13	D	0.24	0.24	0.24	0.24	0.24	0.24	0.24	D												
5	15	2012			0.21	0.26	0.13	D	0.23	0.23	0.23	0.23	0.23	0.23	0.00	D												
5	16	2012			0.05	0.07	0.01	D	0.24	0.24	0.24	0.24	0.24	0.24	0.00	D												
5	17	2012							0.27	0.27	0.27	0.27	0.27	0.27	0.54	D												
5	18	2012							0.22	0.22	0.22	0.22	0.22	0.22	0.23	D												
5	19	2012							0.21	0.21	0.21	0.21	0.21	0.21	0.22	D						0.50	0.50	0.50	0.50	S		
5	20	2012							0.12	0.12	0.12	0.12	0.12	0.12	0.00	D	0.50	0.50	0.50	0.50	S							
5	21	2012																										
5	22	2012	0.23	0.43																								
5	23	2012							0.28	0.28	0.28	0.28	0.28	0.28	0.39	D	0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S		
5	24	2012							0.40	0.40	0.40	0.40	0.40	0.40	0.39	D												
5	25	2012							0.38	0.38	0.38	0.38	0.38	0.38	0.39	D												
5	26	2012							0.37	0.37	0.37	0.37	0.37	0.37	0.38	D												
5	27	2012							0.33	0.33	0.33	0.33	0.33	0.33	0.39	D												
5	31	2012																										
6	1	2012															0.25	0.25	0.25	0.25	S							
6	2	2012															0.25	0.25	0.25	0.25	S							
6	3	2012	0.55	0.20													0.25	0.25	0.25	0.25	S							
6	4	2012	2.62	2.40													0.25	0.25	0.25	0.25	S							
6	13	2012	0.11	0.18																								
6	15	2012	0.80	0.75																								
6	16	2012	1.12	1.14																								
6	29	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
6	30	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	1	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	2	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	3	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	4	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	5	2012															0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	6	2012			0.10	0.10	0.10	D	0.08	0.08	0.00	0.15	0.15	0.00	0.12	D												
7	7	2012			0.10	0.10	0.10	D	0.09	0.09	0.00	0.16	0.16	0.00	0.14	D												

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

Date			Halfway @ Building	Helms @ Well 1		Field 2				Field 3								Field 5 - A spans 2-4	Field 5 - A spans 5-8				Field 5 - B spans 2-4	Field 5 - B spans 5-8				Field 5 - C spans 2-4	Field
						Drip				Drip								Pivot	Pivot				Pivot	Pivot				Pivot	Pivot
						Cot	Cot	Cot		Cot								Cot	Cot				Cot	Cot				Sorg.	Sorg.
Mo	Da	Yr				T 1	T 2	T 3	system	T1	T2	T3	T4	T5	T6	Border	system		Base	Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system		Base
7	8	2012				0.11	0.11	0.11	D	0.08	0.08	0.00	0.15	0.15	0.00	0.14	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	9	2012				0.11	0.11	0.11	D	0.07	0.07	0.37	0.14	0.14	0.00	0.21	D												
7	10	2012	0.45	0.50		0.09	0.09	0.09	D	0.08	0.08	0.18	0.14	0.14	0.57	0.10	D												
7	11	2012				0.10	0.10	0.10	D	0.10	0.10	0.00	0.15	0.15	0.43	0.13	D												
7	12	2012				0.13	0.13	0.13	D	0.08	0.08	0.00	0.16	0.16	0.00	0.16	D												
7	13	2012				0.13	0.13	0.13	D	0.10	0.10	0.00	0.15	0.15	0.00	0.17	D												
7	14	2012				0.11	0.11	0.11	D	0.08	0.08	0.00	0.15	0.15	0.00	0.19	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	15	2012				0.11	0.11	0.11	D	0.07	0.07	0.00	0.14	0.14	0.00	0.18	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	16	2012	0.10	0.07		0.11	0.11	0.11	D	0.08	0.08	0.36	0.15	0.15	0.00	0.17	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	17	2012				0.10	0.10	0.10	D	0.08	0.08	0.14	0.14	0.14	0.57	0.10	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	18	2012				0.11	0.11	0.11	D	0.09	0.09	0.00	0.15	0.15	0.43	0.19	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	19	2012				0.27	0.27	0.27	D	0.11	0.11	0.00	0.21	0.21	0.00	0.09	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	20	2012				0.29	0.29	0.29	D	0.11	0.11	0.00	0.21	0.21	0.00	0.15	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	21	2012	0.30	0.00		0.34	0.34	0.34	D	0.11	0.11	0.00	0.21	0.21	0.00	0.26	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	22	2012				0.30	0.30	0.30	D	0.11	0.11	0.00	0.21	0.21	0.00	0.17	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	23	2012				0.30	0.30	0.30	D	0.11	0.11	0.32	0.21	0.21	0.00	0.17	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	24	2012				0.23	0.23	0.23	D	0.12	0.12	0.38	0.22	0.22	0.46	0.27	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	25	2012				0.21	0.21	0.21	D	0.11	0.11	0.00	0.21	0.21	0.77	0.21	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	26	2012				0.20	0.20	0.20	D	0.10	0.10	0.00	0.19	0.19	0.14	0.19	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
7	27	2012				0.19	0.19	0.19	D	0.09	0.09	0.00	0.17	0.17	0.00	0.17	D											0.20	0.20
7	28	2012				0.22	0.22	0.22	D	0.10	0.10	0.00	0.18	0.18	0.00	0.28	D												
7	29	2012				0.20	0.20	0.20	D	0.10	0.10	0.00	0.18	0.18	0.00	0.18	D												
7	30	2012				0.19	0.19	0.19	D	0.09	0.09	0.27	0.17	0.17	0.00	0.16	D												
7	31	2012				0.21	0.21	0.21	D	0.18	0.18	0.69	0.31	0.31	0.13	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	1	2012				0.22	0.22	0.22	D	0.14	0.14	0.00	0.32	0.32	0.81	0.26	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	2	2012				0.19	0.19	0.19	D	0.15	0.15	0.00	0.25	0.25	0.70	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	3	2012				0.21	0.21	0.21	D	0.13	0.13	0.00	0.29	0.29	0.27	0.31	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	4	2012				0.22	0.22	0.22	D	0.13	0.13	0.00	0.29	0.29	0.00	0.29	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	5	2012				0.18	0.18	0.18	D	0.13	0.13	0.00	0.21	0.21	0.00	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	6	2012				0.18	0.18	0.18	D	0.12	0.12	0.24	0.21	0.21	0.00	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	7	2012				0.19	0.19	0.19	D	0.18	0.18	0.71	0.33	0.33	0.16	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	8	2012	0.05	0.04		0.20	0.20	0.20	D	0.19	0.19	0.02	0.27	0.27	0.73	0.31	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	9	2012				0.18	0.18	0.18	D	0.16	0.16	0.00	0.28	0.28	0.74	0.30	D	0.2	0.200	0.30	0.10	L	0.2	0.200	0.30	0.10	L	0.2	0.200

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date Mo	Da	Yr	Halfway @ Building	Helms @ Well 1	Field 2 Drip Cot T 1	Drip Cot T 2	Drip Cot T 3	system	Field 3 Drip Cot T1	T2	T3	T4	T5	T6	Border	system	Field 5 - A spans 2-4 Pivot Cot	Field 5 - A spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - B spans 2-4 Pivot Cot	Field 5 - B spans 5-8 Pivot Cot Base	Base+ 50%	Base- 50%	system	Field 5 - C spans 2-4 Pivot Sorg.	Field Pivot Sorg. Base
8	10	2012			0.21	0.21	0.21	D	0.15	0.15	0.00	0.30	0.30	0.29	0.30	D												
8	11	2012			0.21	0.21	0.21	D	0.15	0.15	0.00	0.27	0.27	0.00	0.29	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	12	2012			0.18	0.18	0.18	D	0.17	0.17	0.00	0.22	0.22	0.00	0.29	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	13	2012			0.19	0.19	0.19	D	0.15	0.15	0.25	0.19	0.19	0.00	0.28	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	14	2012			0.20	0.20	0.20	D	0.15	0.15	0.69	0.33	0.33	0.17	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	15	2012			0.17	0.17	0.17	D	0.15	0.15	0.00	0.24	0.24	0.70	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	16	2012	0.43	0.30	0.19	0.19	0.19	D	0.15	0.15	0.00	0.31	0.31	0.79	0.30	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	17	2012		0.40	0.2	0.2	0.2	D	0.15	0.15	0.00	0.29	0.29	0.28	0.30	D	0.40	0.40	0.60	0.20	L	0.40	0.40	0.60	0.20	L	0.20	0.20
8	18	2012			0.22	0.22	0.22	D	0.15	0.15	0.00	0.24	0.24	0.00	0.29	D												
8	19	2012			0.19	0.19	0.19	D	0.16	0.16	0.00	0.23	0.23	0.00	0.29	D												
8	20	2012	0.37	0.33	0.19	0.19	0.19	D	0.14	0.14	0.28	0.21	0.21	0.00	0.29	D												
8	21	2012			0.22	0.22	0.22	D	0.15	0.15	0.65	0.30	0.30	0.17	0.30	D											0.20	0.20
8	22	2012			0.12	0.12	0.12	D	0.08	0.08	0.00	0.19	0.19	0.68	0.19	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	23	2012			0.11	0.11	0.11	D	0.08	0.08	0.00	0.11	0.11	0.76	0.17	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	24	2012	0.03	0.15	0.11	0.11	0.11	D	0.09	0.09	0.00	0.15	0.15	0.27	0.16	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	25	2012			0.11	0.11	0.11	D	0.09	0.09	0.00	0.14	0.14	0.00	0.16	D												
8	26	2012			0.1	0.1	0.1	D	0.09	0.09	0.00	0.15	0.15	0.00	0.10	D												
8	27	2012			0.13	0.13	0.13	D	0.10	0.10	0.44	0.18	0.18	0.03	0.19	D												
8	28	2012			0.09	0.09	0.09	D	0.09	0.09	0.00	0.14	0.14	0.69	0.14	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	29	2012			0.09	0.09	0.09	D	0.08	0.08	0.00	0.15	0.15	0.18	0.09	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	30	2012			0.1	0.1	0.1	D	0.08	0.08	0.00	0.16	0.16	0.00	0.13	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
8	31	2012			0.11	0.11	0.11	D	0.05	0.05	0.00	0.23	0.23	0.00	0.18	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20
9	1	2012			0.11	0.11	0.11	D	0.04	0.04	0.00	0.23	0.23	0.00	0.18	D	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L		
9	2	2012			0.10	0.10	0.10	D	0.09	0.09	0.00	0.17	0.17	0.00	0.06	D												
9	3	2012			0.11	0.11	0.11	D	0.07	0.07	0.29	0.11	0.11	0.00	0.19	D												
9	4	2012			0.1	0.1	0.1	D	0.13	0.13	0.15	0.20	0.20	0.64	0.18	D												
9	5	2012	1.00	1.30	0.09	0.09	0.09	D	0.10	0.10	0.00	0.15	0.15	0.27	0.08	D												
9	13	2012	1.78	1.55																								
Pre & At Plant			1.11	1.98	7.19	7.25	7.16		7.29	7.29	7.29	7.29	7.29	7.29	6.90		4.80	4.80	4.80	4.80		3.80	3.80	3.80	3.80		3.10	3.10
Seasonal			4.51	4.64	10.28	10.28	10.28		6.93	6.93	6.43	12.65	12.65	12.83	13.00		9.40	9.40	14.10	4.70		9.40	9.40	14.10	4.70		9.40	9.40
TOTALS			10.82	11.29	17.47	17.53	17.44		14.22	14.22	13.72	19.94	19.94	20.12	19.90		14.20	14.20	18.90	9.50		13.20	13.20	17.90	8.50		12.50	12.50

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date			Halfway @ Building	Helms @ Well 1		5 - C spans 5-8			Field 5 - D spans 2-4	Field 5 - D spans 5-8				Field 5 - E spans 2-4	Field 5 - E spans 5-8				Field 5 - F spans 2-4	Field 5 - F spans 5-8				Field 6 - A,C,F	Field 6 - B,D,E	Field 6 - DRY	Field 6 - G	Field 6 - H	
									Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	Drip	Drip	
									Cot	Cot				Cot	Cot				Sorg.	Sorg.				Cot	Cot	Cot	Cot	Cot	
Mo	Da	Yr				Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system	1.0 B.I.	0.5 B.I.				syste
4	9	2012	0.06	0.10																									
4	10	2012																	0.50	0.50	0.50	0.50	L	0.10	0.10	0.10	0.12	0.13	D
4	11	2012																						0.12	0.12	0.12	0.12	0.13	D
4	12	2012																						0.10	0.10	0.10	0.13	0.12	D
4	13	2012																						0.11	0.11	0.11	0.13	0.12	D
4	14	2012																						0.13	0.13	0.13	0.13	0.12	D
4	15	2012																						0.12	0.12	0.12	0.13	0.12	D
4	16	2012																						0.11	0.11	0.11	0.13	0.12	D
4	17	2012							0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L						0.10	0.10	0.10	0.12	0.12	D
4	18	2012				0.40	0.40	L																0.27	0.27	0.27	0.25	0.24	D
4	19	2012							0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.40	0.40	0.40	0.40	L	0.18	0.18	0.18	0.25	0.24	D
4	20	2012				0.40	0.40	L																0.26	0.26	0.26	0.24	0.25	D
4	21	2012							0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.26	0.26	0.26	0.25	0.24	D
4	22	2012				0.30	0.30	L											0.30	0.30	0.30	0.30	L	0.17	0.17	0.17	0.25	0.25	D
4	23	2012	0.20	0.23		0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L						0.24	0.24	0.24	0.25	0.24	D
4	24	2012							0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.21	0.21	0.21	0.25	0.24	D
4	25	2012				0.30	0.30	L											0.30	0.30	0.30	0.30	L	0.22	0.22	0.22	0.25	0.25	D
4	26	2012	0.15	0.70		0.30	0.30	L	0.30	0.30	0.30	0.30	L	0.30	0.30	0.30	0.30	L						0.22	0.22	0.22	0.24	0.24	D
4	27	2012																	0.30	0.30	0.30	0.30	L	0.20	0.20	0.20	0.25	0.24	D
4	28	2012																						0.27	0.27	0.27	0.24	0.24	D
4	29	2012	0.10	0.00																				0.21	0.21	0.21	0.24	0.24	D
4	30	2012																						0.22	0.22	0.22	0.24	0.24	D
5	1	2012																						0.21	0.21	0.21	0.24	0.24	D
5	2	2012																						0.22	0.22	0.22	0.24	0.24	D
5	3	2012																						0.22	0.22	0.22	0.24	0.24	D
5	4	2012				0.3	0.3	L	0.3	0.3	0.3	0.3	L	0.3	0.3	0.3	0.3	L						0.20	0.20	0.20	0.24	0.24	D
5	5	2012							0.3	0.3	0.3	0.3	L	0.3	0.3	0.3	0.3	L	0.2	0.2	0.2	0.2	L	0.25	0.25	0.25	0.24	0.24	D
5	6	2012				0.3	0.3	L																0.19	0.19	0.19	0.25	0.25	D
5	7	2012																						0.19	0.19	0.19	0.24	0.24	D
5	8	2012																						0.22	0.22	0.22	0.16	0.16	D
5	9	2012																											
5	10	2012	0.10	0.10																				0.18	0.18	0.18	0.25	0.24	D
5	11	2012																						0.26	0.26	0.26	0.25	0.25	D

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date Mo	Date Da	Date Yr	Halfway @ Building	Helms @ Well 1	5 - C spans 5-8 Base+ 50%	5 - C spans 5-8 Base- 50%	system	Field 5 - D spans 2-4 Pivot Cot	Field 5 - D spans 5-8 Pivot Cot Base	Field 5 - D spans 5-8 Base+ 50%	Field 5 - D spans 5-8 Base- 50%	system	Field 5 - E spans 2-4 Pivot Cot	Field 5 - E spans 5-8 Pivot Cot Base	Field 5 - E spans 5-8 Base+ 50%	Field 5 - E spans 5-8 Base- 50%	system	Field 5 - F spans 2-4 Pivot Sorg.	Field 5 - F spans 5-8 Pivot Sorg. Base	Field 5 - F spans 5-8 Base+ 50%	Field 5 - F spans 5-8 Base- 50%	system	Field 6 - A,C,F Drip Cot 1.0 B.I.	Field 6 - B,D,E Drip Cot 0.5 B.I.	Field 6 - DRY Drip Cot	Field 6 - G Drip Cot	Field 6 - H Drip Cot	syste
5	12	2012			0.50	0.50	S	0.50	0.50	0.50	0.50	S											0.25	0.25	0.25	0.24	0.24	D
5	13	2012	0.24	0.39									0.50	0.50	0.50	0.50	S	0.50	0.50	0.50	0.50	S	0.13	0.13	0.13	0.24	0.24	D
5	14	2012	0.03	0.03																			0.11	0.11	0.11	0.12	0.12	D
5	15	2012																					0.11	0.11	0.11	0.12	0.12	D
5	16	2012																					0.22	0.22	0.22	0.24	0.24	D
5	17	2012																					0.33	0.33	0.33	0.60		D
5	18	2012																					0.21	0.21	0.21			D
5	19	2012						0.50	0.50	0.50	0.50	S											0.21	0.21	0.21	0.4		D
5	20	2012											0.50	0.50	0.50	0.50	S						0.21	0.21	0.21	0.41		D
5	21	2012																					0.12	0.12	0.12	0.25		D
5	22	2012	0.23	0.43																								
5	23	2012						0.20	0.20	0.20	0.20	S	0.20	0.20	0.20	0.20	S											
5	24	2012																										
5	25	2012																										
5	26	2012																										
5	27	2012																										
5	31	2012																										
6	1	2012						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						
6	2	2012						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						
6	3	2012	0.55	0.20				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						
6	4	2012	2.62	2.40				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						
6	13	2012	0.11	0.18																								
6	15	2012	0.80	0.75																								
6	16	2012	1.12	1.14																								
6	29	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
6	30	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	1	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	2	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	3	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	4	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	5	2012			0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L						
7	6	2012																					0.09	0.04			0.29	D
7	7	2012																					0.15	0.11		0.22		D

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

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

Date			Halfway @ Building	Helms @ Well 1		5 - C spans 5-8			Field 5 - D spans 2-4	Field 5 - D spans 5-8				Field 5 - E spans 2-4	Field 5 - E spans 5-8				Field 5 - F spans 2-4	Field 5 - F spans 5-8				Field 6 - A,C,F	Field 6 - B,D,E	Field 6 - DRY	Field 6 - G	Field 6 - H	
									Pivot	Pivot				Pivot	Pivot				Pivot	Pivot				Drip	Drip	Drip	Drip	Drip	
									Cot	Cot				Cot	Cot				Sorg.	Sorg.				Cot	Cot	Cot	Cot	Cot	
Mo	Da	Yr				Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system		Base	Base+ 50%	Base- 50%	system	1.0 B.I.	0.5 B.I.				syste
7	8	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.14	0.02			0.38	D
7	9	2012																						0.15	0.11		0.22		D
7	10	2012	0.45	0.50																				0.13	0.02			0.38	D
7	11	2012																						0.12	0.12		0.22		D
7	12	2012																						0.15	0.02			0.38	D
7	13	2012																						0.13	0.12		0.22		D
7	14	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.02			0.38	D
7	15	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.12		0.22		D
7	16	2012	0.10	0.07		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.05			0.45	D
7	17	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.09	0.09		0.22	0.14	D
7	18	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.05			0.49	D
7	19	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.24		0.02	0.32	D
7	20	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.39	0.07		0.22	0.16	D
7	21	2012	0.30	0.00		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.23	0.26		0.26	0.32	D
7	22	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.38	0.05		0.24	0.16	D
7	23	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.18	0.23		0.23	0.32	D
7	24	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.41	0.08		0.26	0.16	D
7	25	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.21	0.25		0.22	0.34	D
7	26	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.38	0.06		0.21	0.16	D
7	27	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.23		0.27	0.32	D
7	28	2012																						0.43	0.08		0.30	0.16	D
7	29	2012																						0.19	0.25		0.18	0.32	D
7	30	2012																						0.40	0.07		0.26	0.15	D
7	31	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.24		0.22	0.32	D
8	1	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.41	0.07		0.30	0.16	D
8	2	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.16	0.23		0.17	0.31	D
8	3	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.42	0.08		0.27	0.15	D
8	4	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.28		0.20	0.32	D
8	5	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.37	0.04		0.24	0.15	D
8	6	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.16	0.22		0.23	0.32	D
8	7	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.42	0.09		0.27	0.15	D
8	8	2012	0.05	0.04		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.17	0.24		0.15	0.31	D
8	9	2012				0.30	0.10	L	0.2	0.200	0.30	0.10	L					L						0.33	0.10		0.20	0.18	D

2012 Rain and Irrigation Amounts at Helm Farm and Halfway

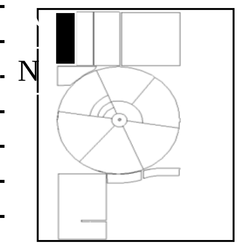
Rainfall (inches) Helms Irrigation Amounts (inches) D= driip irrigation, L = LEPA irrigation, S = spray irrigation, F= furrow water

Mo	Da	Yr	Halfway @ Building	Helms @ Well 1		5 - C spans 5-8 Base+ 50%	5 - C spans 5-8 Base- 50%	system	Field 5 - D spans 2-4 Pivot Cot	Field 5 - D spans 5-8 Pivot Cot Base	Field 5 - D spans 5-8 Base+ 50%	Field 5 - D spans 5-8 Base- 50%	system	Field 5 - E spans 2-4 Pivot Cot	Field 5 - E spans 5-8 Pivot Cot Base	Field 5 - E spans 5-8 Base+ 50%	Field 5 - E spans 5-8 Base- 50%	system	Field 5 - F spans 2-4 Pivot Sorg.	Field 5 - F spans 5-8 Pivot Sorg. Base	Field 5 - F spans 5-8 Base+ 50%	Field 5 - F spans 5-8 Base- 50%	system	Field 6 - A,C,F Drip Cot 1.0 B.I.	Field 6 - B,D,E Drip Cot 0.5 B.I.	Field 6 - DRY Drip Cot	Field 6 - G Drip Cot	Field 6 - H Drip Cot	syste
8	10	2012												0.20	0.20				0.20	0.20				0.19	0.25		0.26	0.31	D
8	11	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.42	0.08		0.32	0.15	D
8	12	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.24		0.15	0.32	D
8	13	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.40	0.08		0.22	0.15	D
8	14	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.19	0.26		0.25	0.31	D
8	15	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.38	0.07		0.20	0.15	D
8	16	2012	0.43	0.30		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.19	0.25		0.27	0.31	D
8	17	2012		0.40		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.40	0.08		0.22	0.15	D
8	18	2012																						0.20	0.27		0.26	0.32	D
8	19	2012																						0.39	0.06		0.27	0.15	D
8	20	2012	0.37	0.33																				0.18	0.26		0.21	0.32	D
8	21	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.41	0.07		0.29	0.15	D
8	22	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.10	0.10		0.30	0.12	D
8	23	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.15	0.03		0.19	0.18	D
8	24	2012	0.03	0.15		0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.14	0.12		0.11	0.11	D
8	25	2012																						0.13	0.03		0.19	0.18	D
8	26	2012																						0.11	0.09		0.11	0.11	D
8	27	2012																						0.21	0.04		0.19	0.18	D
8	28	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.12	0.09		0.11	0.11	D
8	29	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.11	0.03		0.17	0.18	D
8	30	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.14	0.16		0.11	0.11	D
8	31	2012				0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.20	0.20	0.30	0.10	L	0.16	0.05		0.17	0.18	D
9	1	2012																						0.15	0.16		0.10	0.11	D
9	2	2012																						0.13	0.02		0.19	0.18	D
9	3	2012																						0.13	0.12		0.11	0.11	D
9	4	2012																						0.15	0.04		0.19	0.18	D
9	5	2012	1.00	1.30																				0.11	0.09		0.11	0.11	D
9	13	2012	1.78	1.55																									
Pre & At Plant			1.11	1.98		3.10	3.10		4.80	4.80	4.80	4.80		4.80	4.80	4.80	4.80		4.10	4.10	4.10	4.10	#	7.86	7.86	7.86	9.18	7.43	
Seasonal			4.51	4.64		14.10	4.70		9.40	9.40	14.10	4.70		9.40	9.40	13.80	4.60		9.40	9.40	13.80	4.60	#	13.73	7.49	0.00	11.51	13.09	
TOTALS			10.82	11.29		17.20	7.80		14.20	14.20	18.90	9.50		14.20	14.20	18.60	9.40		13.50	13.50	17.90	8.70		21.59	15.35	7.86	20.69	20.52	

Operations Summary

Year	2012
Farm	Helm
Field ID	Field 1 Corn Hybrids for Drought Tolerance Xu
Exp. Design	5 zones, 24 rows x 1300' plots, 40" row width
Soil Type	

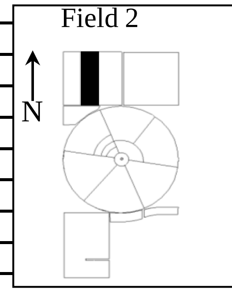
Field 1



Field Operations	Date	Activity
Tillage	3/13/2012	Lister on (30" spacing) F.1 North & F.1 South
	4/6/2012	Bed Conditioners F1 North & F.1 South
	5/25/2012	Rotary Hoe F.1 North & F.1 South
	6/9/2012	Rotary Hoe F.1 North & F.1 South
	6/13/2012	Cultivate F.1 South
	6/15/2012	Rotary Hoe F.1 North
	6/18/2012	Rotary Hoe F.1 North
	7/6/2012	Cultivate & Dike F.1 North
Fertility	3/12/2012	150-30-0 Dry
	6/12/2012	100 lbs N/ac (32-0-0 applied thru coulter rig F.1 South)
Planting	5/16/2012	Corn plots F.1 South
	5/21/2012	DeltaPine 0912 B2RF at 52,272 seed/ac F.1 North
Herbicide/Growth Regulator	3/13/2012	Gly-Star Gold 32 oz/ac F. South
	4/17/2012	Gly-Star Gold 32 oz/ac F.1 South
	5/8/2012	Cornerstone Plus 32 oz/ac F.1 South
	5/17/2012	Lumax & Mad Dog 32 oz/ac F.1 South
	5/21/2012	Caparol 3 pt/ac & Mad Dog 32 oz/ac F.1 North
	6/20/2012	Mad Dog 32 oz/ac F.1 North
	6/13/2012	Warrant 3 pt/ac F.1 South
	6/20/2012	Mad Dog 32 oz/ac F.1 North
	7/18/2012	Mad Dog 32 oz/ac & Mepiquat 8 oz/ac F.1 North
	7/24/2012	Mepiquat 8 oz/ac F.1 North
	8/8/2012	Mad Dog 32 oz/ac & Mepiquat 8 oz/ac F.1 North
Insecticide	6/20/2012	Acephate 4 oz/ac F.1 North
Harvest aid	10/9/2012	Prep 32 oz/ac & E.T. 2 oz/ac F.1 North
	10/17/2012	Firestorm 24 oz/ac & LI 700 1 oz/ac F.1 North
Irrigation Amt.		
PrePlant & Planting		
Seasonal		
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

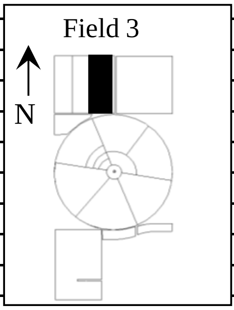
Year	2012
Farm	Helm
Field ID	Field 2
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	11/29/2011	Shredder
	1/4/2012	Chisel
	1/11/2012	Off Set Disk
	1/23/2012	Field Cultivator
	3/8/2012	Lister on 60" spacing
	3/12/2012	Roller & Bed Conditioners
	4/30/2012	Roller & Bed Conditioners
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/17/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
	7/16/2012	Cultivate & Dike
Fertility	11/29/2011	19 lbs N/ac + 63 lbs P/ac (10-34-0 applied thru coulter rig)
	7/12,13/2012	50 lbs N/ac (32-0-0 applied thru Drip)
Planting	5/17/2012	FM 9180 B2F at 56,144 seed/ac
Herbicide/Growth Regulator	3/12/2012	Trifluralin 1 qt/ac
	5/18/2012	Caparol 3 pt/ac
	5/18/2012	Roundup 32 oz/ac
	6/18/2012	Mad Dog 32 oz/ac
	7/17/2012	Mad Dog 32 oz/ac
Insecticide	6/18/2012	Acephate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1 oz/ac
Irrigation Amt.		
PrePlant & Planting	4/9-5/16	Trt. 1 7.19 in.; Trt. 2 7.25 in.; Trt. 3 7.16 in.
Seasonal	7/6-9/5	Trt. 1 10.28 in.; Trt. 2 10.28 in.; Trt. 3 10.28 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

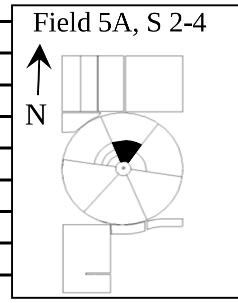
Year	2012
Farm	Helm
Field ID	Field 3
Exp. Design	Cotton Response to Irregation Interval and Field Topography
Soil Type	



Field Operations	Date	Activity
Tillage	11/29/2011	Shredder
	1/4/2012	Chisel
	1/10/2012	Off Set Disk
	1/23/2012	Field Cultivator
	2/27/2012	Lister on 60" spacing
	3/12/2012	Roller & Bed Conditioners
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/17/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
	7/11/2012	Cultivate & Dike
Fertility	11/29/2011	17 lbs N/ac + 58 lbs P/ac (10-34-0 applied thru coulter rig)
	7/10-23/2012	32 lbs N/ac (32-0-0 applied thru Drip on Low Irr.)
	7/10-23/2012	56 lbs N/ac (32-0-0 applied thru Drip on High Irr.)
Planting	5/17/2012	FM 9180B2F at 56,144 seed/ac
Herbicide/Growth Regulator	3/12/2012	Trifluralin 1 qt/ac
	5/18/2012	Caparol 3 pt/ac
	5/18/2012	Roundup 32 oz/ac
	6/18/2012	Mad Dog 32 oz/ac
	7/16/2012	Mad Dog 32 oz/ac
Insecticide	6/18/2012	Acephate 4oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4/25-5/29	7.29in.
Seasonal	7/6-9/5	Trt. 1 6.93 in.;Trt. 2 6.93 in.
	7/6-9/5	Trt. 4 12.65 in.; Trt. 5 12.65 in.
	7/6-9/5	Trt. 3 6.43 in.
	7/6-9/5	Trt. 6 12.83 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

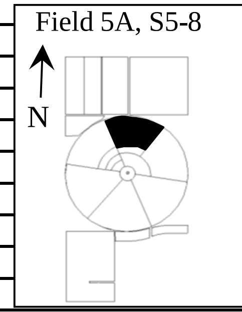
Year	2012
Farm	Helm
Field ID	Field 5a Spans 2-4
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/3/2012	Big Ox
	1/19/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/26/2012	Lister (Roller & Bed Conditioners)
	4/3/2012	Dike (Bed Conditioners)
	5/2/2012	Dike (Bed Conditioners)
	5/24/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/25/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (45-15-0 applied thru coulter rig)
Planting	5/18/2012	D.O.W. Regulated plots (Span 3,4)
	5/19/2012	Phytogen 367 WFR Filler (Span 3,4)
	5/21/2012	DP 0912 B2RF (Span 2) at 52,272 see/ac
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1 qt/ac (Span 2-4)
	5/21/2012	Caparol 3 pt/ac (Span 2)
	5/22/2012	Roundup Powermax 32 oz/ac (Span 2)
	6/14/2012	Mad Dog 32 oz/ac (Span2)
	7/14/2012	Mad Dog 32 oz/ac (Span2)
	7/19/2012	Medal 1.25 pt/ac (Span 3,4)
	7/20/2012	Mad Dog 32 oz/ac & Medal 1.25 pt/ac (Span2)
	8/16/2012	Mad Dog 32 oz/ac (Span2)
Insecticide	6/14/2012	Acephate 4oz/ac (Span 2)
	6/14/2012	Acephate 4oz/ac (Span 3,4)
Harvest aid	10/9/2012	Prep
	10/17/2012	Firestorm
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

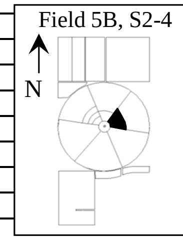
Year	2012
Farm	Helm
Field ID	Field 5a Spans 5-8
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/13/2012	Big Ox
	1/19/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/26/2012	Lister (Roller & Bed Conditioners)
	4/3/2012	Dike (Bed Conditioners)
	5/2/2012	Dike (Bed Conditioners)
	5/15/2012	Rotary Hoe
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/25/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig on High Irr.)
	6/25/2012	45.7 lbs N/ac +16 lbs P/ac (applied thru coulter rig on Meduim Irr.)
Planting	5/7/2012	Bayor CAP FM 1944 GLB2, FM 2011GT, FM 9250GL, FM 9170 B2F, FM 2484 B2F
		(Span 5-8) at 52,272 seed/ac
	5/7/2012	FM 9180 B2F at 52,272 seed/ac (Overhang)
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1qt./ac (Span 5-8)
	5/9/2012	Caparol 3pt./ac & Cornerstone 32 oz/ac (Span 5-8)
	5/22/2012	Roundup Powermax 32oz/ac (Span5-8)
	6/14/2012	Mad Dog 32 oz/ac (Span5-8)
	6/21/2012	Mad Dog 32oz/ac (Span5-8)
	7/21/2012	Mad Dog 32oz/ac & Medal 1.25 pt/ac (Span5-8)
	8/3/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/16/2012	Mad Dog 32oz/ac (Span5-8)
Insecticide	6/14/2012	Acephate 4oz/ac (Span 5-8)
Harvest aid	10/9/2012	Prep 32oz/ac & E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac & LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

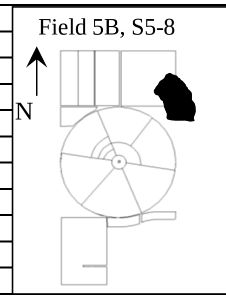
Year	2012
Farm	Helm
Field ID	Field 5b Spans 2-4
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/18/2012	Big Ox
	1/19/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/26/2012	Lister (Roller & Bed Conditioners)
	4/3/2012	Dike (Bed Conditioners)
	5/2/2012	Dike (Bed Conditioners)
	5/24/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/25/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig)
Planting	5/18/2012	D.O.W. Regulated Plots (Span 3,4)
	5/19/2012	Phytogen 367 WRF Filler (Span 3,4)
	5/21/2012	Delta Pine 0912 B2RF (Span 2) at 52,272 seed/ac
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1qt./ac (Span 2-4)
	5/21/2012	Caparol 3pt./ac (Span 2-4)
	5/24/2012	Roundup Powermax 32oz/ac (Span 2)
	6/14/2012	Mad Dog 32oz/ac (Span2)
	7/14/2012	Mad Dog 32oz/ac (Span2)
	7/19/2012	Medal 1.25pt/ac (Span 3,4)
	7/20/2012	Mad Dog 32oz/ac & Medal 1.25pt/ac (Span 2)
	8/16/2012	Mad Dog 32 oz/ac (Span 2)
Insecticide	6/14/2012	Acephate 4oz/ac (Span 2-4)
Harvest aid	10/9/2012	Prep 32oz/ac & E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac & LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	3.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

Year	2012
Farm	Helm
Field ID	Field 5b Spans 5-8
Exp. Design	Cotton
Soil Type	

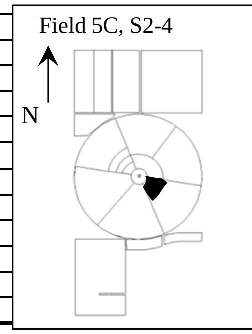


Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/18/2012	Big Ox
	1/19/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/26/2012	Lister (Roller & Bed Conditioners)
	4/3/2012	Dike (Bed Conditioners)
	5/2/2012	Dike (Bed Conditioners)
	5/15/2012	Rotary Hoe
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/25/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig on High Irr.)
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig on Medium Irr.)
Planting	5/8/2012	FM 9180 B2F at 52,272 seed/ac (Overhang)
	5/8/2012	FM 9180 B2F, DP 0912 B2RF, NG 3348 B2RF, ST 4288 B2F (Span 5-8) at 52,272 see/ac
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1qt./ac (Span 5-8)
	5/9/2012	Caparol 3qt./ac & Cornerstone Plus 32oz/ac (Span 5-8)
	5/24/2012	Roundup Powermax 32oz/ac (Span 5-8)
	6/21/2012	Mad Dog 32oz/ac (Span 5-8)
	7/21/2012	Mad Dog 32oz/ac & Medal 1.25pt./ac (Span 5-8)
	8/3/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/16/2012	Mad Dog 32oz/ac (Span 5-8)
Insecticide	6/14/2012	Acephate 4oz/ac (Span 5-8)
Harvest aid	10/9/2012	Prep 32oz/ac & E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac & LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Plantin	4-10 to 6-4	3.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Plantin	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

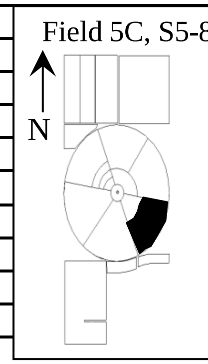
Year	2012
Farm	Helm
Field ID	Field 5c (Spans 2-4)
Exp. Design	Sorghum
Soil Type	

Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/19/2012	Big Ox
	1/20/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/27/2012	Lister (Roller & Bed Conditioners)
	4/4/2012	Dike (Bed Conditioners)
	5/3/2012	Dike (Bed Conditioners)
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/26/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig)
Planting	5/30/2012	DKS 53-67 (span 2) at 75,392 seed/ac
	6/1/2012	Mixed Varieties (Span 3,4)
Herbicide/Growth Regulator	5/24/2012	Roundup Powermax 32oz/ac (Span 2-4)
	6/2/2012	Touch Down 32oz/ac, Milo Pro 1qt/ac, Warrant 3pt/ac (Span 2-4)
	7/12/2012	Huskie 16oz/ac & Dual 16oz/ac (Span 2-4)
Insecticide		
Harvest aid	10/3/2012	Roundup Powermax 1qt/ac
Irrigation Amt.		
PrePlant & Planting		
Seasonal	4-10 to 6-4	3.1
	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.



Operations Summary

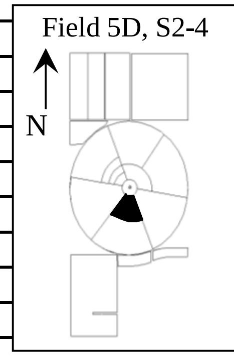
Year	2012
Farm	Helm
Field ID	Field 5c Spans 5-8
Exp. Design	Sorghum
Soil Type	



Field Operations	Date	Activity
Tillage	12/15/2011	Shredder
	1/6/2012	Off Set Disk
	1/19/2012	Big Ox
	1/20/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/27/2012	Lister (Roller & Bed Conditioners)
	4/4/2012	Dike (Bed Conditioners)
	5/3/2012	Dike (Bed Conditioners)
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/26/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig High Irr.)
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig Meduim Irr.)
Planting	5/30/2012	DKS 53-67 at 75,392 seed/ac (Overhang)
	5/30/2012	DKS 44-20, DKS 53-67 (Span 5-8) at 75,392 seed/ac
Growth Regulator	5/24/2012	Roundup Powermax 32oz/ac (Span 5-8)
	6/2/2012	Touchdown 32oz/ac, Milo Pro 1qt/ac, Warrant 3pt/ac (Span 5-8)
	7/12/2012	Huskie 16oz/ac & Dual 16oz/ac (Span 5-8)
Insecticide		
Harvest aid	10/3/2012	Roundup Powermax 1qt/ac
Irrigation Amt.	4-10 to 6-4	3.1
PrePlant & Plan	6-29 to 9-1	9.4
Seasonal		
Rainfall		
PrePlant & Plan	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

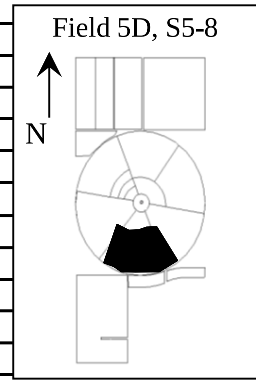
Year	2012
Farm	Helm
Field ID	Field 5d (Spans 2-4)
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	12/14/2011	Shredder
	1/9/2012	Off Set Disk
	1/12/2012	Big Ox
	1/18/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/27/2012	Lister(Roller & Bed Conditioners)
	4/4/2012	Dike (Bed Conditioners)
	5/3/2012	Dike (Bed Conditioners)
	5/24/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/26/2012	Cultivate & Dike
	8/10/2012	Shredder (Span 4)
	9/4/2012	Off Set Disk (Span 4)
Fertility	3/5/2012	54-30-0 Dry
		45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig)
Planting	5/18/2012	D.O.W. Regulated Plots (Span4)
	5/21/2012	Phytogen 367 WRF Filler (Span 2,3,4) at 52,272 seed/ac
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1qt./ac (Span 2-4)
	5/21/2012	Caparol 3pt./ac (Span 2)
	5/24/2012	Roundup Powermax 32oz/ac (Span2)
	6/21/2012	Mad Dog 32oz/ac (Span 2)
	7/14/2012	Mad Dog 32oz/ac (Span 2)
	7/19/2012	Mad Dog 32oz/ac, Medal 1.25pt/ac (Span 2,3)
	8/8/2012	Mad Dog 32oz/ac (Span 3,4) Border Area
	8/17/2012	Mad Dog 32oz/ac (Span 2,3,4)
Insecticide		
Harvest aid	10/9/2012	Prep 32oz/ac, E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac, LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-9 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

Year	2012
Farm	Helm
Field ID	Field 5d Spans 5-8
Exp. Design	Cotton
Soil Type	

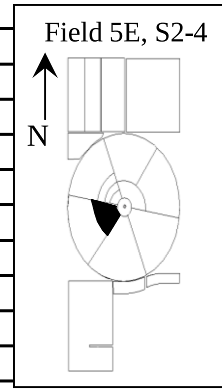


Field Operations	Date	Activity
Tillage	12/14/2011	Shredder
	1/9/2012	Off Set Disk
	1/12/2012	Big Ox
	1/18/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/27/2012	Lister (Roller & Bed Conditioners)
	4/4/2012	Dike (Bed Conditioners)
	5/3/2012	Dike (Bed Conditioners)
	5/15/2012	Rotary Hoe
	5/25/2015	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/26/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig High Irr.)
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig Meduim Irr.)
Planting	5/9/2012	FM 9180 B2F, DP 0912 B2RF, NG 3348 B2RF, ST 4288 B2F (Span5-8) at 52,272 seed/ac
	5/9/2012	FM 9180 B2F at 52,272 seed/ac (Overhang)
	5/10/2012	NG 3348 B2RF, NG 3348 B2RF (Span 6-8) at 52,272 seed/ac
Herbicide/Growth Regulator	3/5/2012	Trifluralin 1qt./ac (Span 5-8)
	5/12/2012	Caparol 3pt./ac Span 5-8)
	5/24/2012	Roundup Powermax 32oz/ac (Span 5-8)
	6/21/2012	Mad Dog 32oz/ac (Span 5-8)
	7/14/2012	Mad Dog 32oz/ac (Span 5-8)
	7/19/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 5)
	7/20/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 6)
	7/23/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 7,8)
	7/25/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/3/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/17/2012	Mad Dog 32oz/ac (Span 5-8)
Insecticide		
Harvest aid	10/9/2012	Prep 32oz/ac, E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac, LI 7001oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

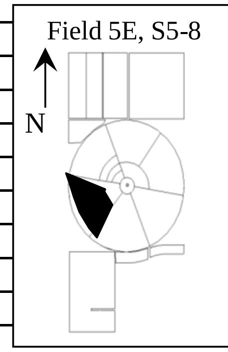
Year	2012
Farm	Helm
Field ID	Field 5e (Spans 2-4)
Exp. Design	Cotton
Soil Type	

Field Operations	Date	Activity
Tillage	12/14/2011	Shredder
	1/9/2012	Off Set Disk
	1/11/2012	Big Ox
	1/18/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/30/2012	Lister (Roller & Bed Conditioners)
	4/5/2012	Dike (Bed Conditioners)
	5/4/2012	Dike (Bed Conditioners)
	5/15/2012	Rotary Hoe
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/27/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig)
Planting	5/9/2012	DeltaPine 0912 B2RF (Span 2,3,4) at 52,272 seed/ac
Herbicide/Growth Regulator	3/6/2012	Trifluralin 1qt./ac (Span 2-4)
	5/12/2012	Caparol 3pt./ac (Span 2-4)
	5/25/2012	Roundup Powermax 32oz/ac (Span 2-4)
	6/21/2012	Mad Dog 32oz/ac (Span 2-4)
	7/19/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 2-4)
	8/17/2012	Mad Dog 32oz/ac (Span 2-4)
Insecticide		
Harvest aid	10/9/2012	Prep 32oz/ac, E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac, LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.



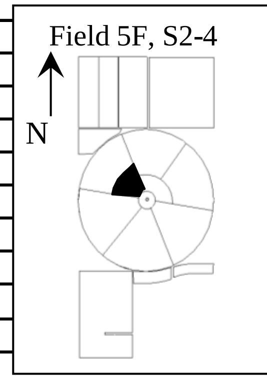
Operations Summary

Year	2012
Farm	Helm
Field ID	Field 5e (Spans 5-8)
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	12/14/2011	Shredder
	1/9/2012	Off Set Disk
	1/11/2012	Big Ox
	1/18/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/30/2012	Lister (Roller & Bed Conditioners)
	4/5/2012	Dike (Bed Conditioners)
	5/4/2012	Dike (Bed Conditioners)
	5/15/2012	Rotary Hoe
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/27/2012	Cultivate & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/25/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig High Irr.)
	6/25/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig Meduim Irr.)
Planting	5/9/2012	Fibermax 9180 B2F at 52,272 seed/ac (Overhang)
	5/9/2012	FM 9180 B2F, DP 0912 B2RF, NG 3348 B2RF, ST 4288 B2F (Span5-8) at 52,272 seed/ac
Herbicide/Growth Regulator	3/6/2012	Trifluralin 1qt./ac (Span 5-8)
	5/12/2012	Caparol 3pt./ac (Span 5-8)
	5/25/2012	Roundup Powermax 32oz/ac (Span 5-8)
	6/21/2012	Mad Dog 32oz/ac (Span 5-8)
	7/19/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 5)
	7/20/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 6)
	7/23/2012	Mad Dog 32oz/ac, Medal 1.25pt./ac (Span 7,8)
	7/25/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/3/2012	Mepiquat 8oz/ac (Span 5-8) High Irr.
	8/17/2012	Mad Dog 32oz/ac (Span 5-8)
Insecticide		
Harvest aid	10/9/2012	Prep 32oz/ac, E.T 2oz/ac
	10/17/2012	Firestorm 24oz/ac, LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.8
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

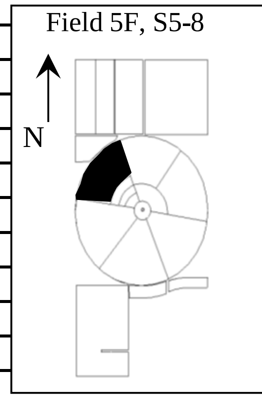
2012
Helm
Field 5f (Spans 2-4)
Sorghum



Date	Activity
12/14/2011	Shredder
1/9/2012	Off Set Disk
1/10/2012	Big Ox
1/17/2012	Off Set Disk
3/6/2012	Field Cutltivator
3/30/2012	Lister (Roller & Bed Conditioners)
4/5/2012	Dike (Bed Conditioners)
5/4/2012	Dike (Bed Conditioners)
5/25/2012	Rotary Hoe
6/10/2012	Rotary Hoe
6/15/2012	Rotary Hoe Skips
6/18/2012	Rotary Hoe
6/27/2012	Cultivate & Dike
3/5/2012	54-30-0 Dry
6/22/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig)
5/30/2012	ST 4288 B2F (Span 2) at 52,272 seed/ac (8 row strips)
5/30/2012	DKS 53-67 (Span 2,3) at 75,392 seed/ac
5/30/2012	FACT Test (Span 4)
5/24/2012	Roundup Powermax 32oz/ac (Span 2-4)
6/2/2012	Touch Down 32oz/ac, Milo Pro 1qt./ac, Warrant 3pt./ac (Span 2-4)
7/12/2012	Huskie 16oz/ac & Medal 16oz/ac (Span 2-4)
10/3/2012	Roundup Powermax 1qt./ac
4-10 to 6-4	4.1
6-29 to 9-1	9.4
1/25-5/22	3.31in.
6/3-9/13	9.31in.

Operations Summary

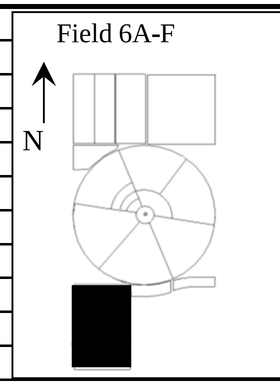
Year	2012
Farm	Helm
Field ID	Field 5f (Spans 5-8)
Exp. Design	Sorghum
Soil Type	



Field Operations	Date	Activity
Tillage	12/14/2011	Shredder
	1/9/2012	Off Set Disk
	1/10/2012	Big Ox
	1/17/2012	Off Set Disk
	3/6/2012	Field Cultivator
	3/30/2012	Lister (Roller & Bed Conditioners)
	4/5/2012	Dike (Bed Conditioners)
	5/4/2012	Dike (Bed Conditioners)
	5/25/2012	Rotary Hoe
	6/10/2012	Rotary Hoe
	6/15/2012	Rotary Hoe Skips
	6/18/2012	Rotary Hoe
	6/27/2012	Cultivates & Dike
Fertility	3/5/2012	54-30-0 Dry
	6/22/2012	113 lbs N/ac + 40 lbs P/ac (applied thru coulter rig High Irr.)
	6/22/2012	45.7 lbs N/ac + 16 lbs P/ac (applied thru coulter rig Meduim Irr.)
Planting	5/31/2012	DKS 53-67 (Span 5-8) at 75,392 seed/ac
Herbicide/Growth Regulator	5/24/2012	Roundup Powermax 32oz/ac (Span 5-8)
	6/2/2012	Touch Down 32oz/ac, Milo Pro 1qt./ac, Warrant 3pt./ac (Span 5-8)
	7/12/2012	Huskie 16oz/ac & Medal 16oz/ac (Span 5-8)
Insecticide		
Harvest aid	10/3/2012	Roundup Powermax 1qt./ac
Irrigation Amt.		
PrePlant & Planting	4-10 to 6-4	4.1
Seasonal	6-29 to 9-1	9.4
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

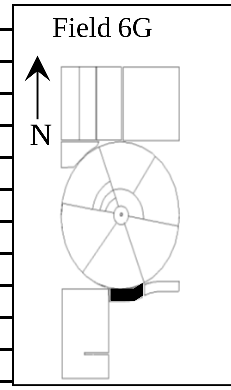
Year	2012
Farm	Helm
Field ID	Field 6 - Zone A-F
Exp. Design	Cotton
Soil Type	



Field Operations	Date	Activity
Tillage	11/28/2011	Shredder
	12/15/2011	Chisel
	1/13/2012	Off Set Disk
	1/20/2012	Field Cultivator
	2/29/2012	Lister on 60" spacing
	3/13/2012	Roller & Bed Conditioners
	5/1/2012	Roller & Bed Conditioners
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
	7/13/2012	Cultivate & Dike
Fertility	11/28/2011	19 lbs N/ac + 66 lbs P/ac (10-34-0 applied thru coulter rig)
	7/5-7/27/2012	70 lbs N/ac (32-0-0 applied thru coulter rig and SDI on Low Water Low N)
	7/5-7/27/2012	26 lbs N/ac (32-0-0 applied thru coulter rig and SDI on Low Water High N)
	7/5-7/27/2012	88 lbs N/ac (32-0-0 applied thru coulter rig and SDI on High Water Low N)
	7/5-7/27/2012	126 lbs N/ac (32-0-0 applied thru coulter rig and SDI on High Water High N)
Planting	5/16/2012	FM 9180 B2F, DP 0912 B2RF at 56,144 seed/ac
Herbicide/Growth Regulator	3/13/2012	Trifluralin 1 qt/ac
	4/25/2012	Cornerstone Plus 32 oz/ac
	4/25/2012	Aim 1 oz/ac
	5/21/2012	Caparol 3 pt/ac
	6/4/2012	Mad Dog 32 oz/ac
	7/16/2012	Mad Dog 32 oz/ac
Insecticide	6/4/2012	Acephate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24oz/ac
	10/17/2012	LI 700 1 oz/ac
Irrigation Amt.		
PrePlant & Planting	4/9-5/21	Dry 7.86 in.; Low 7.86 in.; High 7.86 in.
Seasonal	7/6-9/5	Dry 0.0 in.; Low 7.49 in.; High 13.73 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

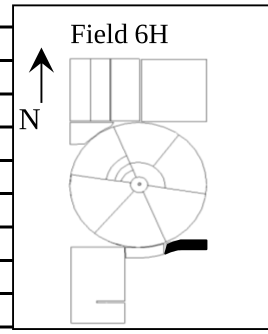
Year	2012	
Farm	Helm	
Field ID	Field 6 - Zone G	
Exp. Design	Cotton Drip Irrigated Nitrogen Level Effects on Insects	Parajulee
Soil Type		



Field Operations	Date	Activity
Tillage	11/28/2011	Shredder
	12/14/2011	Chisel
	1/11/2012	Off Set Disk
	1/24/2012	Field Cultivator
	3/5/2012	Lister on 60" spacing
	3/13/2012	Roller & Bed Conditioners
	5/22/2012	Rotary Hoe
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
	7/9/2012	Cultivate & Dike
Fertility	7/6/2012	32-0-0 liquid (applied thru coulter rig at mixed rates)
Planting	5/17/2012	Fibermax 9063 B2F at 56,144 seed/ac
Herbicide/Growth Regulator	3/13/2012	Trifluralin 1 qt/ac
	4/25/2012	Cornerstone Plus 32 oz
	4/25/2012	Aim 1 oz/ac
	5/18/2012	Caparol 3 pt/ac
	5/18/2012	Roundup 32 oz/ac
	6/2/2012	Roundup Powermax 32 oz/ac
	6/2/2012	Acephate 4 oz/ac
	7/16/2012	Mad Dog 32 oz/ac
Insecticide	6/2/2012	Acephate 4 oz/ac
	8/16/2017	Karate 4 oz/ac
	8/23/2012	Karate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1 oz/ac
Irrigation Amt.		
PrePlant & Planting	4/9-5-21	9.18 in.
Seasonal	7/6-9/5	11.51 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

Year	2012
Farm	Helm
Field ID	Field 6 - Zone H
Exp. Design	Cotton Drip Irrigated
Soil Type	



Field Operations	Date	Activity
Tillage	11/28/2011	Shredder
	12/14/2011	Chisel
	1/11/2012	Off Set Disk
	1/24/2012	Field Cultivator
	2/27/2012	Lister on 60" spacing
	3/13/2012	Roller & Bed Conditioners
	4/30/2012	Roller & Bed Conditioners
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
Fertility	11/29/2011	19 lbs N/ac + 60 lbs P/ac (10-34-0 applied thru coulter rig)
	7/17-18/2012	96 lbs N/ac (32-0-0 applied thru Drip)
Planting	5/7/2012	FM 9180 B2F at 52,272
	5/7/2012	FM 9180 B2F at 63,162 (Skip row over the top of the drip tape)
Herbicide/Growth Regulator	3/13/2012	Trifluralin 1 qt/ac
	4/25/2012	Cornerstone Plus 32oz/ac
	4/25/2012	Aim 1oz/ac
	5/12/2012	Caparol 3 pt/ac
	6/2/2012	Roundup Powermax 32 oz/ac
	7/16/2012	Mad Dog 32 oz/ac
	7/18/2012	Mad Dog 32 oz/ac
	7/18/2012	Mepiquat 8 oz/ac
	8/3/2012	Mepiquat 8 oz/ac
	8/16/2012	Mad Dog 32 oz/ac
Insecticide	6/2/2012	Acephate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1oz/ac
Irrigation Amt.		
PrePlant & Planting	4/9-5/21	7.43 in.
Seasonal	7/6-9/5	13.09 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.

Operations Summary

Year	2012	
Farm	Helm	
Field ID	Field 10	
Exp. Design		
Soil Type		
	Date	Activity
Tillage	11/29/2011	Shredder
	1/24/2012	Row Stalker
	2/29/2012	Lister on 60" spacing
	3/12/2012	Roller & Bed Conditioners
	5/1/2012	Roller & Bed Conditioners
	5/25/2012	Rotary Hoe
	6/9/2012	Rotary Hoe
	6/15/2012	Rotary Hoe
	6/17/2012	Rotary Hoe
	6/18/2012	Rotary Hoe
	7/6/2012	Cultivate & Dike
Fertility	11/29/2011	19 lbs N/ac + 60 lbs P/ac (10-34-0 applied thru coulter rig)
	6/12/2012	100 lbs N/ac (32-0-0 applied thru coulter rig)
Planting	5/17/2012	Fibermax 9180 B2F at 56,144 seed/ac
Herbicide/Growth Regulator	3/12/2012	Trifluralin 1 qt/ac
	3/13/2012	Gly-Star Gold 32 oz/ac
	4/25/2012	Cornerstone Plus 32 oz/ac
	4/25/2012	Aim 1 oz/ac
	5/18/2012	Caparol 3 pt/ac
	5/18/2012	Roundup 32 oz/ac
	6/2/2012	Roundup Powermax 32 oz/ac
	6/20/2012	Mad Dog 32 oz/ac
	6/20/2012	Acephate 4 oz/ac
	7/17/2012	Mad Dog 32 oz/ac
Insecticide	6/20/2012	Acephate 4 oz/ac
		Acephate 4 oz/ac
Harvest aid	10/9/2012	Prep 32 oz/ac
	10/9/2012	E.T. 2 oz/ac
	10/17/2012	Firestorm 24 oz/ac
	10/17/2012	LI 700 1 oz/ac
Irrigation Amt.		
PrePlant & Planting	4/30-5/9	6.22 in.
Seasonal	7/8-8/28	9.31 in.
Rainfall		
PrePlant & Planting	1/25-5/22	3.31in.
Seasonal	6/3-9/13	9.31in.