2015 Extension Cotton Project Annual Report

Southwest Research and Extension Center, Altus

In cooperation with the Oklahoma State University Integrated Pest Management Program

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2015 Extension Cotton Project Report

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An effective cotton integrated pest management (IPM) program includes all aspects of production. This report contains summarized data from various applied research trials and demonstrations that address many different cotton production components. Cotton Extension Team efforts included areas such as IPM and crop management during the entire 2015 growing season. The 4-year drought in southwestern Oklahoma that began basically at the end of 2010 was finally broken in May of 2015. Inflow into both Lake Lugert and Lake Tom Steed resulted in both lakes being filled to over-capacity, with surplus water released. The photograph below shows the flooded Otter Creek bottom just west of Snyder on US Highway 62 on May 26th.

According to the most recent USDA-NASS 2015 crop report, 215,000 acres were planted with 205,000 acres expected to be harvested. Due to record May rainfall in many areas, substantial soil moisture was prevalent in many counties. A dry spell in August and September was the main limiting factor impacting the crop. USDA-NASS projects Oklahoma cotton production to total 370,000 thousand bales, 37 percent higher production than 2014. Yield is expected to average 866 pounds per acre, compared with 615 pounds last year. If this projection is met, the 2015 crop would be the second largest since 2000.

The 2015 Oklahoma cotton crop, although late planted due to high rainfall in May, made excellent progress in September and October. A significant amount of irrigated cotton was on time with respect to cutout during the last half of August. Even though the crop in most areas reached cutout on time, the loss of about 2 weeks of blooming due to late planting, impacted yields. Supplemental irrigation in most areas was adequate according to in-season crop demands. Since rainfall became scarce in many areas beginning in July, the “possible record” dryland crop struggled with short moisture conditions in some areas in August. September temperatures were good for fiber maturity. However, scant precipitation ramped up moisture stress significantly in many fields. The dryland crop was ultimately fair to excellent, but did not produce what it could have if provided sufficient rainfall in August and September. With the hot September (about 30% above normal for cotton heat units), the crop moved rapidly toward maturity. Fall rainfall interrupted harvesting operations, but overall quality was good to excellent for the crop. From an insect management perspective, early thrips pressure failed to develop in most fields across the state but where populations were detected they were easily controlled. Cotton fleahopper pressure was persistent and multiple control sprays were used in many fields. Stink bugs appeared late in only a few dryland and irrigated fields with a small percentage of these needing control measures. Population trends, insect updates, and control tips were published in the Cotton Comments Newsletter and distributed to the state’s cotton producers and consultants to help formulate management strategies to enhance profitability. Field surveys were conducted weekly in 7 counties with a total of 19 fields. Insect pressure as well as plant development were recorded and reported in the newsletter.

It is of utmost importance that growers make good decisions with respect to varieties planted. The Extension cotton crop management program is critical to this success. The USDA-AMS Classing Office at Abilene is reporting that color and leaf grades, staple, micronaire, strength, uniformity, and bark contamination have all been good to excellent for many producers. This is based on classing results for about 327,000 bales of Oklahoma ginned cotton classed through February 12. A total of 63% have been color grades 11, 21 or 31, with 27% with color grade 11 or 21 – the best possible. Leaf grades have averaged 3.1 with 28% exhibiting leaf grade 1 or 2 – the best quality possible. Bark contamination is present in about 13% of the bales classed thus far. Staple (fiber length expressed in 32^{nds} inch) has averaged 36.1. This is good considering the moisture stress encountered in some areas in August and September. A total of 45% of the crop has a 37 or longer staple, with an additional 25% classed as a 36. Micronaire (a measure of maturity) averaged 4.1 units, with 92% in the base range of 3.5-4.9. Currently the strength average is 31.3 g/tex, with nearly 89% classed as 30 g/tex or higher. Oklahoma-ginned bales classed at Abilene have the highest average staple, uniformity and strength averages, and this again is a result of wise variety selection. The Abilene classing office serves east Texas, the Texas Rolling Plains, Oklahoma, and Kansas.

We are very appreciative of the contributions made by the OSU IPM Program. Without their support and participation, much of this work would not be possible. We also appreciate the support from producers and ginners, County Extension Educators, the Oklahoma Cooperative Extension Service, and the Oklahoma Agricultural Experiment Station. Cotton Incorporated, through the Oklahoma State Support Committee as well as the Core program, has also provided assistance through partial funding of several projects. We also appreciate the assistance of the Oklahoma Cotton Council, because their continued support of our educational programs is critical to our success.

A thank you is extended to the following entities and individuals whose specific contributions make it possible to maintain and expand our research and demonstration programs and distribute results.

Cotton Incorporated
BASF Corporation
Crop Production Services
Helena Chemical
Worrell Farms
Bayer CropScience
Dow AgroSciences
Winfield Solutions
Americot/NexGen
Monsanto/Deltapine
DuPont
FMC

OSU Southwest Research & Extension Center, Altus & Caddo Research Station, Fort Cobb

Kaleb Kerr, Student worker
Chance Taylor, Student Worker
Darren Butchee, Temporary Worker
Rocky Thacker, Senior Superintendent
Toby Kelley, Assistant Superintendent
Chase Harris, Field Supervisor
Stella Carson, Administrative Assistant
Lynn Halford, Field Assistant
Greg Chavez, Field Assistant
Robert Weidenmaier, Assistant Superintendent
Harley Houston, Field Assistant
Brennan Leighton, Agriculturist

County Extension Personnel

Gary Strickland, Jackson & Greer Counties
Aaron Henson, Tillman County
Charity Martin, Harmon County
Ron Wright, Custer County
Kyle Worthington, Canadian County
Glenn Detweiler, (formerly) Washita County
Greg Hartman, Beckham County
David Nowlin, Caddo County
Travis Tacker, Kiowa County
Dan Cook, Roger Mills County

Producers and Cooperators

Western Oklahoma State College
Danny Davis - Elk City
Keeff Felty & Natalie Wheeler - Altus
Roger Fischer - Frederick
Tony Cox - Wellington, TX
Kelly Horton - Hollis
Clint Abernathy - Altus
Brad Moreau - Altus
Humphreys Co-operative - Altus-Tipton
Cotton Growers Co-op - Altus
Mark Nichols - Altus
Merlin Schantz - Hydro
Drew Darby - Duke
Harvey Schroeder - Oklahoma Cotton Council
Jack and Jake Damron - Delhi

We appreciate the interest, cooperation and support of all those involved in Oklahoma's cotton industry and encourage your comments and suggestions for the improvement of our programs. This report can be accessed via the Internet at the following websites: www.cotton.okstate.edu and www.ntokcotton.org.

Variety Performance

2015 Extension On-Farm Variety Testing

Extension on-farm large-plot replicated cotton variety trials are an important component in modern germplasm evaluation. Producer-cooperator and industry support for these trials is substantial. These trials enable growers to observe the newest genetics and transgenic traits on their operations, under their management conditions and are planted and harvested with their equipment. Multiple sites have provided excellent information on which growers can base important variety selection decisions. The objective of this project was to evaluate multiple cotton varieties in producer-cooperator fields under irrigated and dryland management systems.

Nine large-plot trials were planted and harvested using grower equipment. The testing locations were Custer, Harmon, Tillman, Jackson, Beckham and Washita Counties. Most trials were established under no-till or strip-till conditions. For the Replicated Agronomic Cotton Evaluation (RACE) trials, typically 6-8 entries (one entry per brand name, plus a grower choice option) were planted at each site, with 3 replicates used. The Cotton Incorporated Core program provided direct support for two trials, the Enhanced Variety Trials, which contained up to 10 entries and 3 replicates (Custer and Harmon Counties). A West Texas Lee weigh wagon (for boll buggies) or Western Forage Systems platform scale (for round modules) was utilized to capture plot weights. At harvest, grab samples were taken from each plot and ginned on research equipment at the Southwest Research and Extension Center. Fiber samples were submitted to the Texas Tech University Fiber and Biopolymer Research Institute (FBRI) for high volume instrument (HVI) analysis and these data were used to compute the 2015 Commodity Credit Corporation (CCC) Loan value for each sample. Final plant heights and visual estimates of storm resistance were taken prior to harvest.

The HVI data include several important fiber property measurements. Fiber length (staple when expressed as 32nds), micronaire, strength, and uniformity are the fiber properties reported which partially determine the price per pound for lint. Fiber length was measured as the upper half mean (in inches). Those measurements were also converted into 32nds to determine staple. Uniformity was obtained by dividing mean length (also measured in inches) by the upper half mean length and expressing the result as a percentage. Micronaire is actually a confounded measurement of both fiber fineness and maturity. Micronaire was measured in standard micronaire units. Fiber strength was measured in grams-force per tex on a “beard of fibers” during HVI analysis.

Higher values for lint yield, lint turnout, staple, strength, and uniformity are generally more desirable than lower ones. Micronaire is acceptable anywhere within the “base” range of 3.5 to 4.9 inclusive. The “premium” range is between 3.7 and 4.2 inclusive. If micronaire falls in the “discount” range (below 3.5 or above 4.9), the price per pound of lint is reduced. Penalties tend to be more severe for micronaire values below 3.5 (especially below 3.0) than for those above 4.9. Therefore, producers should probably select varieties with micronaire values toward the upper half of the range, rather than the lower.

Assumptions for all sites include: $3.00/cwt ginning cost, $225/ton for gin-run seed, value for lint based on CCC loan value from grab samples and FBRI HVI results with color grades set to 21, leaf grades set to 2. Net value/acre was calculated by summing lint value based on gross CCC Loan (lint yield times Loan value) and gin-run seed (valued at $225/ton) and then removing seed and technology fees and ginning costs. Analysis of variance was performed using SAS version 9.4 for Windows.

Replicated trials are used in order to obtain multiple independent observations of each variety’s performance in comparison with other entries. Statistical analyses of each characteristic reported are represented by “protected” LSD (least significant difference) values given at the bottom of each column in the table. If the difference between the characteristic of concern (i.e. yield, lint turnout, staple, etc) of any two varieties exceeds the LSD (0.05) value provided, then the chances are approximately 95 out of 100 that the difference is real and not a result of other factors such as random error.

Cultural practices and other information for each site are provided in Table 1. Data summaries for each individual location are provided in Tables 2-17. Summaries across irrigated locations for several important characteristics are provided in Tables 18-22. Summaries for these same characteristics across dryland locations are provided in Tables 23-27.

The irrigated projects indicate that variety selection was important in all RACE and Cotton Incorporated Enhanced variety trial fields. Statistically significant differences in net value/acre ranged from $1120 to $950/acre in Custer County; $1219 to $992/acre in Harmon County; $830 to $730/acre in Tillman County; $934 to $823/acre in Jackson County; and $974 to $748/acre in Beckham County (Table 22). These differences in performance are $170, $227, $100, $111, and $226/acre for Custer, Harmon, Tillman, Jackson, and Beckham Counties, respectively. Across the five trials, the average difference between top and bottom performers in net value/acre range was $167/acre.

Good to excellent yields were obtained in three no-till dryland trials. Fiber quality was generally good to excellent at the three sites. Statistically significant differences in net value/acre ranged from $816 to $672/acre in Washita County; $363 to $280/acre in Tillman County; and $614 to $475/acre in Jackson County (Table 27). These differences in performance are $144, $83, and $139/acre for Washita, Tillman and Jackson Counties, respectively. Across the three dryland sites, the average difference between top and bottom performers in net value/acre range was $122/acre.

Another important attribute producers should consider is storm resistance. Storm resistance ratings were visually scored just prior to harvest at all sites. These ratings range from 1 (bolls loose, with considerable seedcotton loss) to 9 (bolls very tight, with no seedcotton loss). The degree of storm tolerance that a grower can accept can vary from one operation to another. The most important consideration is to be aware of the storm tolerance of varieties planted. This is a major component of risk management. Storm resistance for irrigated and dryland locations can be found in Tables 19 and 24, respectively.

Plant height is another varietal characteristic that producers should investigate. The plant heights provided were measured near the end of the growing season, prior to harvest aid applications. Excessive rainfall and/or irrigation coupled with high nitrogen fertility can result in varieties producing large plants in spite of high doses of mepiquat based plant growth regulators. Final plant height data for irrigated locations can be found in Table 20 and in Table 25 for dryland trials.

Results from the 2015 on-farm large-plot variety trials indicate that variety selection remains a critical decision for both irrigated and dryland producers in the state. Table 18 indicates that differences in yields (lb/acre) between highest and lowest lint producers were 233, 344, 85, 165, and 301 among irrigated sites. The largest difference when averaged across three irrigated sites for common entries was 202 lb/acre. Table 23 shows that for the dryland sites, the differences in yields between the highest and lowest producers were 257, 137 and 221 lb/acre. The largest difference when averaged across three dryland sites for common entries was 175 lb/acre.

Industry Trials – New Germplasm and Traits

Additional large and small plot industry germplasm evaluation trials were also initiated at 6 sites (Table 28). Two Bayer CropScience Cotton Agronomic Performance (CAP) plots were planted (Harmon and Custer Counties), but the Custer County site was damaged by a phenoxy herbicide in mid-season. A Deltapine XtendFlex germplasm comparison trial was also conducted in Custer County. Two Dow AgroSciences Innovation Trials (Custer and Beckham Counties) were also conducted. Both of these trials were planted under center pivots. A USDA regulated pre-bloom crop destruct Dow AgroSciences Enlist cotton demonstration was established at the Caddo Research Station at Fort Cobb August 6. The late planting time was to force the first bloom stage to be near the September 24 field day. This project was one of the stops on the field tour there. Data were provided to these industry sponsors and all of these trials assisted companies in better understanding the performance of their genetics in Oklahoma.

Monsanto/Deltapine XtendFlex Germplasm Trial

A large plot replicated XtendFlex variety/germplasm evaluation trial was conducted on the Merlin Schantz Farm in Custer County under center pivot irrigation. For cultural practices and other information, see Table 28. Yield and quality data are presented in Tables 29 and 30. In terms of net value/acre, two experimental entries (now designated as DP 1614B2XF and DP 1612B2XF) performed statistically similar to DP 1518B2XF. Fiber quality for these B2XF varieties is remarkable, with staples nearing 40 32nds inch.

Crop Tours and Field Days Supported

Crop tours and field days were publicized and held at all RACE, Cotton Incorporated Enhanced Variety, and industry trial sites in late September and early October. A total of 6 meetings were held, with nearly 300 clientele in attendance. Company representatives were invited to participate at the sites and to provide updates on variety and technology pipeline issues. As more XtendFlex varieties become available and as the Enlist cotton varieties are launched in the next few years, variety testing will undoubtedly remain important to producers.

ACKNOWLEDGEMENTS

The authors thank our cooperators: Merlin Schantz, Tony Cox, Mark Nichols, Drew Darby, Jack Damron, Danny Davis, Roger Fischer, and Clint Abernathy. We also thank the Texas Tech University-Fiber and Biopolymer Research Institute personnel for timely assistance with HVI analyses.

Table 1. 2015 Cultural information for Extension large plot trial sites.

	Irrigated Cotton Inc Enhanced Variety		Irrigated RACE			Dryland RACE		
County-location	Custer - Hydro	Harmon - Hollis	Tillman - Tipton	Jackson - Duke	Beckham - Delhi	Washita - Elk City	Tillman - Hollister	Jackson - Altus
Cooperator	Merlin Schantz	Tony Cox	Mark Nichols	Drew Darby	Jack Damron	Danny Davis	Roger Fischer	Clint Abernathy
Tillage system	strip till	no-till	no-till	conventional till	no-till	no-till	no-till	no-till
Planting date	2-Jun	27-May	3-Jun	2-Jun	3-Jun	3-Jun	10-Jun	9-Jun
Seeding rate (seeds/acre)	52,000	40,000	49,000	49,000	40,000	28,000	26,000	23,000
Row spacing (inches)	36	40	40	40	40	40	40	38
Replicates	3	3	3	3	3	3	3	3
Harvested plot width (rows)	8	6	6	4	6	6	4	6
Harvested plot length (ft)	600	~1300	~1200	725	600	1,092	666	1000
Harvest date	23-Nov	23-Nov	3-Nov	7-Nov	7-Dec	27-Oct	10-Nov	29-Oct
Comments	pivot irrigation	drip irrigation	pivot irrigation	furrow irrigation	pivot irrigation			
Harvester type	picker	moduling picker	moduling picker	stripper	stripper	stripper	stripper	stripper
Entries	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF	NG 3406B2XF
	FM 1900GLT	FM 1900GLT	FM 1830GLT	FM 1830GLT	FM 1830GLT	FM 1900GLT	FM 1900GLT	FM 1900GLT
	ST 4946GLB2	ST 4946GLB2	ST 4747GLB2	ST 4747GLB2	ST 4747GLB2	ST 4946GLB2	ST 4946GLB2	ST 4946GLB2
	PHY 333WRF	PHY 333WRF	PHY 333WRF	PHY 333WRF	PHY 333WRF	PHY 333WRF	PHY 333WRF	PHY 333WRF
	DP 1321B2RF	DP 1321B2RF	DP 1219B2RF	DP 1219 B2RF	DP 1219B2RF	DP 1044B2RF	DP 1044B2RF	DP 1044B2RF
	CG 3787B2RF	CG 3787B2RF	CG 3475B2XF	CG 3475B2XF	CG 3475B2XF	CG 3475B2XF	CG 3475B2XF	CG 3475B2XF
	DP 0912 B2RF	NG 1511 B2RF						
	NG 1511 B2RF	DP 1044B2RF						
	FM 1740 B2F							
Grower's choice	DP 1518B2XF	DP 1522 B2XF	DP 1522B2XF	ST 4946 GLB2	NG 1511 B2RF	DP 1522B2XF	DP 1219B2RF	DP 0912B2RF

Table 2. Harvest results from the Custer County irrigated Cotton Incorporated Enhanced Variety trial, Merlin Schantz Farm, Hydro, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	---------------------------- $/acre ------------------------------						
ST4946GLB2	39.7	56.6	4546	1805	2574	0.5820	1051	290	1340	136	83	1120	a
NG1511B2RF	42.5	54.1	4105	1743	2221	0.5785	1008	250	1258	123	79	1056	ab
PHY333WRF	41.7	54.2	4085	1702	2215	0.5808	989	249	1238	122	78	1037	b
CG3787B2RF	41.7	55.0	4052	1688	2228	0.5813	981	251	1232	122	77	1033	b
FM1900GLT	41.9	53.5	4064	1703	2175	0.5830	993	245	1237	122	85	1031	b
DP0912B2RF	38.5	56.5	4299	1656	2427	0.5807	961	273	1234	129	78	1028	b
DP1321B2RF	40.9	55.9	4069	1662	2274	0.5815	966	256	1222	122	80	1020	bc
FM1740B2F	39.7	55.8	4073	1619	2272	0.5798	938	256	1194	122	72	1000	bc
NG3406B2XF	39.7	56.9	4067	1613	2313	0.5795	935	260	1195	122	79	994	bc
DP1518B2XF	41.3	54.4	3807	1572	2071	0.5800	912	233	1145	114	80	950	c
Test average	40.7	55.3	4117	1676	2277	0.5807	973	256	1230	123	79	1027	
CV, %	1.9	1.5	3.9	3.8	3.9	0.2	3.9	3.9	3.9	4.8	--	4.2	
OSL	<0.0001	0.0004	0.0041	0.0138	0.0002	0.0146	0.0138	0.0002	0.0149	0.0052	--	0.0187	
LSD	1.3	1.4	274	110	153	0.0021	65	17	82	8	--	74	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 3. Harvest results from the Custer County irrigated Cotton Incorporated Enhanced Variety trial, Merlin Schantz Farm, Hydro, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3787B2RF	50,820	33.7	4.0	4.2	38.6	30.8	84.4
DP0912B2RF	52,272	29.5	4.0	4.1	37.1	32.6	83.4
DP1321B2RF	47,916	30.9	4.0	4.1	37.9	32.2	83.6
DP1518B2XF	45,012	32.2	5.0	3.9	38.8	31.1	82.4
FM1740B2F	48,884	28.5	5.0	4.1	37.8	31.8	83.3
FM1900GLT	46,464	29.2	8.0	4.1	39.7	35.2	84.2
NG1511B2RF	46,948	31.0	5.2	4.3	36.8	32.0	83.4
NG3406B2XF	50,820	29.6	6.2	4.0	37.3	30.8	83.6
PHY333WRF	42,108	33.4	4.8	4.0	38.8	31.7	83.0
ST4946GLB2	47,916	30.9	6.3	4.2	38.6	33.7	83.9
Test average	47,916	30.9	5.2	4.1	38.1	32.2	83.5
CV, %	9.6	4.3	5.2	2.3	1.6	3.4	1.0
OSL	0.3083	0.0013	<0.0001	0.0014	0.0002	0.0026	0.3185
LSD	NS	2.3	0.5	0.2	1.0	1.9	NS

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 4. Harvest results from the Harmon County irrigated Cotton Incorporated Enhanced Variety trial, Tony Cox Farm, Hollis, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
DP1321B2RF	40.6	54.1	4911	1992	2655	0.5668	1129	298	1428	147	62	1219	a
GCDP1522B2XF	39.4	54.7	4800	1892	2625	0.5792	1096	295	1391	144	62	1185	ab
PHY333WRF	39.7	54.9	4687	1862	2574	0.5732	1067	290	1356	141	60	1155	ab
NG3406B2XF	38.9	54.5	4678	1819	2550	0.5733	1043	287	1330	140	61	1129	ab
FM1900GLT	40.5	53.8	4531	1837	2435	0.5737	1053	274	1327	136	65	1127	ab
DP1044B2RF	39.5	55.1	4584	1810	2525	0.5693	1032	284	1316	138	56	1122	ab
CG3787B2RF	38.9	55.8	4658	1812	2600	0.5633	1020	292	1313	140	59	1113	ab
ST4946GLB2	38.6	56.0	4624	1784	2588	0.5570	997	291	1288	139	64	1085	bc
NG1511B2RF	38.8	55.9	4253	1648	2379	0.5527	912	268	1180	127	61	992	c
Test average	39.4	55.0	4636	1828	2548	0.5676	1039	287	1325	139	61	1125	
CV, %	4.2	3.1	4.7	4.6	4.7	3.3	6.1	4.7	5.7	4.6	--	6.2	
OSL	0.7745	0.6983	0.0920	0.0156	0.1797	0.7458	0.0362	0.1881	0.0541	0.0793	--	0.0538	
LSD	NS	NS	308 †	147	NS	NS	110	NS	108 †	9 †	--	100 †	

For net value/acre, means within a column with the same letter are not significantly different.

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Note: some columns may not add up due to rounding error.

Assumes:

$3.00/cwt ginning cost.

$225/ton for seed.

Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 5. Harvest results from the Harmon County irrigated Cotton Incorporated Enhanced Variety trial, Tony Cox Farm, Hollis, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3787B2RF	38,333	39.7	4.3	3.4	39.0	31.4	83.8
DP1044B2RF	36,590	36.0	6.3	3.5	38.9	32.0	84.2
DP1321B2RF	36,590	35.7	4.7	3.6	38.6	30.0	83.0
FM1900GLT	34,848	32.1	7.7	3.5	38.9	32.5	82.5
GCDP1522B2XF	39,204	35.7	6.0	3.7	39.5	30.7	83.6
NG1511B2RF	31,799	36.2	5.0	3.3	38.1	30.1	83.2
NG3406B2XF	34,848	32.1	4.7	3.6	38.0	30.1	84.1
PHY333WRF	39,640	35.1	5.3	3.5	38.8	32.0	83.5
ST4946GLB2	36,590	35.0	5.7	3.3	39.1	29.4	83.1
Test average	36,493	35.3	5.5	3.5	38.8	30.9	83.4
CV, %	10.2	4.3	14.1	7.2	1.7	5.7	1.4
OSL	0.3104	0.0007	0.0021	0.6616	0.2292	0.3788	0.6733
LSD	NS	2.6	1.4	NS	NS	NS	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 6. Harvest results from the Tillman County irrigated RACE trial, Mark Nichols Farm, Tipton, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
FM1830GLT	41.9	55.2	3297	1382	1820	0.5810	803	205	1007	99	78	830	a
PHY333WRF	40.2	54.7	3428	1378	1875	0.5680	783	211	994	103	73	817	a
CG3475B2XF	38.4	56.0	3462	1330	1939	0.5797	771	218	989	104	72	812	ab
GCDP1522B2XF	38.3	55.9	3385	1297	1892	0.5808	753	213	966	102	75	789	bc
NG3406B2XF	38.9	56.0	3354	1301	1878	0.5727	745	211	957	101	74	781	c
ST4747GLB2	37.9	56.8	3408	1292	1936	0.5660	731	218	949	102	78	768	c
DP1219B2RF	37.5	57.2	3257	1221	1863	0.5623	687	209	896	98	69	730	d
Test average	39.0	56.0	3370	1314	1886	0.5729	753	212	965	101	74	790	
CV, %	1.3	1.0	1.7	1.7	1.7	1.2	1.7	1.7	1.6	1.6	--	1.8	
OSL	<0.0001	0.0029	0.0101	<0.0001	0.0090	0.0187	<0.0001	0.0067	<0.0001	0.0065	--	<0.0001	
LSD	0.9	1.0	103	40	58	0.0118	23	6	28	3	--	25	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 7. Harvest results from the Tillman County irrigated RACE trial, Mark Nichols Farm, Tipton, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	37,462	35.4	4.3	3.6	37.1	32.9	83.3
DP1219B2RF	37,897	42.2	5.0	3.4	38.2	33.7	82.4
FM1830GLT	36,155	33.5	6.3	3.6	38.5	33.7	83.3
GCDP1522B2XF	43,560	37.1	5.7	3.9	37.8	33.1	83.4
NG3406B2XF	41,818	32.0	7.0	3.5	36.7	31.1	83.3
PHY333WRF	35,284	38.4	5.3	3.4	38.0	31.2	83.3
ST4747GLB2	40,075	34.5	6.0	3.4	38.0	30.8	81.8
Test average	38,893	36.2	5.7	3.6	37.8	32.4	83.0
CV, %	17.2	6.4	10.5	3.4	1.0	3.3	0.6
OSL	0.712	0.0029	0.0030	0.0036	0.0007	0.0147	0.017
LSD	NS	4.1	1.1	0.2	0.6	1.9	1.0

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 8. Harvest results from the Jackson County irrigated RACE trial, Drew Darby Farm, Duke, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	-------------------------- $/acre ----------------------------						
ST4747GLB2	32.2	50.5	4762	1533	2405	0.5767	884	270	1155	143	78	934	a
GCST4946GLB2	32.6	51.5	4608	1503	2373	0.5790	870	267	1137	138	78	921	a
PHY333WRF	33.4	47.7	4539	1516	2165	0.5760	873	243	1117	136	73	907	a
CG3475B2XF	33.3	50.7	4188	1395	2123	0.5792	808	239	1047	126	72	848	b
NG3406B2XF	33.6	49.8	4125	1386	2054	0.5782	801	231	1032	124	74	834	b
DP1219B2RF	32.8	49.6	4158	1368	2062	0.5787	792	232	1024	125	69	830	b
FM1830GLT	35.1	48.4	3957	1385	1915	0.5808	804	215	1020	119	78	823	b
Test average	33.3	49.8	4334	1441	2157	0.5784	833	243	1076	130	75	871	
CV, %	1.0	1.2	2.6	2.6	2.6	0.2	2.6	2.6	2.6	2.7	--	2.9	
OSL	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.0160	0.0004	<0.0001	0.0001	<0.0001	--	0.0003	
LSD	0.6	1.0	201	67	100	0.0024	39	11	50	6	--	44	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 9. Harvest results from the Jackson County irrigated RACE trial, Drew Darby Farm, Duke, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	26,136	28.3	5.3	3.9	36.9	31.0	82.9
DP1219B2RF	30,928	34.1	5.3	3.6	38.2	31.6	82.0
FM1830GLT	23,958	27.5	6.0	3.8	38.2	32.7	82.9
GCST4946GLB2	33,541	31.4	7.0	3.7	36.9	31.5	83.5
NG3406B2XF	23,958	29.6	6.3	3.8	37.2	30.2	83.2
PHY333WRF	34,412	32.4	5.3	3.7	37.5	29.1	83.2
ST4747GLB2	38,333	28.3	6.0	3.7	37.9	29.5	81.3
Test average	30,181	30.2	5.9	3.7	37.5	30.8	82.7
CV, %	15.9	6.2	7.4	1.8	1.3	2.2	0.7
OSL	0.0178	0.0074	0.0036	0.0033	0.0229	0.0003	0.0095
LSD	8,547	3.3	0.8	0.1	0.9	1.2	1.1

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 10. Harvest results from the Beckham County irrigated RACE trial, Jack Damron Farm, Delhi, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	---------------------------- $/acre ------------------------------						
CG3475B2XF	31.2	52.2	4930	1538	2573	0.5797	892	289	1181	148	59	974	a
GCNG1511B2RF	33.1	50.2	4634	1534	2326	0.5807	891	262	1152	139	61	953	ab
PHY333WRF	30.5	50.4	5068	1546	2549	0.5538	855	287	1142	152	60	930	ab
FM1830GLT	32.4	50.3	4555	1475	2291	0.5668	836	258	1094	137	64	893	ab
NG3406B2XF	31.0	51.0	4741	1470	2418	0.5548	815	272	1088	142	61	884	b
ST4747GLB2	30.1	50.1	4857	1462	2434	0.5478	801	274	1075	145	64	865	b
DP1219B2RF	31.6	51.7	3940	1245	2037	0.5565	693	229	922	118	56	748	c
Test average	31.4	50.8	4675	1467	2375	0.5629	826	267	1094	140	61	893	
CV, %	2.5	1.6	4.4	4.5	4.5	2.0	5.4	4.4	5.1	4.5	--	5.6	
OSL	0.0060	0.0430	0.0006	0.0015	0.0009	0.0212	0.0021	0.0007	0.0023	0.0008	--	0.0026	
LSD	1.4	1.4	370	116	191	0.0204	79	21	99	11	--	88	

For net value/acre, means within a column with the same letter are not significantly different.

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Note: some columns may not add up due to rounding error.

Assumes:

$3.00/cwt ginning cost.

$225/ton for seed.

Value for lint based on CCC loan value from grab samples and FBRI HVI results.

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 11. Harvest results from the Beckham County irrigated RACE trial, Jack Damron Farm, Delhi, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	35,719	34.1	3.7	3.7	38.2	30.4	83.5
DP1219B2RF	35,719	38.9	4.0	3.2	38.3	33.9	81.5
FM1830GLT	33,541	29.7	5.7	3.4	39.1	31.1	83.6
GCNG1511B2RF	31,799	35.1	4.3	3.7	38.0	32.2	83.6
NG3406B2XF	38,333	30.3	5.0	3.3	37.8	30.6	82.1
PHY333WRF	33,977	37.6	4.3	3.3	39.0	30.0	82.5
ST4747GLB2	37,026	34.5	5.3	3.2	38.9	29.9	81.7
Test average	35,159	34.3	4.6	3.4	38.5	31.2	82.6
CV, %	8.3	6.4	14.3	4.6	2.3	2.8	0.8
OSL	0.2012	0.0020	0.0263	0.0051	0.3906	0.0013	0.0074
LSD	NS	3.9	1.2	0.3	NS	1.6	1.2

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 12. Harvest results from the Washita County dryland RACE trial, Danny Davis Farm, Elk City, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
PHY333WRF	33.1	44.8	4049	1340	1814	0.5787	776	204	979	122	42	816	a
ST4946GLB2	32.8	48.1	3914	1284	1883	0.5822	748	212	959	117	45	797	a
NG3406B2XF	32.8	48.7	3698	1213	1801	0.5792	702	203	905	111	43	751	b
CG3475B2XF	32.5	48.4	3671	1193	1777	0.5815	694	200	894	110	42	742	b
FM1900GLT	32.6	47.2	3597	1173	1698	0.5810	681	191	872	108	45	719	b
GCDP1522B2XF	33.6	48.3	3472	1166	1677	0.5808	678	189	866	104	43	719	b
DP1044B2RF	30.6	47.9	3538	1083	1695	0.5787	627	191	817	106	39	672	c
Test average	32.6	47.6	3706	1207	1763	0.5803	701	198	899	111	43	745	
CV, %	2.0	1.4	2.8	2.8	2.8	0.3	2.8	2.8	2.8	2.8	--	3.0	
OSL	0.0038	0.0002	0.0002	<0.0001	0.0018	0.1328	<0.0001	0.0020	<0.0001	0.0002	--	<0.0001	
LSD	1.2	1.2	184	60	87	NS	35	10	45	6	--	39	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 13. Harvest results from the Washita County dryland RACE trial, Danny Davis Farm, Elk City, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	27,879	28.0	5.3	4.1	38.1	31.6	83.7
DP1044B2RF	33,541	29.4	6.8	3.8	37.0	30.6	83.3
FM1900GLT	27,443	31.9	7.8	4.0	38.8	34.8	82.6
GCDP1522B2XF	27,879	31.8	6.2	4.1	37.9	31.3	83.7
NG3406B2XF	26,136	29.1	7.0	4.0	37.1	30.7	83.2
PHY333WRF	28,314	32.1	5.7	4.1	37.8	30.8	82.6
ST4946GLB2	27,007	30.8	7.2	3.9	38.1	33.5	84.3
Test average	28,314	30.4	6.6	4.0	37.8	31.9	83.4
CV, %	8.9	7.1	6.1	2.6	1.6	3.0	0.7
OSL	0.0644	0.2159	<0.0001	0.1333	0.0453	0.0009	0.0401
LSD	3669 †	NS	0.7	NS	1.1	1.7	1.1

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 14. Harvest results from the Tillman County dryland RACE trial, Roger Fischer Farm, Hollister, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
PHY333WRF	30.1	45.5	2163	651	984	0.5463	356	111	467	65	39	363	a
NG3406B2XF	30.1	48.4	2104	633	1019	0.5348	340	115	454	63	40	351	ab
ST4946GLB2	30.3	49.1	2060	624	1012	0.5366	335	114	449	62	42	346	ab
CG3475B2XF	29.4	47.3	2092	615	990	0.5294	326	112	438	63	39	336	ab
DP1044B2RF	30.3	49.8	1948	590	968	0.5386	318	109	427	59	37	332	ab
GCDP1219B2RF	29.5	46.9	1903	562	891	0.5303	298	100	398	57	37	304	bc
FM1900GLT	29.0	47.8	1773	514	848	0.5445	280	95	375	54	42	280	c
Test average	29.8	47.8	2006	598	959	0.5372	322	108	430	60	39	330	
CV, %	4.3	3.6	7.4	7.4	7.4	3.7	9.2	7.4	8.6	7.4	--	10.0	
OSL	0.6859	0.0443	0.0192	0.0053	0.0228	0.8448	0.0309	0.0211	0.0299	0.0236	--	0.0298	
LSD	NS	2.6	220	66	106	NS	44	12	55	7	--	49	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 15. Harvest results from the Tillman County dryland RACE trial, Roger Fischer Farm, Hollister, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	23,196	33.1	5.9	3.6	34.1	29.9	81.2
DP1044B2RF	24,829	31.0	6.5	3.9	34.1	30.7	81.2
FM1900GLT	20,582	34.5	7.8	3.3	35.5	29.4	80.6
GCDP1219B2RF	25,483	31.8	4.8	3.7	34.0	29.6	80.2
NG3406B2XF	22,216	32.6	6.4	3.6	33.9	28.9	81.5
PHY333WRF	20,255	29.3	5.3	3.7	34.8	29.1	80.8
ST4946GLB2	23,523	30.4	7.6	3.7	34.1	30.8	81.1
Test average	22,869	31.8	6.3	3.6	34.3	29.8	80.9
CV, %	20.9	6.8	5.7	5.4	1.6	3.3	1.0
OSL	0.6598	0.0542	<0.0001	0.0204	0.0045	0.077	0.4155
LSD	NS	2.7 †	0.5	0.3	0.8	1.2 †	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 16. Harvest results from the Jackson County dryland RACE trial, Clint Abernathy Farm, Olustee, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
PHY333WRF	33.6	49.0	2964	996	1452	0.5767	574	163	738	89	35	614	a
ST4946GLB2	33.0	53.0	2866	943	1519	0.5787	546	171	716	86	38	593	a
CG3475B2XF	33.4	51.4	2632	879	1353	0.5732	504	152	656	79	35	543	b
GCDP0912B2RF	32.8	52.2	2661	870	1389	0.5622	489	156	645	80	35	531	b
NG3406B2XF	33.9	52.5	2557	867	1342	0.5677	492	151	643	77	36	531	b
DP1044B2RF	31.2	51.9	2668	833	1385	0.5608	468	156	624	80	33	511	bc
FM1900GLT	30.9	51.5	2508	775	1292	0.5717	443	145	589	75	38	475	c
Test average	32.7	51.6	2694	880	1390	0.5701	502	156	659	81	36	542	
CV, %	1.9	1.4	4.5	4.5	4.5	1.6	4.9	4.6	4.8	4.4	--	5.2	
OSL	0.0003	0.0004	0.0059	0.0005	0.0147	0.2180	0.0005	0.0147	0.0012	0.0071	--	0.0009	
LSD	1.1	1.3	215	70	111	NS	44	13	56	6	--	50	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 17. Harvest results from the Jackson County dryland RACE trial, Clint Abernathy Farm, Olustee, OK, 2015.

Entry	Final population	Final plant height	Storm resistance	Micronaire	Staple	Strength	Uniformity
	plants/acre	inches	1-9 visual scale*	units	32nds inch	g/tex	%
CG3475B2XF	24,761	30.3	5.5	4.0	35.9	31.3	82.7
DP1044B2RF	20,176	32.1	6.8	4.1	35.4	30.2	82.5
FM1900GLT	21,551	32.2	7.5	3.6	37.6	33.9	81.2
GCDP0912B2RF	20,175	32.7	4.7	4.5	35.0	30.1	82.0
NG3406B2XF	21,551	33.5	6.5	3.9	35.2	30.3	82.7
PHY333WRF	22,468	37.8	6.0	4.1	36.6	30.7	82.3
ST4946GLB2	24,761	35.8	7.2	4.0	36.0	33.1	82.7
Test average	22,206	33.5	6.3	4.0	35.9	31.4	82.3
CV, %	12.8	6.6	2.6	3.8	2.4	3.6	1.1
OSL	0.3036	0.0210	<0.0001	0.0005	0.0377	0.0051	0.4548
LSD	NS	3.9	0.3	0.3	1.5	2.0	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

Table 18. Lint yield results from the Extension irrigated RACE trials, 2015.

County ==>	Custer	Harmon	Tillman	Jackson	Beckham	3-Site
Irrigation Type ==>	Pivot	Drip	Pivot	Furrow	Pivot	Mean
Location ==>	Hydro	Hollis	Tipton	Duke	Delhi	for Common
Cooperator ==>	Schantz	Cox	Nichols	Darby	Damron	Entries
Entry	--		Lint yield (lb/acre)	--		
NG 3406B2XF	1613	1819	1301	1386	1470	1386
FM 1830GLT			1382	1385	1475	1414
ST 4747GLB2			1292	1533	1462	1429
PHY 333WRF	1702	1862	1378	1516	1546	1480
DP 1219B2RF			1221	1368	1245	1278
CG 3475B2XF			1330	1395	1538	1421
CG 3787B2RF	1688	1812				
DP 0912B2RF	1656					
DP 1044B2RF		1810				
DP 1321B2RF	1662	1992				
DP 1518B2XF	1572					
DP 1522B2XF		1892	1297			
FM 1900GLT	1703	1837				
FM 1740B2F	1619					
NG 1511B2RF	1743	1648			1534	
ST 4946GLB2	1805	1784		1503		
Test average	1676	1828	1314	1441	1467	1401
CV, %	3.8	4.6	1.7	2.6	4.5	
OSL	0.0138	0.0156	<0.0001	0.0003	0.0015	
LSD	110	147	40	67	116	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 19. Storm resistance results from the Extension irrigated RACE trials, 2015.

County ==>	Custer	Harmon	Tillman	Jackson	Beckham	3-Site
Irrigation Type ==>	Pivot	Drip	Pivot	Furrow	Pivot	Mean
Location ==>	Hydro	Hollis	Tipton	Duke	Delhi	for Common
Cooperator ==>	Schantz	Cox	Nichols	Darby	Damron	Entries
Entry	---------------------------- Storm resistance (visual rating: 1 loose, 9 tight) ----------------------------------					
NG 3406B2XF	6.2	4.7	7.0	6.3	5.0	6.1
FM 1830GLT			6.3	6.0	5.7	6.0
ST 4747GLB2			6.0	6.0	5.3	5.8
PHY 333WRF	4.8	5.3	5.3	5.3	4.3	5.0
DP 1219B2RF			5.0	5.3	4.0	4.8
CG 3475B2XF			4.3	5.3	3.7	4.4
CG 3787B2RF	4.0	4.3				
DP 0912B2RF	4.0					
DP 1044B2RF		6.3				
DP 1321B2RF	4.0	4.7				
DP 1518B2XF	5.0					
DP 1522B2XF		6.0	5.7			
FM 1900GLT	8.0	7.7				
FM 1740B2F	5.0					
NG 1511B2RF	5.2	5.0			4.3	
ST 4946GLB2	6.3	5.7		7.0		
Test average	5.3	5.5	5.7	5.9	4.6	5.3
CV, %	5.2	14.1	10.5	7.4	14.3	
OSL	<0.0001	0.0021	0.0030	0.0036	0.0263	
LSD	0.5	1.4	1.1	0.8	1.2	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 20. Plant height results from the Extension irrigated RACE trials, 2015.

County ==>	Custer	Harmon	Tillman	Jackson	Beckham	3-Site
Irrigation Type ==>	Pivot	Drip	Pivot	Furrow	Pivot	Mean
Location ==>	Hydro	Hollis	Tipton	Duke	Delhi	for Common
Cooperator ==>	Schantz	Cox	Nichols	Darby	Damron	Entries
Entry	Plant height (inches)					
NG 3406B2XF	29.6	32.1	32.0	29.6	30.3	30.6
FM 1830GLT			33.5	27.5	29.7	30.2
ST 4747GLB2			34.5	28.3	34.5	32.4
PHY 333WRF	33.4	35.1	38.4	32.4	37.6	36.1
DP 1219B2RF			42.2	34.1	38.9	38.4
CG 3475B2XF			35.4	28.3	34.1	32.6
CG 3787B2RF	33.7	39.7				
DP 0912B2RF	29.5					
DP 1044B2RF		36.0				
DP 1321B2RF	30.9	35.7				
DP 1518B2XF	32.2					
DP 1522B2XF		35.7	37.1			
FM 1900GLT	29.2	32.1				
FM 1740B2F	28.5					
NG 1511B2RF	31.0	36.2			35.1	
ST 4946GLB2	30.9	35.0		31.4		
Test average	30.9	35.3	36.2	30.2	34.3	33.4
CV, %	4.3	4.3	6.4	6.2	6.4	
OSL	0.0013	0.0007	0.0029	0.0074	0.0020	
LSD	2.3	2.6	4.1	3.3	3.9	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 21. Loan value results from the Extension irrigated RACE trials, 2015.

County ==>	Custer	Harmon	Tillman	Jackson	Beckham	3-Site
Irrigation Type ==>	Pivot	Drip	Pivot	Furrow	Pivot	Mean
Location ==>	Hydro	Hollis	Tipton	Duke	Delhi	for Common
Cooperator ==>	Schantz	Cox	Nichols	Darby	Damron	Entries
Entry	-- Loan value ($/lb) --					
NG 3406B2XF	0.5795	0.5733	0.5727	0.5782	0.5548	0.5686
FM 1830GLT			0.5810	0.5808	0.5668	0.5762
ST 4747GLB2			0.5660	0.5767	0.5478	0.5635
PHY 333WRF	0.5808	0.5732	0.5680	0.5760	0.5538	0.5659
DP 1219B2RF			0.5623	0.5787	0.5565	0.5658
CG 3475B2XF			0.5797	0.5792	0.5797	0.5795
CG 3787B2RF	0.5813	0.5633				
DP 0912B2RF	0.5807					
DP 1044B2RF		0.5693				
DP 1321B2RF	0.5815	0.5668				
DP 1518B2XF	0.5800					
DP 1522B2XF		0.5792	0.5808			
FM 1900GLT	0.5830	0.5737				
FM 1740B2F	0.5798					
NG 1511B2RF	0.5785	0.5527			0.5807	
ST 4946GLB2	0.5820	0.5570		0.5790		
Test average	0.5807	0.5676	0.5729	0.5784	0.5629	0.5699
CV, %	0.2	3.3	1.2	0.2	2.0	
OSL	0.0146	0.7458	0.0187	0.0160	0.0212	
LSD	0.0021	NS	0.0118	0.0024	0.0204	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, NS - not significant.
Note: Color grades set to 21, leaf grades set to 2 for entire trial.

Table 22. Net value results from the Extension irrigated RACE trials, 2015.

County ==>	Custer	Harmon	Tillman	Jackson	Beckham	3-Site
Irrigation Type ==>	Pivot	Drip	Pivot	Furrow	Pivot	Mean
Location ==>	Hydro	Hollis	Tipton	Duke	Delhi	for Common
Cooperator ==>	Schantz	Cox	Nichols	Darby	Damron	Entries
Entry	---------- Net value ($/acre) ----------					
NG 3406B2XF	994	1129	781	834	884	833
FM 1830GLT			830	823	893	849
ST 4747GLB2			768	934	865	856
PHY 333WRF	1037	1155	817	907	930	885
DP 1219B2RF			730	830	748	769
CG 3475B2XF			812	848	974	878
CG 3787B2RF	1033	1113				
DP 0912B2RF	1028					
DP 1044B2RF		1122				
DP 1321B2RF	1020	1219				
DP 1518B2XF	950					
DP 1522B2XF		1185	789			
FM 1900GLT	1031	1127				
FM 1740B2F	1000					
NG 1511B2RF	1056	992			953	
ST 4946GLB2	1120	1085		921		
Test average	1027	1125	790	871	892	845
CV, %	4.2	6.2	1.8	2.9	5.6	
OSL	0.0187	0.0538	<0.0001	0.0003	0.0026	
LSD	74	100 †	25	44	88	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 23. Lint yield results from the Extension dryland RACE trials, 2015.

County ==>	Washita	Tillman	Jackson	3-Site
Location ==>	Elk City	Hollister	Olustee	Mean
Cooperator ==>	Davis	Fischer	Abernathy	for Common Entries
Entry	----------------------------	Lint yield (lb/acre)	----------------------------	
CG 3475B2XF	1193	615	879	896
DP 1044B2RF	1083	590	833	835
FM 1900GLT	1173	514	775	821
NG 3406B2XF	1213	633	867	904
PHY 333WRF	1340	651	996	996
ST 4946GLB2	1284	624	943	950
DP 1522B2XF	1166			
DP 1219B2RF		562		
DP 0912B2RF			870	
Test average	1207	598	880	900
CV, %	2.8	7.4	4.5	
OSL	<0.0001	0.0053	0.0005	
LSD	60	66	70	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 24. Storm resistance results from the Extension dryland RACE trials, 2015.

County ==>	Washita	Tillman	Jackson	3-Site
Irrigation Type ==>	Elk City	Hollister	Olustee	Mean
Location ==>	Davis	Fischer	Abernathy	for Common
Cooperator ==>				Entries
Entry	---------- Storm resistance (visual rating: 1 loose, 9 tight) ----------			
CG 3475B2XF	5.3	5.9	5.5	5.6
DP 1044B2RF	6.8	6.5	6.8	6.7
FM 1900GLT	7.8	7.8	7.5	7.7
NG 3406B2XF	7.0	6.4	6.5	6.6
PHY 333WRF	5.7	5.3	6.0	5.7
ST 4946GLB2	7.2	7.6	7.2	7.3
DP 1522B2XF	6.2			
DP 1219B2RF		4.8		
DP 0912B2RF			4.7	
Test average	6.6	6.3	6.3	6.6
CV, %	6.1	5.7	2.6	
OSL	<0.0001	<0.0001	<0.0001	
LSD	0.7	0.5	0.3	

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 25. Plant height results from the Extension dryland RACE trials, 2015.

County ==>	Washita	Tillman	Jackson	3-Site
Irrigation Type ==>	Elk City	Hollister	Olustee	Mean
Location ==>	Davis	Fischer	Abernathy	for Common
Cooperator ==>				Entries
Entry	---------------------- Plant height (inches) ---------------------------			
CG 3475B2XF	28.0	33.1	30.3	30.5
DP 1044B2RF	29.4	31.0	32.1	30.8
FM 1900GLT	31.9	34.5	32.2	32.9
NG 3406B2XF	29.1	32.6	33.5	31.7
PHY 333WRF	32.1	29.3	37.8	33.1
ST 4946GLB2	30.8	30.4	35.8	32.3
DP 1522B2XF	31.8			
DP 1219B2RF		31.8		
DP 0912B2RF			32.7	
Test average	30.4	31.8	33.5	31.9
CV, %	7.1	6.8	6.6	
OSL	0.2159	0.0542	0.0210	
LSD	NS	2.7 †	3.9	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

Table 26. Loan value results from the Extension dryland RACE trials, 2015.

County ==>	Washita	Tillman	Jackson	3-Site
Irrigation Type ==>	Elk City	Hollister	Olustee	Mean
Location ==>	Davis	Fischer	Abernathy	for Common
Cooperator ==>				Entries
Entry	---------------------------- Loan value ($/lb)		--------------------------------	
CG 3475B2XF	0.5815	0.5294	0.5732	0.5614
DP 1044B2RF	0.5787	0.5386	0.5608	0.5594
FM 1900GLT	0.5810	0.5445	0.5717	0.5657
NG 3406B2XF	0.5792	0.5348	0.5677	0.5606
PHY 333WRF	0.5787	0.5463	0.5767	0.5672
ST 4946GLB2	0.5822	0.5366	0.5787	0.5658
DP 1522B2XF	0.5808			
DP 1219B2RF		0.5303		
DP 0912B2RF			0.5622	
Test average	0.5803	0.5372	0.5701	0.5634
CV, %	0.3	3.7	1.6	
OSL	0.1328	0.8448	0.2180	
LSD	NS	NS	NS	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Note: Color grades set to 21, leaf grades set to 2 for entire trial.

Table 27. Net value results from the Extension dryland RACE trials, 2015.

County ==> Irrigation Type ==> Location ==> Cooperator ==>	Washita Elk City Davis	Tillman Hollister Fischer	Jackson Olustee Abernathy	3-Site Mean for Common Entries
Entry	----------------------------- Net value ($/acre)			---------------------------------
CG 3475B2XF	742	336	543	540
DP 1044B2RF	672	332	511	505
FM 1900GLT	719	280	475	491
NG 3406B2XF	751	351	531	544
PHY 333WRF	816	363	614	598
ST 4946GLB2	797	346	593	579
DP 1522B2XF	719			
DP 1219B2RF		304		
DP 0912B2RF			531	
Test average	745	330	543	543
CV, %	3.0	10.0	5.2	
OSL	<0.0001	0.0298	0.0009	
LSD	39	49	50	

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, NS - not significant.

Table 28. 2015 Cultural information for Extension large-plot trial sites for cooperating companies.

Trial type	Bayer CAP Trial	Bayer CAP Trial	Deltapine XtendFlex Variety Trial	PhytoGen Innovation Trial	PhytoGen Innovation Demonstration
County - location	Custer - Hydro	Harmon - Hollis	Custer - Hydro	Custer - Hydro	Beckham - Delhi
Cooperator	Merlin Schantz	Kelly Horton	Merlin Schantz	Merlin Schantz	Jack Damron
Tillage system	strip till	conventional	strip till	strip till	no-till
Planting date	1-Jun	1-Jun	1-Jun	1-Jun	3-Jun
Seeding rate (seeds/acre)	52,000	49,000	52,000	52,000	40,000
Row spacing (inches)	36	40	36	36	40
Replicates	1	1	3	3	1
Harvested plot width (rows)	8	6	8	8	6
Harvested plot length (ft)	600	820	600	600	600
Harvest date	19-Nov	23-Nov	20-Nov	20-Nov	7-Dec
Comments	pivot irrigation	drip irrigation	pivot irrigation	pivot irrigation	pivot irrigation
Harvester type	picker	picker	picker	picker	stripper
Entries	FM 1944GLB2	FM 1944GLB2	DP1518B2XF	PHY 222WRF	PHY 312WRF
	FM 1830GLT	FM 1830GLT	DP1522B2XF	PHY 312WRF	PHY 333WRF
	FM 2334GLT	FM 2334GLT	DP1612B2XF (14R913B2XF)	PHY 333WRF	PHY 339WRF
	FM 2484B2F	FM 2484B2F	DP1614B2XF (15R515B2XF)	PHY 339WRF	PHY 444WRF
	ST 4946GLB2	ST 4946GLB2	Experimental A	PHY 444WRF	PX 3003-04 WRF
	ST 4747GLB2	ST 4747GLB2	Experimental B	Competitor NG 1511 B2RF	Competitor NG 1511 B2RF
	ST 5115GLT	ST 5115GLT	Experimental C		
	ST 6182GLT	ST 6182GLT			
	FM 2007GLT	FM 2007GLT			
	FM 1900GLT	FM 1900GLT			
	BX 1532GLT	BX 1532GLT			
	BX 1634GLT	BX 1634GLT			

Table 29. Harvest results from the Custer County irrigated XtendFlex variety trial, Merlin Schantz Farm, Hydro, OK, 2015.

Entry	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Seed/tech cost	Net value	
	---------- % ----------		----------- lb/acre -----------			--$/lb--	--------------------------- $/acre -----------------------------						
DP1518B2XF	36.0	53.6	4525	1629	2426	0.5793	944	273	1217	136	80	1001	a
DP1614B2XF (15R515B2XF)	39.7	50.5	4179	1659	2111	0.5788	961	238	1198	125	80	992	a
Experimental A	36.6	54.8	4356	1594	2387	0.5798	925	268	1193	131	80	982	a
DP1612B2XF (14R913B2XF)	35.2	55.2	4490	1581	2479	0.5778	913	279	1192	135	80	977	a
DP1522B2XF	36.6	53.9	4278	1566	2306	0.5793	907	259	1167	128	80	958	a
Experimental B	35.7	55.2	3972	1418	2192	0.5790	821	247	1068	119	80	868	b
Experimental C	36.6	54.0	3879	1419	2095	0.5795	823	236	1058	117	80	862	b
Test average	36.6	53.9	4240	1552	2285	0.5791	899	257	1156	127	80	949	
CV, %	1.2	1.2	3.3	3.2	3.4	0.3	3.4	3.4	3.4	3.3	--	3.6	
OSL	<0.0001	<0.0001	0.0006	0.0003	0.0002	0.8508	0.0004	0.0002	0.0010	0.0007	--	0.0008	
LSD	0.8	1.1	249	89	136	NS	54	16	69	8	--	61	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.00/cwt ginning cost.
$225/ton for seed.
Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Color grades set to 21, leaf grades set to 2 for entire trial.

Table 30. Harvest results from the Custer County irrigated XtendFlex variety trial, Merlin Schantz Farm, Hydro, OK, 2015.

Entry	Storm resistance	Micronaire	Staple	Strength	Uniformity
	1-9 visual scale*	units	32nds inch	g/tex	%
DP1518B2XF	5.3	4.3	40.2	30.7	84.0
DP1522B2XF	5.0	4.0	39.4	30.3	83.9
DP1612B2XF (14R913B2XF)	4.3	4.3	40.6	29.7	83.8
DP1614B2XF (15R515B2XF)	4.7	4.5	39.7	30.4	84.1
Experimental A	8.0	4.2	40.8	30.2	84.9
Experimental B	3.7	4.2	39.0	30.7	83.9
Experimental C	6.3	4.3	39.2	30.5	83.8
Test average	5.3	4.3	39.8	30.4	84.1
CV, %	8.8	6.8	1.2	3.0	1.1
OSL	<0.0001	0.5813	0.0023	0.8395	0.8025
LSD	0.8	NS	0.8	NS	NS

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.05 level, † indicates significance at the 0.10 level, NS - not significant.

*Visual storm resistance scale: 1=loose, 9=tight.

Assumes:

Color grades set to 21, leaf grades set to 2 for entire trial.

OSU Cotton Official Variety Tests - 2015

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The Oklahoma Agricultural Experiment Station official variety tests (OVTs) were planted at the Southwest Research and Extension Center at Altus (Lugert-Altus Irrigation District - furrow irrigated), Tipton Valley Research Center (dryland), and Caddo Research Station at Fort Cobb (center pivot irrigated) in 2015.

Site information:

1) Altus conventional tillage furrow irrigated OVT – 40-inch rows, planted June 4 at 4 seeds/row-ft, harvested November 10, 4 replicates planted, 4 replicates harvested

2) Tipton no-till dryland OVT – 40-inch rows, planted June 10 at 3 seeds/row-ft, harvested November 12, 4 replicates planted, 3 replicates harvested for yield and quality.

3) Fort Cobb no-till in terminated small grains cover – low elevation spray center pivot irrigated OVT – 36-inch rows, planted June 8 at 4 seeds/row-ft, 4 replicates planted, trial was compromised by phenoxy herbicide drift (volatilization) from a neighbor south of the research farm in early July, and **was not harvested**.

Plots were four rows wide and 30 feet long at all sites. Harvested area was the center two rows by the length of the plot. Trials were harvested with a brush-roll plot stripper and grab sampled by plot (three replicates). Grab samples were ginned on research equipment at the Southwest Research and Extension Center. These grab samples were used to determine the lint and seed turnout for each individual entry and were used to convert plot bur cotton weights to lint per acre. Lint samples were submitted to the Texas Tech University Fiber and Biopolymer Research Institute (FBRI) to obtain high volume instrument (HVI) data. Additionally, 50-boll samples were taken from each plot in 3 of the 4 replicates and other data (including boll sample lint fractions, boll size, seed index, lint index, and seed per boll) were derived from those. Additional collected data included plant height from the soil surface to terminal and a visual estimate of storm resistance (1-9 with 9 tightest). Important cultural practices are noted in Table 1, and the 2015 OVT results for Altus (Tables 2 and 3) and Tipton (Tables 4 and 5) are presented below.

Table 1. Cultural practices used for the cotton official variety tests at Altus and Tipton, 2015.

Location	Fertilizer application	Irrigations	Herbicide applications	Plant growth regulator application	Insecticide applications	Harvest aid applications
Altus	February 24 - Broadcast air boom truck application of 40-30-0 @ 126 lbs/A, nitrogen rate reduced based on residual N determined by deep soil sampling (to 18 inches)	7 total July 16 July 22 July 30 August 11 August 18 August 25 September 1	March 30 - PPI ground rig broadcast application of Trifluralin HF @ 2.0 ptsA June 3 - Pre-plant ground rig broadcast application of Mad Dog Plus + Choice Weather Master + Activator 90 nonionic surfactant @ 48.0 oz /A + ½ % v/v + ½ % v/v June 24 - Postemerge ground rig broadcast application of Roundup Power Max + Choice Weather Master + Activator 90 nonionic surfactant @ 32.0 oz /A + ½ % v/v + ½ % v/v July 8 - Postemerge ground rig broadcast application of Roundup PowerMax + Staple LX + Choice Weather Master + Activator 90 nonionic surfactant @ 48.0 oz /A + 3.2 oz /A + ½ % v/v + ½ % v/v	August 3 - Aerial application of Mepex + Induce nonionic surfactant @ 16.0 oz/A + ¼ % v/v	June 17 - Aerial application of Acephate 90 WDG + Induce nonionic surfactant @ 6.5 oz/A + ¼ % v/v July 11 - Aerial application of Acephate 90 WDG + Induce nonionic surfactant @ 8.0 oz/A + ¼ % v/v July 19 - Aerial application of Acephate 90 WDG + Induce nonionic surfactant @ 8.0 oz/A + ¼ % v	October 15 - Aerial application of Boll Buster + DFT 6 @ 2.0 pts/A + 1.5 pts/A October 27 - Aerial application of Aim EC + Maximizer Crop Oil @ 1.6 oz/A + 1% v/v
Tipton	February 24 - Broadcast air boom truck application of 40-30-0 @ 126 lbs/A	n/a	March 26 - Pre-plant ground rig broadcast application of Roundup Power Max + Clarity + Choice Weather Master + Activator 90 nonionic surfactant @ 32 oz /A + 8 oz/A + ½ % v/v + ½ % v/v June 11 – Preemerge ground rig broadcast application of 48 oz/A Gramoxone 2.0 SL + 1qt/A Prowl H20 June 25 - Postemerge ground rig broadcast application of Mad Dog Plus + Choice Weather Master + Activator 90 nonionic surfactant @ 48.0 oz/A + ½ % v/v + ½ % v/v July 8 - Postemerge ground rig broadcast application of Mad Dog Plus + Staple LX + Choice Weather Master + Activator 90 nonionic surfactant @ 48.0 oz/A + 3.2 oz/A + ½ % v/v + ½ % v/v August 13 - Postemerge ground rig broadcast application of Mad Dog Plus + Choice Weather Master + Activator 90 nonionic surfactant @ 48.0 oz/A + ½ % v/v + ½ % v/v	July 11 - Aerial application of Mepiquat Chloride @ 3.0 oz/A	June 19 - Aerial application of Acephate 97 + Induce nonionic surfactant @ 6.5 oz/A + ¼ % v/v July 11 - Aerial application of Acephate 97 + Induce nonionic surfactant @ 8.0 oz/A + ¼ % v/v July 18 - Aerial application of Acephate 97 + Induce nonionic surfactant @ 8.0 oz/A + ¼ % v/v	October 12 - Aerial application of Boll Buster + Folex 6 EC + Kinetic Nonionic surfactant @ 2.0 pts/A + 1.5 pts/A + ¼ % v/v October 26 - Aerial application of Aim EC + Maximizer Crop Oil @ 1.6 oz/A + 1% v/v

Table 2. Yield and agronomic results from the OSU irrigated cotton official variety test, Southwest Research and Extension Center, Altus, OK 2015.

Entry	Lint yield	Grab sample turnout		Boll sample lint fraction		Boll size	Seed index	Lint index	Seed per boll	Storm resistance	Final plant height
		Lint	Seed	Picked	Pulled						
	lb/acre	-------------------------%	-------------------------			g seed cotton/boll	g wt 100 fuzzy seed	g wt lint from 100 fuzzy seed	count/boll	visual scale (1=loose, 9=tight)	inches
FiberMax FM 2322GL	1663	29.7	42.1	45.2	34.9	7.5	10.2	8.8	29.9	7	31
Deltapine DP 1614B2XF	1656	27.0	41.9	43.6	31.6	7.0	8.2	6.5	34.0	6	29
PhytoGen PHY333WRF	1649	25.0	43.0	40.1	28.9	7.1	9.5	6.7	30.9	6	32
Deltapine DP 1612B2XF	1568	25.2	45.7	38.2	28.4	7.1	9.8	6.3	32.1	5	29
Deltapine DP 1410B2RF	1542	26.8	47.9	38.7	28.9	7.1	10.2	6.6	31.2	8	29
PhytoGen PX2037-18WRF	1508	24.9	44.9	38.3	29.1	6.8	11.2	7.2	27.8	7	29
Monsanto MON15R525B2XF	1498	26.4	45.3	40.0	29.6	7.6	9.8	6.7	33.3	5	31
PhytoGen PHY312WRF	1482	24.2	44.9	38.8	28.0	7.0	10.5	6.8	28.6	6	32
Monsanto MON15R513B2XF	1475	25.0	45.5	39.1	27.9	7.1	9.8	6.5	30.6	4	31
Monsanto MON15R519B2XF	1474	26.3	43.3	42.6	31.0	6.7	8.5	6.4	32.1	4	30
FiberMax FM 1320GL	1472	25.4	44.3	40.8	31.8	7.3	10.0	7.1	33.0	8	27
Deltapine DP 1518B2XF	1466	25.1	46.3	38.1	27.7	6.2	9.8	6.2	27.5	7	32
PhytoGen PHY222WRF	1463	23.3	43.3	39.0	28.0	7.3	10.8	7.1	28.6	6	28
PhytoGen PHY339WRF	1459	25.8	46.4	39.6	29.7	6.8	9.4	6.2	32.0	5	32
FiberMax FM 1830GLT	1422	26.9	44.5	42.0	33.1	6.9	10.6	7.9	29.6	6	27
PhytoGen PHY444WRF	1422	25.6	44.2	40.5	31.6	6.5	9.8	6.9	30.0	7	32
Deltapine DP 1549B2XF	1409	24.6	46.1	39.7	29.4	6.8	9.3	6.2	32.0	7	32
Stoneville ST 4747GLB2	1406	24.5	44.8	39.0	30.0	7.0	10.0	6.6	31.8	6	32
NexGen NG 3406B2XF	1390	24.8	46.1	39.5	29.2	7.3	9.8	6.5	32.8	6	29
Stoneville ST 4946GLB2	1354	23.9	46.7	37.2	29.4	7.3	10.7	6.5	33.1	7	29
FiberMax FM 1900GLT	1350	25.0	46.1	39.0	30.8	7.4	10.5	7.0	32.4	7	28
FiberMax FM 2334GLT	1329	26.8	43.3	41.5	32.4	6.7	9.1	6.7	32.7	6	26
PhytoGen PX2045-11WRF	1326	23.5	46.7	36.6	28.6	7.2	10.5	6.2	33.3	7	30
Deltapine DP 1044B2RF	1319	23.3	48.0	37.2	29.2	6.3	9.6	5.8	31.7	7	33
PhytoGen PX2048-04WRF	1312	23.0	43.2	35.8	29.5	7.0	11.1	7.4	28.2	7	30
NexGen NG 3405B2XF	1307	23.4	46.5	37.7	27.3	7.2	10.1	6.3	31.4	5	28
Deltapine DP 1522B2XF	1297	23.4	45.8	36.1	28.4	6.6	9.7	6.4	29.4	6	31
DynaGro CT 14515B2RF	1290	25.3	44.4	41.4	32.5	7.5	10.5	7.6	32.0	7	33
Monsanto MON15R511B2XF	1198	24.7	48.8	37.8	29.2	7.5	9.7	6.0	36.4	8	34
FiberMax FM 1944GLB2	1196	23.0	46.7	37.3	29.2	7.2	11.0	6.7	31.6	7	29
DynaGro CT 15143B2XF	1194	25.2	43.3	41.0	31.9	6.7	10.7	7.7	28.4	4	39
DynaGro CT 15994B2XF	1142	24.3	45.1	38.3	29.7	7.2	9.7	6.2	34.3	6	34
Test average	1407	25.0	45.2	39.4	29.9	7.0	10.0	6.7	31.3	6	30
CV, %	7.2	3.2	2.0	4.1	5.3	6.1	4.9	5.6	5.6	9.7	6.8
OSL	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0134	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD	142	1.3	1.5	2.6	2.6	0.7	0.8	0.6	2.9	1	3

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 3. Fiber property results from the OSU irrigated cotton official variety test, Southwest Research and Extension Center, Altus, OK 2015.

Entry	Micronaire	Length	Staple	Strength	Uniformity	Elongation	Reflectance	Yellowness
	units	inches	32nds inch	g/tex	%	%	rd %	+b %
Deltapine DP 1044B2RF	3.2	1.17	37.5	32.1	82.5	7.2	68.4	6.8
Deltapine DP 1410B2RF	3.2	1.21	38.8	32.0	81.1	5.5	68.6	6.5
Deltapine DP 1518B2XF	3.3	1.21	38.6	29.4	82.7	6.0	67.3	6.3
Deltapine DP 1522B2XF	3.2	1.15	36.9	31.7	81.9	7.2	67.7	7.0
Deltapine DP 1549B2XF	3.3	1.19	38.0	32.8	82.1	6.1	69.7	7.1
Deltapine DP 1612B2XF	3.3	1.21	38.6	32.9	83.2	7.1	66.1	6.8
Deltapine DP 1614B2XF	3.9	1.22	39.0	31.6	83.8	7.4	65.4	7.2
DynaGro CT 14515B2RF	3.4	1.18	37.8	32.9	81.8	6.6	69.8	7.5
DynaGro CT 15143B2XF	3.4	1.14	36.5	31.6	82.5	6.3	65.8	6.2
DynaGro CT 15994B2XF	3.5	1.16	37.2	31.9	83.0	6.3	67.8	6.4
FiberMax FM 1320GL	3.6	1.17	37.4	34.2	83.4	6.3	68.9	7.0
FiberMax FM 1830GLT	3.6	1.23	39.3	33.7	83.2	5.0	73.4	6.2
FiberMax FM 1900GLT	3.3	1.22	39.1	33.7	83.6	4.5	66.4	6.7
FiberMax FM 1944GLB2	3.3	1.22	39.1	33.3	82.3	4.9	71.8	6.5
FiberMax FM 2322GL	3.7	1.24	39.6	34.6	83.2	4.6	67.9	6.6
FiberMax FM 2334GLT	3.7	1.25	39.9	34.3	84.4	4.9	71.8	6.3
Monsanto MON15R511B2XF	2.9	1.24	39.7	31.0	82.2	5.5	71.6	6.5
Monsanto MON15R513B2XF	3.5	1.22	38.9	30.2	83.4	6.8	66.6	6.8
Monsanto MON15R519B2XF	3.9	1.12	35.8	29.7	83.8	6.1	67.4	6.7
Monsanto MON15R525B2XF	3.9	1.24	39.8	31.9	83.0	4.8	67.1	6.4
NexGen NG 3405B2XF	3.2	1.12	35.9	27.4	81.7	6.4	71.2	7.0
NexGen NG 3406B2XF	3.2	1.16	37.2	31.6	83.3	7.2	70.8	6.9
PhytoGen PHY222WRF	3.6	1.19	38.1	31.8	84.3	7.3	69.2	6.5
PhytoGen PHY312WRF	3.1	1.20	38.4	32.1	83.0	6.3	66.6	6.9
PhytoGen PHY333WRF	3.1	1.19	38.2	31.0	82.4	5.8	66.4	7.0
PhytoGen PHY339WRF	3.3	1.20	38.3	31.9	82.6	6.3	68.7	6.3
PhytoGen PHY444WRF	2.8	1.25	40.0	31.0	83.3	5.7	71.6	7.1
PhytoGen PX2037-18WRF	3.1	1.23	39.4	30.7	81.7	6.4	68.4	6.5
PhytoGen PX2045-11WRF	3.1	1.26	40.2	32.6	83.8	6.5	66.8	6.2
PhytoGen PX2048-04WRF	3.5	1.18	37.8	34.7	82.9	6.7	65.2	7.1
Stoneville ST 4747GLB2	3.3	1.19	38.2	29.8	81.5	4.9	67.0	6.0
Stoneville ST 4946GLB2	3.2	1.19	38.0	35.1	83.3	7.3	68.3	7.3
Test average	3.4	1.20	38.4	32.0	82.8	6.1	68.4	6.7
CV, %	4.1	1.6	1.6	3.4	1.1	4.5	2.2	3.6
OSL	<0.0001	<0.0001	<0.0001	<0.0001	0.0029	<0.0001	<0.0001	<0.0001
LSD	0.2	0.03	1.0	1.8	1.5	0.4	2.4	0.4

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 4. Yield and agronomic results from the OSU dryland cotton official variety test, Tipton Valley Research Center, Tipton, OK 2015.

Entry	Lint yield	Grab sample turnout		Boll sample lint fraction		Boll size	Seed index	Lint index	Seed per boll	Storm resistance	Final plant height
		Lint	Seed	Picked	Pulled						
	lb/acre	-------------------------%-------------------------				g seed cotton/boll	g wt 100 fuzzy seed	g wt lint from 100 fuzzy seed	count/boll	visual scale (1=loose, 9=tight)	inches
PhytoGen PHY 333WRF	742	25.0	41.7	40.4	29.9	5.9	8.8	6.2	28.5	7	29
PhytoGen PHY 444WRF	728	26.7	42.5	42.0	31.9	6.1	9.5	7.0	27.9	8	28
Stoneville ST 4946GLB2	709	26.4	46.3	40.3	31.1	6.7	10.2	7.0	30.1	8	29
FiberMax FM 2322GL	707	28.3	41.1	43.1	32.2	7.0	10.2	7.9	28.8	7	30
FiberMax FM 1900GLT	704	25.4	45.6	39.1	30.4	6.8	10.0	6.5	31.7	8	26
NexGen NG 3406B2XF	695	25.3	45.4	40.0	30.1	6.0	8.8	6.0	30.3	7	26
FiberMax FM 1830GLT	695	27.9	43.8	42.2	32.5	7.2	9.9	7.4	31.7	7	28
PhytoGen PHY 312WRF	688	24.9	44.2	40.0	30.2	6.1	9.4	6.5	28.6	6	30
PhytoGen PHY 222WRF	681	23.6	44.7	39.3	28.9	6.2	10.1	6.6	27.3	6	26
Stoneville ST 4747GLB2	679	24.0	45.0	37.5	28.4	6.2	9.5	5.8	30.3	7	27
NexGen NG 3405B2XF	671	24.6	43.8	41.1	30.4	6.4	9.4	6.7	29.1	6	27
Deltapine DP 1044B2RF	656	25.5	45.9	39.1	31.7	6.0	9.3	6.1	30.7	7	29
PhytoGen PHY 339WRF	655	25.2	45.5	39.8	31.2	6.1	8.9	6.0	31.7	6	30
FiberMax FM 2334GLT	628	26.3	42.2	43.0	32.1	6.1	8.7	6.7	29.1	5	29
FiberMax FM 1944GLB2	563	23.6	45.1	37.1	27.8	6.0	9.7	5.9	28.7	5	27
DynaGro CT 15425B2XF	553	22.8	41.7	39.8	28.5	7.5	10.6	7.1	30.0	8	30
DynaGro CT 15994B2XF	525	25.0	44.1	39.2	29.1	5.9	9.2	6.1	28.2	6	30
Deltapine DP 1549B2XF	512	25.2	43.8	41.9	32.3	6.2	8.4	6.1	32.6	7	31
DynaGro CT 15143B2XF	479	25.0	41.2	40.9	30.4	5.7	9.4	6.6	26.5	5	31
Test average	646	25.3	43.9	40.3	30.5	6.3	9.5	6.5	29.6	7	29
CV, %	11.4	3.6	2.6	3.2	4.3	7.8	5.6	5.4	5.5	11.5	6.1
OSL	0.0007	<0.0001	<0.0001	<0.0001	0.0005	0.0022	0.0004	<0.0001	0.0018	<0.0001	0.0045
LSD	122	1.5	1.9	2.1	2.2	0.8	0.9	0.6	2.7	1	3

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Table 5. Fiber property results from the OSU dryland cotton official variety test, Tipton Valley Research Center, Tipton, OK 2015.

Entry	Micronaire	Length	Staple	Strength	Uniformity	Elongation	Reflectance	Yellowness
	units	inches	32nds inch	g/tex	%	%	rd %	+b %
Deltapine DP 1044B2RF	4.3	1.12	35.7	31.8	81.9	7.1	71.6	8.0
Deltapine DP 1549B2XF	4.1	1.11	35.6	32.5	81.4	5.2	71.1	8.7
DynaGro CT 15143B2XF	4.3	1.04	33.4	30.5	81.3	6.1	68.5	7.3
DynaGro CT 15425B2XF	4.2	1.15	36.7	34.6	83.3	5.5	74.1	7.7
DynaGro CT 15994B2XF	4.5	1.10	35.3	31.9	82.2	5.8	68.4	7.5
FiberMax FM 1830GLT	4.5	1.15	36.8	34.7	82.9	4.4	75.0	7.4
FiberMax FM 1900GLT	3.8	1.14	36.5	33.2	81.5	3.9	70.5	8.0
FiberMax FM 1944GLB2	3.7	1.11	35.4	28.6	81.2	5.1	72.1	7.0
FiberMax FM 2322GL	4.3	1.16	37.1	36.1	83.0	4.5	70.5	8.2
FiberMax FM 2334GLT	4.3	1.17	37.5	33.5	83.6	4.3	74.2	7.5
NexGen NG 3405B2XF	4.1	1.07	34.2	27.9	81.5	5.9	71.4	8.0
NexGen NG 3406B2XF	4.0	1.09	34.8	30.2	82.4	7.2	70.6	7.8
PhytoGen PHY 222WRF	4.2	1.13	36.1	32.6	83.6	7.3	71.1	7.9
PhytoGen PHY 312WRF	4.0	1.13	36.3	30.9	82.9	6.0	69.5	7.8
PhytoGen PHY 333WRF	3.9	1.10	35.3	30.2	81.3	5.5	68.0	8.1
PhytoGen PHY 339WRF	3.7	1.13	36.0	31.9	82.3	6.2	71.2	7.5
PhytoGen PHY 444WRF	3.6	1.16	37.2	32.8	83.1	5.8	73.5	8.2
Stoneville ST 4747GLB2	3.7	1.10	35.3	26.2	79.4	4.1	69.9	6.9
Stoneville ST 4946GLB2	4.1	1.10	35.3	31.9	83.0	6.4	71.2	8.2
Test average	4.1	1.12	35.8	31.7	82.2	5.6	71.2	7.8
CV, %	3.7	2.0	2.0	4.1	0.9	11.1	1.5	5.3
OSL	<0.0001	<0.0001	<0.0001	<0.0001	0.0034	<0.0001	<0.0001	0.0007
LSD	0.3	0.04	1.2	2.1	1.3	1.0	1.8	0.7

CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.05 level.

Choosing Which Cotton Varieties to Grow

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Variety Selection

Selecting productive cotton varieties is not an easy task, especially in Oklahoma where weather can literally make or break a crop. Producers need to compare several characteristics among many different varieties, then key the characteristics to typical growing conditions. The growing environment from year to year cannot be controlled, but varieties can be selected based on desired attributes. It is very important to select and plant varieties that fit specific fields. Do not plant the entire farm with a single variety, and try relatively small acreages of new varieties before extensive planting. When it comes to variety selection in Oklahoma, several factors are important to consider.

Maturity (Earliness)

Scrutinizing the relative maturity rankings provided by seed companies will be beneficial. Don't expect a mid- to full-season cotton variety to perform well in a short-season environment, where an early or early- to mid-season variety might work best. Many longer season cotton varieties are better adapted to areas with longer growing seasons, although significant gains in yield may sometimes be obtained in years with warm September and October temperatures. Longer season varieties will typically do much better when planted earlier, then provided an excellent finish. For later plantings, early- to mid-season maturity varieties may be better. For late plantings or replant situations, early maturity varieties may be better. Relative maturity for most varieties gets compressed when moisture stress occurs. With drought stress, maturity of longer season varieties will not be expressed to the degree that would generally be noted when under high water and fertility regimes.

Pounds

Yield potential is probably the single most important agronomic characteristic, because pounds do drive profitability and provides for the safety net of higher actual production history (APH) in case of catastrophic loss of acres. The benefit this can provide from the crop insurance perspective is important in our high risk area. Yield stability across environments is going to be important, and finding a variety that has the ability to provide high yield across varying water inputs is critical.

Fiber Quality

Producers should also consider lint quality. Progress has been made in terms of fiber quality during the last several years. Significant improvements have been seen in overall fiber quality packages associated with modern varieties. Staple is generally good to excellent for most new varieties. Many things can affect crop micronaire, including overall environment, planting date, variety, early season fruit loss with later compensation, excessive late season irrigation or rainfall, seedling disease, early season set-backs due to hail damage, blowing sand, thrips, etc. Fiber strength has also significantly improved and many newer varieties tend to be at least 30 g/tex. Length uniformity can be affected by staple, maturity and harvest method (picker harvested is typically higher than stripper harvested). Higher maturity fiber generally results in better uniformity. Leaf grade can be affected by density of leaf hairs on specific varieties in some years. Generally, cool, wet fall conditions can lead to lower quality leaf grades for varieties which tend to be hairy. In drier harvesting environments, these differences tend to diminish.

Color grades are basically a function of weathering or exposure of the fiber on the plant to wet conditions. The highest quality that a cotton boll can have is on the day that it opens. After that, if conditions favor microbial growth (warm, wet conditions). An early freeze can affect immature cotton by reducing its color grade. Bark contamination is generally also driven by significant late season rainfall followed by a freeze. In some years, this can't be easily managed if stripper harvested. Conversely, picker harvesting can significantly reduce or eliminate bark contamination.

Storm Resistance

Storm resistance is still a concern for growers in our area. Even though many producers have adopted less storm-resistant cotton varieties during the last several years, and generally done well with them, the overall management system the producer adopts can be important. Under significant moisture stress on dryland, some newer varieties may provide an unacceptable level of storm resistance, especially if the field is left to a freeze. Producers planning to execute a sound harvest aid program as soon as the crop is mature can probably grow some fields with less storm-resistant cotton. However, having large acreages of varieties with low storm resistance might be a prescription for disaster if the right environmental conditions align at harvest. Do not plan to leave looser cotton varieties in the field until a freeze conditions the plants for harvest. Unacceptable pre-harvest lint loss is likely to result. Higher storm resistance varieties are better adapted to our harvesting conditions and they are more likely to survive damaging weather prior to harvest without considerable seedcotton loss. Inquire about the storm resistance of any variety on your potential planting list. If choosing a variety with low storm resistance, plan and budget ahead for a good harvest aid program that will achieve an early harvest. Good storm resistance data are now being provided by most companies and we visually evaluate all Extension and research variety trials for this attribute. For those planning to harvest with spindle pickers, varieties with higher storm resistance may possibly result in reduced picker harvesting efficiency.

Disease and Nematode Resistance/Tolerance

Producers should not plant the entire farming operation to one cotton variety. A question should be "do I have plant diseases or Root knot nematodes in this specific field?" Although we have not been able to identify substantial acreage with this pest in Oklahoma, varietal tolerance or resistance will be critical for management. It is important to know which disease is present. If there is a problem with a wilt disease, but don't know what it is, then have the problem identified. If known Verticillium wilt pressure is present, then take a look at Texas A&M AgriLife Research and Extension testing data from several locations investigating variety performance under constraints from this particular disease. The same should be considered for Fusarium wilt/Root-knot nematode issues. Many times varieties which do well under Verticillium wilt pressure may not be the same ones which are resistant with Fusarium or Root-knot nematode. Bacterial blight is an occasional problem in the region, and the only way to manage this disease is planting resistant or immune genetics. There are several varieties that can provide high levels of resistance/immunity. To determine the disease reaction of many currently available varieties, visit the Texas A&M AgriLife Research and Extension Center website at: http://lubbock.tamu.edu

Biotech Trait Types

Producers need to ask themselves several questions. "Do I want a herbicide-tolerant variety, and if so, which system?" Weed control has been catapulted forward by the advent of transgenic Roundup Ready® Flex, GlyTol®, Liberty Link®, and Glytol® plus Liberty Link® (stacked) cotton varieties. The agronomic capabilities of glyphosate-tolerant cotton varieties continue to improve and the weed control system it enables is very effective, if properly executed. The Liberty Link® system has thus far been more widely adopted in other regions, perhaps due to our hot and dryl early season environments in some years. The widely anticipated GlyTol®, the proprietary glyphosate tolerance trait from Bayer CropScience (BCS) has been approved by regulatory agencies and has been launched. In 2013, there were several varieties with GlyTol®/Liberty Link® stacked technologies.

As for insect protection, for several years now, Monsanto's Bollgard® II and Dow AgroSciences' Widestrike® technologies have provided outstanding lepidopteran pest control. In 2014, TwinLink® Bt from BCS will be available. Based on local pricing, these technologies have been widely planted on Oklahoma cotton acres. Because of the lack of disruption of beneficial arthropods by insecticides used to target bollworms, etc., aphids will likely not be flared, which is of considerable value. In the near future, Bollgard® II, Widestrike®, and TwinLink® technologies will be "stacked" with an additional Bt trait (Syngenta's VIP 3A) to improve the control spectrum of caterpillar pests and for resistance management issues.

Variety Testing Publications

If disease issues are not concerning, then scrutinize all possible university trial data available to see how a specific variety has performed across a series of environments, and if possible, across years. It is best to consider multi-year and multi-site performance averages when they are available. However, due to the rate of varietal release, many new varieties are sold that have not undergone multi-year university testing, or perhaps no university testing at all. The 2012 and to a certain degree, 2013 variety testing programs were adversely affected by drought and results are available here: http://cotton.okstate.edu/variety-tests

SeedMatrix is a recently developed web-based application that enables users to analyze test plot data from multiple sites in a simple format. SeedMatrix allows the user to analyze variety trial data on cotton, wheat, corn and soybean. The application can analyze the data to find best varieties based on multiple criteria selections, including geography, soil texture, irrigation type, as well as technology traits. Although it is always best to identify varieties that perform well locally, sometimes a tool such as this is useful to help identify yield and fiber quality stability across a large number of sites. It can be found here: https://seedmatrix.com

Seed and Technology Cost

Cost should not necessarily be the primary reason for selecting a variety, but it is important. The value of a high yielding cotton variety with biotech traits to ease management requirements across a large number of acres is a serious consideration. According to USDA-AMS Cotton Varieties Planted - 2012 Crop, the Abilene Classing Office indicated producers planted about 100 percent of the acreage to Roundup Ready® Flex varieties, and about 98 percent to Bollgard® II or Widestrike® Bt technologies. The Plains Cotton Growers Seed Cost Comparison Worksheet can certainly be useful for planning purposes, and they annually update the Microsoft Excel spreadsheet. This file can be used within your Web browser, or downloaded and saved to your computer. About 100 varieties of many types can be found in the spreadsheet. The user can select up to 10 varieties to simultaneously compare total seed and technology fee costs based on a specific seeding rate. The row spacing and seed per row-ft can be entered by the user. This then calculates a seed drop on a per acre basis. Based on published pricing for the various seed varieties and technology fees, the cost per acre is automatically calculated. It should be noted that the pricing used in the spreadsheet does not include premium seed treatments or any incentive program that might be provided by the various companies. The Seed Cost Comparison Worksheet is available here: www.plainscotton.org

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Weed Control

Season Summary

This season brought a welcome change to the rainfall patterns around the state. Record rainfall amounts were recorded in most cotton production areas of Oklahoma over the months of April through June. Along with these record rainfall amounts we also experienced a record amount of pigweed control issues, most of which were due to glyphosate resistance. In fact, feedback from a well- attended turn-row meeting in August suggested that there were no cotton farmers in Oklahoma this year that did not experience some level of difficulty controlling their pigweeds. It was a very educational year in many respects. Many learned that you don't have to be a poor farmer to have pigweed problems and you don't even have to farm next to the problem in order to have it yourself. Due to the nature of (pigweed) pollen travel, these problems spread quickly and in a broad fashion. While pigweed problems seemed to be noticeably smaller in clean (conventional) tillage fields, difficulties were still present in all production types (conventional, minimum, no-till, with or without cover crops, etc.). Growers that planned ahead and invested in early-season residual herbicide programs definitely reaped the benefits through mid-summer. Those that did not plan ahead quickly became familiar with the short list of alternatives: Liberty (if they had the trait in their planted variety), cultivation, hand-hoeing, hooded sprayer treatments or some very expensive (yet incomplete) combination of all four. Even those that did utilize effective residual herbicide programs still dealt with a few pigweed escapes. While this may be a testament to this weed's prolific nature, I also think that under normal rainfall conditions the number of these escapes would have been much fewer. Looking back, I think some growers were anticipating the full approval of the XtendFlex system from Monsanto to aid in their fight against pigweeds and unfortunately only the trait (and not the herbicide) received approval for use in 2015. Similarly, the Enlist Cotton system from Dow Agrosciences also did not received full approval for use in Oklahoma, so neither system was available to help battle weeds in 2015, leaving growers dependent on existing technology. Despite the "failure to launch" this did provide additional time for growers to become more educated with each system. Based on our own project experience with each system I think growers will quickly appreciate the advantages of each. First and foremost, both systems have continued to prove very safe in regards to drift potential. In my experience, when the new dicamba and/or 2,4-D choline herbicides are utilized according to expected recommendations, there is no greater risk of drift than what we currently assume with other herbicides already in use. Secondly, both herbicide systems have proven to be very effective against pigweeds and morningglory. While those two characteristics alone are probably enough to win admiration (and a technology fee) from most growers there are some additional points that should be noted. Based on our experience, both systems are at their best when they are integrated into weed control programs that continue the use of residuals. These residuals will continue to be the basis of our recommendations in the future and it appears that both companies agree on this position as well. Also, producers should remember that while these two new technologies both offer tolerance to glyphosate (Roundup) and glufosinate (Liberty) in addition to their respective hormone herbicide component, they DO NOT have reciprocal tolerance to each other's hormone herbicide. In other words, the XtendFlex trait does not confer tolerance to any formulation of 2,4-D and likewise the Enlist cotton trait does not confer tolerance of any formulation of dicamba. Therefore, record keeping may be a critical issue if mixing technologies within one operation. In addition, in the event that an operation doesn't plant the same technology "wall-to-wall", tank cleanout will also be very important. While all of these issues may seem to complicate life, the good news is that the pigweeds are soon to be in the crosshairs of two very effective weapons and I know growers will be appreciative. A common question that continues to come up in turn-row meetings in the far southwestern counties of Oklahoma is "What about the current regulations that require applicators to file an intent and then a notification when an application of 2,4-D or dicamba is made in certain restricted counties? Will this change once these two technologies become available?" Our current understanding is that nothing will change once these technologies become available. When these applications (2,4-D choline, or the new dicamba) do occur in restricted counties in the future, the same intent and notification will be required to be filed with the Oklahoma Department of Agriculture as it is currently. While this does appear to create extra paperwork, I think most (affected) growers will be willing to trade paperwork for pigweed control.

Project Summary

Resistant weeds continue to take the focus of our weed control programs due to their continued spread. Glyphosate resistant horseweed (or marestail) is one of those weeds. Although horseweed can be easily controlled with traditional auxin herbicides (2,4-D or dicamba), exploring additional options may result in the development of effective combinations that increase the sustainability of these auxin products for the future. Afforia is one of these additional options. Afforia was evaluated for the control of horseweed and other winter weeds prior to planting cotton. Combinations of Afforia with 2,4-D and glyphosate effectively controlled horseweed ahead of cotton planting.

The remainder of our weed control programs in 2015 focused on the control of glyphosate resistant (GR) pigweed. Given the important role that residual herbicides play within a successful program, the focus of our efforts revolved around highlighting this value. Five projects were established to support that mission. The collective result of these projects demonstrated excellent residual pigweed control from applications of Prowl H20, Warrant, Dual Magnum, Staple LX, Caparol, Reflex and Brake F2. This work also indicated that residual herbicides may reduce the number of trips a producer makes through the field.

The integration of auxin herbicide technologies into current systems was also an area of interest. Three projects were established to address this goal. Excellent pigweed control was observed from the utilization of residual herbicides within a Liberty Link System or an XtendFlex system. Data also indicated that the removal of a single residual herbicide from one of these systems resulted in reduced pigweed control. In conclusion, this work also indicated that tank-mixes of Liberty or Staple LX with dicamba provide excellent postemergence pigweed control. These types of multiple modes of action tank-mixes may play a key role in the sustainability of these technologies in the future. Detailed results of each project are presented in the remainder of this section.

Winter Weed Control with Afforia

Afforia is a new herbicide offering from Dupont. Afforia is a combination of flumioxazin, thifensulfuron methyl and tribenuron methyl (active ingredients formerly associated with Valor, Harmony and Express, respectively). All of these products provide broadleaf weed control with limited residual carryover to cotton (14-30 days). In addition, some (Harmony and Express) have been instrumental components in other products (FirstShot) that have shown promise for the control of horseweed ahead of cotton planting. Afforia was applied in early April for the control of horseweed and other winter weeds present. This was compared to several other treatments considered standard options for this timing. Most of these comparisons included either 2,4-D or paraquat. All treatments are listed in Table 1. As indicated in the photo below (Figure 1) very good weed control was observed from applications of Afforia. Treatments of Afforia + 2,4-D + glyphosate effectively controlled henbit, redstem filaree and rescuegrass, which was similar to all other treatments. However, horseweed was controlled more effectively when Gramoxone was included in the application compared to all other treatments. This may be due to the fact that the horseweed at the time of application (information presented in Table 2.) was greater than optimum size (it had already bolted and was approximately 3-6 inches in height).

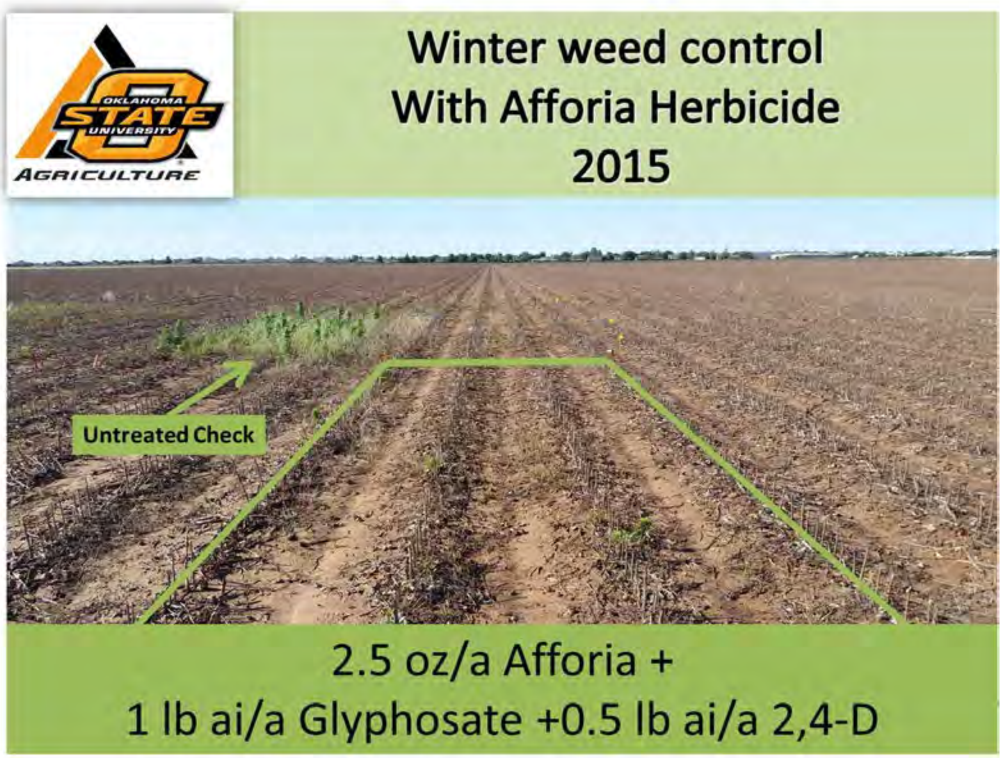


Figure 1. Weed Control with Afforia.

Table 1. Afforia Treatments

Trt No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Growth Stage	Appl Code
1	Untreated Check							
2	Afforia	51	%W/W	WDG	2.5	oz/a	PPBdown	A
	Abundit Extra	4	LBA/GAL	SL	1	qt/a	PPBdown	A
	Barrage	4.7	LBA/GAL	L	0.5	lb ai/a	PPBdown	A
3	FirstShot SG	50	%W/W	SG	0.8	oz/a	PPBdown	A
	Barrage	4.7	LBA/GAL	L	0.5	lb ai/a	PPBdown	A
	Glyphosate	4	LBA/GAL	L	32	oz/a	PPBdown	A
4	Barrage	4.7	LBA/GAL	L	1	lb ai/a	PPBdown	A
	Glyphosate	4	LBA/GAL	L	32	oz/a	PPBdown	A
5	Rowel	51	%W/W	WDG	2	oz/a	PPBdown	A
	Barrage	4.7	LBA/GAL	L	1	lb ai/a	PPBdown	A
	Glyphosate	4	LBA/GAL	L	32	oz/a	PPBdown	A
6	Gramoxone 2.0 SL	2	LBA/GAL	L	0.75	lb ai/a	PPBdown	A
	NIS (induce)	100	LBA/GAL	L	0.5	% v/v	PPBdown	A
7	Rowel	51	%W/W	WDG	2	oz/a	PPBdown	A
	Gramoxone 2.0 SL	2	LBA/GAL	L	0.75	lb ai/a	PPBdown	A
	NIS (induce)	100	LBA/GAL	L	0.5	% v/v	PPBdown	A

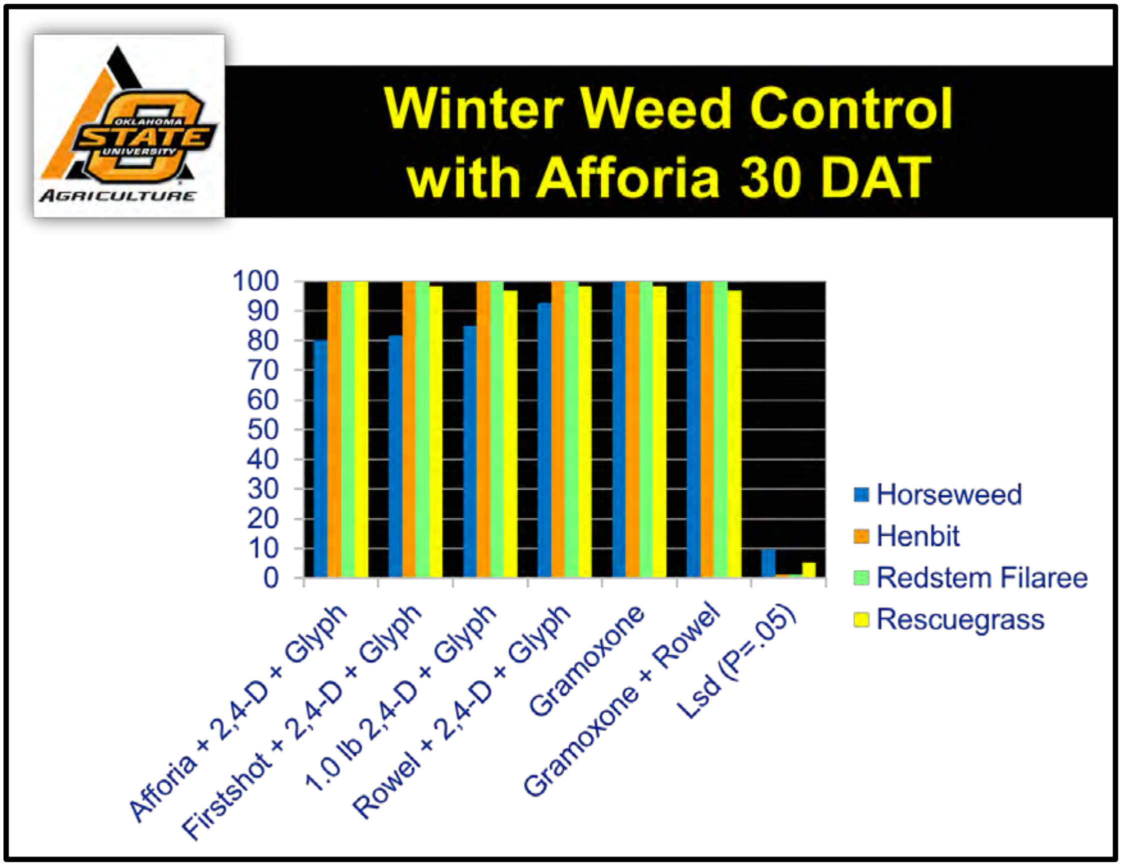


Figure 2. Weed control with Afforia.

Table 2. Application information

Application Description	
	A
Application Date:	4/9/2015
Appl. Start Time:	6:00 PM
Appl. Stop Time:	6:45 PM
Application Method:	Spray
Application Timing:	PPBurn
Application Placement:	Broadcast
Applied By:	OSU
Air Temperature, Unit:	74 F
% Relative Humidity:	30
Wind Velocity, Unit:	8.5 mph
Wind Direction:	N
Soil Temperature, Unit:	69 F
Soil Moisture:	Adequate
% Cloud Cover:	15
Next Moisture Occurred On:	4/12/2015
Time to Next Moisture, Unit:	3 days
Application Equipment	
	A
Appl. Equipment:	Lee Spider
Equipment Type:	HICLEA
Operation Pressure, Unit:	32 psi
Nozzle Type:	Turbotee
Nozzle Size:	11002
Nozzle Spacing, Unit:	20 in
Nozzles/Row:	2
Ground Speed, Unit:	2.6 mph
Carrier:	WATER
Spray Volume, Unit:	15 GAL/AC
Mix Size, Unit:	1 gallons
Propellant:	comp.air
Tank Mix (Y/N):	Y yes
Weed Height at Application:	
Horseweed	3-6 inches
Henbit	4-6 inches
Redstem Filaree	2-8 inches
Rescuegrass	3-6 inches

Improving Pigweed Control with Increased Sprinkler Irrigation When Activating Prowl H20 in Terminated Wheat Cover

An additional demonstration was established under a low elevation spray center pivot to observe the effects of two different sprinkler irrigation rates (targeting 0.75 inches and 1.5 inches) over applications of Prowl H20 into both green wheat cover and terminated wheat cover within a strip-till system. Both applications of Prowl H20 resulted in very good weed control however, the effects of the activating irrigation rates on each treatment were masked due to excessive rainfall received during this period.

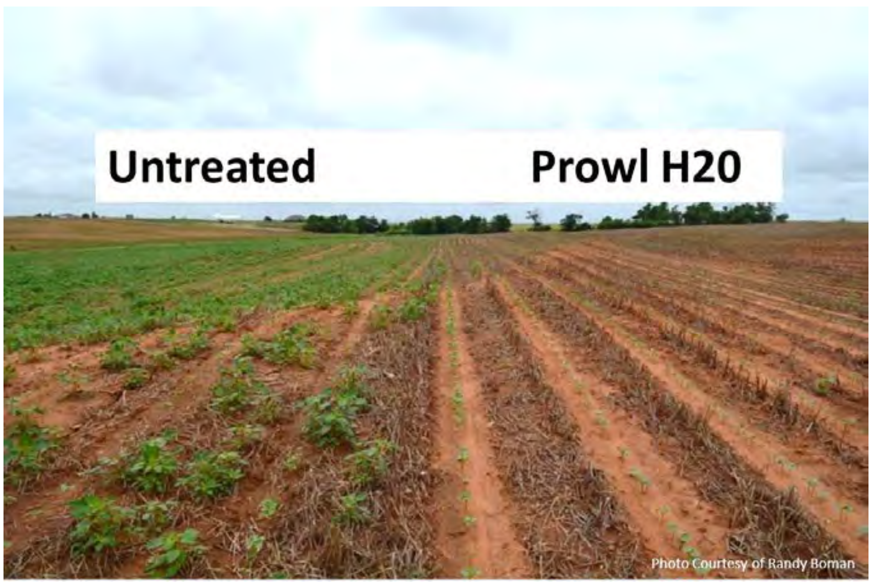


Figure 1. Effective pigweed control with Prowl H20

Although, for obvious reasons, no untreated plots were included in this demonstration, the grower ran out of spray mix before finishing his application of Prowl H20 and did not return to treat the area. Many growers tend to think that residual herbicides are not effective enough in production systems with cover crops. The results shown above in Figure 1 speak for themselves. This field also received a postemergence application of Liberty at 43 oz/acre to deal with pigweed escapes. The results of this application are shown in Figure 2. The increased density of pigweeds that must be controlled at an early postemergence timing when no residual herbicide is used (shown in Figure 3) can be enormous by comparison. Spraying dense populations of emerged pigweed often results in partial shading or shielding of the spray solution. Since Liberty herbicide is very dependent on complete coverage, residual programs that effectively reduce this density significantly increase the opportunity for effective postemergence programs. In addition, we would like to thank BASF, Bayer CropScience and Monsanto for providing product to the grower for this project, their support was greatly appreciated.

Figure 2. Effective pigweed control from Liberty applied early postemergence

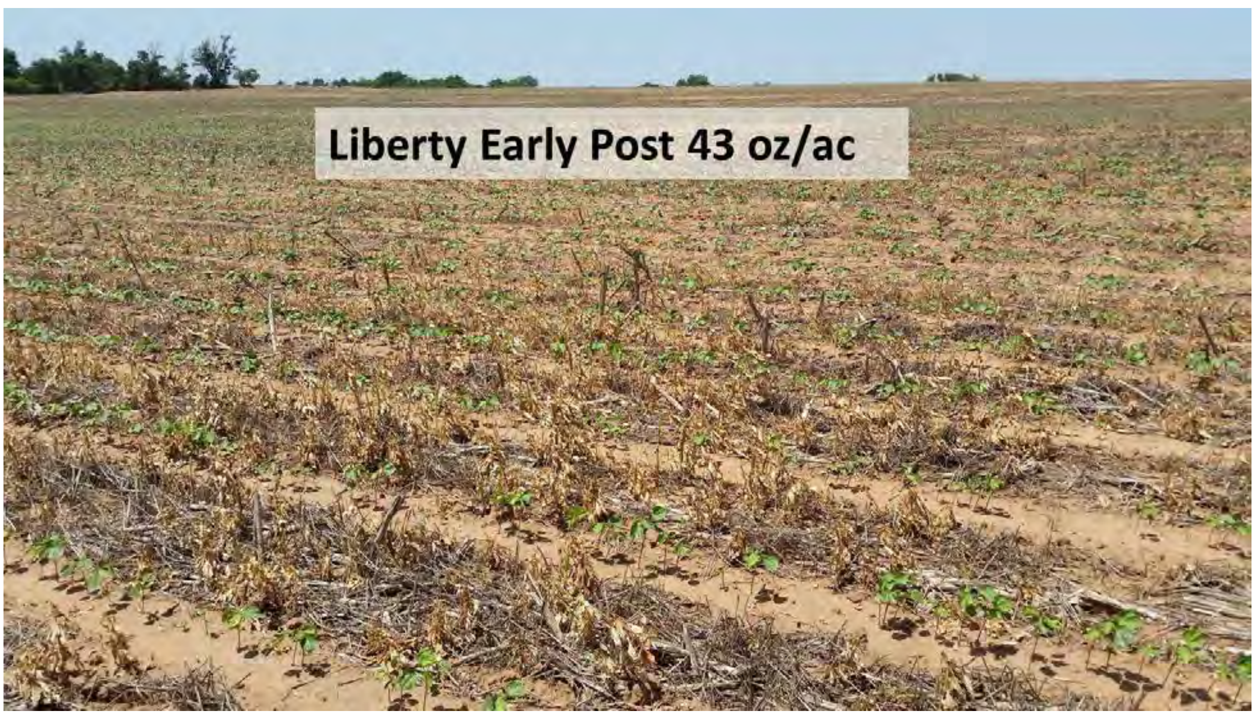


Figure 3. Dense population of pigweed after postemergence Liberty application.

Glyphosate Resistant Pigweed Control Demonstration

In 2015 we conducted a pigweed control demonstration on a farm known to have a severe population of glyphosate resistant (GR) pigweed escapes from the previous year. Growers currently unaffected by GR pigweed don't quite understand the scope of the damage caused by this fierce competitor. This demonstration was established for two purposes. One was to help producers identify residual herbicide programs that effectively control GR pigweed. The second purpose was to help growers understand that while effective control with current products may be possible in practice, in severe cases it may not be economically feasible. The early adoption of residual programs can prevent these situations while limiting the spread of resistance. All treatments applied were commercially available products. Figures 1 and 2 present the details of each weed control program. Both systems effectively controlled pigweed and oddly enough the expenses of these herbicide programs were very similar. However, it should be noted that adding one more residual (increasing from 3 to 4) reduced the overall number of trips through the field (highlighted in Figure 3). In addition, the lack of annual grass control with System Two resulted in the need for an application of glyphosate due to the choice of early season residuals (Caparol and Staple LX do not provide good grass control).

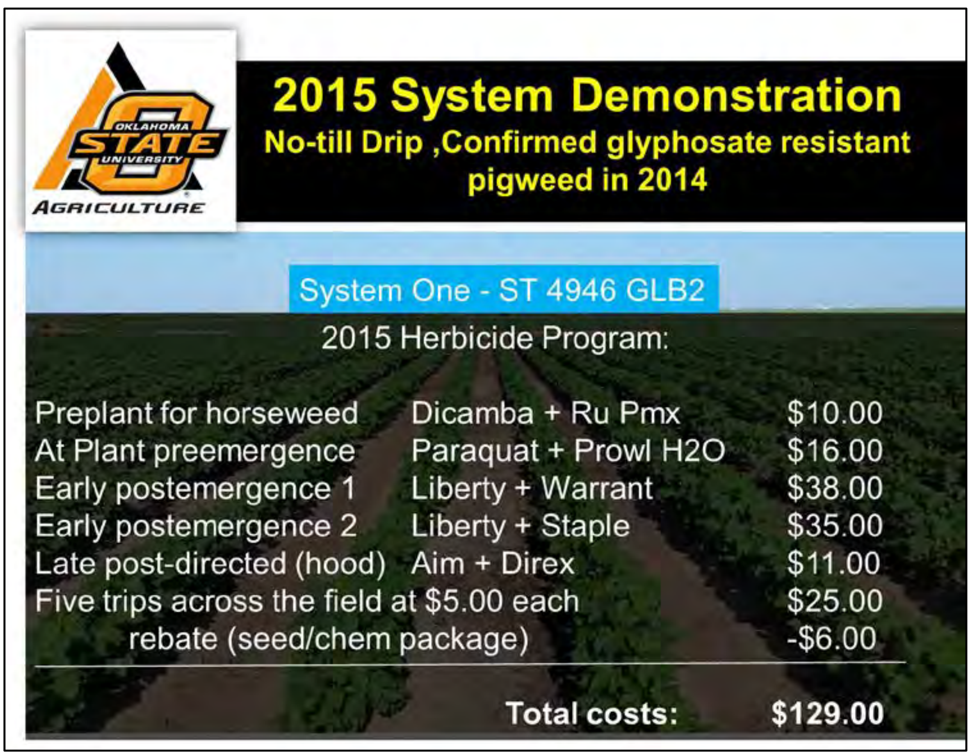


Figure 1. Weed control program for System One.

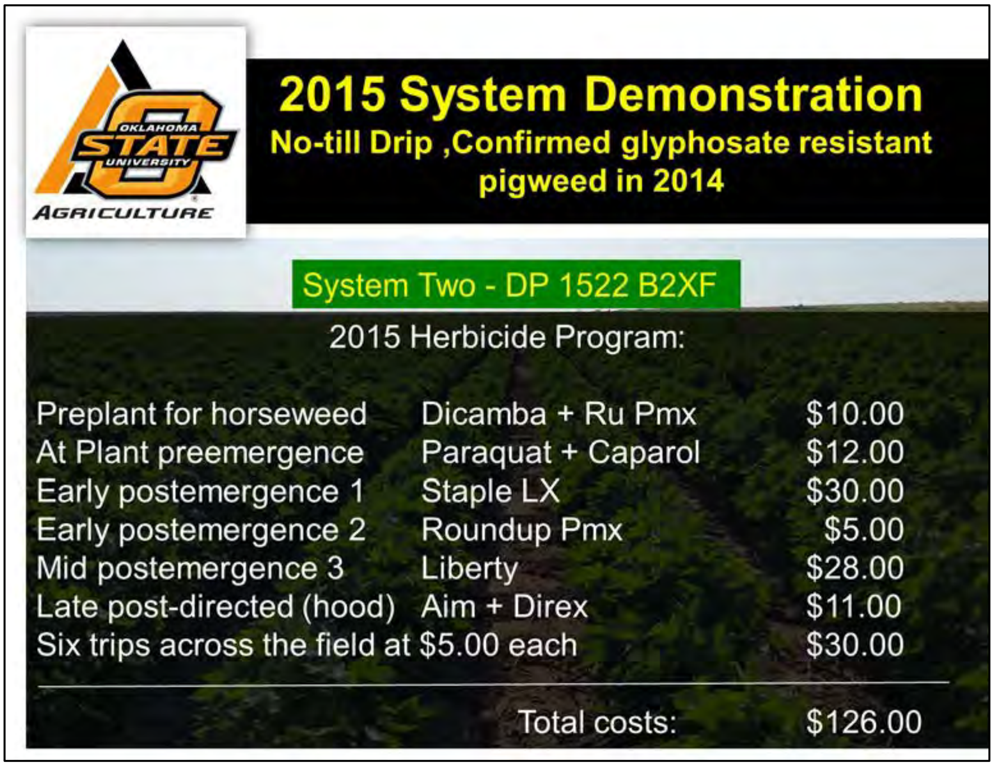


Figure 2. Weed control program for System Two.

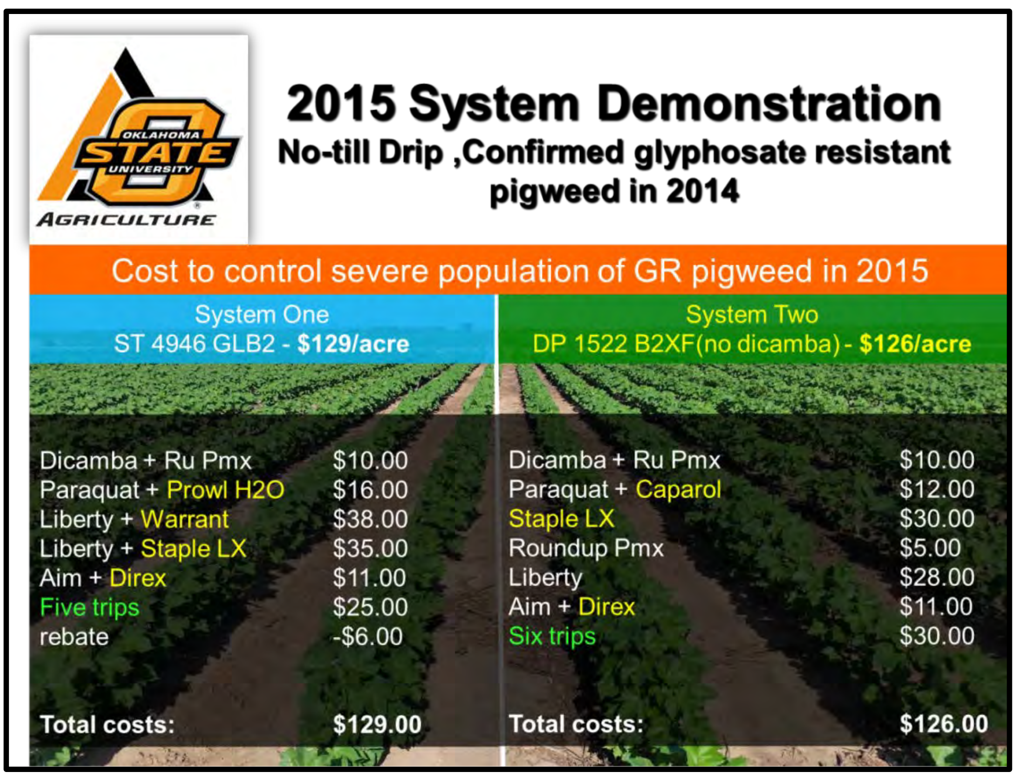


Figure 3. Comparison of weed control system costs.

Liberty Dicamba Combinations

An additional project focused on combinations of Liberty with Dicamba. While many growers ask the question, “why add more expense to an effective program of dicamba plus residuals?” It is important for them to be reminded that combinations of dicamba (and/or 2,4-D) plus glyphosate (which both companies plan to market) applied to glyphosate resistant (GR) pigweed is in effect repeating history. Since the glyphosate component has no activity on GR pigweed, they would really just be applying one active postemergence product. Therefore combinations of dicamba or 2,4-D with Liberty may give us the opportunity to practice what we preach if you will…two active postemergence products with different modes of action. The goal of this project was to identify any benefits that Liberty may bring to the table when attempting to control pigweeds with postemergence applications. Lower than normal rates of each product were utilized to help identify the value of each herbicide within the tank-mix. Liberty was applied alone or in combination with two different formulations of dicamba (M119096 and Clarity) to pigweed 3-8 inches in height. Pigweed control observed from these applications varied by treatment. First, it was clear that lower rates (8oz/ac of Clarity) of dicamba will not effectively control pigweed (approximately 68% at 30 DAT). However, it was also clear that the addition of Liberty to either M119096 or Clarity improved pigweed control (indicated in Figure 1) over either formulation of dicamba alone. This suggests some level of synergy when these products are combined. Figure 2 shows a comparison 7 days after treatment of Liberty plus dicamba (m119096) versus dicamba (m119096) alone. Further studies are planned to continue to evaluate these combinations in hopes of developing effective recommendations for the future that may steward this new technology early in the adoption process. One additional issue that has not been mentioned is the potential conflict between the expected label of M119096 and the current label of Liberty in regards to droplet size, spray volume and drift control. As indicated in table one, these applications were made with Teejet turbo-tee induction nozzles producing an “extra-coarse” spray droplet in 15 gallons of finished spray solution. While this is in direct conflict with directions provided by the current Liberty label (which recommends a medium spray droplet), drift concerns surrounding future auxin herbicide use directed our decision to use a droplet size that is expected to be approved for dicamba applications in the future. Once the official label for m119096 is available, additional considerations may be necessary when considering these tank-mix options in the future.

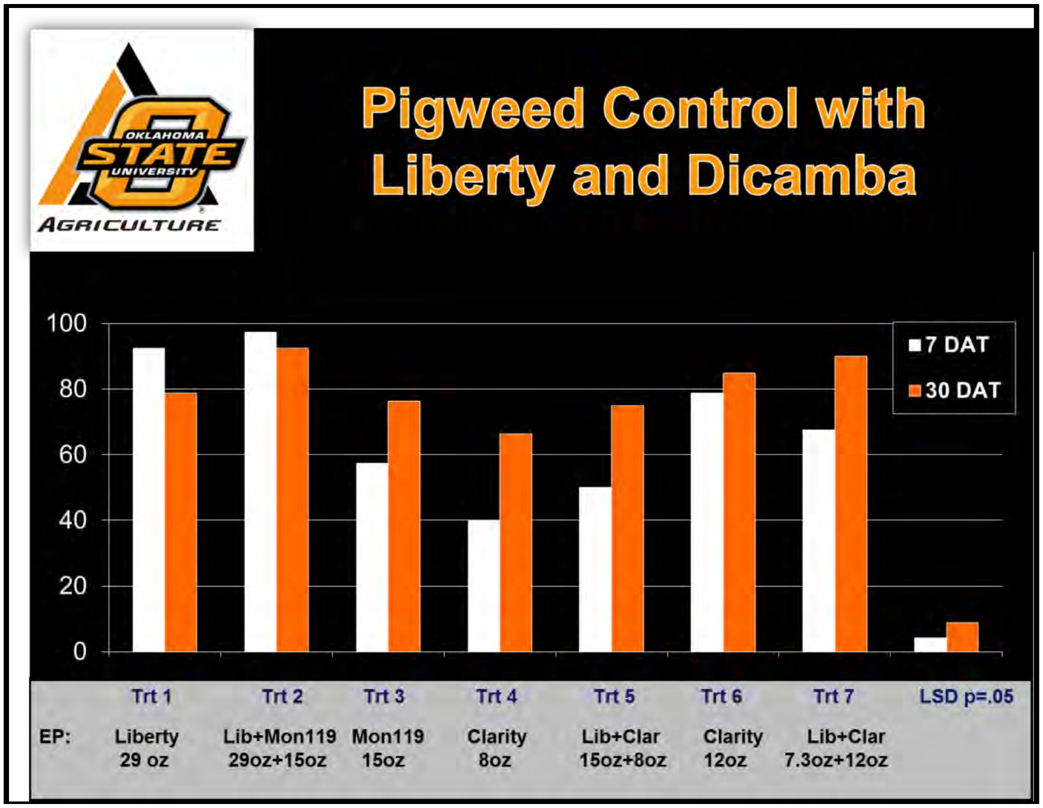


Figure 1. Treatment performance of Liberty-dicamba combinations.

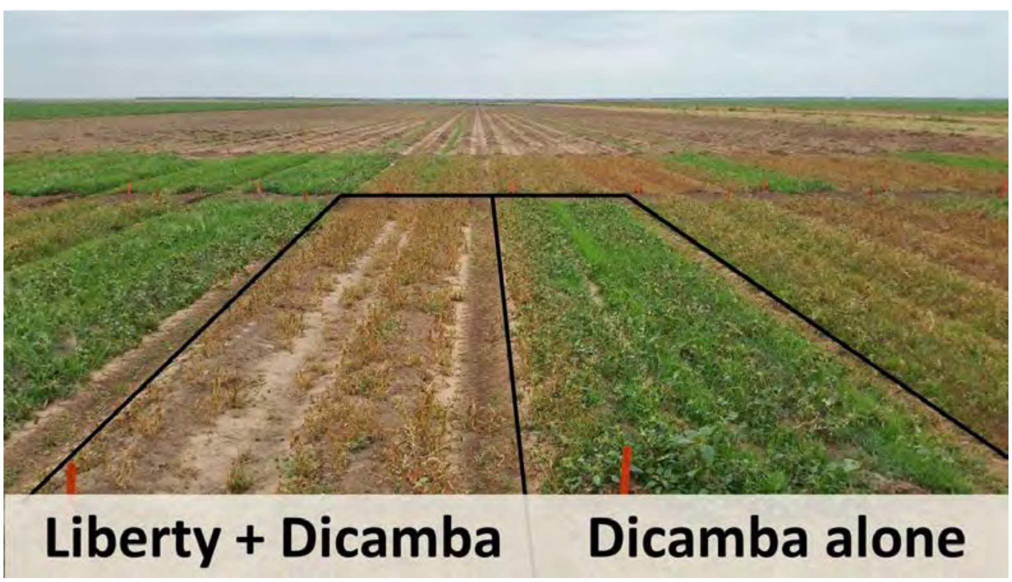


Figure 2. Liberty plus dicamba versus dicamba alone

Table 1. Application Information.

Application Description	
	A
Application Date:	7/1/2015
Appl. Start Time:	6:00 AM
Application Method:	Spray
Application Timing:	Postemergenc
Application Placement:	Broadcast
Applied By:	OSU
Air Temperature, Unit:	67 F
% Relative Humidity:	95
Wind Velocity, Unit:	4 mph
Wind Direction:	SSW
Soil Temperature, Unit:	79 F
Soil Moisture:	Good
% Cloud Cover:	10
Next Moisture Occurred On:	8/3/2015
Time to Next Moisture, Unit:	32 days
Application Equipment	
	A
Appl. Equipment:	Lee Spider
Equipment Type:	HICLEA
Operation Pressure, Unit:	70 PSI
Nozzle Type:	TTInducti
Nozzle Size:	110015
Nozzle Spacing, Unit:	20 in
Nozzles/Row:	2
Ground Speed, Unit:	3.7 mph
Carrier:	WATER
Spray Volume, Unit:	15 GAL/AC
Mix Size, Unit:	1 gallons
Propellant:	comp.air
Tank Mix (Y/N):	Y yes
Weed Size at application:	
Palmer Amaranth	3-8 inches

Systems with Staple LX and Dicamba for Pigweed Control

This project was focused on developing systems that utilized Staple LX in both preemergence and postemergence applications for the control of glyphosate resistant (GR) pigweed. This project was established as a non-crop evaluation and utilized Clarity as the dicamba source.

PRE treatments of Caparol alone or Staple LX plus Caparol were applied prior to pigweed emergence. These treatments were followed by one of two POST applications: Roundup + Clarity+Dual or Liberty + Dual to pigweeds 3-6 inches in height. Late season POST applications consisted of Roundup+Clarity, Roundup+Clarity+Staple LX, Roundup+Staple LX or Liberty+Staple LX. Treatment and performance information can be found in Figure 1. Applications were made with Turboteejet induction nozzles delivering 10 gallons per acre in an ultra-coarse spray droplet (Table 1). Pigweeds were 2-6 inches in height at this timing. Excellent season-long pigweed control was observed (98-100%) when both POST applications included dicamba (Clarity). However, a significant reduction in pigweed control was observed from plots treated with systems that did not receive a second (or late) POST application that included dicamba (treatments 5-9). While Liberty and Staple LX do have POST activity on many pigweed species, they are both known to be very sensitive to environments with low humidity, high temperatures and limited soil moisture. These conditions did exist during the late-POST timing and this is believed to be the reason for reduced pigweed control. In addition, the performance of combinations that included dicamba at this same timing suggest that there may be an advantage with dicamba under these tough environmental conditions.

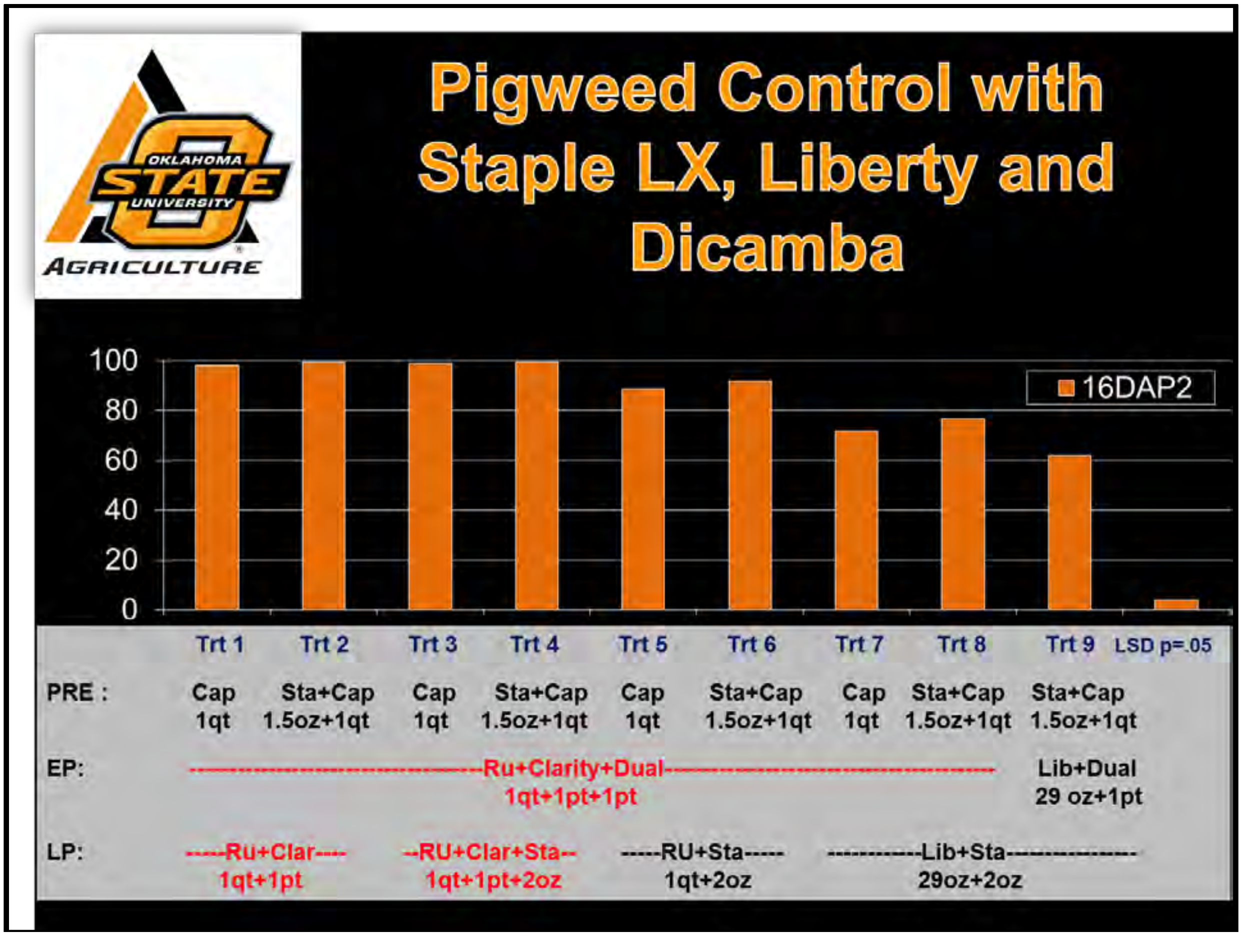
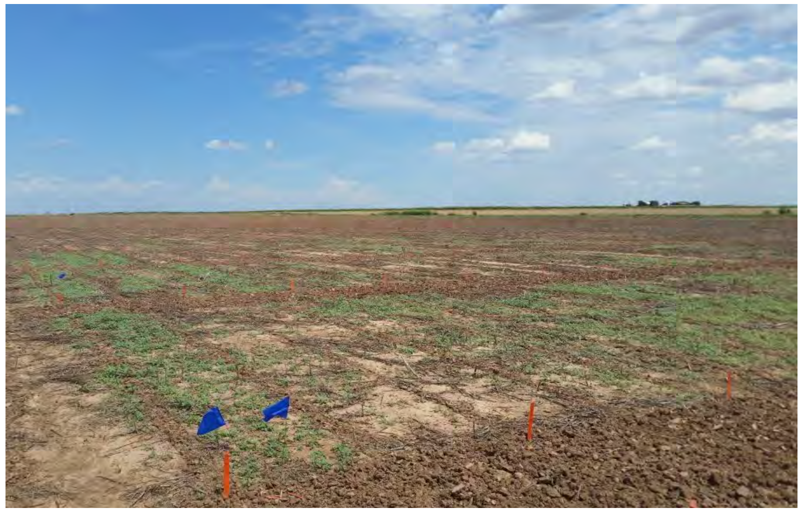


Figure 1. Treatment and performance information.

Table 1. Application information

Application Description			
	A	B	C
Application Date:	6/11/2015	7/1/2015	7/21/2015
Appl. Start Time:	11:00 AM	10:00 AM	10:00 AM
Appl. Stop Time:	12:00 PM	11:00 AM	11:00 AM
Application Method:	Spray	Spray	Spray
Application Timing:	PRE	EP	MP
Application Placement:	Broadcast	Broadcast	Broadcast
Applied By:	OSU	OSU	OSU
Air Temperature, Unit:	89 F	85 F	80 F
% Relative Humidity:	48	57	73
Wind Velocity, Unit:	3 mph	8 mph	8 mph
Wind Direction:	SSW	SW	SE
Soil Temperature, Unit:	86 F	80 F	84 F
Soil Moisture:	Good	Good	Good
% Cloud Cover:	0	10	10
Next Moisture Occurred On:	6/12/2015	7/7/2015	7/29/2015
Time to Next Moisture, Unit:	1 day	6 days	8 days
Application Equipment			
	A	B	C
Appl. Equipment:	Lee Spider	Lee Spider	Lee Spider
Equipment Type:	HICLEA	HICLEA	HICLEA
Operation Pressure, Unit:	40 psi	40 psi	40 psi
Nozzle Type:	TT Induct	TT Induct	TT Induct
Nozzle Size:	110015	110015	110015
Nozzle Spacing, Unit:	20 in	20 in	20 in
Nozzles/Row:	2	2	2
Ground Speed, Unit:	4 mph	4 mph	4 mph
Carrier:	WATER	WATER	WATER
Spray Volume, Unit:	10 GAL/AC	10 GAL/AC	10 GAL/AC
Mix Size, Unit:	1 gallons	1 gallons	1 gallons
Propellant:	Comp. air	Comp. air	Comp. air
Trt No Treatment Application Comment			
Weed Size at application:			
Palmer Amaranth		Post 1 3-6 inches	
		Post 2 2-6 inches	

Residual Pigweed Control with Brake F2



An additional pigweed study was established to to evaluate residual pigweed control from applications of the product Brake F2. Brake F2 is a combination of the active ingredients fomesafen (Reflex) and fluridone (Sonar). While heavy rotational restrictions have limited the use of Reflex in many areas including Oklahoma, Brake F2 (which has half the amount of fomesafen combined with fluridone) may offer growers an opportunity to control palmer amaranth with less risk of crop injury and shorter rotation intervals to crops known to be sensitive to higher rates of fomesafen applied alone. This was a non-crop project and due to the timing of establishment, this study did not include a focus on cotton injury. Therefore only residual pigweed control was evaluated. Applications of Brake F2 were made on May 1st to a clay loam soil with a significant amount of cotton stalk residue from the previous year. This site was previously identified as having a severe population of glyphosate resistant pigweed. Applications were made with a standard high clearance research sprayer delivering 10 gallons per acre (GPA) of spray volume at a speed of 3 miles per hour (MPH). Teejet 110015 “Turbotee” nozzles were used to make the application. Treatment performance was evaluated at both 14 and 30 days after treatment (DAT). Brake F2 controlled pigweed 97.3% at 30 DAT. Similar control was observed from plots receiving Reflex or Warrant. Slightly less control (85-91%) was observed from plots that received Prowl H20, Dual Magnum and Staple LX. Significantly less control was observed from plots receiving Caparol. It should be noted that Brake F2 and/or Reflex are not currently registered for cotton in Oklahoma. **Furthermore, it should be noted that fomesafen (the active ingredient in Reflex and Brake F2) use in Oklahoma may have significant rotational implications for several other cropping systems.**

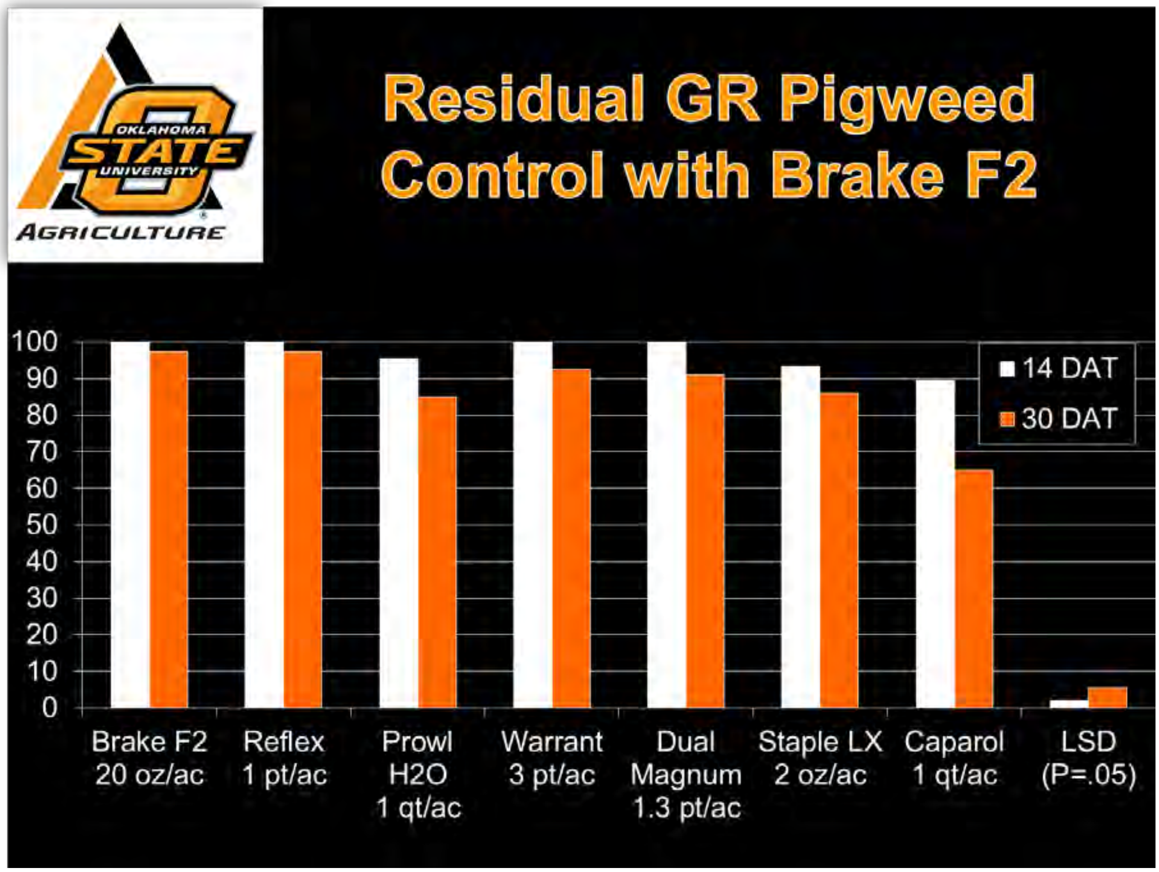


Figure 1. Treatment and performance information.

Table 1. Application Information.

Application Description	
	A
Application Date:	5/1/2015
Appl. Start Time:	7:30 AM
Appl. Stop Time:	9:00 AM
Application Method:	Spray
Application Timing:	PRE
Application Placement:	Broadcast
Applied By:	OSU
Air Temperature, Unit:	52 F
% Relative Humidity:	85
Wind Velocity, Unit:	1 mph
Wind Direction:	East
Dew Presence (Y/N):	Y yes
Soil Temperature, Unit:	63 F
Soil Moisture:	Good
% Cloud Cover:	10
Next Moisture Occurred On:	5/5/2015
Time to Next Moisture, Unit:	4 days
Application Equipment	
	A
Appl. Equipment:	5/1/2015
Equipment Type:	HICLEA
Operation Pressure, Unit:	30 psi
Nozzle Type:	Turbotee
Nozzle Size:	110015
Nozzle Spacing, Unit:	20 in
Nozzles/Row:	2
Ground Speed, Unit:	3 mph
Carrier:	WATER
Spray Volume, Unit:	10 GAL/AC
Mix Size, Unit:	1 gal
Propellant:	comp. air
Tank Mix (Y/N):	Y yes

COTTON HERBICIDE SUGGESTIONS

Read and follow all label directions before product use.

Products with Residual Control Highlighted in Yellow

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated, PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
2,4-D LV6 5.6 lb ai per gallon **All applications:** 2/3 – 2 2/3 pt /A For broadleaf weeds only	Active Ingredients: 2,4-Dichlorophenoxyacetic Acid MOA: 4	EARLY PRE-PLANT. **Apply at least 30 days prior to planting cotton for control of existing broadleaf weeds or potential for crop injury exists.** Tank-mix with glyphosate for additional control of grass species.	Coverage is essential for good control. Do not apply this product through any type of irrigation system. In order to maximize control of horseweed, apply before horseweed passes the rosette stage (prior to upright growth). A minimum of 1.0 lb ai/acre is recommended for optimum horseweed control.
Aim 2 EC 2.0 lb ai per gallon **EPP to PRE:** Up to 2.0 oz/A **Hooded and Post (directed)** Up to 1.6 oz/A For broadleaf weeds only	**Active Ingredients:** **Carfentrazone** **Similar Products:** None MOA: 14	**EARLY PRE-PLANT to PRE.** May be applied no later than one day after cotton planting. **Hooded and Post (directed).** Cotton less than 12 inches in height requires closed hood applications in order to avoid any contact with cotton stem or foliage or potential for crop injury exists. For layby applications cotton must be at least 12 inches in height and have sufficient bark on stem to avoid contact with green stem tissue.	Aim provides absolutely no grass control therefore tankmixing with glyphosate is recommended when grasses are present. **Hooded and Post (directed).** Do not apply when winds are above 10 mph or at application speeds above 5 mph. 10 GPA minimum spray volume. Include crop oil concentrate at 1% v/v. **Coverage is essential for good control.** When attempting to control volunteer cotton apply before volunteer reaches 5 leaf stage.
Assure II 0.88 lb ai per gallon **POST applications:** 5-12 fl oz. /A For grass weeds only	**Active Ingredients:** Quizalofop **Similar Products:** None **MOA:** 1	**POST.** Apply to young, actively growing grasses according to the rate chart listed on the label. If field is to be irrigated, apply product after irrigation. **Do not** apply more than 18 fl oz /A per season.	**Do not** apply this product through any type of irrigation system. **Do not** apply within 80 days of harvest. **Do not** feed forage or hay from treated areas.
Caparol 4 lb ai per gallon **PRE applications:** 2.4 pt /A For broadleaf and some grass weeds	**Active Ingredients:** Prometryn **Similar Products:** None **MOA:** 5	**PRE.** Apply at planting or shortly after planting (prior to cotton emergence) at the rate of 2.4 to 4.8 pt/A depending on soil type. See label for soil type and rate restrictions. **POST (layby).** Prevent spray from contacting green foliage or injury may occur. Use precision application equipment so the spray is accurately directed to the base of the cotton plants and still thoroughly covers soil and weeds beneath the cotton plants.	**Do not** feed treated forage to livestock, or graze treated areas, or illegal residues may result. **Do not** use on glandless cotton varieties, or crop injury will occur. **Do not** make more than one application per year. **POST-layby**. Cotton must be at least 12 inches tall. Rates vary from 1.6-3.2 pt/A depending on soil classification. See label for rate information according to soil type. Apply before weeds are two inches tall. May be tank-mixed with 2 lb ai/A MSMA at layby for morningglory control. When applying to emerged weeds, add 2 qt of surfactant per 100 gal of spray mixture.
Clarity 4 lb. ai per gallon **EPP applications:** 8 fl oz /A For broadleaf weeds only	**Active Ingredients:** Dicamba **Similar Products:** Banvel Rates may vary due to formulation. **MOA:** 4	**EARLY PREPLANT.** For best performance, apply when weeds are in the 2-4 leaf stage and rosettes are less than 2" in diameter. Following application and a minimum 1" of rainfall or overhead irrigation, a waiting interval of 21 days is required per 8 fluid ounces per acre or less. These intervals must be observed prior to planting cotton or potential for crop injury exists.	**Do not** apply through any type of irrigation equipment. **Do not** cultivate within 7 days after application. **For optimum control of horseweed apply a minimum of 8 oz/A to 2-4 leaf weeds or rosettes less than 2 inches across.** Consult label for cotton plant-back interval following application. Tank-mix with glyphosate for additional control of grass species.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Dual II Magnum 7.64 lb ai per gallon **All applications:** 1 to 1.33 pt /A For small-seeded broadleaf and annual grass weeds	**Active Ingredients:** Metolachlor **Similar Products:** Dual Magnum Cinch **MOA:** 15	**PPI.** Apply and incorporate into top 1 inch immediately before planting, at planting, or after planting, but before crop or weeds emerge. **PRE.** Apply to soil surface at planting or after planting, but before weeds or crop emerges. **POST.** Apply after cotton emergence but prior to weed emergence. Will not control weeds that have already emerged prior to application. **All applications.** Apply at a rate of 1.0 pt/A on sandy loams, 1.0-1.33 pt/A on medium soil, or 1.33 pt/A on fine soils.	**Do not** use on sands and loamy sand. **Do not** feed forage from treated areas to livestock. **PPI.** PPI application is recommended if furrow irrigation is used or when a period of dry weather after application is expected. Crop should be planted below the level of incorporation; i.e., at least 1 inch on fine soils and 1.5 inches on coarse and medium soils. **PRE. Do not** apply to areas where water is likely to pond over the bed. **Do not** make broadcast applications to crops planted in furrows more than 2 inches deep.
Fusilade DX 2 lb ai per gallon **POST applications:** 48 fl oz /A For grass weeds only	**Active Ingredients:** Fluazifop **Similar Products:** None **MOA:** 1	**POST.** Refer to label for weed specific application rates and timing. Thorough coverage of all grass foliage is important for good activity. Optimum control is achieved when young actively growing grasses are treated that are not under stress from moisture, temperature, low soil fertility, mechanical, or chemical stress. **Always** add either crop oil concentrate, nonionic surfactant, or other adjuvant.	**Do not** apply to crop after boll set. **Do not** harvest within 90 days of application. **Do not** graze fields or harvest for forage or hay. **If applied through irrigation system,** apply only through sprinkler systems including center pivot, lateral move, end tow, side (wheel) roller, big gun, solid set, or hand move. **Do not** apply through any other type of irrigation system.
Fusion 2.56 lb ai per gallon **POST applications:** 6-12 fl oz /A For grass weeds only	**Active Ingredients:** Fluazifop Fenoxaprop **Similar Products:** None **MOA:** 1 & 1	**POST.** Best control of susceptible grasses is obtained when applied to actively growing grasses before they exceed the recommended growth stages listed, refer to label for list of grasses and application rates for specific weeds and areas.	**Do not** apply this product through any type of irrigation system. **Do not** apply if rainfall is expected within 1 hour. **Do not** apply more than 24 fluid ounces per acre per season. **Do not** apply after boll set. **Do not** harvest within 90 days of application. **Do not** graze fields or feed treated forage or hay to livestock.
Roundup Power Max 5.5 lb ai per gallon **All applications:** 22 to 32 oz /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Glyphosate **Similar Products:** Many Rates may vary due to formulation. **MOA:** 9	**EARLY PREPLANT to PRE.** May be applied before, during or after planting crop. **POST (conventional cotton).** May be applied through hooded sprayers, recirculating sprayers, shielded applicators or wiper applicators. Allow at least 7 days between application and harvest. **POST over-the-top (Roundup Ready Flex or GlyTol cotton varieties).** Apply anytime from preemergence to 7 days prior to harvest. Late season applications may require directed applications to ensure proper weed coverage.	**Do not** apply through any type of irrigation system. **Do not** apply more than 5.3 qt per acre per year. **Refer** to label for application rates for specific weed types. **Do not** apply postemergence to any crops other than those listed as Roundup Ready Flex or GlyTol. **Do not** apply to Roundup Ready Flex or GlyTol crops within 7 days of harvest. For horseweed control apply a tank-mix of 22 oz/A Roundup PowerMax + a minimum of 1.0 lb ai /A 2,4-D or 0.25 lb ai/A of Dicamba. **In order to maximize control, apply before horseweed passes the rosette stage .**

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Gramoxone Inteon[r] 2 lb ai per gallon **EPP to PRE applications:** 2.5 to 4 pt /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Paraquat **Similar Products:** Firestorm (3 lb) **MOA:** 22	**EARLY PREPLANT to PRE.** Apply prior to, during, or after planting, but before crop emergence. For fallow bed treatment, beds should be preformed to permit maximum broadleaf weed and grass emergence prior to treatment. Seeding should be done with minimum soil disturbance.	**Do not** apply this product through any type of irrigation system. **Always** add nonionic surfactant. Complete coverage is essential for good control.
Liberty 280 (formerly Ignite) 2.34 lb ai per gallon **POST applications:** 22 to 29 fl oz /A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Glufosinate-ammonium **Similar Products:** None **MOA:** 10	**EARLY PREPLANT to PRE.** Apply to actively growing weeds up to 120 prior to planting cotton. **POST over-the-top. Apply POST, over LibertyLink Cotton varieties only,** to actively growing weeds when the cotton has emerged and up to the cotton early bloom stage.	**Do not** apply more than 43 fl oz/A in a single application. **Do not** apply more than 87 fl oz/A in a growing season if 22-29 oz/A rates are used. **Do not** apply more than 72 oz/A in a growing season if first application of up to 30-43 oz/A is used. **Do not** apply within 70 days prior to harvest. Herbicide should be applied broadcast in a minimum of 15 gallons of water per acre. Use a spray volume of 20 to 40 gallons per acre for dense weed/crop canopies so that thorough spray coverage will be obtained.
Karmex DF 80% DF **EPP applications:** See table **PRE applications:** See table **POST applications:** 1 to 1.5 lb /A For small seeded broadleaf and annual grass weeds	**Active Ingredients:** Diuron **Similar Products:** Direx 4L Direx 80 DF Diuron 4L Diuron 80 DF **MOA:** 7	**EARLY PREPLANT.** Apply from 15 to 45 days prior to planting. If weeds are present the addition of a non-ionic surfactant is recommended. Weeds should be 2 inches or smaller. **PRE. Do not** apply to sand or loamy sand soils. Use only where crop is planted on flat or raised seedbeds (not planted in a furrow). Apply 1-2 lb/A according to labeled guidelines regarding soil texture. **POST-directed applications.** Apply 1 to 1.5 lb/A when crop is at least 12" high. In irrigated crops, best control is obtained if the field is irrigated within 3-4 days after application. Apply to soil beneath crop and between rows immediately after last cultivation.	**Do not** spray over the top of crop plants. **Do not** apply to sand or loamy sand soils. **Do not** use on soils with less than 1% organic matter as crop injury may result. **Do not** use in preplant or preemergence applications where soil-applied organophosphate insecticides are used due to potential for severe crop injury and possible stand loss. **Do not** allow livestock to graze treated cotton. **EPP & PRE.** If less than the maximum rate is used, a second PRE application can be made, but total can not exceed maximum use rates listed on label. **Do not** apply PRE if maximum application rate was used in preplant application.

Karmex DF Application Rates		
Soil Texture	**Rate/Acre**	**Rate/Acre/Season**
Sandy loam, Loam, Silt loam, Silt	1 lb /A	1 lb /A
Sandy clay loam, Clay loam, Silty clay loam, Sandy clay	1.25 lb /A	1.25 lb /A
Silty clay, Clay	2 lb /A	2.75 lb /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
MSMA 6.6 6.6 lb ai per gallon **All applications:** 0.5 to 2.5 pt /A For broadleaf and grass weeds	**Active Ingredients:** MSMA **Similar Products:** MSMA 6 Plus 120 Herbicide 912 Herbicide **MOA:** 17	**EARLY PREPLANT.** Apply preplant or postplant up to cracking of soil before cotton emergence using ground or aircraft equipment. Apply at a rate of 2.5 pt/A of product with a suitable surfactant. **POST (over-the-top).** Apply over the top when crop is 3 to 6 inches tall or up to early first square stage, apply at a rate of 1 to 1.25 pt/A with a suitable surfactant. **Will cause significant leaf burn of the crop.** **POST (Directed Spray).** Applicable as a directed spray with ground equipment when crop is 3 inches tall to first bloom, apply at a rate of 2.5 pt/A with a suitable surfactant.	**Apply** over the top of crop only as a salvage operation; apply only to healthy, rapidly growing crops, 3 inches high but no later than 6 inches high. **POST (Directed Spray). Do not** apply as a directed spray after the first bloom. A second or repeat application, if needed, should be timed about 1 to 3 weeks after first application.
Poast Plus 1 lb ai per gallon **POST applications:** 1.5 to 3.75 pt /A For grass weeds only	**Active Ingredients:** Sethoxydim **Similar Products:** Poast **<u>Rates may vary due to formulation.</u>** **MOA:** 1	**POST.** Applications can be made to actively growing weeds as aerial, broadcast, band, or spot spray applications. Most effective control is achieved if applied when weeds are small and actively growing.	**Do not** apply this product through any type of irrigation system. **Do not** apply within 40 days of harvest. To achieve consistent weed control, always use either seed oil or crop oil concentrate. **Do not** cultivate within 5 days before or 7 days after application. **Processed** meal may be fed to animals.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Prowl 3.3 EC 3.3 lb ai per gallon **All applications:** See table. For small seeded broadleaf and grass weeds	**Active Ingredients:** Pendimethalin **Similar Products:** Pendimax 3.3 Prowl H2O **MOA:** 3	**EARLY PREPLANT.** Apply up to 15 days prior to planting. **PPI.** Apply up to 60 days prior to planting and incorporate within 7 days of application; however, immediate incorporation is best. **PRE.** Apply overlay application at planting or up to 2 days after planting. Total amount applied per acre cannot exceed the highest labeled rate for a given soil type. **POST/LAYBY.** Apply directly to the soil between rows as a directed spray following the last normal cultivation (layby). **Fall Application.** May be applied for weed control in cotton in the fall, after Oct. 15 (up to 140 days prior to planting). Apply at a broadcast rate of 1.8 pt /A on coarse soils, 2.4 pt /A on medium soils and 3.6 pt /A on fine soils.	**If applied through irrigation system,** use only center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation systems. **Do not** apply this product through any other type of irrigation system for layby applications. **Do not** apply as a broadcast spray over-the-top of crop. **Do not** feed forage or graze livestock in treated fields. **Product** is most effective when adequate rainfall or overhead irrigation is received within 7 days after application. **Use** higher rates listed for no-tillage applications for control of rhizome johnsongrass in specified soil textures. This use is not recommended for soils with more than 3% organic matter. **There** must be an interval of at least 60 days between the last application and harvest.
Prowl H2O 3.8 lb ai per gallon **All applications:** See table. For small-seeded broadleaf and grass weeds	**Active Ingredients:** Pendimethalin **Similar Products:** Pendimax 3.3 Prowl 3.3 EC MOA: **3**	**EARLY PREPLANT.** Apply up to 15 days prior to planting. **PPI.** Apply up to 60 days prior to planting and incorporate within 7 days of application; however, immediate incorporation is best. **PRE.** Apply overlay application at planting or up to 2 days after planting. Total amount applied per acre cannot exceed the highest labeled rate for a given soil type. **POST/LAYBY.** Apply directly to the soil between rows as a directed spray following the last normal cultivation (layby). **Fall Application.** May be applied for weed control in cotton in the fall, after Oct. 15 (up to 140 days prior to planting). Apply at a broadcast rate of 1.8 pt /A on coarse soils, 2.4 pt /A on medium soils and 3.6 pt /A on fine soils.	**If applied through irrigation system,** use only center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation systems. **Do not** apply this product through any other type of irrigation system for layby applications. **Do not** apply as a broadcast spray over the top of crop. **Do not** feed forage or graze livestock in treated fields. **Product** is most effective when adequate rainfall or overhead irrigation is received within 7 days after application. **Use** higher rates listed for no-tillage applications for control of rhizome johnsongrass in specified soil textures. This use is not recommended for soils with more than 3% organic matter. **There** must be an interval of at least 60 days between the last application and harvest. **Postemergence** over-the-top broadcast tank-mix applications with Roundup PowerMax may be made **to Roundup Ready Flex** or **GlyTol** cotton varieties between the 4 leaf and 8 leaf growth stages. Over-the-top applications past the 8 leaf stage may result in crop injury and or yield loss. Do not apply over-the-top of cotton with fluid fertilizer or to cotton under stress. Dry ammonium sulfate (at 17 lb/100 gal) or the liquid equivalent must be used when tank-mixing with Roundup PowerMax.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

EPP, PPI &/or PRE	**Prowl 3.3 EC Broadcast Rates pt/A**		
	Soil Texture	**Conventional or Minimum Tillage**	**No-Tillage**
	Coarse	1.2 to 2.4 pt /A	1.8 to 2.4 pt /A
	Medium	1.8 to 2.4 pt /A	2.4 to 3.6 pt /A
	Fine	2.4 to 3.6 pt /A	3.6 to 4.8 pt /A
	For heavy clay soils, apply at a broadcast rate of 3.6 pt /A.		
	Total amount applied per acre cannot exceed the highest labeled rate for a given soil type.		

POST/LAYBY	**Prowl 3.3 EC Layby Application Use Rates**	
	Soil Texture	**Use Rate pt /A**
	Coarse	1.2 to 1.8 pt /A
	Medium	1.8 to 2.4 pt /A
	Fine	2.4 to 3.6 pt /A

EPP, PPI &/or PRE & Layby	**Prowl H2O 3.8 Broadcast Use Rates**		
	Soil Texture	**Conventional or Minimum Tillage**	**No-Tillage**
	Coarse	1 to 2 pt /A	2 pt /A
	Medium	2 pt /A	3 pt /A
	Fine	3 pt /A	4 pt /A
	For heavy clay soils, apply at a broadcast rate of 3 pt /A.		
	Total amount applied per acre cannot exceed the highest labeled rate for a given soil type.		

POST alone or tank-mixed with Roundup PowerMax	**Prowl H2O 3.8 Broadcast Use Rates** **Conventional, Minimum or No-till**	
	Soil Texture	**Use Rate pt /A**
	Coarse	1 to 2 pt /A
	Medium	1.5 to 2 pt /A
	Fine	2 pt /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Select 2 EC 2 lb ai per gallon **POST applications:** 6 to 16 fl oz /A For grass weeds only	**Active Ingredients:** Clethodim **Similar Products:** Prism **MOA:** 1	**POST.** Apply to actively growing grasses, refer to label for specific rates for weed type. In arid regions, application should be made as soon as possible after irrigation (within 7 days). A second application will generally provide more effective perennial grass control in arid conditions than a single application. Make second application to actively growing grass 2 to 3 weeks after emergence of new growth.	**Do not** apply within 60 days of harvest. **Do not** graze treated fields or feed treated forage or hay to livestock. **Do not** apply through any type of irrigation system. **Do not** apply if rainfall is expected within one hour of application. **Always** use a crop oil concentrate at 1.0 qt /A by ground or 1% v/v in the finished spray volume by air. **Refer** to label for application rates for specific grass species controlled.
Sequence 5.25 lb ai per gallon **All applications:** 2.5 to 4 pt/A Non-selective control of broadleaf and grass weeds	**Active Ingredients:** Metolachlor & Glyphosate **Similar Products:** None **MOA:** 15 & 9	**EARLY PREPLANT.** Apply prior to planting for control of emerged actively growing weeds and soil residual activity. **Do not** incorporate if applied EPP or crop injury will result. **PRE.** Apply after planting in no-till production system for control of emerged actively growing weeds and soil residual activity. **POST on Roundup Ready Flex and GlyTol cotton varieties.** Apply after crop and weeds have emerged for control of emerged actively growing weeds and soil residual activity.	**Do not** apply POST to non-Roundup Ready Flex or non-GlyTol cotton varieties. **Do not** graze or feed forage or fodder from Sequence treated cotton to livestock. **Do not** apply EPP or PRE on sand or loamy sand soils. **POST applications on Roundup Ready Flex or GlyTol cotton varieties:** Make postemergence applications from cotyledon stage to the 10-leaf stage (not to exceed 12 inches tall) of cotton development. **Do not** apply later as severe injury, including yield loss, could occur**. Do not** exceed 2.5 pt of Sequence per acre in a single application on cotton with less than 5 leaves. Apply up to 2.75 pt of Sequence per acre in a single application from the 5-leaf through the 10-leaf stage of cotton. **Do not** use if cotton plants are under stress.
Sharpen 2.85 lb ai per gallon **Early Preplant applications:** 1.0 oz/A For broadleaf weeds only	**Active Ingredients:** Saflufenacil **Similar Products:** None MOA: **14**	**EARLY PREPLANT.** Apply at least 42 days prior to planting cotton for control of emerged actively growing weeds and soil residual activity or crop injury may occur.	**Do not** plant cotton until 42 days and an accumulation of 1 inch of rainfall has occurred after application in order to avoid crop injury. **Do not** apply to coarse soils classified as sand with less than 1.5% organic matter or cotton injury may occur. **Do not** apply Sharpen with other Group 14/GroupE herbicides (such as flumioxazin) as a tank-mix or sequential application within 30 days or crop injury may result. **Do not** apply sharpen where an at-planting application of an organophosphate or carbamate insecticide(s) is planned because severe injury may result. May be tank-mixed with 0.25 lb ai/A Dicamba or 1.0 lb ai/A 2,4-D for horseweed control. **In order to maximize control, apply before horseweed passes the rosette stage (prior to upright growth).** For control of grass species tank-mix with glyphosate. Include either a crop oil concentrate or methylated seed oil at 1% v/v plus ammonium sulfate at 8.5 to 17 lb/100 gal.
Staple LX 3.2 lb ai per gallon **PRE applications:** 1.3 to 2.1 oz /A **POST applications:** 2.6 to 3.8 oz /A For broadleaf weeds only	**Active Ingredients:** Pyrithiobac **Similar Products:** None **MOA:** 2	**PRE.** May be applied preemergence to aid in the control of many problematic weeds. Applications require rainfall or sprinkler irrigation to activate the herbicide. Use the higher application rate for difficult to control weeds or in fields where high infestation of weeds occur. **POST.** Application should be made over-the-top or as a post-directed spray to cotton (begin at cotyledon stage) and actively growing weeds.	**PRE. Do not** apply through any type of irrigation system. **Do not** use on coarse soils such as sands or loamy sands. **Do not** use on soils with less than 0.5% organic matter. **Do not** use on crops planted in furrows. **POST.** Use a minimum of 10 gallons of water per acre by ground or 3 gallons of water per acre by air. All rates are broadcast. Use proportionately less for banded applications. **All applications. Do not** apply more than 5.1 oz/A per year. Add a non-ionic surfactant at the rate of 0.25-0.5% v/v or a crop oil concentrate at the rate of 1-2% v/v with all postemergence applications. Under arid conditions, a crop oil concentrate is recommended. Weed size at application is critical for optimal control, consult label for appropriate weed sizes.

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Trade Name, Formulation, and Application Rate	Active Ingredient(s), Similar Products and MOA Group	Application Timing(s), EPP-early preplant, PPI-preplant incorporated PRE-preemergence, or POST-postemergence	Special Instructions and Remarks
Treflan HFP 4.0 lb ai per gallon **PPI applications:** See table. For small seeded broadleaf and grass weeds	**Active Ingredients:** Trifluralin **Similar Products:** Treflan TR-10 Trifluralin HF Trust 10G Trust 4EC Trust Herbicide **MOA:** 3	**Fall applications.** Apply to flat ground and incorporate once within 24 hours. **Spring applications.** Application and incorporation may occur before planting or after planting prior to crop emergence. Use the lower application rates when sequential applications are anticipated. **Layby applications.** Application may be made in established crops from the 4 true leaf stage of growth up to layby, but no less than 90 days before harvest.	**If applying through irrigation system:** Apply only through continuously moving center pivot, lateral move, end tow, solid set, or hand move irrigation systems. **Refer** to label for additional chemigation instructions. **Do not** apply to soils that are wet or are subject to prolonged periods of flooding as poor weed control may result.

Treflan HFP Application Rates

Soil Texture	Spring Application	Fall Application	Chemigation Application	Conservation Tillage	Layby Application
Coarse	1 pt /A	2 pt /A	1-3 pt /A	1-2 pt /A	1 pt /A
Medium	1.25-1.5 pt /A	2 pt /A	1.5-4 pt /A	1.5-2 pt /A	1.5 pt /A
Fine	1.5-2 pt /A	2.5 pt /A	2-4 pt/A	2-4 pt /A	2 pt /A

COTTON HERBICIDE SUGGESTIONS (CONT'D)

Read and follow all label directions before product use.

Valor SX 51% WP **Preplant Burndown applications:** 1 to 2 oz/A **POST-Directed/Hooded applications:** 2.0 oz/A For broadleaf and some grass weeds	**Active Ingredient:** Flumioxazin **Similar Products:** Valor **Rates may vary due to formulation** **MOA:** 14	**EARLY PREPLANT.** A minimum of 14 to 30 days must pass prior to planting cotton after application depending on tillage system and rate applied, consult label. **POST-Directed/Hooded Applications.** Precautions should be taken to avoid contacting the green foliage of cotton plants or severe crop injury may result. Cotton should be at least 6 inches in height at the time of application. Direct the spray onto the bottom 2 inches of the cotton stem-bark layer. **Do not** allow spray to contact green cotton stems. **Layby Application** Layby application of VALOR SX tank-mixes may be made once cotton has developed a minimum of 4 inches of bark and has reached a minimum of 18 inches in height. **Cotton that is smaller than 18 inches in height and/or has less than 4 inches of bark may be injured by VALOR SX applications.** VALOR SX application must be directed to the lower 2 inches of bark to avoid crop injury. Severe crop injury may result if application is made to green or unbarked stem.	**Do not** graze treated fields or feed treated forage or hay to livestock. **Do not** incorporate into the soil after application. **Do not** apply more than 2 oz/A in a single application or 4 oz/A during a single growing season. **Do not** make a sequential Valor WP application within 30 days of the previous Valor application. Do not apply within 60 days of harvest. **Do not** use on crops grown for seed. Only apply with nonionic surfactant, d**o not** apply with crop oil concentrate, methylated seed oil or other types of adjuvants as crop injury may result. Valor should be tank-mixed with glyphosate or MSMA to provide grass control. Consult label for rotation intervals to other crops. Spray equipment used to apply VALOR SX should not be used to apply other materials to any crop foliage
Warrant 3.0 lb ai/gallon **POST applications** 1.25 to 2 qt/A For small-seeded broadleaf and grass weeds	**Active Ingredient:** Acetochlor **Similar Products:** None **MOA:** 15	**POST.** Apply this product postemergence to cotton and preemergence to weeds at 1.25 to 2 qt/A according to soil classification rate chart listed on label. Application should be made after cotton is completely emerged but before bloom.	**Postemergence to Roundup Ready Flex or GlyTol cotton varieties.** This product may be tank-mixed with Roundup agricultural herbicides on Roundup Ready Flex or GlyTol cotton varieties when cotton is completely emerged until cotton reaches first bloom. The optimum timing of application is when cotton is in 2-3 leaf stage. Product may be applied again when cotton is in the 5 to 6 leaf stage if directed to the soil. **Do not make postemergence surface applications using sprayable fluid fertilizer as the carrier because severe crop injury may occur.**

Warrant Application Rates (Broadcast per acre)		
Soil Texture	**Less than 1.5% Organic Matter (quarts)**	**1.5% or More Organic Matter (quarts)**
Coarse	1.25 to 1.6	1.25 to 1.7
Medium	1.25 to 1.7	1.25 to 1.9
Fine	1.25 to 1.9	1.25 to 2.0

Herbicide Program Suggestions for Controlling Glyphosate Resistant Pigweed in Cotton

Herbicides with residual activity highlighted in yellow

	Production System	Preplant Burndown	At-plant Burndown or Preemerge	Early to Mid-season Postemergence	Late-season Layby-Hoods
1	Minimum or No-till	Dicamba or 2,4-D + Glyphosate	Gramoxone 2.0 SL + Prowl H20	Liberty + Warrant*	Aim + Direx
2	Minimum or No-till	Dicamba or 2,4-D + Valor + Glyphosate	Gramoxone 2.0 SL + Dual Magnum	Liberty + Warrant*	Liberty + Direx
3	Minimum or No-till	Dicamba or 2,4-D + Valor + Gramoxone 2.0 SL	Gramoxone 2.0 SL + Warrant	Liberty + Dual Magnum*	Liberty + Anthem Flex

	Production System	Preplant Incorporated	At-plant Preemerge	Early to Mid-season Postemergence	Late-season Layby-Hoods
1	Conventional Tillage	Treflan or Prowl H20	Caparol	Liberty + Dual Magnum*	Liberty + Valor
2	Conventional Tillage	Treflan or Prowl H20	Dual Magnum	Liberty + Warrant*	Aim + Caparol
3	Conventional Tillage	Treflan or Prowl H20	Warrant	Liberty + Dual Magnum*	Aim + Direx

In-season, broadcast over-the-top applications of Roundup (Glyphosate) and/or Liberty (Glufosinate) require the respective Tolerant cotton varieties, i.e. Roundup Ready Flex, Xtendflex, Glytol, Liberty Link, etc. Dicamba and 2,4-D require strict guidelines regarding planting of cotton after application. Always read and follow all product labeling.

* Do not use any additional surfactants, additives or fertilizers (including ammonium sulfate) within this tank-mix application or injury may occur.

Herbicides Regulated in the Restricted Areas of Greer, Harmon, Kiowa, Jackson, and Tillman Counties From May 1 to October 15

Printed April 2009

2,4-D

Ester Formulations

Trade Name	EPA Reg. No.
2, 4-D LV4	42750-15
2, 4-d Lv6	42750-20
2,4-D Lo-V 6E Weed Killer	1386-616-72693
2,4-D LV4	1381-102
2,4-D LV6	1381-101
Agrisolutiions E-99 (Winfield Solutions)	1381-195
Alligare Everett Herbicide	81927-29
Barrage Hf	5905-529
Candor Herbicide	228-565
Conbelt 4# Lovol Ester Emulsifable Liquid Herbicide	11773-3-11773
Cornbelt 6# Lovol Ester Emulsifable Liquid Herbicide	11773-4-11773
Cornbelt Salvan	11773-16
Crossbow	62719-260
Crossbow L Herbicide	62719-260-34704
Crossbow Specialty Herbicide Low Volatile Weed And Brush Herbicide	62719-260-72693
D-638	42750-36
Double Up B+D	5905-552
Five Star	42750-49
Gordon's IVM Products BK 800	2217-758
Low Vol 4 Ester Weed Killer	34704-124
Low Vol 6 Ester Weed Killer	34704-125
Lv 400 2,4-d Weed Killer, (Gordon's)	2217-77
Lv 400 2,4-d Weed Killer, (Gordon's)	2217-77
Nufarm Esteron 99 Concentrate Herbicide	62719-9-71368
Nufarm Turret 5.5 Lb. Solventless Easter Herb.	228-95-71368
Nufarm Weedone LV4 EC Broadleaf Herbicide	228-139-71368
Nufarm Weedone LV4 Solventless Broadleaf Herb.	71368-14
Rage D-Tech Herbicide	279-3316
Riverdale 2,4-D L.V. 4 Ester, Nufarm Americas Inc	228-139
Riverdale 2,4-D LV 6 Ester	228-95
Salvo Low Volatile Weed Killer	34704-609
Shotgun Flowable Herb.	34704-728
ShutOut	2217-869-5905
Solve 2, 4-D	42750-22
Starane + Salvo	62719-306
Tenkoz 638 Herbicide	42750-36-55467
Tenkoz Lo-vol 4 2,4-D Herbicide	42750-15-55467
Tenkoz Lo-Vol 4 2,4-D Low Volatile Herbicide	228-139-55467
Tenkoz Lo-vol 4 Solventless Herb.	42750-22-55467
Tenkoz Lo-Vol 4 Solventless Herbicide	71368-14-55467
Tenkoz Lo-vol 6 2,4-D Herbicide	42750-20-55467
Tenkoz Lo-Vol 6 2,4-D Low Volatile Herbicide	71368-11-55467
Weedone LV6 EC Broadleaf Herbicide	71368-11
Weedone 638 Broadleaf Herbicide	71368-3

Amine Formulations

Trade Name	EPA Reg. No.
2, 4-d Amine 4	42750-19
2, 4-D Amine 6	42750-21
2,4-D Amine 4	1381-103
2,4-D Amine Weed Killer	1386-43-72693
Agrisolutions Brash (Winfield Solutions)	1381-202
Albaugh Landmaster BW	42750-62
American Brand 2,4-D Selective Weed Killer	228-238-7401
Amine 4 2,4-D Weed Killer	34704-120
Amine 400 2,4-d Weed Killer, (Gordon's)	2217-2
Banvel + 2,4-D	51036-308
Banvel + 2,4-D	7969-45-51036
Banvel + 2,4-D	66330-287
Base Camp Amine 4	71368-1-2935
Brush Killer, (Gordon's)	2217-543
Campaign Herbicide	524-351
Clean Amine	34704-120
Cornbelt 4# Amine Liquid Herbicide	11773-2-11773
Cornbelt Salvan	11773-16
Credit Master Herbicide	71368-31
D-638	42750-36
Dupont CIMARRON Max Herbicide	352-615
Dupont CIMARRON Max Part B Herbicide	352-614
ForeFront R&P	62719-524
Gordon's Hi-Dep, Broadleaf Herbicide	2217-703
Gordon's Pasture Pro Herbicide	2217-703
Grazon P+D	62719-182
GrazonNext	62719-587
GunSlinger	42750-80
HardBall 5905-549	
Helena 2010	5905-542
Hi-Dep Broadleaf Herbicide, (Gordon's-Ag Products)	2217-703
Hi-dep Ivm Broadleaf Herbicide, (Gordon's-I.V.M. Products)	2217-703
HiredHand P+D Herbicide	62719-182
HM - 0335A	42750-100-5905
Landmaster Bw	524-351
Millennium Ultra2	228-332
Nufarm KambaMaster Herbicide	71368-34
Nufarm Pasture MD Herbicide	71368-41
Nufarm Pasturemaster Herbicide	228-295-71368
Nufarm Recoil Broad Spectrum Herbicide	71368-35
Opti-Amine	5905-501
Outlaw	5905-574
Range Star	42750-55
Rifle-D Herbicide	34704-869
Riverdale Turflon II Amine	228-316
RT Master Herbicide	524-531
Saber	34704-803
Tenkoz 638 Herbicide	42750-36-55467
Tenkoz Amine 4 2,4-d Herbicide	42750-19-55467
Tenkoz Amine 4 2,4-D Herbicide	71368-1-55467
Triplet Low Odor Premium Selective Herbicide	228-409
Triplet SF	228-312
UAP Timberland Platoon	228-145
Unison	5905-542
Weedar 64 Broadleaf Herbicide	71368-1
Weedestroy AM-40 Amine Salt	228-145
Weedmaster Herbicide	7969-133
Weedmaster Herbicide	71368-34
Weedone 638 Broadleaf Herbicide	71368-3

Dicamba

Trade Name	EPA Reg. No.
Banvel + 2,4-D	51036-308
Banvel + 2,4-D	7969-45-51036
BANVEL HERBICIDE	51036-289
Banvel-K+ Atrazine	51036-307
Brush Killer, (Gordon's)	2217-543
Celebrity Plus Herbicide	7969-175
Clarity Herbicide	7969-137
CoStarr	42750-63
CoStarr	42750-63
Dicam (Tm)	81142-5
Dicamba	42750-40
Dicamba SG	42750-43
Dicambazine	42750-41
Distinct Herbicide	7969-150
DuPont Agility SG Herbicide (With TotalSol Soluble Granules)	352-751
Dupont CIMARRON Max Herbicide	352-615
Dupont CIMARRON Max Part B Herbicide	352-614
DuPont Dicamba XP Herbicide	7969-140-352
DuPont Require Q (MP) Herbicide	352-761
Escalade2	228-442
Fallow Master Broadspectrum Herb.	524-507
Fallow Star	42750-63
Fuego Herbicide	100-975
Gordon's IVM Products BK 800	2217-758
HM - 0335A	42750-100-5905
Marksman Herbicide	7969-136
Millennium Ultra2	228-332
Northstar CustomPak	100-923
Nufarm Glykamba Broadspectrum Herbicide	71368-30
Nufarm KambaMaster Herbicide	71368-34
Nufarm Pasture MD Herbicide	71368-41
Nufarm Pasturemaster Herbicide	228-295-71368
Oracle Dicamba Agricultural Herbicide	33658-14
Outlaw	42750-68
Overdrive Herbicide	7969-150
Rave Herbicide	100-927
Rifle Herbicide	34704-861
Rifle Herbicide	42750-40-34704
Rifle Plus Herbicide	34704-860
Rifle-D Herbicide	34704-869
Riverdale Diablo Herbicide	228-379
Riverdale TruPower2 Selective Herbicide	228-419
Riverdale Veteran 720 Herbicide	228-295
Status Herbicide	7969-242
Sterling	1381-190
Stratos Dicamba+Atrazine Agricultural Herbicide	33658-16
Tie-Down Range and Pasture Herbicide	100-927-2935
Triplet Low Odor Premium Selective Herbicide	228-409
Triplet SF	228-312
Vanquish' Herbicide	100-884
Vision	42750-98
Yukon Herbicide	33906-11-524
Yukon Herbicide Water Soluble Granule	81880-6-10163

Picloram

Trade Name	EPA Reg. No.
Alligare Picloram + 2,4-D RTU	81927-15
Alligare Picloram 22K	81927-18
Alligare Picloram+D	81927-16
Grazon P+D	62719-182
Grazon PC Range & Pasture Management	62719-181
GunSlinger	42750-80
HiredHand P+D Herbicide	62719-182
OutPost 22K Herbicide	62719-6
PD 2	42750-107
Picloram 22K	42750-79-81927
Surmount	62719-480
Surmount	62719-480
Tordon 22k	62719-6
Triumph 22K	42750-79
Triumph K	42750-81
Trooper 22K Herbicide	228-535
Trooper P + D Herbicide	228-530

Triclopyr

Trade Name	EPA Reg. No.
Alligare Everett Herbicide	81927-29
Alligare Prescott Herbicide	81927-30
Alligare Triclopyr 4	81927-11
Candor Herbicide	228-565
Chaser 2 Amine	34704-930
Crossbow	62719-260
Crossbow L Herbicide	62719-260-34704
Crossbow Specialty Herbicide Low Volatile Weed And Brush Herbicide	62719-260-72693
Crossroad	42750-124
Garlon 3a	62719-37
Pasturegard	62719-477
Pathfinder Ii	62719-176
Redeem R&P	62719-337
Redeem R&P	62719-337
Remedy	62719-70
Remedy Ultra	62719-552
Renovate 3	62719-37-67690
Riverdale Tahoe 3A Herbicide	228-384
Riverdale Tahoe 4E Herbicide	228-385
Riverdale Turflon II Amine	228-316
Tahoe 3A Herbicide	228-518
Tahoe 4E Herbicide	228-517
Triclopyr R&P	42750-129
Turflon D	62719-67

Clopyralid

Trade Name	EPA Reg. No.
Accent' Gold Herbicide	352-593
Alligare Clopyraid 3	42750-94-81927
Alligare Clopyralid 3	81927-14
Alligare Prescott Herbicide	81927-30
Brazen Herbicide	228-564
Clean Slate	228-491
Clopyr AG Herbicide	70506-94
Confront	62719-92
Cutback	71368-72
Cutback M	71368-73
Dupont Accent Gold Wdg Herbicide	352-612
Lontrel Turf And Ornamental	62719-305
Millennium Ultra2	228-332
Primera Millennium Ultra2	228-332
Pyramid R & P Herbicide	42750-94
Pyramid R & P Herbicide	42750-94
Reclaim	62719-83
Redeem R&P	62719-337
Refute	42750-125
Stinger	62719-73
SureStart	62719-570
Transline	62719-259
Widematch	62719-512

This is not an all encompassing list of products.

ODAFF website to download application forms can be found at: http://www.oda.state.ok.us/forms/cps/herbform.pdf

For more information please see your County Extension Educator or your local dealer.

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

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Herbicide How-to:

Understanding Herbicide Mode of Action

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Oklahoma Cooperative Extension Fact Sheets are also available on our website at: **http://osufacts.okstate.edu**

The large number of herbicide options—new products, old products with new names, new formulations of old products, premixes, and generics—can make weed control a difficult and confusing task. In addition to knowing the crops in which a herbicide can be used, the weeds it will control, the appropriate rate, and any necessary adjuvants to include, it is also important to know and understand the herbicide's mode of action to design a successful weed management program.

What is "Mode of Action?"

The mode of action is the way in which the herbicide controls susceptible plants. It usually describes the biological process or enzyme in the plant that the herbicide interrupts, affecting normal plant growth and development. In other cases, the mode of action may be a general description of the injury symptoms seen on susceptible plants. In Oklahoma crop production, 11 different herbicide modes of action are commonly used, and each is unique in the way it controls susceptible plants. Some herbicide modes of action comprise several chemical families that vary slightly in their chemical composition, but control susceptible plants in the same way and cause similar injury symptoms.

Herbicides can also be classified by their "site of action," or the specific biochemical site that is affected by the herbicide. The site of action is a more precise description of the herbicide's activity; however, the terms "site of action" and "mode of action" are often used interchangeably to describe different groups of herbicides.

Why is it Important to Know the Mode of Action?

Knowing and understanding each herbicide's mode of action is an important step in selecting the proper herbicide for each crop, diagnosing herbicide injury, and designing a successful weed management program for your production system. Over-reliance on a single herbicide active ingredient or mode of action places heavy selection pressure on a weed population and may eventually select for resistant individuals. Over time, the resistant individuals will multiply and become the dominant weeds in the field, resulting in herbicides that are no longer effective for weed control. Simply rotating herbicide active ingredients is not enough to prevent the development of herbicide-resistant weeds. Rotating herbicide modes of action, along with other weed control methods, is necessary to prevent or delay herbicide-resistant weeds. Always read each product's label to determine the mode of action and best management practices for herbicide-resistant weeds.

Many weeds have developed "cross resistance" and are resistant to multiple herbicides within a single mode of action. Most waterhemp populations in Oklahoma, for example, are cross-resistant to both Scepter (chemical family: imidazolinone) and Classic (chemical family: sulfonylurea). Both of these herbicides are ALS inhibitors, but belong to different chemical families within the same mode of action. Therefore, it is important to not only rotate herbicide active ingredients but also to rotate modes of action to prevent herbicide-resistance weed populations from developing. One of the most effective ways to rotate herbicide modes of action is through crop rotation.

Weeds that have developed "multiple resistance" are resistant to herbicides from two or more modes of action. At this time, there are no weeds in Oklahoma that have been confirmed as resistant to multiple herbicide modes of action; however, instances of weeds with multiple resistance can be found in neighboring states. ALS-resistant, PPO-resistant, and glyphosate-resistant populations of waterhemp have been confirmed in Kansas. As well, Italian ryegrass populations in Arkansas have been confirmed to be resistant to both ALS- and ACCase inhibitor herbicides.

How can I Determine the Herbicide's Mode of Action?

Information regarding each product's mode of action can sometimes be found on the front of the herbicide label. Often, the herbicide is described as being a member of a particular numbered group. These numbers refer to a specific mode of action and were developed to consistently organize herbicides based on their mode of action. For example, "Group 1" herbicides are ACCase inhibitors and "Group 2" herbicides are ALS inhibitors. Some herbicides will list the mode of action somewhere in the general instructions or product description in the label. In other situations, products may not mention the mode of action anywhere in the label. If you are unsure of the herbicide's mode of action, contact your local county extension educator for clarification.

What are the Different Modes of Action? What are their Characteristics?

The following is a short description of the 11 most commonly used herbicide modes of action in Oklahoma crop

(Continued on page 4)

ACCase Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
1	Arloxyphenoxypropionate “FOPs”	Assure II	quizalofop
		Hoelon[r]	diclofop
		Fusilade	fluazifop
		Puma	fenoxaprop
1	Cyclohexanedione “DIMs”	Select, Select Max, others	clethodim
		Poast, Poast Plus	sethoxydim
1	Phenylpyrazoline “DENs”	Axial XL	pinoxaden

ALS Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
2	Imidazolinone “IMIs”	Beyond, Raptor	imazamox
		Cadre	imazapic
		Pursuit	imazethapyr
		Scepter	imazaquin
2	Sulfonylurea “SUs”	Accent	nicosulfuron
		Ally	metsulfuron
		Amber	triasulfuron
		Autumn	iodosulfuron
		Beacon	primisulfuron
		Classic	chloriumuron
		Express	tribenuron
		Glean	chlorsulfuron
		Harmony	thifensulfuron
		Maverick	sulfosulfuron
		Option	foramsulfuron
		Osprey	mesosulfuron
		Peak	prosulfuron
		Permit	halosulfuron
		Resolve	rimsulfuron
2	Triazolopyrimidine	FirstRate	cloransulam-methyl
		PowerFlex	pyroxsulam
		Python	flumetsulam
		Strongarm	diclosulam
2	Pyrimidinyl(thio)benzoate	Staple	pyrithiobac
2	Sulfonylaminocarbonyltriazolinones	Everest	flucarbazone
		Olympus	propoxycarbazone

Root Growth Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
3	Dinitroaniline	Treflan, others	trifluralin
		Prowl, others	pendimethalin
		Sonalan	ethafluralin

Growth Regulators

Group	*Chemical family*	*Trade names*	*Active ingredient*
4	Phenoxy-carboxylic acid	many	2,4-D
		Butyrac, others	2,4-DB
			MCPA
4	Benzoic acid	Banvel, Clarity, Status, others	dicamba
4	Pyridine carboxylic acid	Stinger	clopyralid
		Starane	fluroxypyr
		Tordon[r], Grazon[r]	picloram
4	Quinoline carboxylic acid	Paramount	quinclorac

Photosynthesis Inhibitors (Photosystem II)

Group	*Chemical family*	*Trade names*	*Active ingredient*
5	Triazine	Aatrex[r], atrazine[r], others	atrazine
		Princep	simazine
		Caparol	prometryn
5	Triazinone	Sencor	metribuzin
		Velpar	hexazinone
5	Uracil	Sinbar	terbacil
6	Nitrile	Buctril, others	bromoxynil
6	Benzothiadiazinone	Basagran	bentazon
7	Urea	Linex, Lorox	linuron
		Karmex	diuron

Shoot Growth Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
8	Lipid synthesis inhibitor, thiocarbamate	Eptam	EPTC
15	Chloroacetamide	Dual, Cinch, others	metolachlor
		Intrro[r], Micro-Tech[r]	alachlor
		Harness[r], Degree[r], Surpass[r], others	acetochlor
		Outlook	dimethenamid-P
15	Oxyacetamide	Define	flufenacet

Aromatic Amino Acid Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
9	Glycine	Roundup, Touchdown, others	glyphosate

Glutamine Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
10	Phosphonic acid	Ignite, Liberty	glufosinate

Pigment Synthesis Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
12	Pyridazinone	Zorial Rapid 80	norflurazon
13	Isoxazolidinone	Command	clomazone
27	Triketone	Callisto	mesotrione
		Laudis	tembotrione
		Impact	topramezone
27	Isoxazole	Balance[r]	isoxaflutole

PPO Inhibitors

Group	*Chemical family*	*Trade names*	*Active ingredient*
14	Diphenylether	Blazer	acifluorfen
		Reflex, Flexstar	fomesafen
		Cobra	lactofen
		Goal	oxyfluorfen
14	N-phenylphthalimide	Valor	flumioxazin
		Resource	flumiclorac
14	Thiadiazole	Cadet	fluthiacet
14	Triazolinone	Aim	carfentrazone
		Spartan, Authority	sulfentrazone

Photosynthesis Inhibitors (Photosystem I)

Group	*Chemical family*	*Trade names*	*Active ingredient*
22	Bipyridilium	Gramoxone Inteon[r], others	paraquat
		Reglone, others	diquat

[r] Restricted use pesticide.

production. The list of herbicides in the accompanying table (found on the inside pages) is not exhaustive and does not account for herbicide premixes that contain two or more active ingredients. If you have questions regarding mode of action, consult the individual product label and support literature from the manufacturer or contact your county agricultural Extension educator for more information.

ACCase Inhibitors (Group 1)

Inhibitors of the ACCase enzyme in plants are used strictly for grass control. As a result, they are used primarily in broadleaf crops or fallow situations, but there are also some products labeled for use in grass crops to control specific grass weeds. These herbicides are commonly referred to by the nicknames of their chemical families, “FOPs,” “DIMs,” and “DENs.”

ALS Inhibitors (Branched-Chain Amino Acid Inhibitors) (Group 2)

ALS inhibitors, or branched-chain amino acid inhibitors, comprise the largest mode of action and include at least one herbicide used in nearly every crop produced in Oklahoma. Many herbicides in this mode of action fall into two chemical families: imidazolinones (or “IMIs”) or sulfonylureas (or “SUs”), but there are three other chemical families within the ALS inhibitors. Cross resistance, or herbicide-resistance to multiple chemical families within a single mode of action, is common with ALS inhibitors.

Root Growth Inhibitors (Group 3)

Herbicides in this mode of action inhibit cell division, which stops roots from extending and are distinctive because of the yellow color of their formulations. They are applied preplant incorporated or preemergence in a wide range of agronomic crops, vegetables, turf, and ornamentals for control of grasses and small-seeded broadleaf weeds.

Growth Regulators (Group 4)

This mode of action, also known as synthetic auxins, includes many commonly used plant hormone-type herbicides in wheat, corn, sorghum, and pasture settings. These herbicides are generally selective for broadleaf control in grass crops; however, there are some uses for preplant and in-season weed control in broadleaf crops.

Photosynthesis Inhibitors—Photosystem II (Groups 5, 6, and 7)

These herbicides inhibit Photosystem II, part of the photosynthesis pathway, and are used in a variety of crops for control of grass and broadleaf weeds. Because of their extensive use for several decades, some weeds have developed resistance to these herbicides, particularly atrazine and metribuzin.

Shoot Growth Inhibitors (Groups 8 and 15)

Herbicides in this mode of action are soil-applied herbicides and control weeds that have not emerged from the soil surface. These herbicides generally control grass weeds and small-seeded broadleaf weeds.

Aromatic Amino Acid Inhibitors (Group 9)

The only herbicide included in this mode of action is glyphosate. There are many generic glyphosate and glyphosate-containing products available. Depending on the product, glyphosate can be formulated as ammonium, diammonium, dimethylammonium, isopropylamine, and/or potassium salts. Despite the different salt formulations available, it is important to know that the type of salt formulation does not affect weed control, but rather it indicates the way a particular glyphosate product is formulated. Glyphosate is a generally a non-selective herbicide and will severely injure or kill any living plant tissue that it comes in contact with. However, it can be used selectively in glyphosate-resistant crops, including corn, soybean, cotton, and canola. Like the ALS inhibitors, glyphosate controls susceptible plants by inhibiting amino acid synthesis; however, glyphosate and ALS inhibitors control susceptible plants in completely different ways and should not be considered to be the same mode of action.

Glutamine Synthesis Inhibitors (Group 10)

The only herbicide included in this mode of action is glufosinate. Glufosinate can be used as a non-selective burndown treatment or as an over-the-top postemergence application in Liberty Link® crops (glufosinate resistant).

Pigment Synthesis Inhibitors (Groups 12, 13, 27)

These herbicides are also called “bleachers” because of the characteristic white plant tissue that develops in susceptible plants after application. Several of the pigment synthesis inhibitors (mesotrione, isoxaflutole) are also referred to as HPPD-inhibitors, based on their site of action.

PPO Inhibitors (Groups 14)

PPO inhibitors may also be referred to as cell membrane disruptors and are usually “burner”-type herbicides. Some PPO-inhibitors can be applied preemergence, but most are used for postemergence weed control.

Photosynthesis Inhibitors—Photosystem I (Group 22)

Photosystem I inhibitors include paraquat and diquat and are used for non-selective weed control and crop desiccation prior to harvest. These herbicides are also referred to as “cell membrane disruptors” because of their contact activity.

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Horseweed Control Suggestions In No-till Cotton

- ✓ Use an effective control strategy …tank-mix with Glyphosate
  Include 1.0 lb ai/acre - 2,4-D or 0.25 lb ai/acre - Dicamba
- ✓ **Spray when weeds are small**
  -Rosettes are easiest to control

- ✓ Remember labeled plant back intervals
  -30 days after 2,4-D
  -21 days after1" rainfall following Dicamba*

*Do not apply Dicamba in regions receiving less than 25" of average annual rainfall .

Don't Let Horseweed Get the Jump on Your Cotton . . .
Start Clean and Stay Clean!

SPRAY DRIFT RISK

HERBICIDE APPLICATORS

Be aware of herbicide-sensitive crops being grown in your area, especially cotton, grapes and canola, before any weed herbicide application. These crops are very sensitive to certain herbicides, especially products containing 2,4-D.

PLAN BEFORE YOU SPRAY

- **Know what your neighbor has planted.**
- Check your nearest Mesonet weather station information, the Mesonet Drift Risk Advisor and the ODAFF Sensitive Crop Viewer.
- Consider wind speed, temperature, humidity and atmospheric inversion conditions.
- Avoid application during hot or humid parts of the day.
- Use low-drift nozzles.
- Consider newer technology products that have lower drift and crop damage capabilities.

How to Use Agweather's Drift Risk Advisor

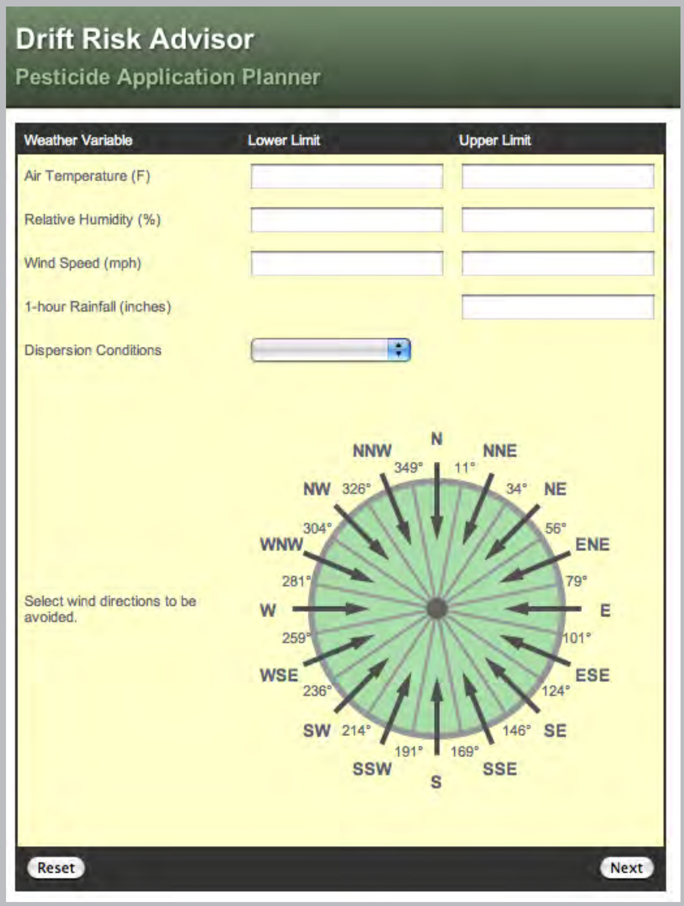
article revised November 2009

Introduction:

Spray applicators are faced with the challenge of avoiding spray drift. Spray drift is defined as "the output from an agricultural crop sprayer that is deflected out of the target area," typically caused by wind. Spray drift can be hazardous to sensitive plants and animals.

To aid applicators in identifying times of higher drift risk due to weather variables, the Oklahoma Mesonet has created a Drift Risk Advisor. This planning tool compares weather variable parameters with an 84-hour forecast matched to each Mesonet site. The Drift Risk Advisor uses the National Weather Service 84-hour North American Model forecast. In addition to weather variables the Drift Risk Advisor has forecasted dispersion conditions.

The Drift Risk Advisor is a weather-based planning tool that provides drift risk guidance, it does not supersede conditions at the field at the time of application that may be different from the forecast. The final judgement of whether conditions are appropriate for a spray application are the responsibility of the applicator.



Drift Risk Advisor Weather Variables:

Select "Upper" and "Lower Limits" that are appropriate for the application material. Upper and/or Lower Limits can be entered for one, all or any combination of the Drift Risk weather variables.

- Air temperature (Fahrenheit)
- Relative humidity (percent)
- Average wind speed (miles per hour)
- One hour rainfall (inches per hour)
- Wind direction
- Dispersion conditions

Dispersion conditions are based on the Oklahoma Mesonet Dispersion Advisor. Dispersion conditions are reported as one of six levels of vapor dispersion. These six categories are given text and number designations: Very Poor (1), Poor (2), Moderately Poor (3), Moderately Good (4), Good (5) and Excellent (6).

Finding the Drift Risk Advisor:

The Oklahoma Mesonet Drift Risk Advisor is located on the Agweather Web site (**http://agweather.mesonet.org**).

- From the main Agweather page, select "**Forecast**"
  - Choose "**Drift Risk Advisor**"

or

- From the main Agweather page, select "**Crop**"
  - Choose any crop
    - Under Pest Control, select "**Drift Risk Advisor**"

or

- From the main Agweather page, select "**Horticulture**"
  - Choose any horticulture crop
    - Under Pest Control, select "**Drift Risk Advisor**"

AGWEATHER

Drift Risk Advisor

Pesticide Application Planner

Date and Time	Criteria Met?	Wind Direction	Wind Direction in degrees	Wind Speed	Air Temperature	Rainfall per Hour	Dispersion Conditions	Relative Humidity
Nov 13, 2009 3:00 pm CST	Yes	SSW	194.7	4 mph	77°F	0.00 in.	5 (G)	36%
Nov 13, 2009 4:00 pm CST	Yes	S	176.7	3 mph	74°F	0.00 in.	4 (MG)	46%
Nov 13, 2009 5:00 pm CST	Yes	SE	143.5	2 mph	70°F	0.00 in.	3 (MP)	56%
Nov 13, 2009 6:00 pm CST	No	ESE	107.2	2 mph	66°F	0.00 in.	1 (VP)	65%
Nov 13, 2009 7:00 pm CST	No	SE	125.3	2 mph	65°F	0.00 in.	1 (VP)	68%
Nov 13, 2009 8:00 pm CST	No	SE	141.4	3 mph	64°F	0.00 in.	2 (P)	71%
Nov 13, 2009 9:00 pm CST	No	SSE	153.7	3 mph	63°F	0.00 in.	2 (P)	74%
Nov 13, 2009 10:00 pm CST	No	SSE	160.6	2 mph	61°F	0.00 in.	1 (VP)	78%
Nov 13, 2009 11:00 pm CST	No	SSW	194.5	1 mph	59°F	0.00 in.	1 (VP)	82%

Drift Risk Advisor Output Table:

The times when Weather Variables are within the user entered "**Upper and Lower Limits**" will appear as green colored boxes in the output table. When the Weather Variable is outside the Upper and Lower Limits, the box will have a red color. Weather Variables not compared will be shown in the table as column(s) of alternating gray and white boxes.

When all selected "**Weather Variables**" for a single hour fall within the entered Upper and Lower Limits, the "**Criteria Met?**" box will be colored green and have "**Yes**" text. When any one Weather Variable for a single hour falls outside the entered Upper and Lower Limits, the box in the "**Criteria Met?**" column will have a red color and "**No**" text.

Examples of Drift Caution Statements on Pesticide Labels

Trade name	Common name	Pesticide group	Drift caution statements
Banvel + 2,4-D	Banvel and 2,4-D	Hormone herbicide	Do not spray near sensitive plants if wind is gusty or in excess of 5 mph and moving in the direction of adjacent sensitive crops
Command 3ME	Clomazone	Preemergecy herbicide	Do not apply in winds about 10 mph. Avoid gusty or windless conditions
Dimethoate 4E	Dimethoate	Organophosphate insecticde	Apply only when the wind is less than or equal to 10 mph
Tordon 22K	Picloram	Hormone herbicide	Drift potential is lowest between wind speeds of 2-10 mph. Application should not occur during an inversion because drift potential is high.
Trigard	Cyromazine	Insect growth regulator	To avoid spray drift, do not apply under windy conditions
Warrior	Lambda-cyhalothrin	Synthetic pyrethroid insecticde	Do not apply when wind velocity exceeds 15 mph.

Your feedback is important to us. Call us at 405-325-3126.

Our story

In 1982, Oklahoma scientists recognized the need for a statewide weather network.

At OSU, agricultural scientists wanted to upgrade weather instruments at their research sites. Their goal was to expand the use of weather data in agricultural applications.

Meanwhile, scientists from OU and the Oklahoma Climatological Survey were helping to plan and implement a flood-warning system for Tulsa.

OSU and OU joined forces in 1987 when they realized that one statewide weather network would help both universities achieve their missions.

No other state or nation is known to have a network that boasts the capabilities of the Oklahoma Mesonet.

Agweather is one Web site that features data from the Oklahoma Mesonet. Agweather provides weather-related products for agriculture and natural resources.

Agweather can be found at http://agweather.mesonet.org/.

Agweather

LOCAL. RELIABLE. FREE.

Oklahoma Mesonet

Entomology & Plant Pathology

Outreach-NTOKcotton.org, cotton.okstate.edu, Cotton Comments Newsletter, and Texas Cotton Resource DVD

The NTOK (North Texas, Oklahoma, and Kansas) program and website (www.ntokcotton.org), was maintained for the Oklahoma Cotton Council. This project was supported by generation of timely information on important issues during the growing season. For the ntokcotton.org website, and based on results from ipower.com website traffic analysis software, from January 1 through December 31, 2015, the number of unique visitors was 11,395. The total number of visits was 43,585, number of page downloads was 26,903, and total hits was 31,384. Documents downloaded totaled 41,742.

The OSU Extension Cotton Team published ten newsletters which were directly sent to 379 email recipients. A yearly survey was sent to all recipients, and a total of 24 responded. It was evident based on this survey, that an additional 94 people were forwarded the newsletter. The best estimate we have for direct distribution of the newsletters would total 473. Therefore, direct distribution of the newsletter totals 4,730 (10 editions x 473) recipients. The recipients were asked to rate the newsletter on a scale of 1 to 5 (1 being not very useful and 5 being extremely useful). The result for the newsletter's usefulness was 4.41. With respect to the question of "topics being timely and discussed" the result was 4.33. When asked whether the newsletter was to be continued the result was 100% of respondents.

We placed considerable content on the www.cotton.okstate.edu website hosted by a campus server since it was initiated in 2012. We supported this website with our publications and newsletters. This website has a great appearance and we have provided various information tabs containing content or links for the following areas: Cotton Team, Cotton Comments Newsletters, Cotton Extension Annual Reports, Extensive Production Information Links, Variety Tests, Budgets, Irrigation, Sprayer Calibration, Weed Control, Weed Resistance Management, Plant Growth Regulators, Plant Growth and Development, Fertility, Insect Management, Diseases, Yield Estimation, Harvest Aids, Harvesting and Ginning, Fiber Quality, Crop Insurance, No-till Production, Producer Organization Links, Seed and Trait Company Links, Oklahoma Mesonet Tools, and Journal of Cotton Science link.

Included in Oklahoma State Support-Cotton Incorporated funding for 2012 was the acquisition of 500 copies of the 2011 Texas Cotton Resource DVD. We worked with Dr. Gaylon Morgan, State Extension Cotton Specialist with Texas A&M AgriLife Extension Service, and were successful in acquiring these DVDs. In addition to copies initially distributed in 2012, more copies were distributed at various meetings during 2015. We will continue to distribute this DVD during subsequent meetings in the state until the supply is exhausted.

Surveys of Crop and Pest Conditions

Population trends, insect updates, and control tips were published in the Cotton Comments Newsletter and distributed to the state's cotton producers and consultants to help formulate management strategies to enhance profitability. Field surveys were conducted in 7 counties with a total of 19 fields. Insect pressure as well as plant development were recorded and reported in the newsletters. Field inspections were performed weekly.

Plant development was also recorded and reported in the newsletter. As part of the COTMAN program, nodes above white flower (NAWF) criterion was tracked at each location (Figures 1 and 2) to assist producers in the identification of the last cohort of bolls that should likely make harvestable lint at each site. This assists with the termination of insecticides for late season pests, and helps determine irrigation termination and harvest aid applications.

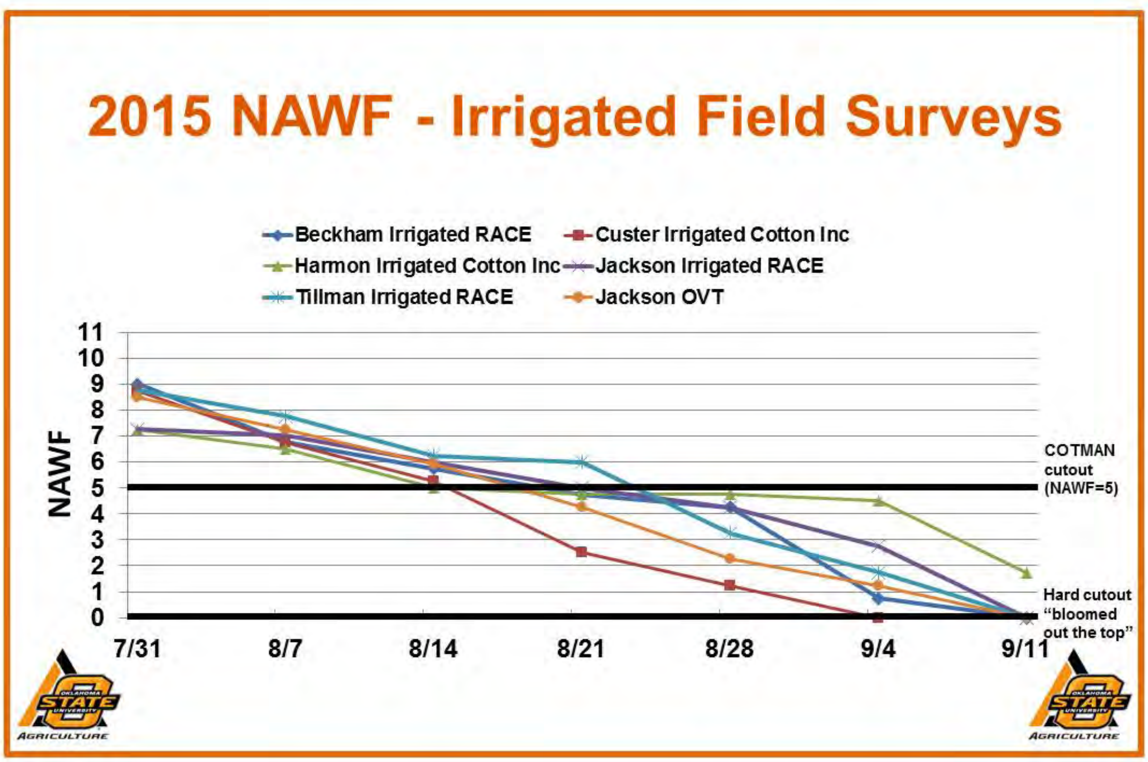


Figure 1. Weekly nodes above white flower (NAWF) in surveyed irrigated fields in 2015.

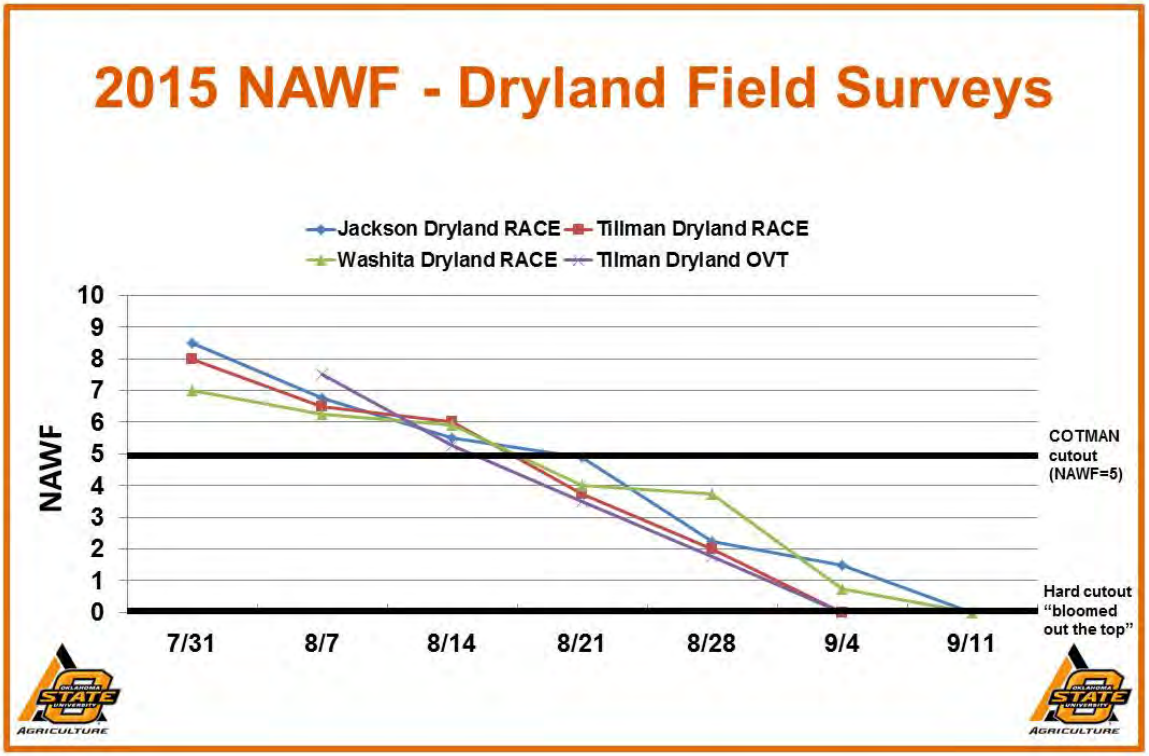


Figure 2. Weekly nodes above white flower (NAWF) in surveyed dryland fields in 2015.

Research Accomplishments

Cotton Bollworm / Tobacco Budworm and Beet Armyworm Monitoring

The bollworm/tobacco budworm complex has been the target of insecticide applications applied annually to a few acres of non-Bt cotton. Monitoring moth activities helps determine species ratio and peak ovipositional activity for these insects.

Pheromone traps were located near the communities of Altus, Delhi, Ft Cobb, Hollis, and Tipton. In addition to Heliothine activity, beet armyworm catches were also monitored at each location. Traps were maintained between June 1 and October 1, 2015. Although both species do coexist and are considered the same by growers, the species ratio is important since tobacco budworms exhibit a higher level of resistance to insecticides than bollworms. Also, it would be important to know this ratio in the event of Bt cotton failures. It is extremely important to detect fluctuations in species ratio of each ovipositional period and adjust insecticide recommendations accordingly if necessary.

A total of 1,639 moths were captured between the weeks of June 1 and October 1. This is approximately double the 2014 trap totals but even with the increase, no economically damaging infestations were reported. Bollworms comprised 85.60% of the total catch in 2015. Beet armyworm moth catches were extremely low.

Table 1. Moth Pheromone Trap Catch Totals for Selected Regions of Oklahoma, Summer 2015.

Bollworm				
Altus	Tipton	Hollis	Ft. Cobb	Delhi
316	385	322	188	192
Tobacco Budworm				
Altus	Tipton	Hollis	Ft.Cobb	Delhi
54	93	70	0	19
Beet Armyworm				
Altus	Tipton	Hollis	Ft. Cobb	Delhi
2	9	6	12	12

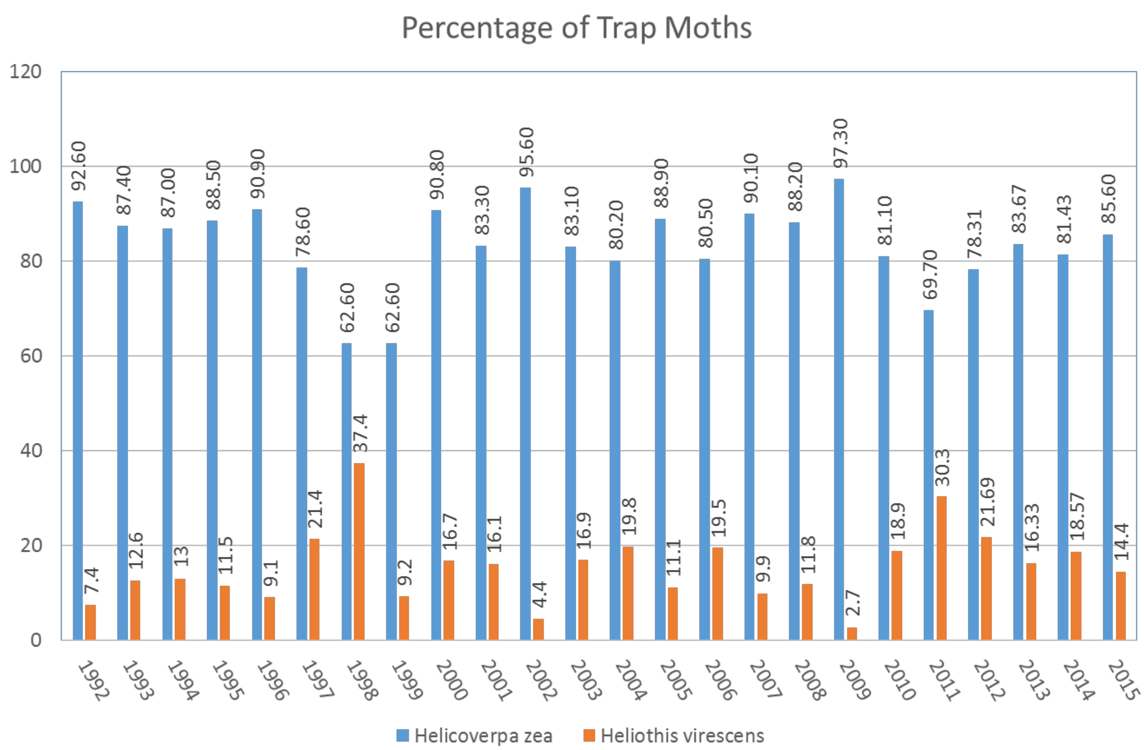


Figure 3. Species composition of moths trapped across Oklahoma, Summer 2015.

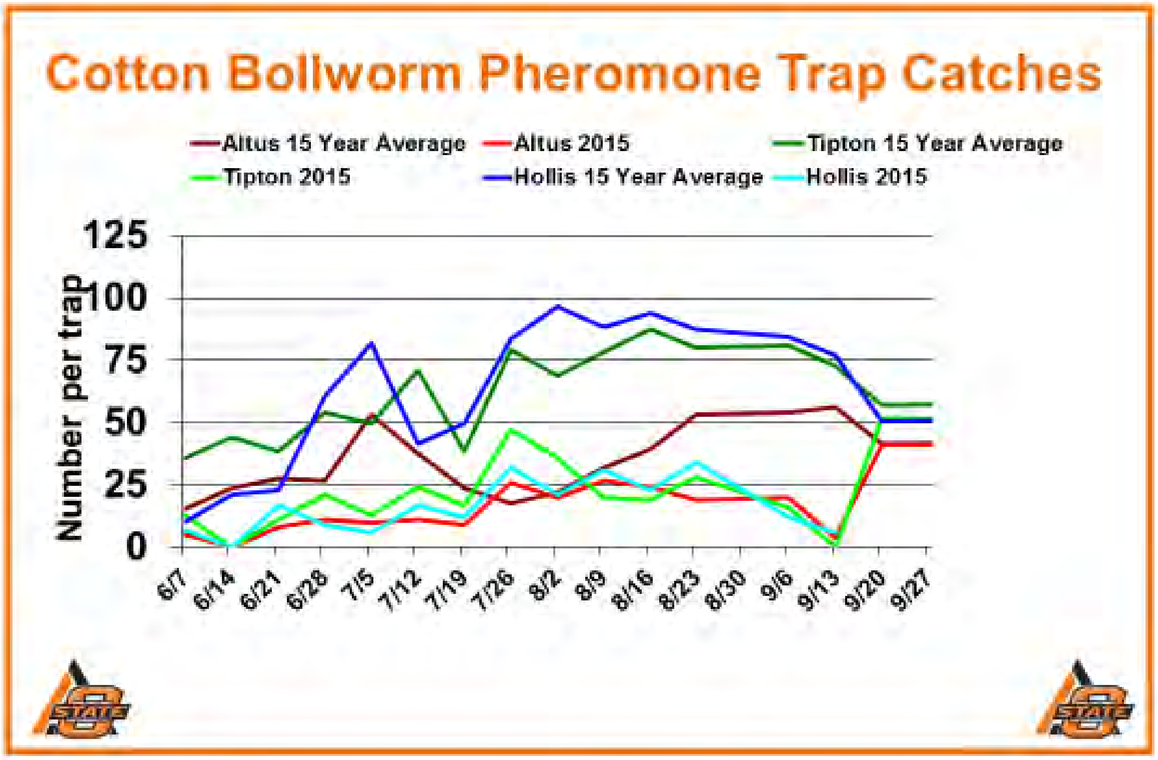


Figure 4. Cotton bollworm moths trapped by week across Oklahoma, Summer 2015.

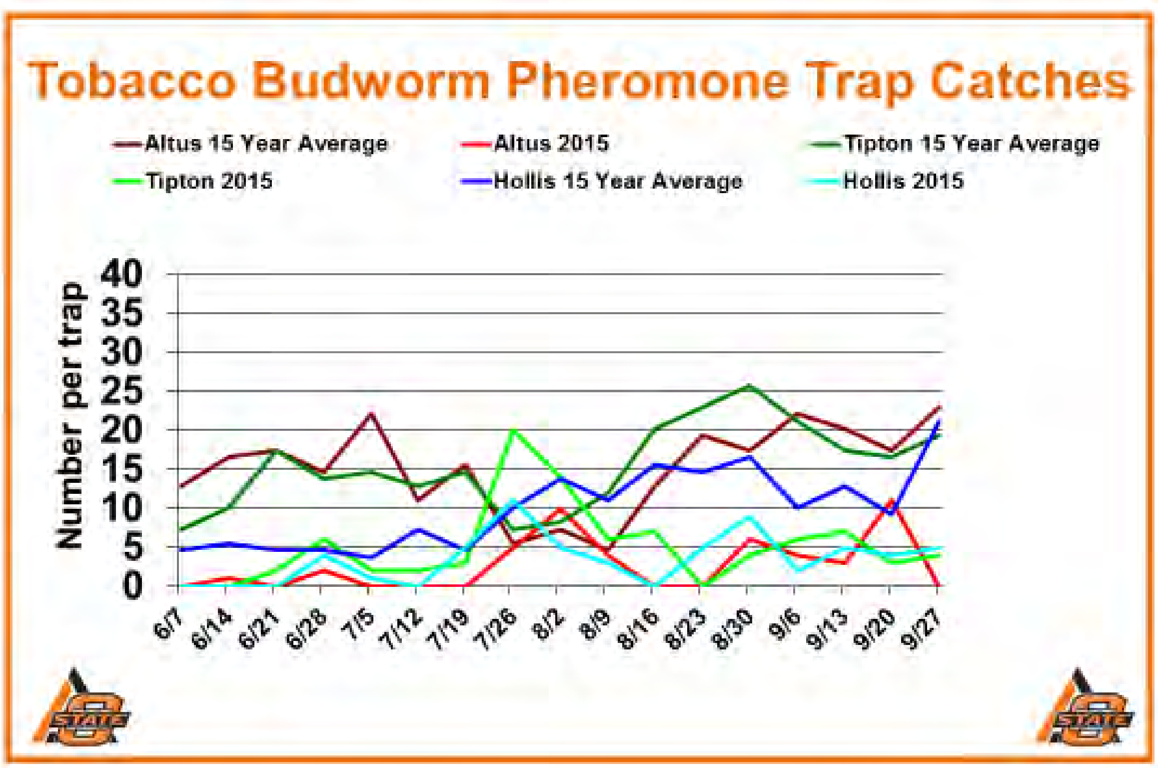


Figure 5. Tobacco budworm moths trapped by week across Oklahoma, Summer 2015.

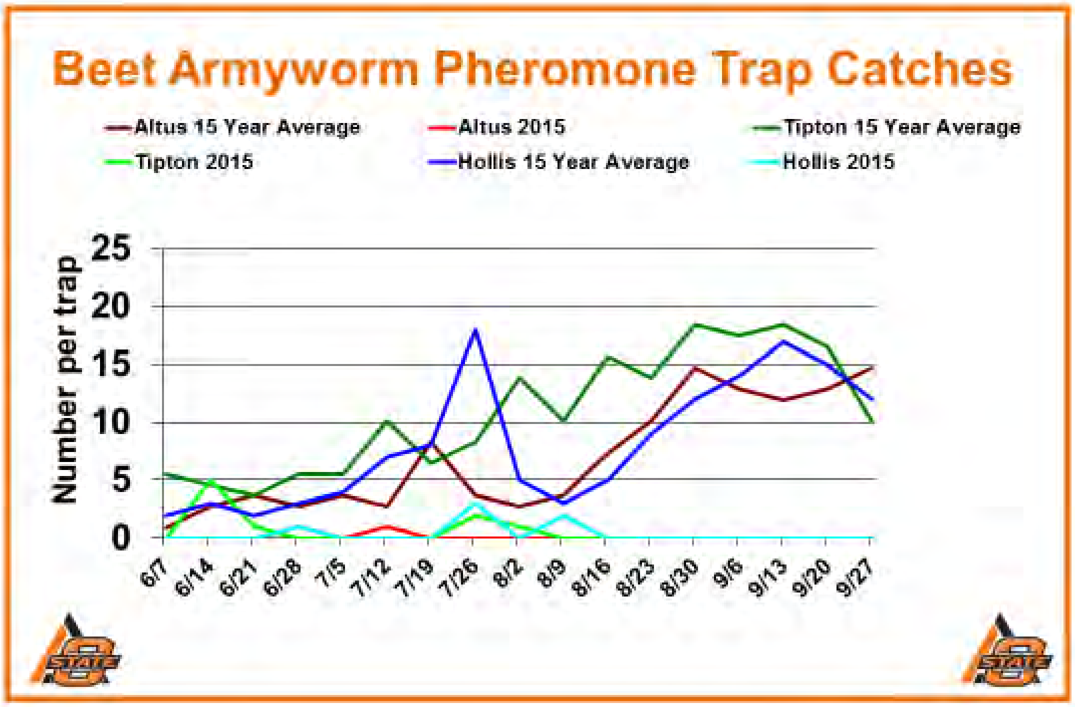


Figure 6. Beet armyworm moths trapped by week across Oklahoma, Summer 2015.

Insecticide Evaluation Trials

Two Bayer CropScience trials were established at the OSU Research and Extension Center at Altus. These trials included various experimental seed treatments and in-furrow treatments using the new Velum Total (combination of fluopyram and imidacloprid). One trial consisted of 7 treatments and the other 6 treatments. All trials were replicated 4 times, with observational data collected and yields determined. Pending outcome of projects conducted across the Cotton Belt, at this time Bayer CropScience has requested that this information not be published.

Dow Widestrike III Bt Observation Trial – Important Tool in Cotton Insect Resistance Management

We initiated a Dow AgroSciences/PhytoGen Innovation Plot at the Caddo Research Station near Fort Cobb. This trial included one entry (PhytoGen 495 W3RF) which contained Widestrike III triple-stacked Bt technology (Cry1A + Cry1F + VIP 3A) targeted to control various lepidopterous pests. Other entries included Dow Agrosciences' Widestrike technology. Although still sourced from Bt, Widestrike III is a different system than what is currently marketed by Monsanto (Bollgard II, Cry1A + Cry2AB), Dow AgroSciences' Widestrike (Cry1A + Cry1F), and Bayer CropSciences' TwinLink. TwinLink (consists of two genes which express Cry1Ab and Cry2Ae proteins) and was approved by EPA and USDA in 2013, and was commercialized in 2014. The objectives of this trial were to evaluate germplasm and to observe Widestrike III performance compared to Widestrike technology. In July a devastating phenoxy drift (volatilization) event occurred at the site. Therefore, observations were limited, and the trial was not harvested for yield. Although moth trap catches indicated low pressure, the trial was abandoned due to this damage. Additional traits will be important to reduce the potential for insect resistance to currently planted Bt traits. In the near future, Bollgard II and TwinLink will also be stacked with the VIP 3A trait. These will be called Bollgard III and TwinLink Plus.

COTTON INSECT LOSSES 2015

This report is sponsored by a grant from the Cotton Foundation.

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Highlights

Cotton losses to arthropod pests reduced overall yields by 2.83%. Thrips were the top ranked pest in 2015 reducing yields by 0.831%. *Lygus* were ranked second at 0.787%. Bollworm/budworm complex were ranked third at 0.462%. Stink bugs were fourth at 0.436%. Cotton fleahopper caused 0.353% loss, aphids reduced yields by 0.18% and spider mites caused 0.143% loss. No other pest exceeded 0.1% loss. Total costs and losses for insects in 2015 were $405.5 million. Direct management costs for arthropods were $27.87 per acre.

Table 1. Oklahoma summary, cotton insect losses, 2015.

Pest	acres infested	acres treated	#apps/ acre trtd	#apps/ tot acres	cost/ acre	%red	Bales lost
Bollworm/Budworm	0	0	0.00	0.00	$0.00	0.000%	0
Beet Armyworm	0	0	0.00	0.00	$0.00	0.000%	0
Fall Armyworm	0	0	0.00	0.00	$0.00	0.000%	0
Loopers	0	0	0.00	0.00	$0.00	0.000%	0
Cutworms	0	0	0.00	0.00	$0.00	0.000%	0
Cotton Leafperforator	0	0	0.00	0.00	$0.00	0.000%	0
Saltmarsh Caterpillar	0	0	0.00	0.00	$0.00	0.000%	0
Verde Plant Bugs	0	0	0.00	0.00	$0.00	0.000%	0
Cotton Fleahopper	156,000	126,750	1.75	1.14	$10.24	0.800%	2,915
Lygus	0	0	0.00	0.00	$0.00	0.000%	0
Stink Bugs	9,750	1,950	0.00	0.00	$0.00	0.050%	182
Clouded Plant bugs	0	0	0.00	0.00	$0.00	0.000%	0
Brown Stink bug	0	0	1.00	0.00	$0.00	0.000%	0
Bagrada Bugs	0	0	0.00	0.00	$0.00	0.000%	0
Leaf footed bugs	0	0	0.00	0.00	$0.00	0.000%	0
Spider Mites	0	0	0.00	0.00	$0.00	0.000%	0
Thrips	29,250	48,750	1.00	0.25	$0.50	0.300%	1,093
Aphids	9,750	3,900	0.00	0.00	$0.00	0.025%	91
Grasshoppers	58,500	29,250	1.00	0.15	$1.50	0.300%	1,093
Banded Winged Whitefly	0	0	0.00	0.00	$0.00	0.000%	0
Silverleaf Whitefly	0	0	0.00	0.00	$0.00	0.000%	0
Darkling Beetle	0	0	0.00	0.00	$0.00	0.000%	0
Pale-striped Flea Beetles	0	0	0.00	0.00	$0.00	0.000%	0
Mealybugs	0	0	0.00	0.00	$0.00	0.000%	0
Crickets	0	0	0.00	0.00	$0.00	0.000%	0
Boll Weevils	0	0	0.00	0.00	$0.00	0.000%	0
				1.54	$12.24	1.475%	5,375

Yield & Management Results	
Total Acres	195,000
Total bales Harvested	329,875
yield (lbs/acre)	812
Total bales Lost to Insects	5,375
Percent Yield Loss	1.48%
Yield w/o Insects (lbs/ac)	824
Ave. # Spray Applications	1.54
Bales lost all factors	34,527
% yield loss all factors	9.48%

Economic Results	Total	Per Acre
Foliar Insecticides Costs	$2,386,313	$12.24
At Planting Costs	$848,250	$4.35
In-furrow costs	$0	$0.00
Scouting costs	$190,125	$0.98
Eradication costs	$877,500	$4.50
Transgenic cotton	$1,170,349	$6.00
Total Costs	$5,472,536	$28.06
Yield Lost to insects	$1,676,978	$8.60
Total Losses + Costs	$7,149,515	$36.66

COTTON DISEASE LOSS ESTIMATE COMMITTEE REPORT, 2015

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Abstract

The National Cotton Council Disease Loss committee submitted estimates of the losses due to each disease during the 2015 growing season. Disease incidence estimates are determined by cotton specialists in each state discussing disease incidence observed across each state during the year. Yield losses are calculated by using the USDA "Crop Production" published at www.usda.gov/nass/PUBS/TODAYRPT/crop1115.pdf which documents cotton acreage planted, harvested, and average yields for each state. Total average percent loss was estimated at 9.18% which is down 2 % from 2014. Plant parasitic nematodes were the group of pathogens responsible for the largest average percent loss estimated at 3.42% down from the previous year. Alabama and North Carolina, suffered the greatest total disease losses of over 20%. California, Florida, Georgia, Louisiana, Mississippi, Tennessee, Texas and Virginia all estimated losses over 10%. Missouri, New Mexico, and Oklahoma, appeared to have the best growing conditions with the least amount of disease losses. South Carolina suffered extreme environmental stress three times during the season. Extremely dry conditions early in the growing season prevented development of any foliar diseases. During the drought plant stress in many fields was higher than normal and this meant that nematode-induced yield losses were projected to be higher than normal. However, the October flood and subsequent rainy weather literally destroyed many fields and separating any yield losses from diseases from those caused by the floods would be inappropriate.

Table 1. Cotton disease loss estimates for the 2015 season.																		
Percent disease loss estimates	**AL**	**AZ**	**AR**	**CA**	**FL**	**GA**	**LA**	**MS**	**MO**	**NM**	**NC**	**OK**	**SC**	**TN**	**TX**	**VA**	**Bales lost**	**% Bales lost**
Fusarium Wilt (F.o. vasinfectum)	1.0	0.0	0.2	1.7	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.5	0.2	0.0		0.24
Bales lost to Fusarium (x 1,000)	3.8	0.0	0.9	6.0	0.0	1.2	0.0	0.6	0.4	0.0	0.0	0.0	0.0	1.5	6.3	0.0	20.7	
Verticillium Wilt (V. dahliae)	1.5	1.5	0.1	0.4	0.0	0.0	0.0	trace	0.1	1.0	0.0	1.0	0.0	0.5	1.2	0.0		0.46
Bales lost to Verticillium (x 1,000)	5.7	2.1	0.5	1.4	0.0	0.0	0.0	0.0	0.4	0.0	0.0	1.3	0.0	1.5	37.7	0.0	50.5	
Bacterial Blight (X. malvacearum)	1.0	0.0	0.5	0.0	0.0	0.2	0.3	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0		0.16
Bales lost to Xanthomonas (x 1,000)	3.8	0.0	2.3	0.0	0.0	2.4	0.6	1.7	0.0	0.0	0.0	0.1	0.0	0.0	6.3	0.0	17.2	
Root Rot (P. omnivora)	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	3.0	0.0		0.29
Bales lost to Phymatotrichopsis (x 1,000)	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	94.2	0.0	96.5	
Seedling Diseases (Rhizoctonia & Etc.)	5.0	0.5	2.5	1.0	0.2	1.0	1.5	1.3	0.1	0.5	1.0	0.1	0.0	5.0	2.6	2.0		1.52
Bales lost to Seedling disease (x 1,000)	18.9	0.7	11.7	3.5	0.1	11.9	2.8	7.5	0.4	0.0	4.1	0.1	0.0	14.9	81.6	2.4	160.7	
Ascochyta Blight (A. gossypii)	0.5	0.0	0.0	0.0	1.0	trace	0.1	trace	0.0	0.0	0.5	0.0	0.0	0.5	0.1	0.1		0.18
Bales lost to Ascochyta (x 1,000)	1.9	0.0	0.0	0.0	0.7	0.0	0.2	0.0	0.0	0.0	2.1	0.0	0.0	1.5	3.1	0.1	9.6	
Boll Rots (Rhizopus, etc.)	4.0	0.1	1.0	0.0	4.0	4.0	0.5	0.3	0.0	0.0	15.0	0.0	0.0	1.0	0.5	5.0		2.21
Bales lost to Rhizopus (x 1,000)	15.1	0.1	4.7	0.0	2.7	47.7	0.9	1.7	0.0	0.0	61.7	0.0	0.0	3.0	15.7	6.0	159.4	
Nematodes (All)	6.5	2.5	4.2	0.1	4.0	10.0	6.0	7.9	0.1	0.5	3.2	0.2	0.0	2.8	2.8	4.0		3.42
Bales lost to Nematodes (x 1,000)	24.5	3.6	19.6	0.4	2.7	119.3	11.3	45.5	0.4	0.0	13.2	0.3	0.0	8.2	87.9	4.8	341.6	
Nematodes (Meloidogyne spp.)	2.0	2.5	2.0	0.1	3.0	7.5	3.0	1.6	0.0	0.5	2.5	0.2	0.0	0.0	2.4	2.0		1.83
Bales lost to Meloidogyne (x 1,000)	7.5	3.6	9.3	0.4	2.0	89.5	5.7	9.2	0.0	0.0	10.3	0.3	0.0	0.0	75.3	2.4	215.5	
Nematodes (Reniform reniformis)	4.0	0.0	2.0	0.0	1.0	2.0	3.0	5.8	0.1	0.0	0.5	0.0	0.0	2.8	0.4	0.0		1.35
Bales lost to Reniform (x 1,000)	15.1	0.0	9.3	0.0	0.7	23.9	5.7	33.4	0.4	0.0	2.1	0.0	0.0	8.2	12.6	0.0	111.2	
Nematodes (Other spp.)	0.5	0.0	0.2	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.0		0.24
Bales lost to other Nematodes (x 1,000)	1.9	0.0	0.9	0.0	0.0	6.0	0.0	2.9	0.0	0.0	0.8	0.0	0.0	0.0	0.0	2.4	14.9	
Leaf Spots & Others	1.0	0.2	1.0	0.0	2.5	0.5	2.0	2.0	0.0	0.0	0.5	0.5	0.0	0.7	0.1	0.1		0.69
Bales lost to Leaf spots & Others (x 1,000)	3.8	0.3	4.7	0.0	1.7	6.0	3.8	11.5	0.0	0.0	2.1	0.6	0.0	2.1	3.1	0.1	39.7	
Total Percent Lost	20.5	6.3	9.5	3.2	11.7	15.8	10.4	11.9	0.4	2.0	20.2	2.1	0.0	11.0	10.7	11.2		9.18
Total Bales Lost (x 1,000)	**77.3**	**9.0**	**44.3**	**11.3**	**8.0**	**188.5**	**19.6**	**68.5**	**1.6**	**0.1**	**83.2**	**2.7**	**0.0**	**32.7**	**335.8**	**13.5**	**896.1**	
Total Yield in Bales (x 1,000) (USDA Nov'15)	**377**	**142**	**467**	**353**	**68**	**1193**	**189**	**576**	**397**	**4**	**411**	**128**	**77**	**298**	**3138**	**121**	**7939.1**	

Harvest Aids

Four harvest aid demonstrations were established on September 25th, 2015. The locations of these demonstrations were as follows: one adjacent to the Tillman County sprinkler irrigated RACE trial (Nichols farm), one by the western Jackson County furrow irrigated RACE trial (Darby farm), one in a subsurface drip irrigated Jackson County field (Felty farm), and one in a subsurface drip-irrigated Harmon County field (Cox farm). Since these plots were not replicated, no data was collected (strictly for demonstration purposes only). These demonstrations focused on tank-mixing various defoliants with ethephon, and consisted of 8 treatments. All treatments were applied in a finished spray volume of 12 gallons per acre at 60 PSI with a medium spray droplet. Signs were installed on each treatment at all sites so producers could observe performance and determine the most effective treatment. Numerous references to these demonstrations were made during visits with growers seeking guidance with harvest aid applications and each of these locations were instrumental in helping growers determine the harvest aid treatment that may be appropriate for their own fields.

Table 1. Treatments applied in 2015 harvest aid demonstrations.

1. 21 oz/a Finish 6 Pro + 16 oz/a Folex
2. 21 oz/a Finish 6 Pro + 6.4 oz/a Ginstar
3. 32 oz/a Ethephon + 16 oz/a Folex
4. 21 oz/a Ethephon + 12 oz/a Folex
5. 32 oz/a Ethephon + 6.4 oz/a Ginstar
6. 32 oz/a Ethephon + 8.0 oz/a Ginstar
7. 32 oz/a Ethephon + 1.25 oz/a ETX + 1% Crop oil
8. 32 oz/a Ethephon + 1 oz/a Sharpen + 1% MSO + Amm. Sulfate

COTTON HARVEST AID SUGGESTIONS FOR OKLAHOMA – 2015

TREATMENTS LISTED ARE NOT NECESSARILY EQUALLY EFFECTIVE
RATES LISTED ARE UNITS OF PRODUCT PER ACRE

Dr. Randy Boman
Research Director and Cotton Extension Program Leader, Altus

CROP CONDITION	DRY TEMPERATURES GREATER THAN 80° (0-3 DAYS AFTER TREATMENT)	DRY TEMPERATURES LESS THAN 80° (0-3 DAYS AFTER TREATMENT)	WET TEMPERATURES LESS THAN 75° (0-3 DAYS AFTER TREATMENT)
HEIGHT: Short 14 inches or less **YIELD:** up to 500 lb/acre	Gramoxone (SL 2.0) 8-16 oz[1]	Gramoxone (SL 2.0) 8-16 oz[1]	Gramoxone (SL 2.0) 8-16 oz[1]
	Firestorm or Parazone 5.3-10.7 oz[1]	Firestorm or Parazone 5.3-10.7 oz[1]	Firestorm or Parazone 5.3-10.7 oz[1]
	Gramoxone (SL 2.0) 4-8 oz followed by (FB) Gramoxone (SL 2.0) up to 32 oz total[2]	Gramoxone (SL 2.0) 8-12 oz FB Gramoxone (SL 2.0) up to 32 oz total[2]	Gramoxone (SL 2.0) 8-12 oz FB Gramoxone (SL 2.0) up to 32 oz total[2]
	Firestorm or Parazone 2.6-5.3 oz FB Firestorm or Parazone up to 21 oz total[2]	Firestorm or Parazone 2.6-5.3 oz FB Firestorm or Parazone up to 21 oz total[2]	Firestorm or Parazone 2.6-5.3 oz FB Firestorm or Parazone up to 21 oz total[2]
	Gramoxone (SL 2.0) 6-10 oz + defoliant/desiccant[3]	Gramoxone (SL 2.0) 8-12 oz + defoliant/desiccant[3]	Gramoxone (SL 2.0) 10-24 oz + defoliant/desiccant[3]
	Firestorm or Parazone 4-6.7 oz + defoliant/desiccant[3]	Firestorm or Parazone 5.3-8 oz + defoliant/desiccant[3]	Firestorm or Parazone 6.7-16 oz + defoliant/desiccant[3]
	Ginstar 6-8 oz banded	Ginstar 8 oz banded	Ginstar 8-10 oz banded
	Aim EC 1-1.6 oz + COC with or without defoliant/desiccant	Aim EC 1-1.6 oz + COC with or without defoliant/desiccant	Aim EC 1-1.6 oz + COC with or without defoliant/desiccant
	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]
	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant
	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]
	Display 1.0 oz + COC with or without defoliant/desiccant	Display 1.0 oz + COC with or without defoliant/desiccant	Display 1.0 oz + COC with or without defoliant/desiccant
	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]
	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant
	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS[4]	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS4	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS[4]

COTTON HARVEST AID SUGGESTIONS FOR OKLAHOMA – 2015 (CONTINUED)

NOT ALL TREATMENTS ARE EQUALLY EFFECTIVE
RATES LISTED ARE UNITS OF PRODUCT PER ACRE

CROP CONDITION	DRY TEMPERATURES GREATER THAN 80° (0-3 DAYS AFTER TREATMENT)	DRY TEMPERATURES LESS THAN 80° (0-3 DAYS AFTER TREATMENT)	WET TEMPERATURES LESS THAN 75° (0-3 DAYS AFTER TREATMENT)
HEIGHT: Medium 15-24 inches **YIELD:** 500+ lb/acre	**FOR TREATMENTS LISTED BELOW, A SEQUENTIAL APPLICATION OF PARAQUAT (OR OTHER DESICCANT ACTIVITY PRODUCT) 7-14 DAYS AFTER INITIAL TREATMENT WILL LIKELY BE NECESSARY TO SUFFICIENTLY CONDITION CROP FOR STRIPPER HARVESTING**		
	Gramoxone (SL 2.0) 6-10 oz[1] + defoliant/desiccant[3]	Gramoxone (SL 2.0) 8-12 oz[1] + defoliant/desiccant[3]	Gramoxone (SL 2.0) 10-24 oz[1] + defoliant/desiccant[3]
	Firestorm or Parazone 4-6.7 oz[1] + defoliant/desiccant[3]	Firestorm or Parazone 5.3-8 oz[1] + defoliant/desiccant[3]	Firestorm or Parazone 6.7-16 oz[1] + defoliant/desiccant[3]
	Gramoxone (SL 2.0) 4-8 oz followed by (FB) Gramoxone (SL 2.0) up to 32 oz total[2]	Gramoxone (SL 2.0) 6-8 oz FB Gramoxone (SL 2.0) up to 32 oz total[2]	Gramoxone (SL 2.0) 6-8 oz FB Gramoxone (SL 2.0) up to 32 oz total[2]
	Firestorm or Parazone 2.6-5.3 oz FB Firestorm or Parazone up to 21 oz total[2]	Firestorm or Parazone 4-5.3 oz FB Firestorm or Parazone up to 32 oz total[2]	Firestorm or Parazone 4-5.3 oz FB Firestorm or Parazone up to 32 oz total[2]
	Ginstar 6-8 oz	Ginstar 8 oz	Ginstar 8-10 oz
	Aim EC 1-1.6 oz + COC + defoliant/desiccant	Aim EC 1-1.6 oz + COC + defoliant/desiccant	Aim EC 1-1.6 oz + COC + defoliant/desiccant
	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]	Aim EC 1-1.6 oz + COC FB Aim EC 1-1.6 oz + COC[4]
	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant	ETX 0.9-1.7 oz + COC with or without defoliant/desiccant
	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]	ETX 0.9-1.7 oz + COC FB ETX 0.9-1.7 oz + COC[4]
	Display 1.0 oz + COC with or without defoliant/desiccant	Display 1.0 oz + COC with or without defoliant/desiccant	Display 1.0 oz + COC with or without defoliant/desiccant
	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]	Display 1.0 oz + COC FB Display 1.0 oz + COC[4]
	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant	Sharpen 1 oz + MSO + AMS with or without defoliant/desiccant
	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS[4]	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS[4]	Sharpen 1 oz + MSO + AMS FB Sharpen 1 oz + MSO + AMS[4]
	Ethephon 16-32 oz + Ginstar 3-5 oz	Ethephon 16-32 oz[5] + Ginstar 3-5 oz	Ethephon 21-32 oz[5] + Ginstar 3-5 oz
	Ethephon 16-32 oz + Folex 8-16 oz	Ethephon 16-32 oz[5] + Folex 16 oz	Ethephon 21-32 oz[5] + Folex 16 oz
	Ethephon 16-32 oz + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 16-32 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 21-32 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]
	Finish 6 Pro 21 oz + defoliant (Folex 8 oz or Ginstar 3-5 oz)	Finish 6 Pro 21-32 oz[5] (defoliant may be required)	Finish 6 Pro 21-42 oz[5] (defoliant may be required)
	FirstPick 3 pts + Ginstar 3 oz	FirstPick 3-4 pts[5] + Ginstar 5 oz	FirstPick 4 pts[5] + Ginstar 6-8 oz

COTTON HARVEST AID SUGGESTIONS FOR OKLAHOMA – 2015 (CONTINUED)

NOT ALL TREATMENTS ARE EQUALLY EFFECTIVE
RATES LISTED ARE UNITS OF PRODUCT PER ACRE

CROP CONDITION	DRY TEMPERATURES GREATER THAN 80º (0-3 DAYS AFTER TREATMENT)	DRY TEMPERATURES LESS THAN 80º (0-3 DAYS AFTER TREATMENT)	WET TEMPERATURES LESS THAN 75º (0-3 DAYS AFTER TREATMENT)
	FOR TREATMENTS LISTED BELOW, A SEQUENTIAL APPLICATION OF PARAQUAT (OR OTHER DESICCANT ACTIVITY PRODUCT) 7-14 DAYS AFTER INITIAL TREATMENT WILL LIKELY BE NECESSARY TO SUFFICIENTLY CONDITION CROP FOR STRIPPER HARVESTING		
HEIGHT: Greater than 24 inches **YIELD:** 1000+ lb/acre	Ethephon 21-32 oz + Folex 8-16 oz	Ethephon 21-32 oz + Folex 16 oz	Ethephon 32-42 oz[5] + Folex 16 oz
	Finish 6 Pro 21 oz + defoliant (Folex 8 oz or Ginstar 3-5 oz)	Finish 6 Pro 21-32 oz[5] + defoliant (Folex 8-10 oz or Ginstar 4-6 oz)	Finish 6 Pro 32-42 oz[5] + defoliant (Folex 8-10 oz or Ginstar 6-8 oz)
	Finish 6 Pro 21-32 oz + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Finish 6 Pro 21-32 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Finish 6 Pro 32-42 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]
	Ethephon 21-32 oz + Ginstar 3-5 oz	Ethephon 21-32 oz[5] + Ginstar 4-6 oz	Ethephon 32-42[5] oz + Ginstar 6-8 oz
	Ethephon 21-32 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 21-32 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 32-42 oz[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]
	FirstPick 3-4 pts + Ginstar 3-5 oz	FirstPick 4-5 pts[5] + Ginstar 6-8 oz	FirstPick 6-7 pts[5] + Ginstar 6-8 oz
	FirstPick 3-4 pts + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	FirstPick 4-5 pts[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	FirstPick 6-7 pts[5] + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]
	Ginstar 6-8 oz	Ginstar 8 oz	Ginstar 8-10 oz
	CONDITIONING TREATMENT ONLY (Apply after daily heat units drop below 5, but at least 7 days before average first killing freeze date)		
LATE MATURING	Gramoxone (SL 2.0) 4-8 oz	Gramoxone (SL 2.0) 6-12 oz	Gramoxone (SL 2.0) 10-16 oz
	Firestorm or Parazone 2.6-5.3 oz	Firestorm or Parazone 4-8 oz	Firestorm or Parazone 6.7-10.7 oz
	Ethephon 32 oz	Ethephon 32-42 oz[5]	Ethephon 32-42 oz[5]
	Ethephon 32 oz + Folex 8 oz or + Ginstar 8 oz or + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 32-42 oz[5] + Folex 8 oz or + Ginstar 8 oz or + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]	Ethephon 32-42 oz[5] + Folex 16 oz or + Ginstar 8-16 oz or + Aim EC 1-1.6 oz + COC or + Display 1.0 oz + COC or + ETX 0.9-1.7 oz + COC or + Sharpen 1 oz + MSO + AMS[4]

FOOTNOTES

FB = Followed by

[1] - Use on cotton with natural leaf shed. High rates can cause green, healthy leaves to stick. There is some concern for the single high dose rate, especially on hairy-leaf cotton varieties. Reduced fiber quality with respect to leaf grades may be obtained. Always use a non-ionic surfactant at 0.25% v/v to 0.5% v/v when applying paraquat-based products (Gramoxone (SL 2.0), Firestorm, Parazone). For maximum paraquat desiccation activity, apply late in the day prior to a forecast for a bright, sunny morning. Make sure the cotton has at least 80% open bolls at application, use a sufficient paraquat rate and application to completely kill all foliage, then stripper harvest only when leaves are dry enough to "crunch" when crushed by hand. Proper ginning techniques must be followed in order to reduce trash in the stripped cotton and to minimize potential for lint quality loss. This typically includes adequate drying, pre-cleaning and two stages of lint cleaning. **Avoid stripper harvesting moist, dead leaves or poor leaf grades may be encountered. Adjacent small grains or other desirable vegetation may be severely damaged by paraquat drift so use appropriate caution.**

[2] - No more than 32 oz/acre total of Gramoxone (SL 2.0) (2 lb paraquat/gallon) or no more than 21 oz/acre total of Firestorm or Parazone (3 lb paraquat/gallon) may be applied as a cotton harvest aid. The need for and rate of Gramoxone (SL 2.0), Firestorm, or Parazone in a second application will depend upon green leaves and unopened bolls remaining. Use higher rates if regrowth is excessive.

[3] - Tankmix partners with Gramoxone (SL 2.0), Firestorm, or Parazone can include Folex, Aim, Display, and ETX.

[4] - No more than: 3.2 oz/acre total of Aim 2EC as a cotton harvest aid (in two applications) or 7.9 oz/acre for all uses in one season may be applied. No more than 2 oz/acre total of Display as a cotton harvest aid may be applied per season. Do not exceed 3.4 oz/acre total (in no more than 2 applications) of ETX as a cotton harvest aid (or 5.25 oz/acre for all uses) in one season. Do not apply more than 2 oz/acre of Sharpen in a single application, and no more than 2 oz/acre total as a harvest aid per season.

[5] - 6 lb/gallon ethephon-based product (such as Finish 6 Pro, FirstPick, Prep, Super Boll, Boll'd, Boll Buster, Setup, etc.) activity is determined by rate and temperature. At lower temperatures, boll opening response can be enhanced by increasing rate. Do not exceed a maximum of 2.0 lb ethephon active ingredient per acre per year through combined or repeated uses of any ethephon products.

2016 Beltwide Cotton Conference Presentations - New Orleans, LA

Project personnel were involved in several Beltwide Cotton Conference presentations in New Oleans, LA in January 2016.

1) Profitability of dryland cotton production continues to be a major producer concern in southwestern Oklahoma. Many production factors influence profitability, and one of these can be tillage system. A long-term dryland project was initiated at the OSU Southwest Research and Extension Center near Altus, OK in 2003. One of the sub-plot treatments is continuous cotton, and lint yield and quality data from 2003-2015 for the conventional tillage and no-tillage continuous cotton were analyzed.

2) Currently the use of residual herbicides within a Liberty Link system is the best way to chemically control glyphosate resistant (GR) pigweeds in cotton. In addition, growers anticipate the approval of new auxin based technologies (Xtendflex and Enlist) and eagerly await the opportunity to utilize these systems for the control of GR pigweed. Therefore three projects were established, one to evaluate the effectiveness of currently available residual herbicides, one to evaluate the utilization of the Liberty Link system and one to evaluate the effectiveness of residuals in a Bollgard II Xtendflex system.

3) A system for weighing seed cotton onboard stripper harvesters was developed and installed on several producer owned and operated machines. The weight measurement system provides critical information to producers when in the process of calibrating yield monitors or conducting on-farm research. The objective of our work was to conduct system reliability testing and obtain producer feedback on the operation and utility of the system. The system was modified from the system used in 2014 to include new hydraulic system components and a simplified user interface; all of which were added to improve accuracy, data reliability, and ease of operation.

DRYLAND COTTON LINT YIELD AND QUALITY RESPONSE IN LONG-TERM CONVENTIONAL AND NO-TILL SYSTEMS IN SOUTHWEST OKLAHOMA

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Abstract

Profitability of dryland cotton production continues to be a major producer concern in southwestern Oklahoma. Many production factors influence profitability, and one of these can be tillage system. The objective of this project was to compare long-term no-till and conventional tillage practices and determine their impact on cotton lint yield and quality under dryland conditions. A long-term dryland project was initiated at the OSU Southwest Research and Extension Center near Altus, OK in 2003. The study is a split-plot experimental design with three replicates. Tillage types are considered main plots (conventional tillage and no-tillage) with various monocrops (cotton, wheat and grain sorghum) and crop rotations (cotton-wheat-grain sorghum, cotton-wheat, cotton-grain sorghum, and wheat-double crop grain sorghum-cotton) as sub-plots. One of the sub-plot treatments is continuous cotton, and lint yield and quality data from 2003-2015 for the conventional tillage and no-tillage continuous cotton were analyzed. Seedbed preparation for the conventional tilled plots includes primary tillage using a chisel plow and disking in the spring. Cotton stalks are rotary mowed each year after harvest. No-till plots receive no tillage operations. Results from the 9-year combined analysis of this project indicate that tillage system had minimal effect on fiber properties, but both lint yield and net returns above agronomic inputs were statistically increased under the no-till management system when compared to the conventional system.

Introduction

Profitability of dryland cotton production continues to be a major producer concern in southwestern Oklahoma, as well as across the entire Cotton Belt. Many production factors influence profitability, and one of these can be tillage system. The objective of this project was to compare long-term no-till and conventional tillage practices and determine their impact on cotton lint yield and quality under dryland conditions.

Materials and Methods

A long-term dryland project was initiated at the OSU Southwest Research and Extension Center near Altus, OK in 2003 on a fine, mixed, superactive, thermic Vertic Paleustolls soil. It is currently one of the longest continuous no-till projects in the state. The study is a split-plot experimental design with three replicates. Tillage types are considered main plots (conventional tillage and no-tillage) with various monocrops (cotton, wheat and grain sorghum) and crop rotations (cotton-wheat-grain sorghum, cotton-wheat, cotton-grain sorghum, and wheat-double crop grain sorghum-cotton) as sub-plots. In 2014, the experimental focus was changed and some crops were omitted and others added. However, one of the sub-plot treatments is continuous cotton, and lint yield and quality data from 2003-2015 for the conventional tillage and no-tillage continuous cotton will be reported. Experimental unit size is 30 ft wide by 75 ft long with 40-inch row spacing. Seedbed preparation for the conventional tilled plots includes primary tillage using a chisel plow and disking in the spring. Cotton stalks are rotary mowed each year after harvest. No-till plots receive no tillage operations. Seeding rate has been 3 seeds/row-ft or about 40,000 seed per acre. Herbicide applications included trifluralin (preplant, 1 qt./acre); Roundup (post-emergence, 1 or 2 applications, typically 22 or 32 oz/acre); and Dual Magnum (post-emergence, 1 pt/acre as needed). Nitrogen application has been 60 lb N/acre, the recommendation for about 1 bale/acre yield goal. Phosphorus and potassium fertilizer additions were based on soil testing and applied as needed.

Cotton data from 2006 were lost due to drought. Unfortunately, due to persistent Extreme to Exceptional Drought (D3 and D4 categories as defined by the U.S. Drought Monitor), various crops including cotton failed in 2011, 2012, and 2013. From 2003 through 2010, 1/1000th of an acre was hand harvested from each of the center two rows of each plot. Beginning in 2014, harvested area was the center two rows by entire plot length (75 ft) and a modified John Deere 482 plot stripper harvester was used.

Samples were taken from each plot and were ginned on a plot gin. Lint turnout for each plot was used to convert plot bur cotton weights to lint per acre. Ginned lint was submitted to the Texas Tech University Fiber and Biopolymer Research Institute for High Volume Instrument (HVI) analyses. Loan value for all years was determined using HVI data and the 2015 Upland Cotton Loan Valuation Model (Falconer, 2015). With respect to net returns above agronomic inputs, the crop lint value was not based on Commodity Credit Corporation Loan rate, but average crop prices received in the area for each year of the project. Net returns above agronomic inputs were based on custom rates provided by OSU Extension agricultural economists. Agronomic inputs include various tillage or other operations based on average prices provided in the Oklahoma Farm and Ranch Custom Rates Publication, CR-205 in each respective year (Doye and Sahs, 2014).

The GLM procedure was used for by-year analysis and data were combined across years using the Mixed procedure in SAS 9.4 for Windows. Year and Replicate(Year) were considered random effects. Planting and harvesting dates and varieties planted in each year are provided in Table 1.

Table 1. Planting date, variety planted and harvest dates.

Year	Planting Date	Variety	Harvest Date
2003	5/22/2003	PM2266RR	12/5/2003
2004	5/19/2004	PM2266RR	11/7/2004
2005	5/20/2005	PM2266RR	11/23/2005
2006	6/6/2006	PM2266RR	Crop Failure - Drought
2007	5/30/2007	PM2266RR	11/7/2007
2008	5/21/2008	FM9058F	11/20/2008
2009	5/26/2009	DP 174RF	11/20/2009
2010	5/12/2010	DP 174RF	11/10/2010
2011	6/8/2011	DP 1044 B2RF	Crop Failure - Drought
2012	6/15/2012	DP 1044 B2RF	Crop Failure - Drought
2013	6/5/2013	DP 1044 B2RF	Crop Failure - Drought
2014	6/20/2014	DP 1044 B2RF	11/18/2014
2015	6/11/2015	DP 1044 B2RF	10/21/2015

Results and Discussion

Results are presented in Table 2. Tillage system effects on lint yields indicated somewhat mixed results. Early yield data were variable. However, results from later years indicated a more favorable yield response to no-till compared to conventional. When combined across years, the no-till system averaged 49 lb/acre higher lint yield when compared to conventional. The combined analysis also indicated that net returns above agronomic inputs favored the no-till system by $69/acre over conventional, and this difference was highly significant. No consistent tillage system effects were observed for any fiber properties including Loan value in the by-year analysis, and the combined analysis indicated that no statistically significant effects were noted across the 9 years reported.

Summary and Conclusions

Results from the 9-year combined analysis of this project indicate that tillage system had minimal effect on fiber properties, but both lint yield and net returns above agronomic inputs were statistically increased under the no-till management system when compared to the conventional system.

Table 2. Lint yield, net returns, HVI fiber properties, and 2015 Loan value.

Year	System	Lint yield	Net returns above agronomic inputs	Micronaire	Length	Uniformity	Strength	2015 Loan
		lb/acre	$/acre	units	100ths inch	%	g/tex	$/lb
2003	Conventional	282	25	4.7	0.97	81.1	30.5	0.4960
	No-till	194	107	4.7	0.99	82.6	31.3	0.4916
	CV, %	7.3	17.2	2.6	1.2	1.4	3.5	1.3
	Pr>F	0.0245	0.0126	1.0000	0.1835	0.2541	0.4771	0.4851
2004	Conventional	317	50	4.2	1.02	83.3	30.2	0.5195
	No-till	271	76	4.2	0.99	82.1	31.6	0.5040
	CV, %	30.9	74.7	3.4	1.9	1.1	0.7	1.9
	Pr>F	0.6031	0.5685	1.0000	0.1885	0.2567	0.0127	0.1858
2005	Conventional	664	221	3.5	1.01	80.3	30.2	0.4930
	No-till	617	226	3.5	0.99	81.3	29.3	0.4872
	CV, %	10.3	15.4	5.3	3.5	2.2	3.8	3.2
	Pr>F	0.4781	0.8834	1.0000	0.5601	0.5549	0.4069	0.6904
2007	Conventional	623	190	4.5	1.01	81.1	29.2	0.5030
	No-till	740	303	4.2	1.02	81.8	31.2	0.5150
	CV, %	15.7	23.9	4.9	2.4	0.7	2.0	2.2
	Pr>F	0.3151	0.1439	0.2254	0.6667	0.2421	0.0579	0.3170
2008	Conventional	193	-45	4.6	1.00	78.5	26.7	0.4955
	No-till	275	21	4.6	1.07	78.2	29.5	0.5371
	CV, %	14.0	141.8	3.9	4.7	1.8	5.3	5.9
	Pr>F	0.0913	0.0416	0.8399	0.2030	0.8229	0.1490	0.2346
2009	Conventional	328	34	3.9	1.08	80.3	27.1	0.5453
	No-till	298	67	4.0	1.06	79.7	26.4	0.5365
	CV, %	17.2	61.5	7.2	1.7	0.8	2.8	3.6
	Pr>F	0.5695	0.3229	0.5492	0.3701	0.3628	0.3897	0.6372
2010	Conventional	280	336	3.8	1.05	79.0	25.4	0.5085
	No-till	401	482	4.0	1.05	78.9	25.9	0.5263
	CV, %	22.5	22.5	4.5	3.3	1.9	7.3	6.2
	Pr>F	0.1909	0.1922	0.2495	0.9175	0.9426	0.7607	0.5675
2014	Conventional	417	95	4.8	1.11	82.7	33.0	0.5500
	No-till	475	155	4.7	1.11	81.9	33.2	0.5553
	CV, %	26.0	56.8	2.3	2.3	0.4	3.8	1.6
	Pr>F	0.5983	0.4068	0.2697	1.0000	0.1093	0.9086	0.5452
2015	Conventional	392	80	4.0	1.08	81.6	29.2	0.5628
	No-till	486	175	4.2	1.08	81.5	28.6	0.5576
	CV, %	4.3	9.0	5.2	2.0	0.3	7.2	2.5
	Pr>F	0.0257	0.0096	0.3169	1.0000	0.7072	0.7584	0.6950
All years	Conventional	378	110	4.2	1.03	80.9	29.1	0.5193
	No-till	427	179	4.2	1.04	80.9	29.7	0.5234
	Pr>|t|	0.0186	<0.0001	0.6305	0.6067	0.9501	0.1204	0.4447

Acknowledgements

This project was supported by the Oklahoma State Support Committee – Cotton Incorporated, and the OSU Integrated Pest Management Program. The authors also thank Larry Bull, Rocky Thacker and the staff at the Southwest Research and Extension Center at Altus for their excellent cooperation.

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OPTIONS FOR PIGWEED CONTROL IN OKLAHOMA COTTON

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Abstract

Currently the use of residual herbicides within a Liberty Link system is the best way to chemically control glyphosate resistant (GR) pigweeds in cotton. In addition, growers anticipate the approval of new auxin based technologies (Xtendflex and Enlist) and eagerly await the opportunity to utilize these systems for the control of GR pigweed. Therefore three projects were established, one to evaluate the effectiveness of currently available residual herbicides, one to evaluate the utilization of the Liberty Link system and one to evaluate the effectiveness of residuals in a Bollgard II Xtendflex system. Valor, Prowl H20, Warrant, Dual Magnum, Caparol and Direx were applied preemergence (PRE) to evaluate glyphosate resistant pigweed control. Valor, Prowl H20, Warrant and Dual Magnum controlled GR pigweed greater than 90% 30 days after treatment. Caparol and Direx provided slightly less control. In the second project Caparol plus Liberty applied PRE followed by Liberty applied early postemergence (POST) followed by postemergence directed (PD) applications of either Aim plus Direx or Liberty plus Anthem Flex provided excellent control (100%) 10 days after the second POST (10DAP2) application. The third project was established to evaluate the effectiveness of a system comprised of residual herbicides and postemergence combinations including a new formulation of dicamba. Results indicated that effective season-long pigweed control (96-100%) is achieved when two residual herbicides are utilized within a system utilizing postemergence applications of dicamba. Significantly less control was observed (85%) when one of these residual components was removed from the system.

Introduction

Glyphosate resistant pigweed (Amaranthus spp.) is prevalent in most of Oklahoma's cotton production areas. Its prolific nature and unrivaled ability to spread over broad geographies guarantee its continued status as "enemy number one" in the cotton patch. Regardless of whether conventional or minimum tillage is used, producers are struggling to effectively control this weed. In addition, Oklahoma's largest commodity crop is winter wheat. Challenging economics and rainfall patterns have facilitated adoption of no-till production practices in that crop. Unfortunately, heavy dependence upon glyphosate-only treatments for summer weed control in no-till wheat systems has increased the frequency and the distribution of pigweed control failures across the state. Given the ability of various pigweed species to hybridize within its genus it is recommended that producers assume all pigweed is glyphosate resistant and plan accordingly. As recommendations evolved to battle this problem, researchers and producers quickly arrived at three conclusions. First, residual herbicides are a foundational requirement. Second, success is currently dependent on the effectiveness of Liberty (glufosinate) herbicide. Thirdly, new technologies cannot arrive soon enough. Unfortunately, all of these come with their respective challenges.

A grower must realize that cotton production with a "residual free" weed control system is not possible. While most of the residual herbicide options available to growers have been around for quite some time, they should be reminded of their effectiveness. In addition, many growers battling resistance in the Southwest lack personal experience with the Liberty Link herbicide system and its value as it relates to GR pigweed. Lastly, when new technologies (e.g. dicamba or 2,4-D tolerance) become available, producers need to understand that a return to the past (dependence on a single POST herbicide) is only a prescription for repeating history. Utilizing new POST options and maximizing the value and benefits of these systems will continue to depend on the use of foundational residual herbicide programs. Evaluating new systems that integrate residual herbicides will be critical for success in the future.

Three projects were established in 2015. One was designed to educate producers concerning current residual herbicide options and their relative value. Another project was implemented to evaluate the effectiveness of the Liberty Link system with respect to glyphosate resistant pigweed management. The final study was to assess benefits of residual herbicide integration into a Bollgard II® Xtendflex™ Cotton System. The three objectives of this presentation were to re-establish the effectiveness of residual herbicides, to highlight currently available POST control options (Liberty Link System) and to establish the effectiveness of emerging POST technology.

Materials and Methods

In 2015 the Residual Herbicide Trial was established prior to planting in a cotton field previously observed to have a glyphosate resistant population of (primarily) Palmer amaranth. The density of this population was high enough to result in complete crop failure and total abandonment in 2014. Six residual herbicides were applied May 1 to a no-till field (cotton after cotton system) near Altus. No pigweeds were emerged at the time of application due to prior treatment with paraquat. These six herbicides were Valor, Prowl H2O, Warrant, Dual Magnum, Caparol and Direx. Applications were made with a standard high clearance research sprayer delivering 10 gallons per acre (GPA) of spray volume at a speed of 3 miles per hour (MPH). Teejet 110015 "Turbotee" nozzles were used to make the application. Treatment performance was evaluated at both 14 and 30 days after treatment (DAT). Results are presented in Figure 1.

The Pigweed Control with Liberty and Anthem® Flex Project was established near Altus to evaluate the effectiveness of a Liberty Link System with the integration of residual herbicides. The effectiveness of two Liberty Link treatment programs was evaluated in FiberMax 1944GLB2 planted June 5. The first system consisted of Caparol + Liberty applied preemergence (PRE) followed by Liberty alone at the early POST (POST) timing followed by Aim + Direx postemergence-directed (PD). The second consisted of the same Caparol + Liberty PRE application also followed by Liberty alone early POST followed by Anthem® Flex + Liberty PD. All PRE and POST applications were made with a high clearance research sprayer delivering 15 GPA with a medium spray droplet provided by Teejet "Turbotee" nozzles. PD applications were made with a Redball 420 Layby Hood also delivering 15 gallons per acre spray volume with a medium spray droplet. Specific herbicide rate information and weed control observations made 30 days after PRE (30DAPRE), 27 days after post 1 (27DAP1) and 10 days after post 2 (10DAP2) are presented in Figure 2.

The third project was Pigweed Control in a Bollgard II® Xtendflex™ System. A dicamba-tolerant variety was planted June 5 near Altus. Five treatment programs were evaluated for the control of palmer amaranth. Two numbered compounds were evaluated within these programs, Mon 119096 (a new ultra-low volatility formulation of dicamba) and Mon 76832 (a combination of the same dicamba with glyphosate). Caparol was applied PRE alone or with Mon 119096 (M119) followed by two POST applications, either Mon 76832 (M768) with or without Warrant, or Liberty alone. This was compared to PRE applications of M119 + Warrant followed by two POST applications of M768, the first of which was also tank-mixed with Warrant. All applications were made with Teejet "Turbotee induction" nozzles delivering 10 GPA in an ultra-coarse spray droplet. Specific herbicide rate information and treatment performance are presented in Figure 3.

Results and Discussion

The Residual Herbicide Trial site received approximately 1 inch of activating rainfall 5 days after application. An additional 10 inches of rainfall were received during the following three weeks. As indicated in Figure 1, excellent pigweed control (100%) was observed 14 DAT from plots receiving Valor applied at 2 oz/ac. Similar control (97-100%) was observed from plots receiving Prowl H2O applied at 1 qt/ac, Warrant applied at 3 pt/ac, and Dual Magnum applied at 1.3 pt/ac. Slightly less control (89-90%) was observed in treatments that received Caparol applied at 1 qt/ac or Direx applied at 1 qt/ac. Observations at 30 DAT indicated that Valor controlled pigweed 95%, Warrant 93%, Dual Magnum 91%, and Prowl H2O 85%. Applications of Caparol and Direx controlled pigweed 59% and 65%, respectively, 30 DAT.

The Pigweed Control with Liberty and Anthem® Flex Project site received approximately 1.75 inches of activating rainfall within ten days of the PRE applications. An additional 1.8 inches of rainfall was noted over the next two weeks. Insufficient control (65-68%) of pigweed was observed 30 DAPRE treatments of Caparol at 1 qt/ac plus Liberty applied at 29 oz/ac (Figure 2). Both treatment programs received an additional application of Liberty applied at 29 oz/ac at this timing. Control from these treatments diminished to 80-81% by 27 DAP1. Excellent pigweed control (100%) was observed 10 DAP2 in treatments that received PD applications of Anthem® Flex applied at 1.82 oz/ac plus Liberty applied at 29 oz/ac. Similar control was observed in plots that received PD applications of Aim applied at 1.25 oz/ac plus Direx applied at 1 qt/ac plus crop oil concentrate at 1% v/v.

PRE treatments in the Pigweed Control in a Bollgard II® Xtendflex™ System were activated within ten days of application. Mild temperatures and adequate soil moisture resulted in excellent early POST activity. Although late-season rainfall was limited, irrigation provided sufficient soil moisture to produce good herbicidal activity from all treatments. Excellent, season-long weed control (100% 14DAP2) was observed in plots that received PRE applications of Caparol at 1 qt/ac plus M119 at 22 oz/ac followed by early POST applications of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by late POST applications of M768 at 64 oz/ac. Similar control (96-98%) was observed in plots that received PRE applications of Caparol at 1 qt/ac followed by POST applications of M768 at 64 oz/ac with or without Warrant at 3 pt/ac. PRE applications of M119 at 22 oz/ac plus Warrant at 3 pt/ac followed by early POST treatments of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by late POST applications of M768 alone at 64 oz/ac also controlled pigweed 96%. PRE applications of Caparol alone at 1 qt/ac followed by early POST applications of M768 at 64 oz/ac followed by late POST applications of Liberty at 29 oz/ac provided significantly less pigweed control (85%) 14 DAP2.

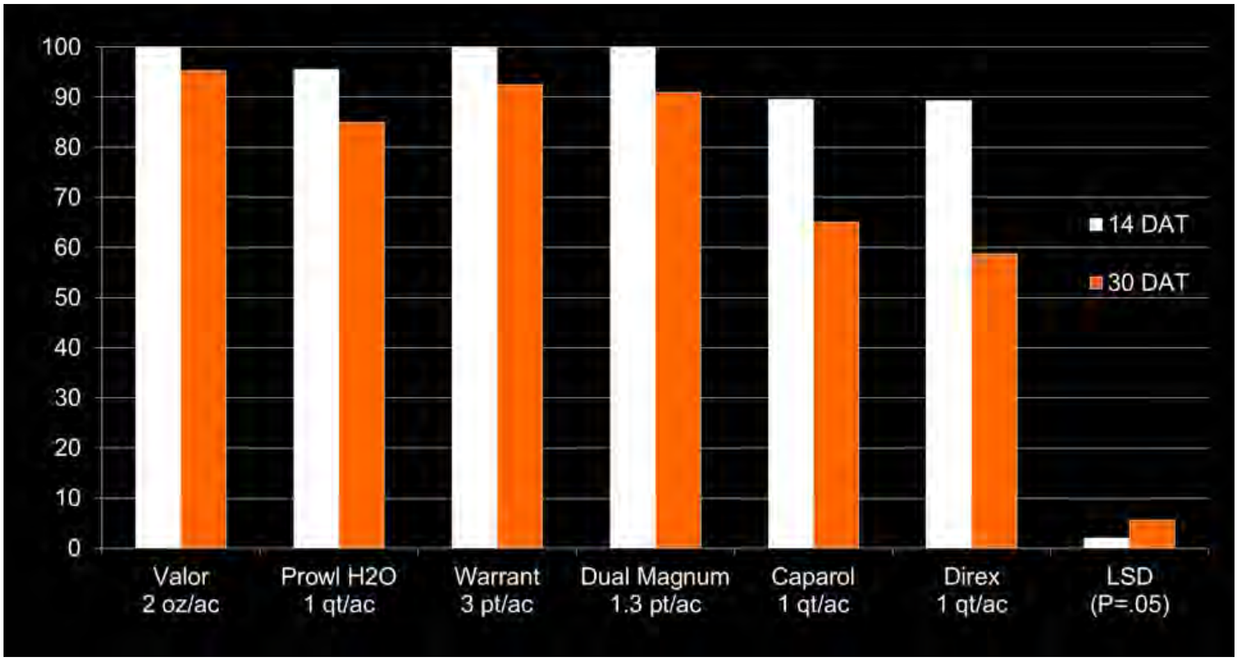


Figure 1. Pigweed Control with Residual Herbicides

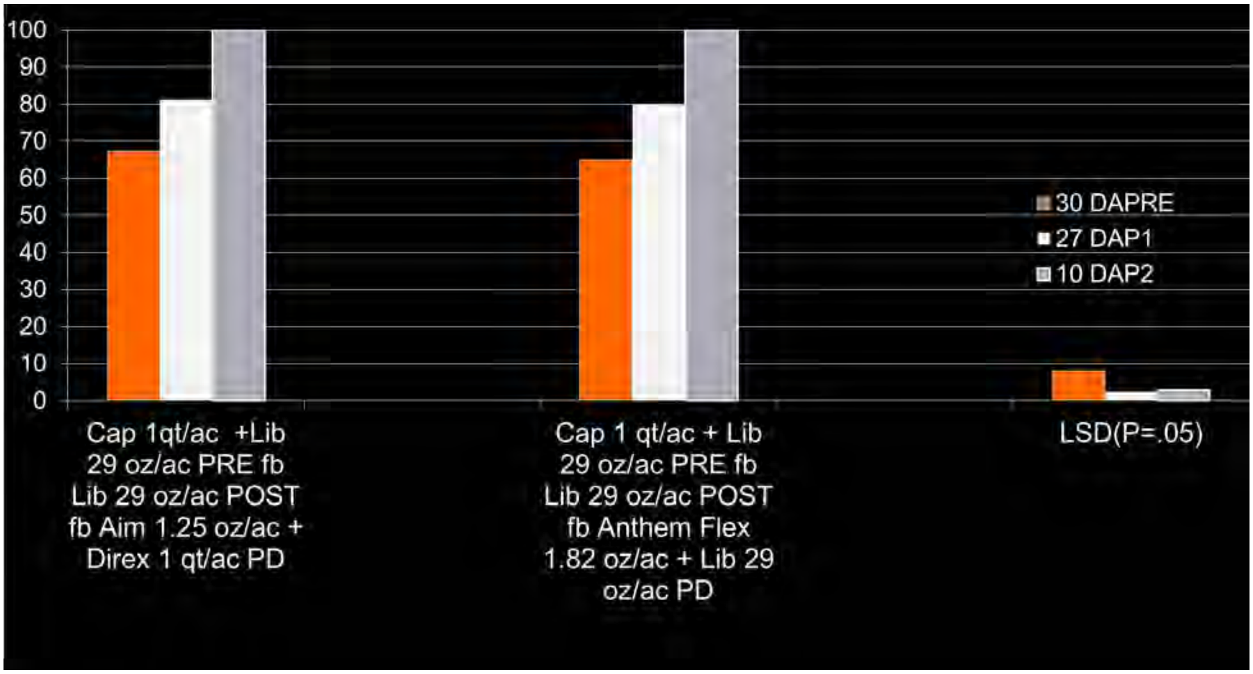
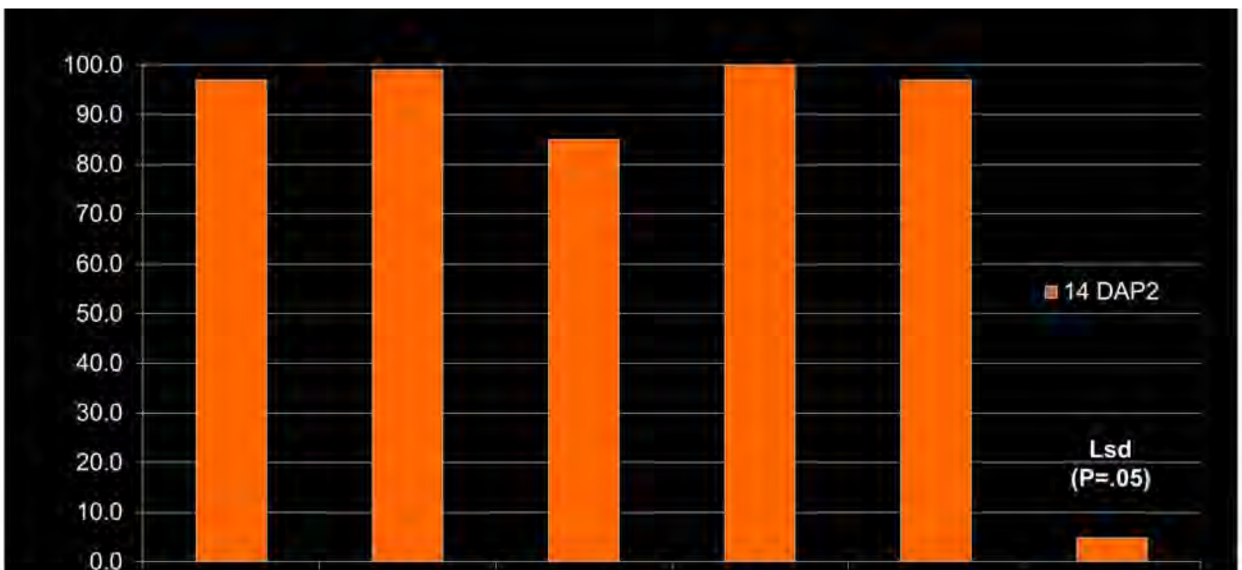


Figure 2. Pigweed Control with Liberty and Anthem Flex



	Trt 1	Trt 2	Trt 3	Trt 4	Trt 5
PRE :	M119+Warr 22 oz/ac+3 pt/ac	Cap 1 qt/ac	Cap 1 qt/ac	Cap+M119 1qt/ac+22 oz/ac	Cap 1 qt/ac
EP:	M768+Warr 64 oz/ac+3 pt/ac	M768+Warr 64 oz/ac+3 pt/ac	M768 64 oz/ac	M768+Warr 64 oz/ac+3 pt/ac	M768 64 oz/ac
LP:	M768 64 oz/ac	Liberty 29 oz/ac	Liberty 29 oz/ac	M768 64 oz/ac	M768+Warr 64 oz/ac+3 pt/ac

Figure 3. Pigweed Control in a Bollgard II Xtendflex System

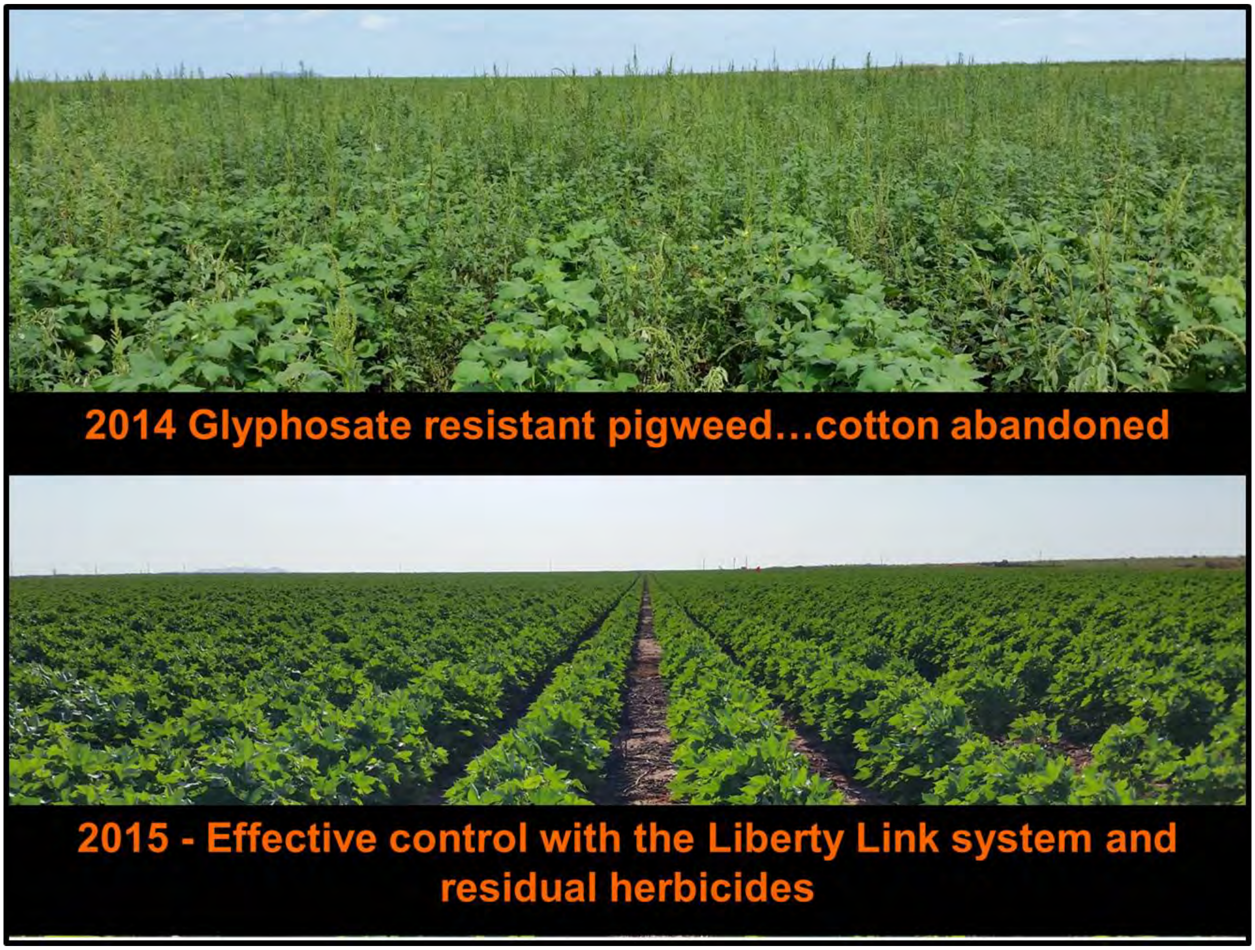


Figure 4. Comparison of abandoned cotton to same field utilizing residuals in Liberty Link system.

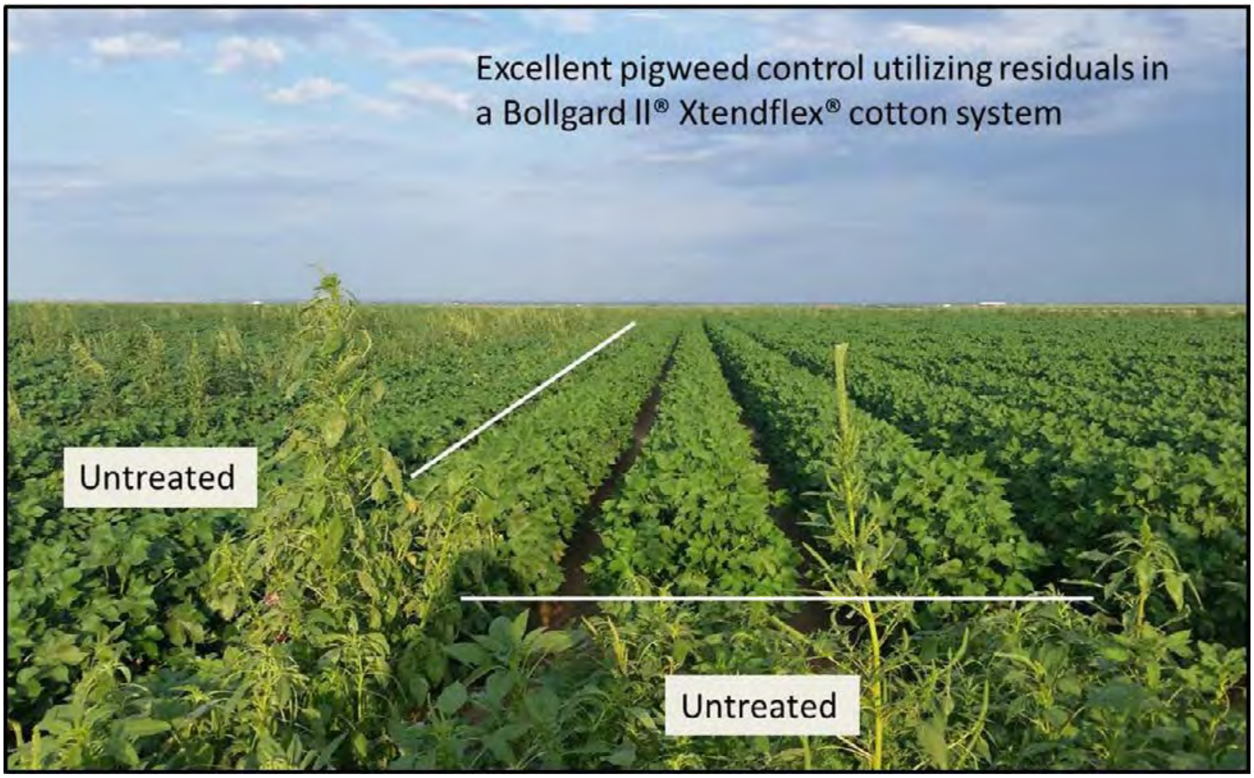


Figure 5. Effective season-long control of pigweed utilizing residuals in a Bollgard II Xtendflex system.

Summary

Though most residual herbicides used in this project may not be new to the marketplace, this data suggests that they will provide effective control of GR pigweed. Even though 2015 had above average rainfall, treatments still performed very well. While growers in the Southwest tend to overlook residual products due to the required, timely, activating rainfall, there are no better alternatives. While excellent GR pigweed control was observed from many of these treatments beyond thirty days, it is important to point out that good control does not mean that pigweeds are not present. In fact, many times there are relatively few compared to the untreated. Therefore, under normal circumstances one should expect additional POST applications to be required to maintain 100% control to 30 days and beyond. Many producers are beginning to turn to the only technology left that can provide adequate pigweed control across multiple species since the Staple LX label only lists suppression of Palmer amaranth. However, there are additional points to consider. Liberty herbicide performance is very sensitive to weed size, spray volume, droplet size, speed at application and environmental conditions. Traditionally in the Southwest, these factors need to be in our favor to obtain satisfactory results. Although we have no control over the weather, success is highly dependent on other factors clearly listed on the product label that we can control. Lastly, due to the extensive proliferation of GR pigweed, growers are poised to adopt any new, effective POST technology coming in the near future. There are two important components of the take-home-message. First, dicamba technology works very well when used properly and it is expected to come with important label requirements. When guidelines are followed very good pigweed control can be achieved. While this work indicates that there are several combinations of residual and POST herbicides that produce effective season-long control, the omission of residual herbicides resulted in significantly decreased control. Residual herbicides must be the foundation of any program - now or in the future, with expectations of season long control.

Disclaimers

This information is for educational purposes only and is not an offer to sell Mon 76832™, Mon 119096™, Bollgard II® XtendFlex™ or Roundup Ready 2 Xtend™ or Engenia. These products are not yet registered or approved for sale or use anywhere in the United States.

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RELIABILITY TESTING OF AN ON-HARVESTER COTTON WEIGHT MEASUREMENT SYSTEM

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Abstract

A system for weighing seed cotton onboard stripper harvesters was developed and installed on several producer owned and operated machines. The weight measurement system provides critical information to producers when in the process of calibrating yield monitors or conducting on-farm research. The objective of our work was to conduct system reliability testing and obtain producer feedback on the operation and utility of the system. The system was modified from the system used in 2014 to include new hydraulic system components and a simplified user interface; all of which were added to improve accuracy, data reliability, and ease of operation. Observed accuracy was similar to that observed in 2014. Recommended practices to ensure high weight accuracy in regard to mitigating the effects of wind, vane position, and tare/weight routine operation were developed. Overall, the cooperating producers provided positive feedback on the weight measurement system. Several noted that the system was easy to use, reliable, and provided valuable information.

Introduction

The objective of this work is to develop a system used onboard a cotton harvester for obtaining seed cotton weight data. This system can be used to measure seed cotton weight on a full basket or partial basket basis, thereby enhancing the ability for a producer to conduct on-farm research to evaluate the yield influence of various treatments applied on a small-plot basis (e.g. variety, tillage, irrigation, chemical, etc.) Further, seed cotton weight data can be used to calibrate yield monitor systems on a semi-continuous basis as crop conditions or varieties change throughout a field. Work began in 2013 on the development of this system and continued in 2014 and 2015. This report details the research conducted in 2015.

Materials and Methods

The main goal of our work in 2015 was to install the weight measurement system on several producer owned and operated cotton strippers and evaluate system performance and reliability. Development work during 2013 and 2014 indicated that the system provided accurate weight measurements using a simple linear regression model based on hydraulic lift circuit pressure (figure 1). The two part model shown in figure 1 was used in 2015 and is based on hydraulic pressure measurements collected with the basket stopped at 13.7 +/- 0.2 degrees from the fully down position in the dump rotation cycle. Based on our work in 2014, industrial limit switches were installed at the rear of the cotton strippers (figure 2) in 2015 to sense the position of the basket and stop it at the specified location for reading the basket lift cylinder circuit pressure. Hydraulic pressure was measured using a pressure transducer with 0 – 2500 psi pressure range from Omega Engineering (PX409-2.5KG5V-EH, error specification +/- 0.05% FS = +/- 1.25 psi).

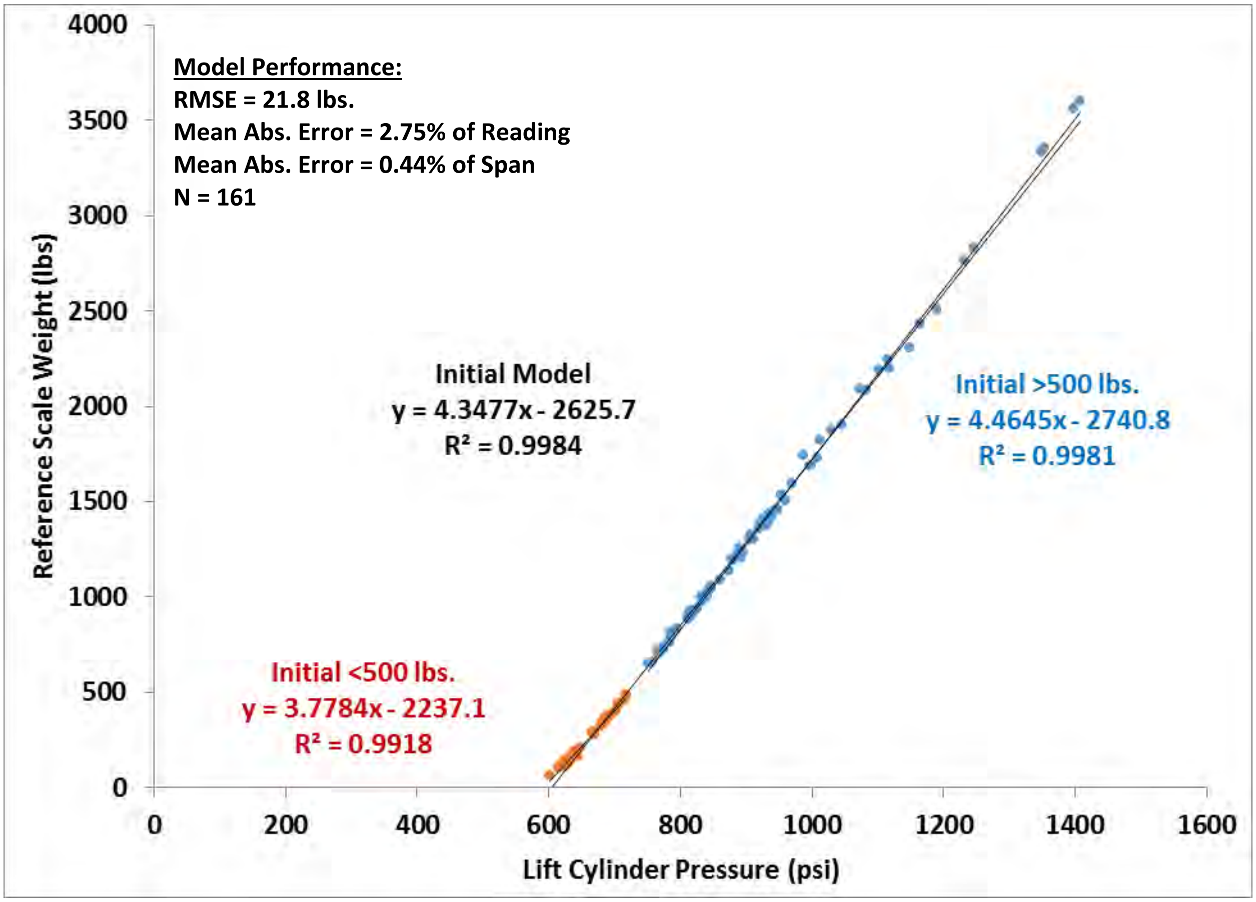


Figure 1. Two part model for cotton load weight as a function of lift cylinder hydraulic pressure.

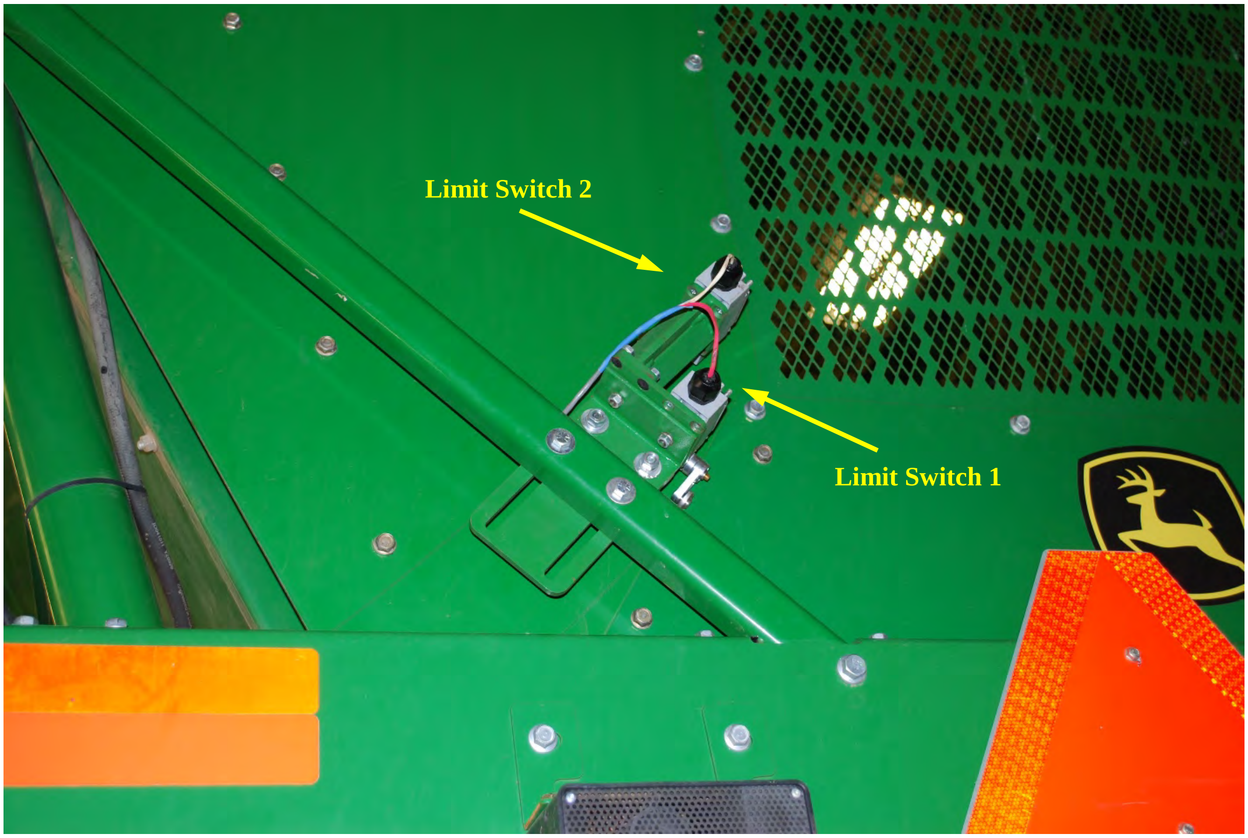


Figure 2. Limit switches mounted at the rear of the basket used to slow and stop the movement of the basket.

A microcontroller on the chassis mounted data acquisition (DAQ) board was used with a proportional directional control valve (DCV) to automate the basket positioning cycle (figure 3). When commanded to move the basket into position by the cab mounted PC, the microcontroller sends a pulse width modulated (PWM) current signal to the proportional DCV hydraulic valve that sends pressurized fluid to the lift cylinder circuit (figure 4). The microcontroller senses the position of the two limit switches mounted on the rear of the machine to sense the presence/position of the basket. The two switches are offset such that when switch one actuates, the microcontroller reduces the duty cycle of the PWM signal, effectively slowing the basket movement. When switch 2 actuates, the microcontroller stops the PWM signal and basket movement. Once the basket stops after switch 2 actuates, the system delays for 0.5 s before closing two hydraulic isolation valves that block flow to and from the top and bottom ports on the lift cylinders. The delay allows any pressure on the top side of the cylinders resulting from the basket movement to dissipate, thus reducing pressure measurement error caused by trapped pressure at the rod end of the cylinders. After the delay, the microcontroller begins reading the voltage signals from the hydraulic pressure transducer. The pressure transducer is read for a preset period that is specified by the user. A filtering scheme is used to reduce weight error caused by hydraulic "noise" induced by stopping the basket, wind, and other sources. The filtering scheme disregards the first third of the data read from the transducer over the reading duration and calculates and records the average of the last third of the data as long as the difference in hydraulic pressure between the average of the middle third and last third of collected data is not greater than the hydraulic pressure threshold set during installation. A reading period of 8 to 12 seconds was used in 2015 with a hydraulic stability threshold of 5 psi.

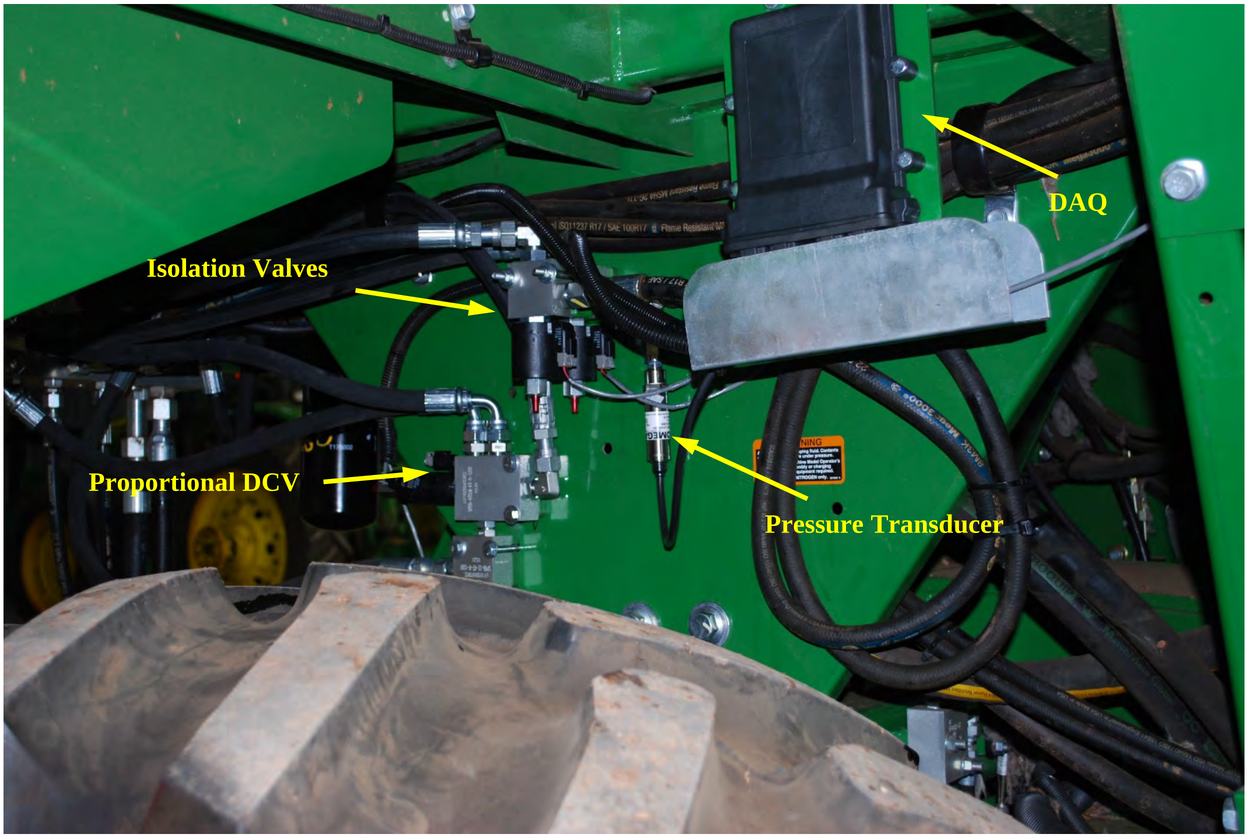


Figure 3. Hydraulic valves, pressure transducer, and DAQ board (inside the black box) used to control basket position and measure basket hydraulic pressure.

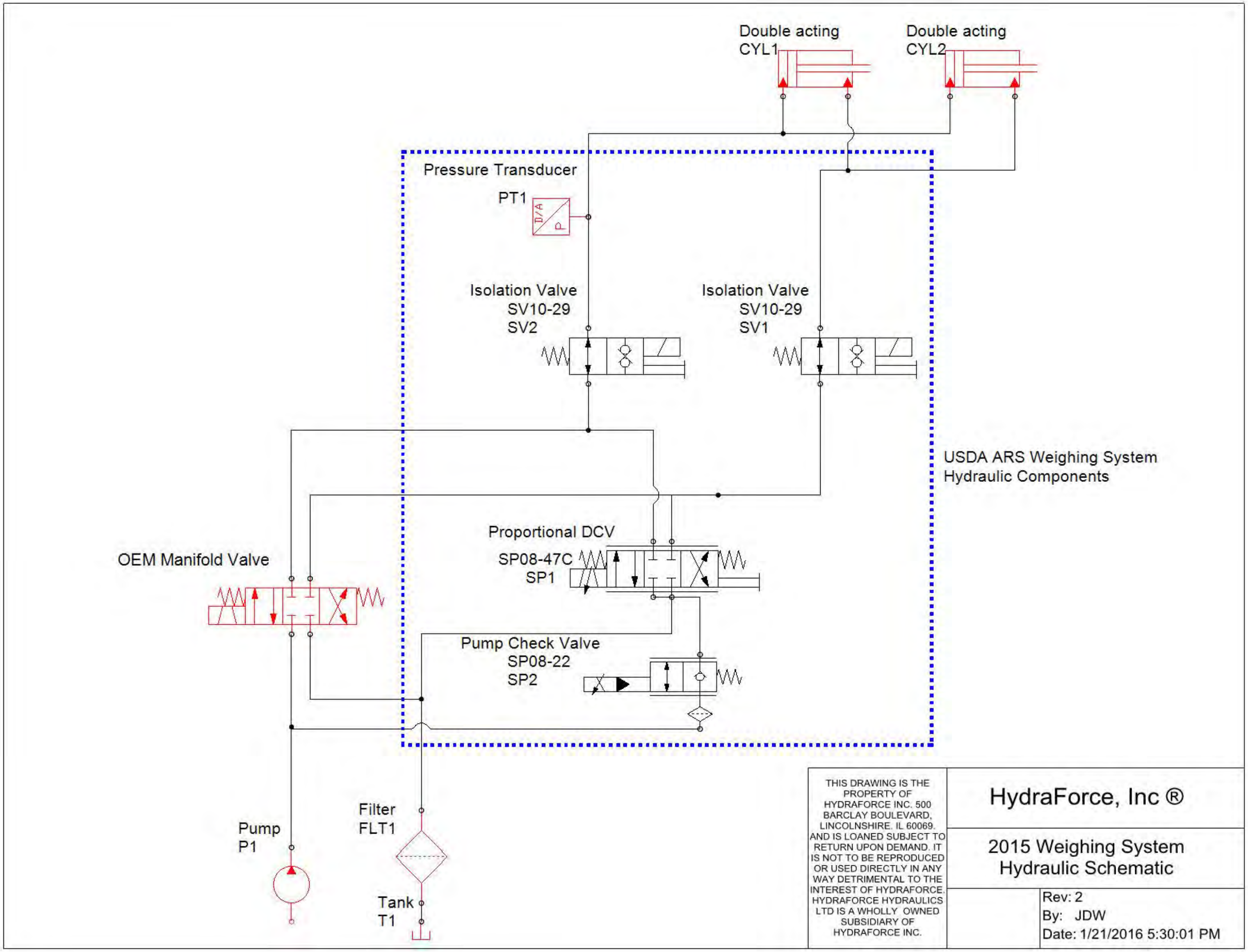


Figure 4. Schematic of hydraulic components used in the weight measurement system in 2015.

A touch screen display and mobile PC mounted in the cab (figure 5) was used with custom written software to control the weight measurement system and record system data from the DAQ board. The DAQ board communicates with the PC via serial communication. In 2015, the DAQ board and PC were configured to power up when the operator switched the ignition key to the run position. The computer was configured to automatically initialize the weight measurement system software upon boot-up. Once initialized, the software opens up to the "Setup" page (figure 6) where the operator populates the client, farm, and field text boxes and selects the radio button corresponding to the current wind conditions – calm (0 – 10 mph), normal (10 – 15 mph), or windy (>15 mph). The operator also inputs values for the header width (number of row units) and row spacing (row unit width, in) on the "Setup" page before pressing "OK" to proceed to the main "Run" page.

Figure 5. Weighing system touch screen display (right) and John Deere 2630 yield monitor display mounted in the cab of a John Deere 7460 cotton stripper.

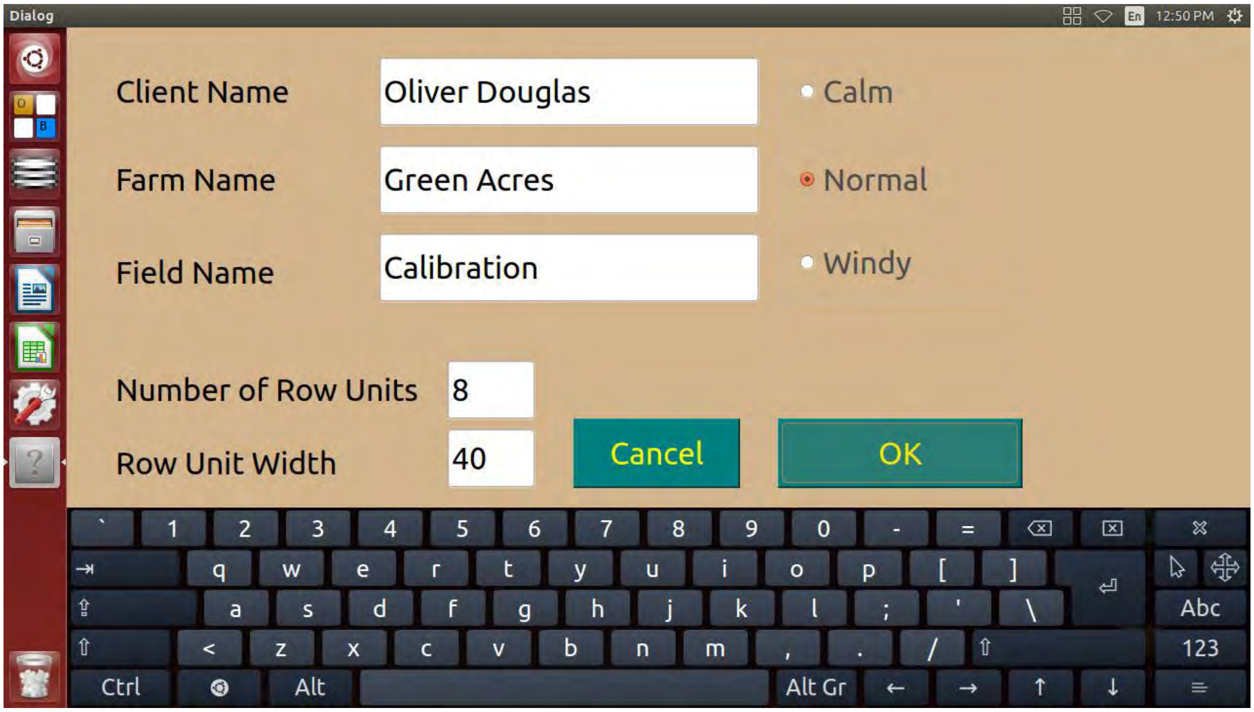


Figure 6 – “Setup” page of weight measurement system software.

The main “Run” page (figure 7) displays the current farm and field entered by the operator and provides an indication for when the system is properly communicating with the GPS receiver and the DAQ board. Prior to harvesting cotton, the system tare function is used to adjust the calculated weights for the empty basket weight including any accumulation of cotton not cleaned from the basket. To perform the tare function, the operator presses the “Tare” button and the system initiates the basket auto-positioning cycle and measures the empty basket weight. The basket tare weight is saved by the system and used to adjust all subsequent basket weights until the tare function is performed again. When the operator is ready to begin harvesting a plot, the harvester is moved to the beginning of the plot and the operator presses the green “area start” button and begins harvesting. With the “area start” button pressed, the system continuously updates and displays the total distance traveled and area harvested (based on distance and header width) until the operator presses the red “area stop” button [at the end of the plot]. With the machine on level ground, the operator presses the blue “weigh basket” button to begin the automatic basket positioning cycle and measure the weight of the cotton in the basket. Once the weight has been determined, the system displays the load number, area harvested, basket weight (lb), and calculated yield (lb/acre). The load number assigned to each basket weight is a sequential number that never repeats even if the machine and weighing system are shut down. The data displayed on the screen for each load number is saved in a comma delimited text file along with the “setup” page data and values for hydraulic stability, measured lift cylinder pressure, GPS coordinates and UTC time where the “area start” and “area stop” buttons were pressed.

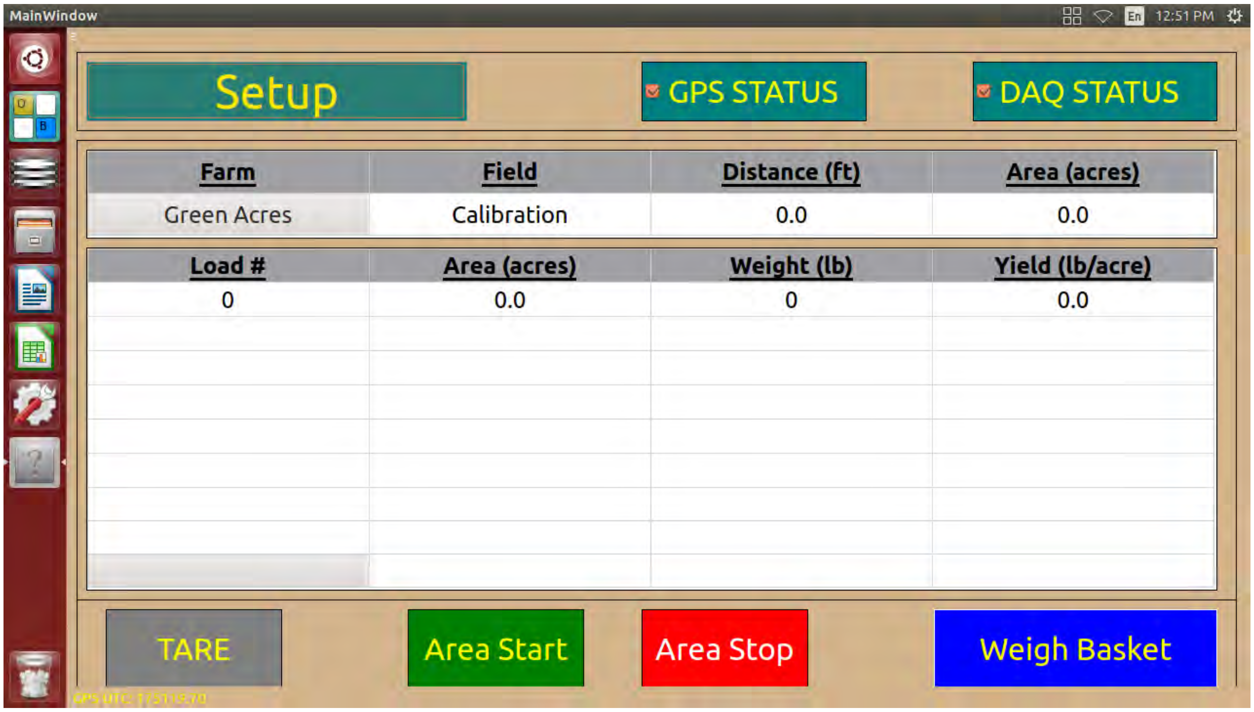


Figure 7. Main “Run” page of weight measurement system software.

In 2015, weight measurement systems were installed on four cotton strippers: a 2014 model JD 7460 owned by Danny Davis, Elk City, OK (Elk City stripper); a 2011 model JD 7460 owned by USDA ARS, Lubbock, TX (USDA stripper); a 2005 model JD 7460 owned by Mark and David Appling, Crosbyton, TX (Crosbyton #1 stripper); and a 2004 model JD 7460 owned by Mark and David Appling, Crosbyton, TX (Crosbyton #2 stripper). Although the amount of weight data collected with each machine varied, a minimum of about 40 loads were harvested using each machine for which corresponding reference weights were also measured using a set of mobile scales. Operators differed in regard to personality and the amount of attention paid to ensure that the system was operated to achieve high accuracy. An operator’s manual was developed for the weight measurement system and provided to each operator prior to the beginning of harvest in 2015.

Results and Discussion

2015 System Performance
After installation of each system, the weight system calibration was verified using a reference scale and approximately five baskets of cotton ranging in weight from about 500 to 2500 lbs. The weights reported by the harvester based system agreed well with the reference scale weights for each installation. Differences in the initial tare values measured for the clean/empty basket weights were observed and were attributed to slight differences in year model. Regardless, the tare function was able to adjust for these differences allowing the system to report accurate weights.

Harvester weight system and reference scale cotton weights are plotted for the systems installed on the Crosbyton #1, USDA, and Elk City strippers in figures 8, 9, and 10, respectively. Data for the system installed on the Crosbyton #2 stripper is under analysis and will be reported in later publications. The slopes of the regression lines of the data shown in figures 8, 9, and 10 are close to 1.0 indicating a consistent dynamic system response relative to the reference scale over the range of weights tested. The intercepts of the regression lines varied between datasets for a particular stripper (see figures 8 and 9) and also between strippers. The intercepts of the regression lines are influenced by the tare value obtained on the stripper prior to the harvest of each field trial. Moreover, differences in the influence of wind on reference scale weights and weights determined by the harvester weight system are manifest in differences in the regression line intercepts. RMSE values indicating the error in weight measurement of each system over the range of values shown in figures 8, 9, and 10 were 61.7, 28.9, and 35.6 lb for the Crosbyton #1, USDA, and Elk City strippers, respectively. The data presented in figure 8 was collected on two days, each with a different tare value and range in measured weights. The RMSE value for the Day 1 data was 32.6 lb and increased to 88.4 lb for the Day 2 data. RMSE expressed as a percentage of span was 2.3%, 2.07, and 1.7% for the Crosbyton #1, USDA, and Elk City strippers, respectively.

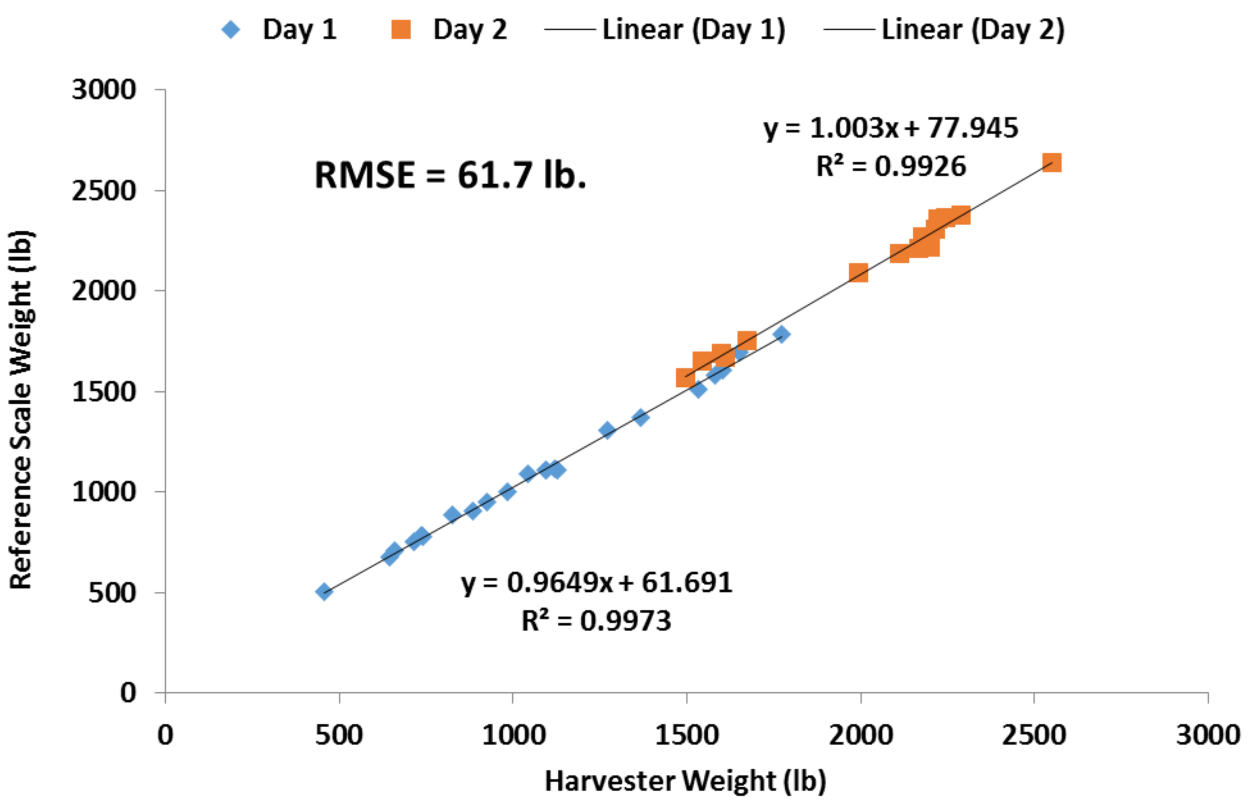


Figure 8. Harvester weight system and reference scale weights for the Crosbyton #1 stripper.

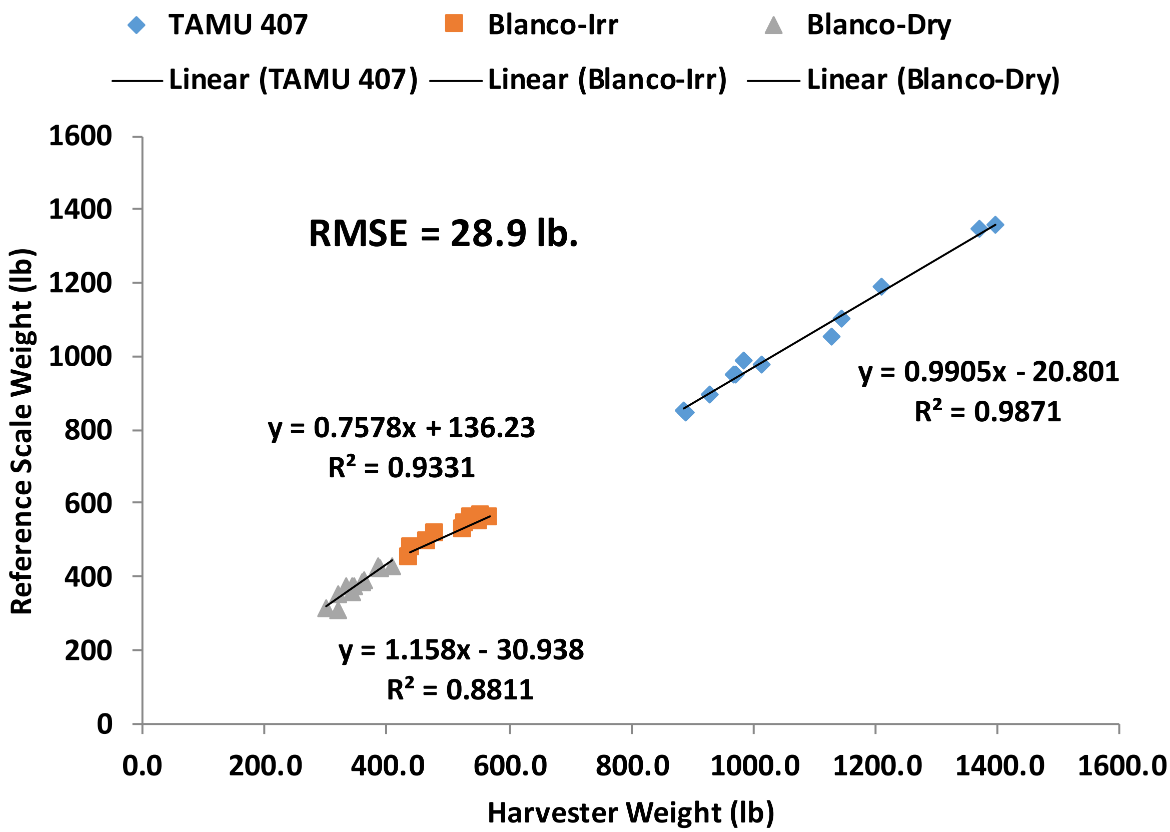


Figure 9. Harvester weight system and reference scale weights for the USDA stripper.

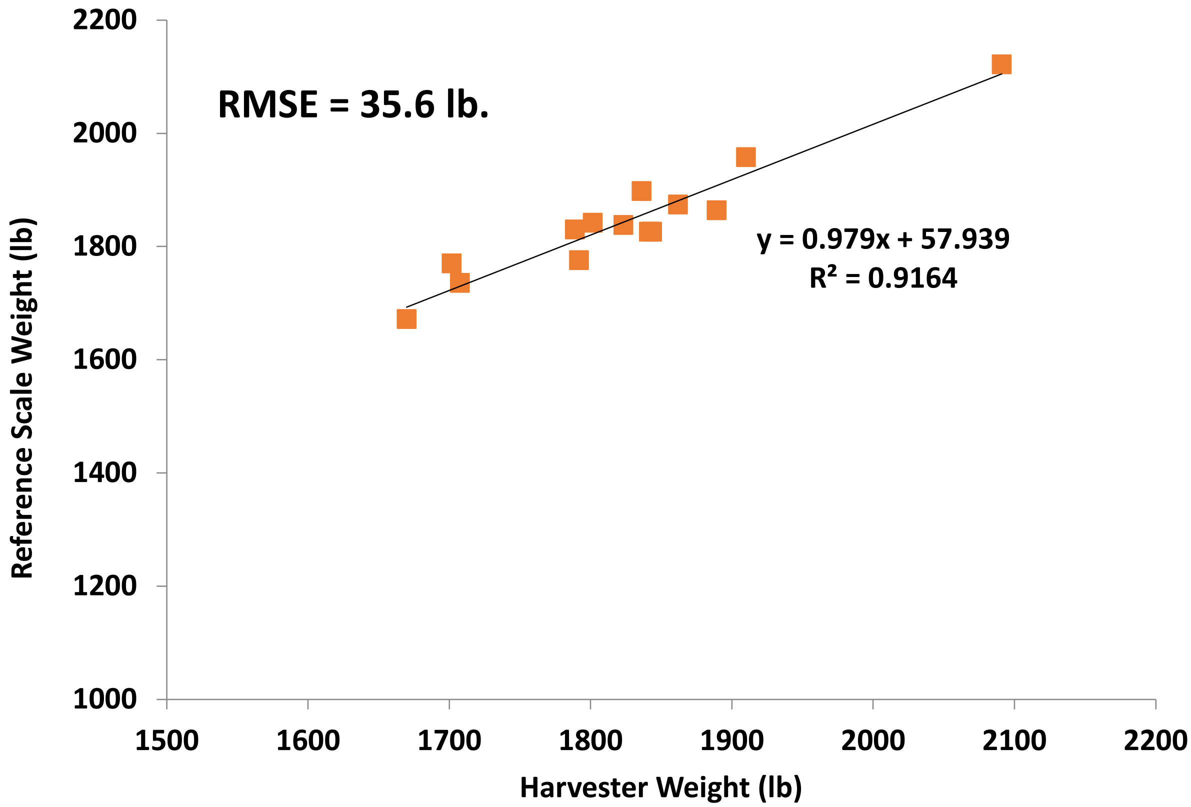


Figure 10. Harvester weight system and reference scale weights for the Elk City stripper.

Operation of the tare function was investigated on the Elk City stripper during harvest of a replicated variety test. In concept, the tare function is considered to be a tool which should be used frequently to improve weight measurement accuracy. Thus, the system was operated for the first 10 loads by performing an initial tare prior to initiation of harvest and then conducting a tare operation after each basket load of cotton was dumped. This practice in combination with varying winds produced poor weight accuracy as illustrated in figure 11. Subsequently, a single tare operation performed prior to the beginning of harvest of a particular field test was recommended to prevent the inclusion of additional error resulting from erratic tare weights. This single tare operation was used to collect the data presented in figures 8, 9, and 10.

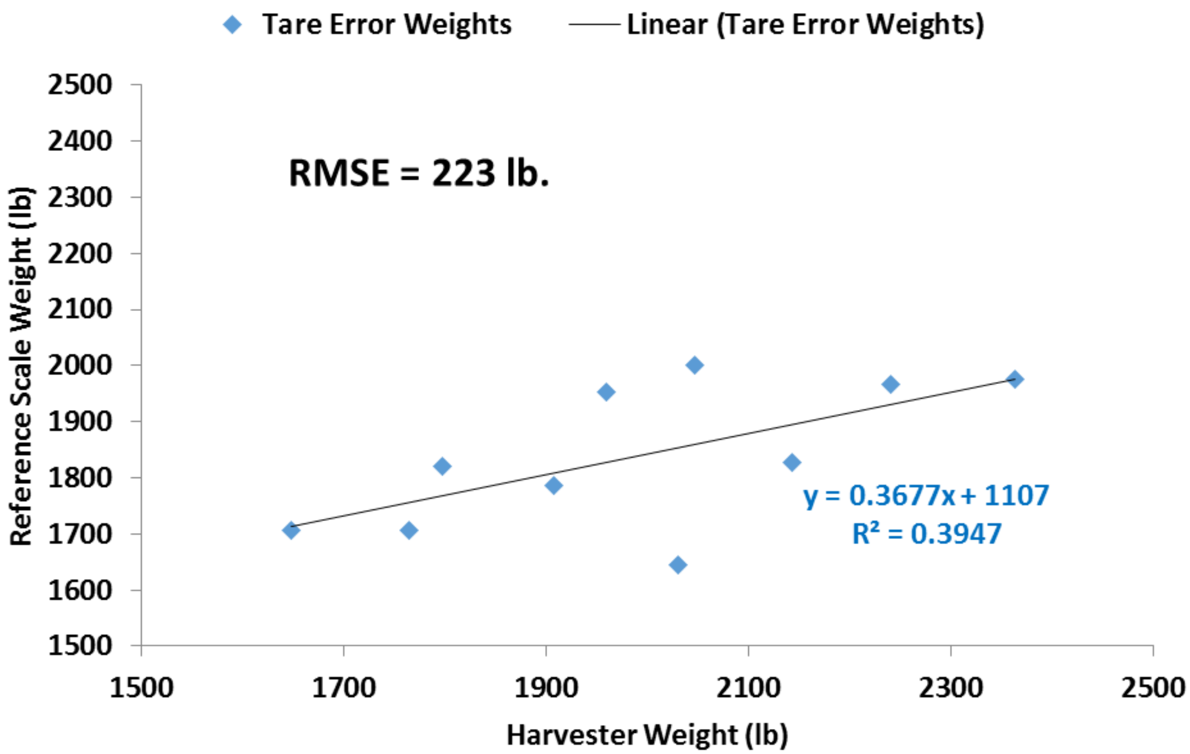


Figure 11. Harvester weight system and reference scale weights for the Elk City stripper when performing the tare function after each basket load of cotton was dumped.

2015 Field Observations and Operator Feedback

Field observations of system performance lead to the following best operating practices:

- All weight and tare functions should be performed with the compactor vanes held in the same position each time. A weight difference of about 100 lbs results from weighing the basket with the vanes in the left vs. right position. Our preference is to position the vanes fully left when operating the weight measurement system.
- All weight and tare functions should be performed with the harvester on level ground and with the machine operating in the same state (i.e. with the header off, field cleaner on, fan on, engine at full throttle).
- Perform the tare routine multiple times (one right after another) at the beginning of a test prior to running any weigh routines so that the system will cycle warm hydraulic fluid through the valves. Perform at least 4 to 6 tare routines so that the tare weight stabilizes and the most recent 3 tare values are within 10 lb of one another. The system will store only the last tare value determined.
- Perform all tare routines with the harvester heading in the same direction as you plan to conduct each basket weigh routine.
- Perform all basket weigh routines in the same direction each time.
- Weight measurement repeatability was good with the standard deviation of 3 repeated measures on one basket load of cotton less than 10 lb. To obtain higher reliability in weight measurements, it is advisable to conduct several (3 – 5) weigh routines on each basket load of cotton.
- If using a weigh wagon or mobile scale system, make sure to conduct all tare and weigh routines with the harvester oriented with the wind in the same way as the reference scale basket. For example, with an east wind (wind blowing from the east) orient the reference scale basket so that it dumps cotton with the wind and also orient the harvester such that it dumps with the wind with the header to the north.
- Operators must be attentive to the system to make sure that the correct load numbers are associated with the corresponding treatment information (e.g. plot number, rep number, or other plot identification information). Additionally, operators must be attentive to input the appropriate client, farm, and field information as needed.

In general, the operators were pleased with the performance of the system over the harvest season. Few issues in regard to the reliability of system components were observed. One system experienced a software issue in which the database/software communication failed. This was remedied by reinstalling a fresh version of the software. Three of the four strippers experienced a serial communication failure between the PC and the GPS receiver. The cause of this failure was traced to a loose USB port connection on the PC and the problem was remedied by adding additional support to the connections (e.g. properly placed tape). Two of the strippers experienced minor hydraulic leaks caused by poorly crimped hose connections. The hoses were replaced to fix the leaks. No failures were experienced with any of the main system components including hydraulic valves, limit switches, pressure transducers, DAQ board electrical circuits, computers or touch panel displays. Suggested improvements to the system for future installations should consider moving away from USB communication ports to better supported DB9 serial ports (vibration caused connection issues); improve the display and computer mount to reduce vibration; a hydraulic system design which incorporates the valves into a single piece manifold block to reduce hose requirements; and a cover for the limit switch bracket which helps keep cotton from falling on the limit switches.

Summary

The harvester weight measurement system was installed on four cotton strippers in 2015 to evaluate system performance and reliability. The system developed in 2014 was used in 2015 with slight modifications to the hydraulic system and software to improve weight accuracy and ease of use. The system performed as expected with weight measurement errors about equal to that observed in 2014. Although operation of the system was simplified through the new software interface, an attentive operator remains an absolutely necessary part of the system to ensure high weight measurement accuracy and data quality. Recommended operating practices to mitigate the effects of wind were developed. Over the 2015 harvest season, few minor system component failures were experienced and were quickly remedied. The weight measurement system is capable of measuring accurate load weights and is a useful tool in conducting on-farm research and in the calibration of cotton yield monitors.

Acknowledgements

Thank you to the cooperating producers for allowing us to install the systems on their harvesters and collect data during harvest. They invested a significant amount of time and effort in working with us and learning to use the system. The authors gratefully acknowledge the financial support of Cotton Incorporated in this research.

2015 Red River Crops Conference

Planning for a new Extension crop production conference specifically tailored to agricultural producers in north Texas and southwest Oklahoma was initiated in the summer of 2013. The inaugural 2014 Red River Crop Conference brought together resources of two land-grant institutions - Texas A&M AgriLife Extension Service and OSU - Oklahoma Cooperative Extension Service and was held at Altus. For the 2015 year, the conference was designated to rotate to Childress, TX. The 2015 planning committee included: Stan Bevers, Professor & Extension Economist, Texas A&M AgriLife Extension Service, Vernon; Dr. Randy Boman, Research Director and Cotton Extension Program Leader, Oklahoma Cooperative Extension Service, Altus; Michael Bowman, Foard County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Crowell; Aaron Henson, Tillman County Extension Educator, Oklahoma Cooperative Extension Service, Frederick; Lonnie Jensche, Childress County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Childress; Dr. Emi Kimura, Assistant Professor and Extension Agronomist, Texas A&M AgriLife Extension Service, Vernon; Charity Martin, Harmon County Extension Educator, Oklahoma Cooperative Extension Service, Hollis; Jason Pace, Area Agricultural Economist, Oklahoma Cooperative Extension Service, SW District, Duncan; Langdon Reagan, Wilbarger County Agricultural Agent, Texas A&M AgriLife Extension Service, Vernon; Steven Sparkman, Hardeman County Agricultural Extension Agent, Texas A&M AgriLife Extension Service, Quanah; Gary Strickland, Jackson County Extension Educator, Oklahoma Cooperative Extension Service, Altus; Dianna Thompson, Southwest Technology Center, Altus; and Katy White, Collingsworth County Agricultural Agent, Texas A&M AgriLife Extension Service, Wellington.

The planning committee met regularly beginning in the spring of 2014. As a result of each meeting, the group developed the agenda, initiated the promotion, and designed the evaluation of the conference. In 2015, the conference was held at the Fair Park Auditorium in Childress, on January 27th and 28th. The first day was considered an in-season and summer crops day while the second day covered cotton exclusively. Promotion for the program began in October 2014 for the conference. Funding for the conference was accomplished via two methods. First, participants were charged a

$25.00 registration fee. This helped to cover the meals, refreshments, and brochures. Second, sponsors were solicited to support the conference at various levels of support of their choosing. These included the Signature sponsor, Platinum sponsor, Gold sponsor, Silver sponsor, or Bronze sponsor. Twenty-five agri-businesses chose to support the conference. These included: Signature Sponsors – the City of Childress and Childress Chamber of Commerce, Oklahoma Cotton Council, and Rolling Plains Cotton Growers; Platinum Sponsors – Americot/NexGen, Bayer CropScience, Brandt, Capital Farm Credit, Diversity-D, K-Coe Isom, Monsanto, Netafim, and Producers Cooperative Oil Mill; Gold Sponsors – Crop Protection Services, Dow AgroSciences/PhytoGen Cottonseed, Eco Drip Irrigation, Farmers Coop Society #1 (Wellington, Texas), Farmers Insurance, Helena Chemical Company, Kathy Fowler Insurance, Oklahoma Wheat Commission, Plains Cotton Cooperative Association, Texas Wheat Board and Association, and Western Equipment; Silver Sponsors – United Guar.

Total conference participants noted by meal counts on Day One (other crops day) of the program totaled 106. Cotton Day meals were served to a total of 108 participants. Thus, total participation over the two days totaled 214. In both cases, the conference had an outstanding attendance. Based on daily evaluation results, the average day one participant planted 2,562 acres of crops other than cotton and the average day two participant planted 1,509 acres of cotton.

The Day Two agenda included some of the most respected experts in the cotton industry. The program began with Mark Lange, President and CEO of the National Cotton Council. Dr. Lange is retiring from his current job and was presented with gift of appreciation from both the Oklahoma Cotton Council and the Texas Rolling Plains Cotton Growers Association.   Following Dr. Lange, Dr. John Robinson from Texas provided his opinion of the cotton market and outlook. Dr. Darren Hudson provided an overview of the new Cotton STAX insurance program. Dr. Jason Woodward from Texas provided results from his seed treatment and plant disease work. After lunch, Shane Osborne from Oklahoma and Dr. Ty Witten from Monsanto discussed cotton weed management and the Xtend Flex technology. Dr. Dennis Coker from Texas provided information on cotton fertilizer programs. Finally, Dr. Gaylon Morgan from Texas and Dr. Randy Boman from Oklahoma provided an update on cotton genetics performance in southwest Oklahoma and the Texas Rolling Plains.

Many verbal comments were received by the planning committee about the quality and breadth of the agenda. Participants certainly recommended continuing the conference each year.

Evaluating the Program

To finalize each day of the program, participants were asked to provide their candid responses to an evaluation. These results were compiled following the conference and are provided below.

The first three questions were scaled one to five with one being poor and five being excellent.

Day 1 (Other Crops Day) Results

1. How would you rate the quality of speakers? 4.33 (Frequency: 1=0 observations; 2=0; 3=2, 4=22; 5=15)
2. How would you rate the facilities? 4.56 (Frequency: 1=0 observations; 2=0; 3=0, 4=17; 5=22)
3. How would you rate the overall conference? 4.51 (Frequency: 1=0 observations; 2=0; 3=1, 4=17; 5=21)

Of particular note regarding the first three questions, only three respondents rated either the speakers, the facilities, or the overall conference less than 3. Obviously, the first of the conference was well received. The fourth question captured whether the participants felt as if they would make changes to pending production and/or marketing plans based on the information they received at the conference. The question was scaled such that 1 represented "definitely will not", 3 equaled "undecided" and 5 was "definitely will". Frequency of responses included: 1=2; 2=2; 3=19; 4=10; and 5=1. Based on these results, 32 percent expected to, at least minimally, change their production and/or marketing plan based on the information they received at the conference.

Day 2 (Cotton Day) Results

1. How would you rate the quality of speakers? 4.45 (Frequency: 1=0 observations; 2=0; 3=3, 4=18; 5=23)
2. How would you rate the facilities? 4.55 (Frequency: 1=0 observations; 2=1; 3=2, 4=13; 5=28)
3. How would you rate the overall conference? 4.49 (Frequency: 1=0 observations; 2=0; 3=4, 4=14; 5=25)

The fourth question was as before. The question was again scaled such that 1 represented "definitely will not", 3 equaled "undecided" and 5 was "definitely will". Frequency of responses included: 1=1; 2=1; 3=16; 4=17; and 5=5. Based on these results, 55 percent expected to, at least minimally, change their production and/or marketing plan based on the information they received at the conference.

Based on the specific respondents who said they would at least minimally change their plans and the average number of acres of cotton or other crops planted annually, a financial impact figure was determined. It was assumed that those that indicated a 5 on question 4 for cotton (definitely would change their plans) would increase their net income $10 per acre for the acres of cotton planted and $7.50 per acre for the other crops. Likewise, for those respondents indicating a 4, it was assumed that an improvement of $7.50 per acre of cotton planted and $5.00 per acre of other crops planted. These changes would be in the form of better marketing, risk management, varietal selection, etc. Given these hypotheses, the financial impact of attending the 2014 Red River Crops Conference was estimated to be $5,002 per respondent.

Finally, the evaluation included three open-ended questions including 1) What were the main benefits you received from the conference; 2) What would improve the conference; and 3) Additional comments.

Extending the Conference Information via Media

Much of the information provided by the speakers was extended by news articles. While other media reporters were probably present, four prominent agricultural reporters spent the two days listening, recording, and reporting information. These four include Ron Smith with the Southwest Farm Press (SWFP), Ron Hayes with the Oklahoma Farm Network, Don Atkinson with Clearwater Communications, and Larry Stalcup from Amarillo, Texas. Within hours, news articles and electronic audio interviews begin showing up on their internet sites.

At least 10 SWFP email articles discussing various speaker topics were generated by Ron Smith. He has previously indicated the distribution of the SWFP Daily email was 11,435. This would indicate that direct distribution of the SWFP Daily email edition would be 114,350. This is a very conservative number as the articles were also distributed by Cotton eNews which is produced by the National Cotton Council of America and disseminated to recipients across the Cotton Belt. Other media outlets also ran or quoted the articles. All SWFP Daily email articles were also printed in the SWFP magazine. Ron Smith recently noted the circulation of that magazine at about 30,000. Since 10 articles were generated, it would appear that an additional 300,000 contacts were made. Combining the SWFP magazine and SWFP Daily email distribution, this would indicate a total of 414,350.

Summary

The 2015 Red River Crops Conference proved to be an outstanding program. Participants were particularly complementary based on their evaluations. Additionally, the program provided information such that 32 and 55 percent of the evaluation respondents intended to make a change to their current production and/or marketing plans that should equal to an estimated $5,002. Finally, it isn’t rare that one states’ Extension Service utilizes another state’ Extension Service faculty for speaking engagements. What is rare is faculty from two separate Extension Services’ coming together to plan, design, implement and evaluate an entire program. The Red River Crops Conference has now completed a cycle, one year held in Oklahoma and one year held in Texas. Competition between the two locations is never mentioned among any one on the planning committee. This conference has now created a reputation for being the leading conference in the Texas Rolling Plains and southwest Oklahoma.

To register for the
2015 Red River Crops Conference
complete the form on the reverse side.
For more conference information contact
your local county extension office.

Contact the Childress Chamber of Commerce at (940) 937-2567 for a discount at participating hotels

January 27 & 28, 2015

Fair Park Auditorium
1000 Commerce Street
CHILDRESS, TEXAS

A hardy group of people chose to settle the upper Red River region in Oklahoma and Texas. In spite of many obstacles, pioneers and their descendants have turned the area into a viable agricultural production region. These obstacles can include water and land resources, and weather extremes such as hot and dry summers and bitterly cold winters. These challenges must be overcome in order to succeed as an agricultural producer.

This region offers high agricultural potential when all of the conditions align. Pastures of both introduced grass and native species have the potential to support traditional cattle operations. Crop mixes include but are not limited to cotton, wheat, and grain and forage sorghum. More recently, producers have discovered that canola, guar, and sesame can also be successfully cultivated within this environment.

The area spans across the state lines of Oklahoma and Texas. Given this, Texas A&M AgriLife Extension and Oklahoma Cooperative Extension have joined together to help address these special agricultural production circumstances.

The goal of the Red River Crops Conference is to provide agricultural producers with relevant management information applicable to this production area that will create and enhance the profitability of farm and ranch enterprises.

CEU's will be offered for this conference.
Pre-registration is encouraged for meal count.

Planning for Success - Crop production information designed for Southwest Oklahoma and the Texas Rolling Plains.

Red River CROPS CONFERENCE

January 27 & 28, 2015

Fair Park Auditorium
1000 Commerce Street
CHILDRESS, TEXAS

TEXAS A&M AGRILIFE EXTENSION

OKLAHOMA STATE UNIVERSITY EXTENSION

RedRiverCropsConf Brochure Ver6.indd 1 9/4/2014 4:07:21 PM

IN SEASON & SUMMER CROPS DAY AGENDA January 27

7:45 - 8:15 am *Registration*

8:15 - 8:30 am *Welcome*
Mr. Steven Sparkman
Hardeman County Agricultural Extension Agent - Agriculture and Natural Resources
Texas A&M AgriLife Extension Service, Quanah, TX

8:30 - 9:15 am *Climate Update*
Mr. Gary McManus
State Climatologist, Oklahoma Mesonet
Oklahoma Climatological Survey, Norman, OK

9:15 - 10:05 am *Specialty and Alternative Crops*
Dr. Calvin Trostle
Professor and Extension Agronomist
Texas A&M AgriLife Extension Service, Lubbock, TX

10:05 - 10:20 am *Break*

10:20 - 11:10 am *Canola Production & Crop Year Outlook*
Mr. Joshua Bushong
Winter Canola Extension Specialist
Oklahoma Cooperative Extension Service, Stillwater, OK

11:10 - 12:00 pm *2014 Farm Bill Decisions*
Dr. Joe Outlaw
Professor and Extension Economist
Texas A&M AgriLife Extension Service, College Station, TX

12:00 - 1:00 pm *Lunch*

1:10 - 2:00 pm *Weed Management in Wheat*
Mr. Gary Strickland
Jackson and Greer County Agriculture Extension Educator
SWREC-Dryland Cropping Systems Specialist
Oklahoma Cooperative Extension Service, Altus, OK

2:00 - 2:50 pm *Wheat Grain & Grazing Interface*
Mr. Stan Bevers
Professor and Extension Economist - Management
Texas A&M AgriLife Extension Service, Vernon, Texas

2:50 - 3:15 pm *Break*

3:15 - 4:00 pm *Commodity Market Outlook*
Mr. Jason Pace
Extension Agricultural Economist
Oklahoma Cooperative Extension Service,
Southwest Area Office, Duncan, OK

4:00 - 4:15 pm *Wrap-Up & Evaluation*

COTTON DAY AGENDA January 28

8:00 - 8:30 am *Registration*

8:30 - 8:45 am *Welcome*
Mr. Aaron Henson
Tillman County Agricultural Extension Educator
Oklahoma Cooperative Extension Service, Frederick, OK

8:45 - 9:30 am *National Cotton Council Update*
Dr. Mark Lange
President and CEO
National Cotton Council, Cordova, TN

9:30 - 10:00 am *Cotton Market Update and Outlook*
Dr. John Robinson
Professor and Extension Economist - Cotton Marketing
Texas A&M AgriLife Extension Service, College Station, TX

10:00 - 10:30 am *Break*

10:30 - 11:00 am *Cotton STAX Insurance*
Dr. Darren Hudson
Director, Cotton Economics Research Institute
Dept. of Agricultural and Applied Economics
Texas Tech University, Lubbock, TX

11:00 - 12:00 pm *Cotton Disease Management*
Dr. Jason Woodward
Associate Professor and Extension Plant Pathologist
Texas A&M AgriLife Extension Service, Lubbock, TX

12:00 - 1:00 pm *Lunch*

1:00 - 2:00 pm *Cotton Weed Management and Xtend Flex*
Mr. Shane Osborne
Associate Extension Specialist
OSU Southwest Research and Extension Center, Altus, OK
Dr. Ty Witten
Cotton Specialty Crop Product Management Lead
Monsanto, St. Louis, MO

2:00 - 2:50 pm *Cotton Fertilizer Management*
Dr. Mark McFarland
Regents Fellow, Professor and Acting Associate Head for Extension Programs, Dept. of Soil and Crop Sciences
Texas A&M AgriLife Extension Service, College Station, TX

2:50 - 3:10 pm *Break*

3:10 - 4:00 pm *New Cotton Genetics Performance*
Dr. Gaylon Morgan
Professor and Extension Agronomist - Cotton
Texas A&M AgriLife Extension Service, College Station, TX
Dr. Randy Boman
Research Director and Cotton Extension Program Leader
OSU Southwest Research and Extension Center, Altus, OK

4:00 - 4:15 pm *Wrap-Up & Evaluation*

EXTENSION CONFERENCE PLANNING COMMITTEE

Stan Bevers, TX
Randy Boman, OK
Michael Bowman, TX
Aaron Henson, OK
Lonnie Jenschke, TX
Marty New, OK
Jason Pace, OK
Langdon Reagan, TX
Steven Sparkman, TX
Gary Strickland, OK
Dianna Thompson, OK
Katy White, TX

REGISTRATION

Red River CROPS CONFERENCE

My check for $ ________ is enclosed

$25 per person conference fee
Pre-registration is encouraged

Name ____________________
Address ____________________
City ____________________
State/Zip ____________________
Phone ____________________
Email ____________________

My guests include:

Name ____________________
Name ____________________
Name ____________________
Name ____________________
Name ____________________
Name ____________________

Make checks payable to the Red River Crops Conference

Mail to 100 Avenue E NW, Courthouse Box 9
Childress, TX 79201-3756
Phone: 940-937-2351

Oklahoma State University Extension — Texas A&M AgriLife Extension

Contact your local county Extension office for more information!

2015 Oklahoma Irrigation Conference

Planning for the second annual Oklahoma Irrigation Conference began in early 2015. The planning committee consisted of David Nowlin, Caddo County Extension Educator, Oklahoma Cooperative Extension Service, Anadarko; Dr. Saleh Taghvaeian, Assistant Professor & Extension Specialist in Water Resources in the Biosystems & Agricultural Engineering Department; and Dr. Randy Boman, Research Director and Cotton Extension Program Leader. The planning committee met in April of 2015. As a result of the meeting, the group developed the agenda, initiated the promotion, and designed the evaluation of the conference.

In 2015, the conference was held at the Caddo-Kiowa Technology Center in Fort Cobb, on August 18th. The first day was considered an in-season and summer crops day while the second day covered cotton exclusively. Promotion for the program began in October 2014 for the conference. Funding for the conference was accomplished via two methods. First, participants were charged a $15.00 registration fee. This helped to cover the meals, refreshments, and brochures. Second, sponsors were solicited to support the conference at various levels of support of their choosing. Nineteen sponsors were obtained. A total of 90 clientele attended the conference.

Evaluating the Program

At the end of the day, participants were asked to provide their candid responses to an evaluation instrument. These results were compiled following the conference and are provided below. Comments included the following:

- Information is timely, especially considering current and future water scarcity issues
- As a non-producer, the information was helpful, though not as an aid to production
- Quick field to conference data is good
- A good cross-section of ideas that can be used now, and some things for the future
- Information good and timely, especially since drought
- Irrigation topics timely and helpful, especially after the drought years
- Salinity is going to continue to be an issue, and the presentations on technology were good
- Good broad evaluation related to irrigation issues and practices
- Very good meeting (3)
- Technology improves profits

- New research and existing issues helpful
- Extraordinarily helpful and timely.
- The salinity talks were new
- Cool combination of providing information on existing crop, soil and water science and cutting edge future science to keep everyone looking into the future
- Quick field to conference data is good
- Great program
- New research and existing issues

Topic/presentations found most useful

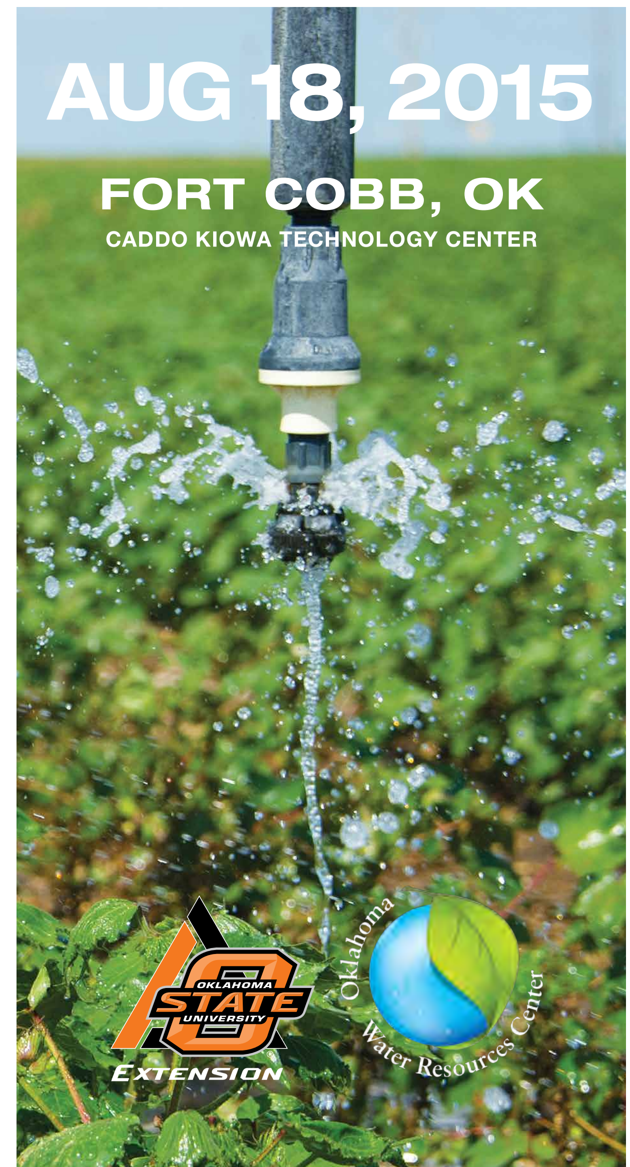
Irrigation & Evapotranspiration – Al Sutherland	11
Understanding Cotton Irrigation Requirements – Randy Boman	11
Managing Salinity in Irrigation – Dana Porter	10
Interpreting Your Soil and Water Test - Halin Zhang	8
Using Sensor-Based Technologies to Improve Irrigation Management – Saleh Taghvaeian	8
Planting Strategies for Wheat Under Subsurface Drip Irrigation- Jason Warren	8
Comparing Performance of Mobile Drip Irrigation to Low Elevation Spray Application – Isaya Kisekka	5
Irrigation Efficiency and Conservation, Including Oklahoma Project Updates - Scott Frazier	5
Tools for Pre-Season and In-Season Adjustments to Irrigation Management – Jonathan Aguilar	5
VRI: Lessons Learned in Oregon – Charles Hilyer	4

Extending the Conference Information via Media

Several agricultural media representatives were at the conference. Presentations from several of the speakers were summarized and published in various outlets by agricultural writers. These included Ron Smith with the Southwest Farm Press (SWFP), and Leslie Smith with the Oklahoma Farm Network.

At least 8 SWFP email articles discussing various speaker topics were generated by Ron Smith. He has previously indicated the distribution of the SWFP Daily email was 11,435. This would indicate that direct distribution of the SWFP Daily email edition would be 91,480. This is a very conservative number as the articles were also distributed by Cotton eNews which is produced by the National Cotton Council of America and disseminated to recipients across the Cotton Belt. Other media outlets also ran or quoted the articles. All SWFP Daily email articles were also printed in the SWFP magazine. Ron Smith recently noted the circulation of that magazine at about 30,000. Since 8 articles were generated, it would appear that an additional 240,000 contacts were made. Combining the SWFP magazine and SWFP Daily email distribution, this would indicate a total of 331,480.

Oklahoma Irrigation Conference



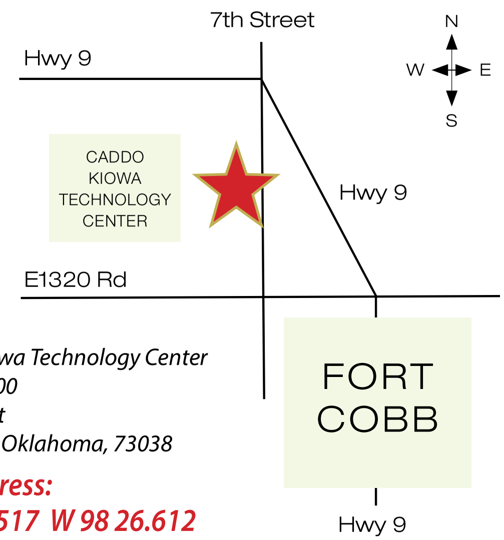
AUG 18, 2015

FORT COBB, OK

CADDO KIOWA TECHNOLOGY CENTER

Oklahoma State University Extension · Oklahoma Water Resources Center

Fort Cobb, Oklahoma



Caddo Kiowa Technology Center
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1415 7th St
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GPS address:
N 35 06.517 W 98 26.612

For more information contact:
Caddo County Extension
405.247.3376

For online registration visit:
oces.okstate.edu/caddo/oklahoma-irrigation-conference

Oklahoma Irrigation Conference Committee

David Nowlin | *Saleh Taghvaeian* | *Randy Boman*

The 2015 Oklahoma Irrigation Conference is brought to you by

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REGISTRATION

Oklahoma Irrigation Conference

AUG 18, 2015
Fort Cobb, OK

$15 REGISTRATION PER PERSON

Please respond by August 14, 2015.

Name____________ Organization____________

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AGENDA

August 18, 2015

9:30 am
Welcome

9:45 am
Irrigation and Evapotranspiration . . . . *Al Sutherland*

10:15 am
Understanding Cotton Irrigation Requirements . . . *Randy Boman*

10:45 am
Break & Visit Displays

11:00 am
Interpreting Your Soil and Water Test . . . . *Hailin Zhang*

11:30 am
Managing Salinity in Irrigation . . . . *Dana Porter*

12:00 pm
Lunch and Visit Displays *Lunch Speaker: OWRB Representative*

1:00 pm
Comparing Performance of Mobile Drip Irrigation to Low Elevation Spray Application . . . . *Isaya Kisekka*

1:30 pm
Irrigation Efficiency and Conservation, Including Oklahoma Project Updates . . . . *Scott Frazier*

2:00 pm
Tools for Pre-Season and In-Season Adjustments in Irrigation Management . . . . *Jonathan Aguilar*

2:30 pm
Break & Visit Displays

2:45 pm
Using Sensor-Based Technologies to Improve Irrigation Management . . . . *Saleh Taghvaeian*

3:15 pm
VRI: Some Lessons Learned in Oregon . . . . *Charles Hillyer*

3:45 pm
Planting Strategies for Wheat Under Subsurface Drip Irrigation: Plant the Dry Rows or Not? . . . . *Jason Warren*

4:15 pm
Adjourn

Oklahoma IRRIGATION CONFERENCE

FEATURING

Al Sutherland

OSU Mesonet Agricultural Coordinator, National Weather Service

Al conducts agricultural and horticultural product development and extension outreach for the Oklahoma Mesonet. He has a Bachelor's degree in horticulture from Oregon State University, a Masters in horticulture from Ohio State University, and has worked for the No. 1 OSU, Oklahoma State University, since 1989. Al is a Certified Crop Advisor and Certified Professional Horticulturist. He is officed on the OU campus at the National Weather Center.

Randy Boman

Research Director and Cotton Extension Program Leader, OSU Southwest Research and Extension Center, OSU

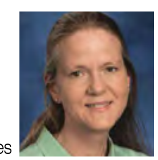
Randy's major responsibilities are to work with the Cotton Team to develop and conduct Extension and applied research programs to inform Oklahoma producers as to best management practices for cotton production. They conduct cotton variety performance and applied research trials as necessary; develop educational materials relating to the information; and disseminate it to growers and Extension personnel by all appropriate means. An important function is serving as an information and materials source for area agronomists and Extension personnel in the state.

Hailin Zhang

Regents Professor, Soil Fertility/Chemistry Director of Soil, Water and Forage Analytical Lab, OSU

Hailin earned his B.S. degree from Nanjing Agricultural University, China, M.S. degree from Iowa State University, and Ph.D. degree from the University of Minnesota. He worked for the Navajo Agricultural Products Industry in Farmington, New Mexico for 6 years before joining OSU in 1996. Hailin's Extension and research programs focus mainly on plant nutrient management and environmental quality protection. He has been actively promoting soil testing as a best management practice for fertilizer and animal waste utilization, and developing decision support tools for farmers and crop consultants.

Dana Porter



Associate Professor, Extension Program Leader and Associate Department Head, Department of Biological and Agricultural Engineering, Texas A&M University, Texas A&M AgriLife Research and Extension Center - Lubbock

Dana's applied research and extension program emphasizes irrigation technologies and best management practices for efficient irrigation management in water-limited agricultural production systems. In addressing practical concerns of irrigation efficiency and irrigation water quality issues, she draws extensively from her experiences on her family's farm in the Texas Panhandle and her interdisciplinary collaborations in crop modeling, agricultural waste management and agricultural irrigation.

Isaya Kisekka

Assistant Professor and Research Agricultural Engineer, Southwest Research and Extension Center, KSU

Isaya's research and extension program focuses on the development of water management strategies and technologies to sustain irrigated agriculture with limited water. His current projects include measurement and modeling of grain and forage yield response to full and deficit irrigation, improving water productivity using Mobile Drip Irrigation, improving ET-based irrigation scheduling by integrating it with soil and plant water status based feedbacks, and soil water conservation through reduced tillage and residue management.

Scott Frazier

Associate Professor, Energy Management Extension Engineer, Oklahoma State University

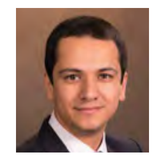
Scott joined the Biosystems and Agricultural Engineering department in June 2008 on a research and Extension appointment. His background is Industrial Engineering specializing in resource and energy management. He worked for the electric utility industry on the East Coast conducting energy studies for the commercial and industrial sectors. His research efforts include energy management of agricultural systems such as irrigation and animal housing, life cycle assessment (LCA) of biofuels and bio-product production, and various energy related education topics.

Jonathan Aguilar

Assistant Professor and Extension Specialist, Southwest Research and Extension Center, KSU

Jonathan's major responsibility is to help the producers efficiently and effectively manage the water in their farm. He is an assistant professor with state extension responsibility in water resources stationed at Southwest Research-Extension Center in Garden City. Prior to his current position, Jonathan worked with the USDA Agricultural Research Service as Research Agricultural Engineer/Scientist. His current research and extension focus include limited irrigation strategies, sensor technologies, irrigation management practices, water quality assessments, and online irrigation applications.

Saleh Taghvaeian



Assistant Professor and Extension Specialist, Oklahoma State University

Saleh is an assistant professor and extension specialist in water resources at the Department of Biosystems & Agricultural Engineering. Prior to joining OSU in Oct 2013 he was a postdoctoral fellow at Colorado State University, conducting research on deficit irrigation management. He received his PhD in Irrigation Engineering in 2011 from Utah State University. Saleh's research and extension interests include irrigation and drainage efficiency, using sensor technologies, and improving irrigation management.

Charles Hillyer

Assistant Professor and Extension Specialist, Texas A&M AgriLife Extension

Charles has spent the last 10 years studying optimal irrigation management, especially in situations where water supplies are limited. Since 2012, he has been working on a project to demonstrate the benefits of variable rate irrigation. He recently joined Texas A&M AgriLife Extension in Amarillo as an irrigation specialist.

Jason Warren

Associate Professor, Soil and Water Conservation/ Management Extension Specialist, OSU

Jason is an associate professor, and soil and water conservation/management Extension specialist. He earned a B.S. degree in Environmental Sciences in 1999 and M.S. in Plant and Soil Sciences in 2001 at Oklahoma State University. Jason continued his education at Virginia Tech, where he obtained a Ph.D. in Crop and Soil Environmental Sciences in 2005. His research and Extension efforts will focus on management practices to reduce soil erosion and improve soil quality in both the agricultural and urban landscapes.

Peer Reviewed Journal Article and American Society of Agronomy Cotton Monograph Chapter

Peer Reviewed Journal Article:

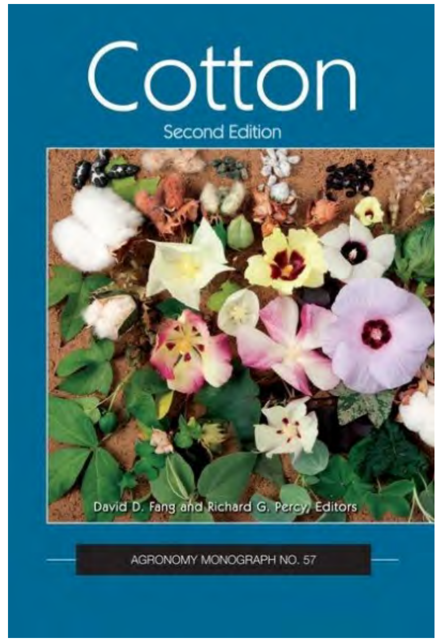
Woodward, J.E., D.M. Dodds, C.L. Main, L.T. Barber, R.K. Boman, J.R. Whitaker, K.L. Edmisten, J.C. Banks, N.W. Buehring, and T.W. Allen. 2016. Evaluation of strobilurin fungicides in cotton across the Southern United States. Accepted for publication (pending final revisions) in the Journal of Cotton Science, January 2016.

ABSTRACT

With the registration of pyraclostrobin (Headline) and azoxystrobin (Quadris) in the United States for protection of cotton (*Gossypium hirsutum*) foliage and bolls against fungal diseases, there has been increased interest in efficacy of the fungicides on mid- to late-season diseases and whether there are non-fungicidal plant health benefits. A total of 15 field trials were conducted throughout cotton growing regions of the United States between the 2008 and 2010 growing seasons. Applications of azoxystrobin and pyraclostrobin were made at the following rates and timings: 0.22 kg ai ha-1 at first bloom (FB); 0.11 kg ai ha-1 at FB with a sequential application being made 14-21 days later; and 0.11 kg ai ha-1 at FB with a second application (0.22 kg ai ha-1) 14-21 days later. Cotton height, total nodes, lint yield, and fiber quality parameters were used to compare treatments, which included a non-treated control. There were no significant treatment differences with respect to most parameters including yield. Overall, disease pressure was low, but foliar symptoms, caused by *Alternaria macrospora* (3 tests in Jackson, TN), and *Stemphylium solani* + *Cercospora gossypina* (1 site in Statesboro, GA), were observed, as well as hardlock and boll rot in selected trials in Mississippi and Tennessee. It is concluded that application of fungicides in cotton should be based on disease risk and the potential of environmental conditions conducive for foliar disease development during the growing season.

Cotton, Agronomy Monograph 57, 2015
Book Chapter – American Society of Agronomy

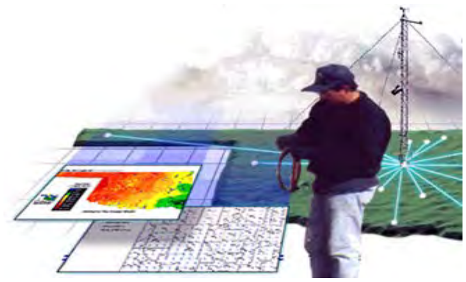
Wanjura, J.D., E.M. Barnes, M.S. Kelley and R.K. Boman. 2015. Chapter 21 - Harvesting. Pp. 571-608. *In* Fang, D.D. and R. G. Percy (eds.) Cotton (2nd ed.). Publisher: ASA-CSSA-SSSA, Madison, WI.



Description

Cotton, 2nd edition, edited by David D. Fang and Richard G. Percy, is a long awaited, much needed comprehensive update on the science of cotton. This book epitomizes the thorough coverage of an Agronomy Monograph. Readers will find essential coverage of the many scientific advancements in the field, from fiber handling to the transgenic cotton revolution. This amazing and versatile crop, cultivated for more than 7000 years, is one of the most powerful stories in agricultural science. More than 50 experts who contributed to this volume represent the leading edge of this exciting story.

Appendix

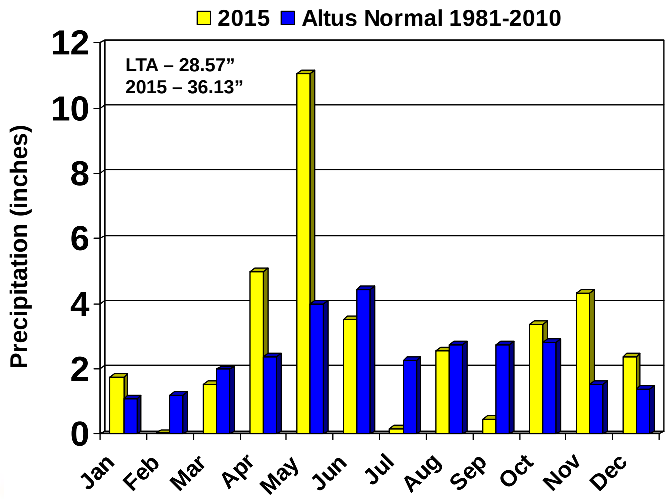


About the Mesonet The Oklahoma Mesonet is a world-class network of environmental monitoring stations. The network was designed and implemented by scientists at the University of Oklahoma (OU) and at Oklahoma State University (OSU). The Oklahoma Mesonet consists of 120 automated stations covering Oklahoma. There is at least one Mesonet station in each of Oklahoma's 77 counties. At each site, the environment is measured by a set of instruments located on or near a 10-meter-tall tower. The measurements are packaged into "observations" every 5 minutes, then the observations are transmitted to a central facility every 5 minutes, 24 hours per day year-round. The Oklahoma Climatological Survey (OCS) at OU receives the observations, verifies the quality of the data and provides the data to Mesonet customers. It only takes 5 to 10 minutes from the time the measurements are acquired until they become available to the public.

History of the Mesonet In 1982, Oklahoma scientists recognized the need for a statewide monitoring network. At OSU, agricultural scientists wanted to upgrade weather instruments at their research sites. Their primary goal was to expand the use of weather data in agricultural applications.Meanwhile, scientists from the OU meteorological community were helping to plan and implement a flood-warning system for Tulsa. The success of Tulsa's rain gauge network pointed to the potential for a more extensive, statewide network. OSU and OU joined forces in 1987 when they realized that one system would help both universities achieve their respective missions. The two universities approached the Governor's Office and, in December of 1990, the Oklahoma Mesonet Project was funded with $2.0 million of oil-overcharge funds available from a court settlement. Both universities contributed almost $350,000 each to bring the grand total to $2.7 million. In addition, the Oklahoma Law Enforcement Telecommunications System (OLETS) donated the use of their communications infrastructure to help move the data from the remote sites to OU. Once funding was available, the Mesonet Project progressed quickly. Committees were formed, potential station sites were located and surveyed and instruments were chosen. In late 1991, the first Mesonet towers were installed and, by the end of 1993, 108 sites were completely operational. Three more sites were added soon thereafter to supplement a U. S. Department of Agriculture network in the Little Washita River Basin. In 1996, three sites were added near Tulsa for an Oklahoma Department of Environmental Quality study of air pollution. Thus, by the fall of 1996, the total number of Oklahoma Mesonet sites was 114. Since 1996, 8 sites have relocated to other areas in the same town, 4 sites have been retired, and 10 sites have been added resulting in our current 120 station network. A 2009 National Research Council report named the Oklahoma Mesonet as the "gold standard" for statewide weather and climate networks. The Mesonet is unique in its capability to measure a large variety of environmental conditions at so many sites across an area as large as Oklahoma. In addition, these conditions are relayed to a wide variety of customers very quickly after the observations are taken.

Agriculture Agricultural applications of the Mesonet include improved insect and disease advisories, spraying recommendations, irrigation scheduling, frost protection, planting and harvesting recommendations and prescribed burn advisories. Agriculture is such a large Oklahoma industry that any increase in efficiency from more accurate environmental information can translate into several million dollars in statewide savings each year. Visit our Agweather site at: agweather.mesonet.org.

Altus Normal (1981-2010) and Mesonet 2015 Rainfall



Altus Normal From
January 1 – April 30
6.66”

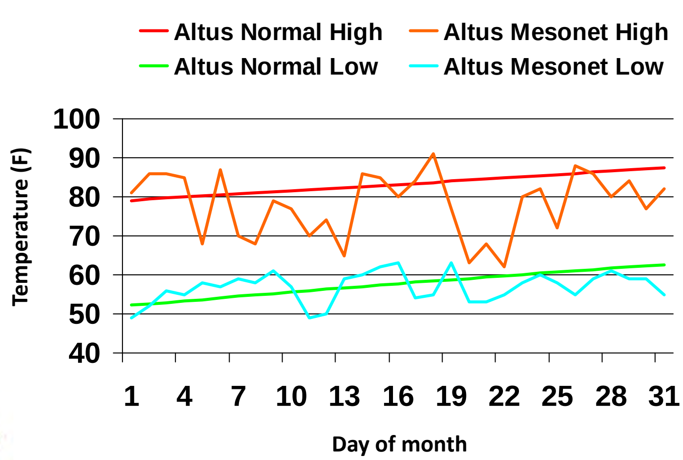
Altus Actual From
January 1 – April 30
8.30”
25% above normal

Altus Normal From
April 1 – June 30
10.82”

Altus Actual From
April 1 – June 30
19.58”
81% above normal

Source: http://climate.ok.gov/index.php/climate/county_climate_by_county/jackson

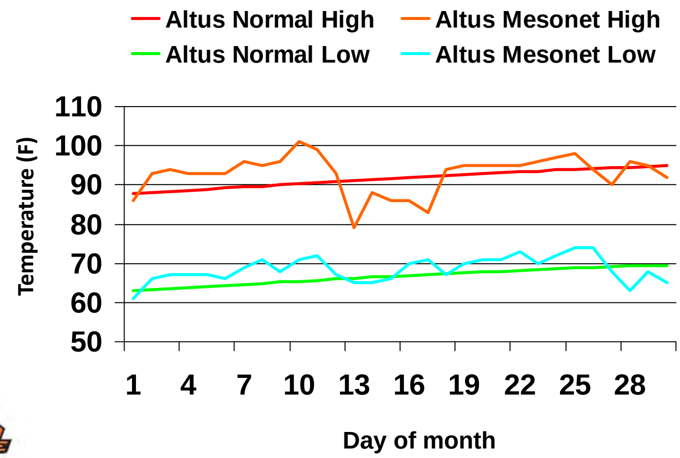
Altus
Normal (1981-2010) and Mesonet Air Temperatures May 2015



Heat Units

Normal: 314
2015: 237
% of normal: -27

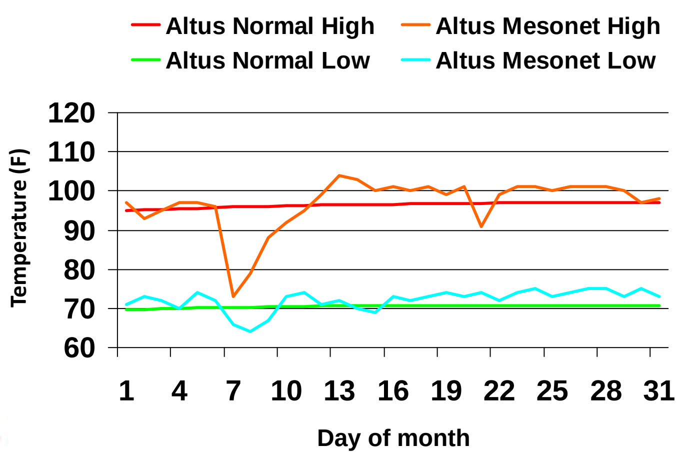
Altus
Normal (1981-2010) and Mesonet
Air Temperatures
June 2015



Heat Units

Normal: 573
2015: 621
% of normal: +8

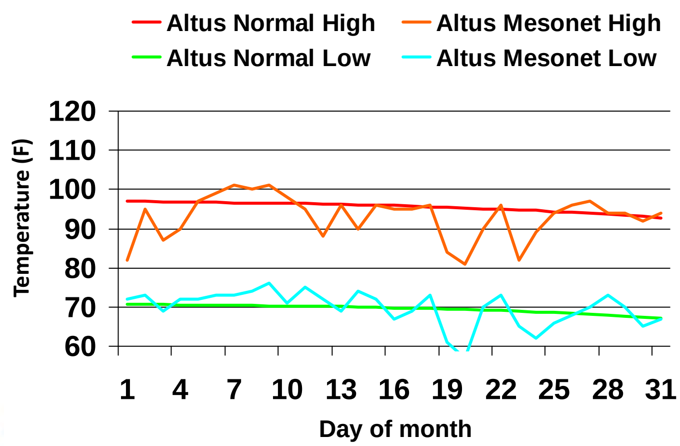
Altus
Normal (1981-2010) and Mesonet
Air Temperatures
July 2015



Heat Units

Normal: 727
2015: 758
% of normal: +4

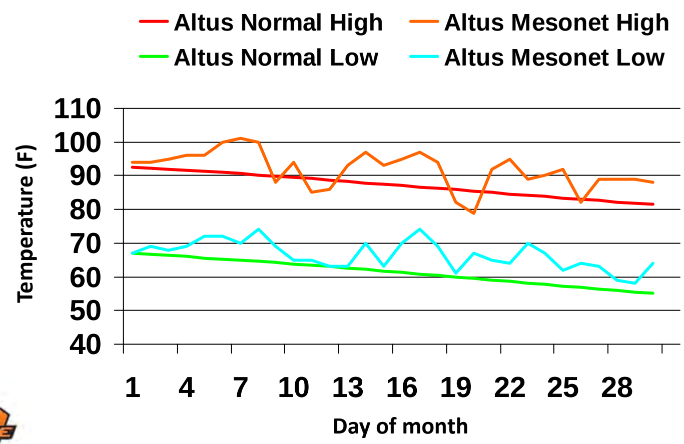
Altus
Normal (1981-2010) and Mesonet
Air Temperatures
August 2015



Heat Units

Normal: 698
2015: 664
% of normal: -5

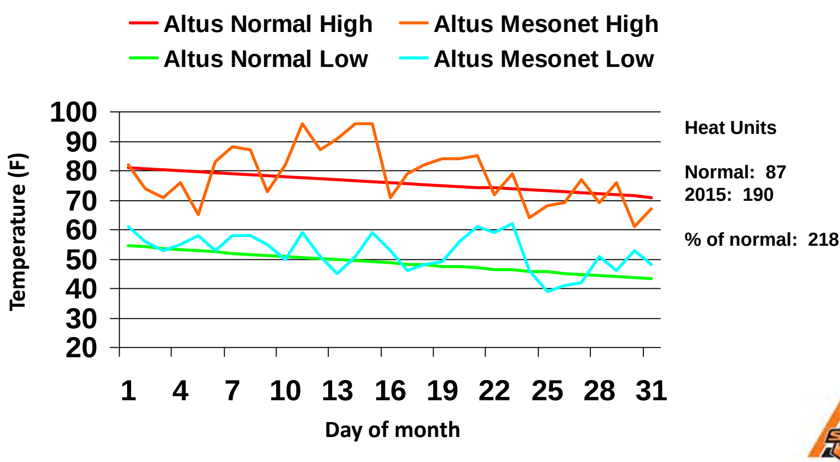
Altus
Normal (1981-2010) and Mesonet
Air Temperatures
September 2015



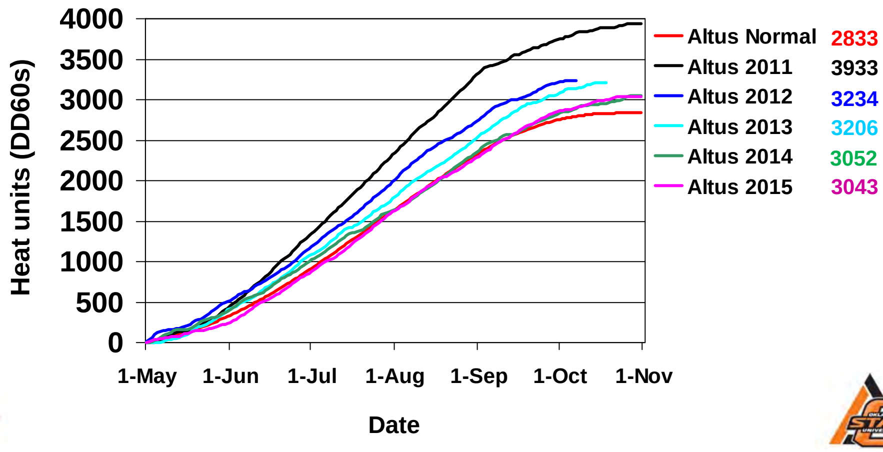
Heat Units

Normal: 427
2015: 575
% of normal: +35

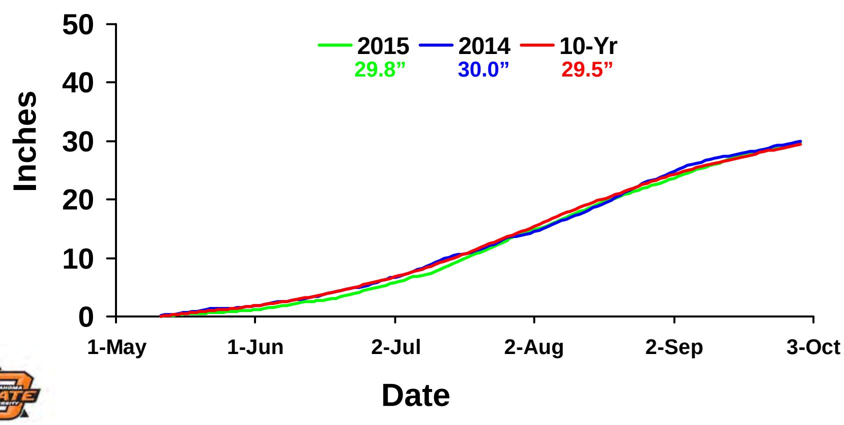
Altus
Normal (1981-2010) and Mesonet
Air Temperatures
October 2015



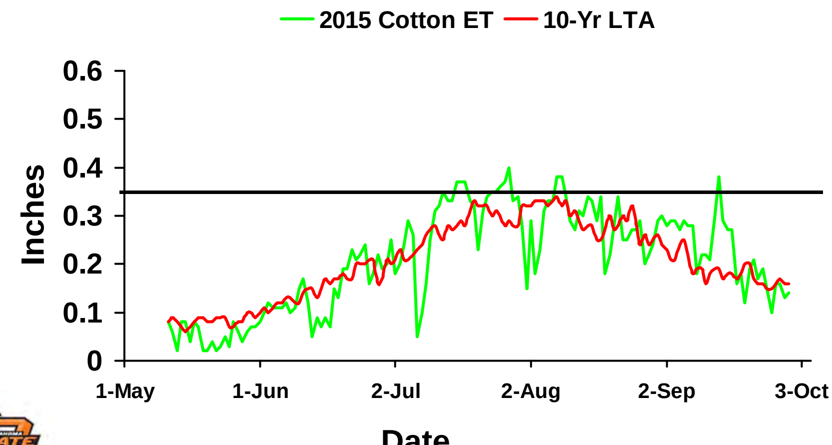
Altus
30-Yr Normal (1981-2010)
with 2011, 2012, 2013, 2014 and 2015
Cotton Heat Unit Accumulation



Altus Mesonet
May 11- September 30
Accumulated Cotton ET
(May 10 Planting Date)



Altus Mesonet
May-September LTA and 2015
Daily Cotton ET (May 10 Planting Date)



Courtesy Al Sutherland, Oklahoma Mesonet

Evaluating Field Trial Data

This article has been reprinted from Southwest Farm Press Vol 25, Number 11, April 9, 1998.

Field Trials can provide helpful information to producers as they compare products and practices for their operations. But field trials must be evaluated carefully to make sure results are scientifically sound, not misleading and indicate realistic expectations for on-farm performance.
This fact sheet is designed to give you the tools to help you determine whether data from a field trial is science fact or science fiction.

What are the best sources of field trial data?

Field trials are conducted by a broad range of individuals and institutions, including universities, ag input suppliers, chemical and seed companies and growers themselves. All are potentially good sources of information.

What are the common types of field trials?

Most field trials fall into one of two categories: side-by-side trials (often referred to as strip trials) or small-plot replicated trials. Side-by-side trials are the most common form of on-farm tests. As the name suggests, these trials involve testing practices or products against one another in plots arrayed across a field, often in strips the width of the harvesting equipment.
These strips should be replicated across the field or repeated at several locations to increase reliability.
Small-plot replicated trials often are conducted by universities and companies at central locations because of the complexity of managing them and the special planting and harvesting equipment often required.
Replicated treatments increase the reliability of an experiment. They compare practices or products against one another multiple times under uniform growing conditions in several randomized small plots in the same field or location.
Small-plot replicated trials also may be conducted on farmers' fields where special conditions exist, for example, a weed infestation that does not occur on an experiment station.

Are side-by-side plots more valuable than small-plot replicated trials, or vice versa?

Both types of plots can provide good information. The key is to evaluate the reliability of the data. It is also important to consider the applicability of the trial to your farming operation.

When is plot data valid, and when isn't it?

There isn't a black-and-white answer to that questions. But there are good rules of thumb that can help guide you. Consider these three field trial scenarios:

Scenario 1:

A single on-farm side-by-side trial comparing 10 varieties. Each variety is planted in one strip the width of the harvesting equipment and is 250 to 300 feet long.

What you can learn:

This trial will allow you to get a general feel for each variety or hybrid in the test, including how it grows and develops during the season.
However, this trial, by itself, probably won't be able to reliably measure differences in yield. This is because variability within the field, even if it appears to be relatively uniform, may be large enough to cause yield variations that mask genetic difference among the varieties. Other varietal characteristics, such as maturity or micronaire in cotton, can also be masked by soil variation.

Scenario 2:

Yield data from side-by-side variety trials conducted on the same varieties on multiple farms in your region.

What you can learn:

When data from multiple side-by-side trials are considered together, reliability increases. In this case, the more trials comparing the same varieties, the better. As you go from three to five to 10 or more locations, the certainty goes up that yield differences represent genetic differences and not field variability. Be aware, however, that small differences between treatments (in this case varieties) may still be within the margin of random variability of the combined trial and may not indicate actual genetic differences. One treatment will almost always be numerically higher. Statistical analysis helps determine if differences are significant (consistent).

Scenario 3:

A university-style small-block replicated trial comparing the same 10 varieties.

What can you learn:

Data from such trials, if they are designed well and carried out precisely, generally are reliable. This is, the results generally determine the yield potential of crop varieties. However, it is still important to consider whether results are applicable to your farming operation and are consistent with other research.

How do I know whether differences in yield, for example, are real and not caused by field variability or sloppy research?

Scientists use statistical analysis to help determine whether differences are real or are the result of experimental error, such as field variation. The two most commonly used statistics are **Least Significant Difference (LSD)** and the **Coefficient of Variation (CV)**, both of which can provide insight on the validity of trial data. If these values aren't provided with trial results, ask for them.

Least Significant Difference (LSD) is the minimum amount that two varieties must differ to be considered significantly different. Consider a trial where the LSD for yield is four bushels per acre. If one variety yields 45 bushels per acre and another yields 43 bushels per acre, the two are not statistically different in yield. The difference in their yields is due to normal field variation, not to their genetics. In this example, a variety that yields 45 bushels per acre is significantly better than those yielding less than 41 bushels per acre. In many research trials, LSDs are calculated at confidence level of 75 to 95 percent. For example, a confidence level of 95 percent means you can be 95 percent certain that yield differences greater than the LSD amount are due to genetics and not to plot variability.

Coefficient of Variation (CV) measures the relative amount of random experimental variability not accounted for in the design of a test. It is expressed as a percent of the overall average of the test.

For measuring yield differences, CV's of up to five percent are considered excellent; 5.1 to 10 percent are considered good; and 10.1 to 15 percent are fair.

A high CV means there must be larger differences among treatments to conclude that significant differences exist. The bottom line: <u>When considering yield test data, be skeptical when the CV exceeds 15 percent.</u>

Is a one-year test valid, or are several years of results necessary to know whether one product or practice is superior to another?

In an ideal world, having several years of tests to verify use of a practice or product is best. But where changes are rapid, such as with crop varieties, having university data from multiple years isn't always possible.

When multi-year university data aren't available, pay more careful attention to statistical measures like CV and LSD, and the number of locations and testing environments.

Multi-year data on yield and performance can also be requested from the developers of new products prior to university testing. In either case, be cautious about making major production changes and trying large acreages of a given variety based on one year's data.

How should I evaluate trial results that are markedly different from other research in my area?

When research results are at odds with the preponderance of scientific evidence, examine the new research with extra care.

Pay special attention to factors that might have influenced the outcome, such as soil type, planting date, soil moisture and other environmental conditions, and disease, insect and weed pressures. For example, was the growing season unusually wet or unusually dry? When was it dry or wet? What was the crop growth stage when it was wet or dry?

Was there a disease that affected one variety or hybrid more than another one? Were there insect problems? Could this have influenced the trial's outcome and its applicability to your operation? If you determine that unusual circumstances affected the outcome, be cautious about how you use the results.