2018 Annual Report

AGRICULTURAL COMPLEX
FOR
ADVANCED RESEARCH
AND
EXTENSION SYSTEMS
(AG-CARES)

IN COOPERATION WITH

Texas A&M Agrilife Research Lamesa Cotton Growers Texas A&M Agrilife Extension Service

Technical Report 19-2

Texas A&M AgriLife and Research and Extension Center of Lubbock
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2018 brought significant changes in the leadership of agricultural programs at Texas A&M. Dr. Patrick J. Stover was named Vice Chancellor and Dean replacing Dr. Mark Hussey, who retired. Dr. Stover was director of the Cornell University Division of Nutritional Science prior to coming to Texas A&M.

2018 will be remembered as a challenging year for agriculture in the Southern High Plains. Rainfall was extremely sparse at planting time and many dryland acres never received sufficient moisture for stand establishment. Rainfall was limited and sporatic throughout the growing season. Most irrigated acreage produced acceptable yields but production costs were high which made returns near breakeven. Rainfall finally came across the region at and during harvest which will provide better subsoil moisture for the 2019 crop.

Significant results at AG-CARES include:

- Evaluation of new cotton varieties for yield, quality, and nematode tolerance as affected by irrigation levels and cropping systems.
- Soil and cotton production effects of longer term no-till/cover crop systems compared to conventional tillage.
- Evaluation of cover crop seeding rates which resulted in NRCS reducing their recommended rates.
- Evaluation of nitrogen and potassium management to reduce fertilizer input costs.

We are pleased to welcome Dr. Murilo Maeda as our new Cotton Extension Specialist replacing Dr. Seth Byrd who accepted a position at Oklahoma State. Dr. Maeda grew up on a cotton farm in Brazil, received his Ph.D. at Texas A&M in crop physiology, and was conducting cotton research and remote sensing work at our Corpus Christi Center prior to coming to Lubbock in October.

We are very grateful to the Officers of the Lamesa Cotton Growers for providing their leadership, guidance, and support for the operation of the AG-CARES research site. This location allows our scientists to continue to address critical research issues in areas south of Lubbock to meet producers' problems in the sandy soils. Current officers are: David Zant, President; Kirk Tidwell, Vice-President; and Glen Phipps, Secretary.

We appreciate the efforts of Dr. Wayne Keeling, who is continuing to coordinate programs and provide leadership while Dr. Danny Carmichael handles day to day operations as site manager.

Jaroy Moore
Resident Director of Research
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The Lamesa Cotton Growers would like to thank the following for their contributions to the AG-CARES Project:

- Americot Cotton Seed
- BASF
- Bayer CropScience
- Corteva
- Cotton, Inc. – State Support Program
- Dawson County Commissioners Court
- National Cotton Council
- PhytoGen Cotton Seed
- Sam Stevens, Inc.
- Syngenta Crop Protection

TITLE:

Cotton variety performance (conventional tillage) as affected by low-energy precision application (LEPA) irrigation levels at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Wayne Keeling – Professor
Justin Spradley and Ray White – Research Assistants
Brice DeLong – Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size:	4 rows by 300-700 feet, 3 replications
Planting Date:	May 16
Varieties:	Deltapine 1646B2XF FiberMax 1911GLT NexGen 4545B2XF PhytoGen 490W3FE Stoneville 4946GLB2
Herbicides:	Trifluralin 1.3 pt/A – April 12 Caparol 26 oz/A – May 16 Roundup 1 qt/A – June 19 Roundup + Outlook 1 qt/A – July 23 Roundup 1 qt/A – August 22 ETX 1.25 oz/A + Ethephon 3 pt/A – October 10 ETX 1.25 oz/A – October 26
Fertilizer in-season:	115-35-0
Irrigation in-season:	

	Low	Base	High
Preplant	3.8”	3.8”	3.8”
In Season	4.2”	6.3”	8.4”
Total	8.0”	10.1”	12.2”

Harvest Date: November 19

RESULTS AND DISCUSSION:

Five varieties (DP 1646B2XF, FM 1911GLT, NG 4545B2XF, PHY 490W3FE, and ST 4946GLB2) were compared under three irrigation levels in a continuous cotton system with conventional tillage. This area has been in continuous cotton for more than 25 years. When averaged across varieties, lint yields ranged from 598 lbs/A to 838 lbs/A with the highest irrigation level (Table 1). When averaged across varieties, lint yields ranged from 623 to 956 lbs/A with ST 4946GLB2 and PHY 490W3FE. Loan values increased with increasing irrigation levels. Highest loan value was produced with DP 1646B2XF and irrigation and no effect on fiber quality for this variety. Gross revenues ($/A) was similar for the base and high irrigations, and less for the low irrigation level. Highest gross revenues wire produced with ST 4946GLB2 and PHY 490W3FE due to higher yields.

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

	Irrigation Levels			
Cultivar	**Low (4.2)**	**Base (6.3)**	**High (8.4)**	**Average**
		------------------ lbs/A------------------		
DP 1646B2XF	562	718	590	**623 C**
FM 1911GLT	547	699	789	**678 C**
NG 4545B2XF	531	945	749	**742 BC**
PHY 490W3FE	659	1053	801	**838 AB**
ST 4946GLB2	689	915	1263	**956 A**
Average	**598 B**	**866 A**	**838 A**	**--**
		------------------cents/lb-----------------		
DP 1646B2XF	54.48	54.23	54.48	**54.39 A**
FM 1911GLT	50.55	51.98	53.23	**51.92 B**
NG 4545B2XF	50.03	50.82	49.48	**50.11 B**
PHY 490W3FE	50.33	49.50	53.48	**51.10 B**
ST 4946GLB2	48.53	49.53	53.45	**50.50 B**
Average	**50.78 B**	**51.21 AB**	**52.82 A**	**--**
		--------------------$/A--------------------		
DP 1646B2XF	306	389	322	**339 C**
FM 1911GLT	277	364	420	**354 C**
NG 4545B2XF	266	483	378	**375 BC**
PHY 490W3FE	332	521	428	**427 AB**
ST 4946GLB2	334	452	675	**487 A**
Average	**303 B**	**442 A**	**445 A**	**--**

TITLE:

Cotton variety performance (continuous cotton, terminated cover crop) as affected by low-energy precision application (LEPA) irrigation levels at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Wayne Keeling – Professor
Justin Spradley and Ray White – Research Assistants
Brice DeLong – Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size:	4 rows by 300-700 feet, 3 replications
Planting Date:	May 21
Varieties:	Deltapine 1646B2XF FiberMax 1911GLT NexGen 4545B2XF PhytoGen 490W3FE Stoneville 4946GLB2
Herbicides:	Prowl 3 pt/A – April 13 Roundup 1 qt/A – April 25 Gramoxone 1 qt/A + Caparol 26 oz/A – May 21 Roundup 1 qt/A – June 19 Roundup + Outlook 1 qt/A – July 23 Roundup 1 qt/A – August 22 ETX 1.25 oz/A + Ethephon 3 pt/A – October 10 ETX 1.25 oz/A – October 26
Fertilizer:	115-35-0

	Low	Base	High
Preplant	3.8”	3.8”	3.8”
In Season	4.2”	6.3”	8.4”
Total	8.0”	10.1”	12.2”

Harvest Date: November 16

RESULTS AND DISCUSSION:

Five varieties (DP 1646B2XF, FM 1911GLT, NG 4545B2XF, PHY 490W3FE, and ST 4946GLB2) were compared in a terminated rye cover-continuous cotton system under three irrigation levels (4.2”, 6.3”, and 8.4” applied in-season). When averaged across varieties, lint yields increased from 515 to 867 lbs/A as irrigation level increased (Table 1.). When averaged across irrigation levels, ST 4946GLB2 produced highest yields. Fiber quality as expressed as loan value was highest at the high irrigation level. When averaged across irrigation levels, DP 1646B2XF, FM 1911GLT, and PHY 490W3FE had the highest loan values. Gross revenues ($/A) were highest with ST 4946GLB2.

Table 1. Effect of cultivar and irrigation level on cotton lint yield (lbs/A), loan value (cents/lb), and gross revenue ($/A) under continuous cotton with a terminated cover crop.

Cultivar	Irrigation Levels Low (4.2)	Base (6.3)	High (8.4)	Average
		------------------ lbs/A------------------		
DP 1646B2XF	410	506	668	**528 C**
FM 1911GLT	540	763	755	**686 B**
NG 4545B2XF	447	754	890	**697 B**
PHY 490W3FE	568	683	915	**722 B**
ST 4946GLB2	612	857	1107	**859 A**
Average	**515 C**	**712 B**	**867 A**	**--**
		------------------cents/lb-----------------		
DP 1646B2XF	54.63	53.35	54.43	**54.13 A**
FM 1911GLT	53.43	54.00	53.75	**53.73 A**
NG 4545B2XF	50.78	51.48	53.70	**51.99 B**
PHY 490W3FE	53.55	51.00	53.25	**52.60 AB**
ST 4946GLB2	50.00	52.48	53.35	**51.94 B**
Average	**52.48 A**	**52.46 A**	**53.70 A**	**--**
		--------------------$/A--------------------		
DP 1646B2XF	224	270	364	**286 C**
FM 1911GLT	288	412	406	**369 B**
NG 4545B2XF	227	392	478	**366 B**
PHY 490W3FE	304	349	487	**380 B**
ST 4946GLB2	306	451	591	**449 A**
Average	**270 C**	**375 B**	**465 A**	**--**

TITLE:

Cotton variety performance (wheat-cotton rotation) as affected by low-energy precision application (LEPA) irrigation levels at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Wayne Keeling – Professor
Justin Spradley and Ray White – Research Assistants
Brice DeLong – Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size: 4 rows by 300-700 feet, 3 replications

Planting Date: May 21

Varieties: Deltapine 1646B2XF
FiberMax 1911GLT
NexGen 4545B2XF
PhytoGen 490W3FE
Stoneville 4946GLB2

Herbicides: Prowl 3 pt/A – April 12
Gramoxone 1 qt/A + Caparol 26 oz/A – May 21
Roundup 1 qt/A – June 19
Roundup + Outlook 1 qt/A – July 23
Roundup 1 qt/A – August 22
ETX 1.25 oz/A + Ethephon 3 pt/A – October 10
ETX 1.25 oz/A – October 26

Fertilizer: 115-35-0

Irrigation in-season:

	Low	Base	High
Preplant	3.8”	3.8”	3.8”
In Season	4.2”	6.3”	8.4”
Total	8.0”	10.1”	12.2”

Harvest Date: November 16

RESULTS AND DISCUSSION:

Five varieties (DP 1646B2XF, FM 1911GLT, NG 4545B2XF, PHY 490W3FE, and ST 4946GLB2) were planted under three irrigation levels in a wheat-cotton rotation. Wheat was planted following cotton harvest in November 2016, harvested in June 2017, and stubble maintained with herbicides and no tillage prior to cotton planting in May 2018. In-season irrigation levels were 4.2”, 6.3”, and 8.4”/A. When averaged across varieties, yields increased with higher irrigation levels (Table 1.). When averaged across irrigation levels, highest yields were produced with ST 4946GLB2 and PHY 490W3FE. Fiber quality, expressed as loan value, was similar across irrigation level and highest with DP 1646B2XF. Gross revenues ($/A) increased with higher irrigation levels and were highest with ST 4946GLB2.

When comparing varieties and irrigation levels across the three systems, the conventional tillage continuous cotton averaged 767 lbs/A compared to 698 lbs/A with the terminated cover crop system (Table 2.). The wheat cotton rotation produced 938 lbs/A when averaged across varieties and irrigation.

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

	Irrigation Levels			
Cultivar	**Low (4.2)**	**Base (6.3)**	**High (8.4)**	**Average**
		------------------ lbs/A------------------		
DP 1646B2XF	700	810	876	796 D
FM 1911GLT	695	1028	1056	926 BC
NG 4545B2XF	674	923	1089	895 C
PHY 490W3FE	768	1099	1134	1000 AB
ST 4946GLB2	788	1103	1325	1072 A
Average	**725 B**	**993 A**	**1096 A**	**--**
		------------------cents/lb-----------------		
DP 1646B2XF	54.75	54.75	55.38	54.96 A
FM 1911GLT	52.85	54.23	52.85	53.31 AB
NG 4545B2XF	52.93	53.05	53.08	53.02 B
PHY 490W3FE	53.63	50.03	54.13	52.60 B
ST 4946GLB2	53.10	51.63	54.13	52.95 B
Average	**53.45 A**	**52.74 A**	**53.91 A**	**--**
		--------------------$/A--------------------		
DP 1646B2XF	383	444	486	438 D
FM 1911GLT	366	558	557	494 BC
NG 4545B2XF	357	489	578	475 CD
PHY 490W3FE	412	553	613	526 AB
ST 4946GLB2	419	574	717	570 A
Average	**387 B**	**523 A**	**590 A**	**--**

Table 2. Yield – (Average of 5 varieties)

	Irrigation Levels			
System	**Low (4.2)**	**Base (6.3)**	**High (8.4)**	**Average**
		------------------ lbs/A------------------		
Conventional	598	866	838	**767**
Termination Rye	515	712	867	**698 (-9%)**
Wheat-Cotton	725	993	1096	**938 (+22%)**
Average	**612**	**857**	**933**	**801**
		------------------ cents/lb------------------		
Conventional	50.78	51.21	52.82	**51.60**
Termination Rye	52.48	52.46	53.70	**52.88 (+2%)**
Wheat-Cotton	53.45	52.74	53.91	**53.37 (+3%)**
Average	**52.23**	**52.13**	**53.47**	**52.61**
		------------------ $/A------------------		
Conventional	303	442	445	**396**
Termination Rye	270	375	465	**370 (-7%)**
Wheat-Cotton	387	523	590	**500 (+26%)**
Average	**320**	**446**	**500**	**422**

TITLE:

Effect of cropping system, variety, and irrigation rate on root-knot nematode population build-up from 2014 to 2018 at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Terry Wheeler – Professor
Cecil Haralson, Jimmy Grant, and Zach Hilliard – Research Assistants

MATERIALS AND METHODS:

Plot size: Length of the entire wedge, 4-rows wide, three replications/water treatment, nine replications/variety in each wedge.

Cropping System: wheat/fallow/cotton (2014-2018) versus continuous cotton with wheat cover (2014-2018) and continuous cotton with no cover and conventional cultivation (2017-2018).
Each plot in each cropping system with cotton was soil sampled in the late summer or fall each year and assays were run for nematodes.

RESULTS AND DISCUSSION:

The wheat/fallow/cotton system was effective at reducing root-knot nematode density, eventually to where there was no advantage in using nematode resistant varieties (Fig. 1).

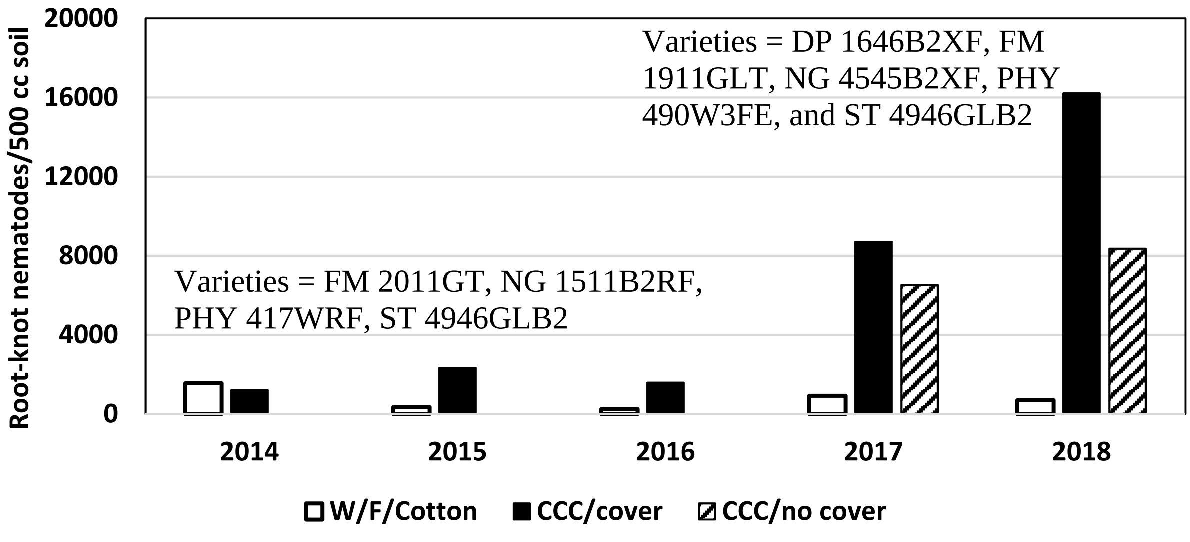


Figure 1. Root-knot nematode density comparing a wheat (W)/Fallow (F)/Cotton system to a continuous cotton (CCC) with a rye cover or with no cover and using conventional tillage.

From 2014-2016, the 2-gene resistant PHY 417WRF had lower densities of root-knot nematode than all other varieties tested (FM 2011GT, NG 1511B2RF, ST 4946GLB2). In 2017-2018, root-knot nematode density in the continuous cotton systems were similar across all varieties. During 2017 and 2018, the continuous cotton with rye cover had a higher average density of root-knot nematode (12,152 RK/500 cm^3 soil) than the continuous cotton with no cover (7,468 RK/500 cm^3 soil). Both systems had more nematodes than the wheat/fallow/cover in 2017-2018 (average of 963 RK/500 cm^3 soil).

TITLE:

Root-knot nematode management at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Terry Wheeler – Professor

MATERIALS AND METHODS:

1) A number of small plot nematicide trials were conducted with various products at AG-CARES. Plots were 4 rows wide, 36 feet long, and treatments were arranged in a randomized complete block design with four replications. Two rows were used for harvest and the other 2 rows of each plot were used for destructive root and soil sampling.

   Table 1. Yield response of cotton comparing nematicide products to the non-treated check in small plot trials.

Product	# of trials	Yield Response Relative to Non-treated
Aeris	3	+9%
AVICTA	2	-5%
BioST Nematicide 100	3	0%
Copeo	5	+9%
Nemastrike	1	0%
Velum Total (14 oz/acre)	4	+12%

2) Root-knot nematode density in large plot variety/Irrigation rate/cropping system trial. There are three areas of the circle involved, one is in a cotton/winter wheat/summer fallow rotation; one is continuous cotton with a wheat or rye cover crop; and one is continuous cotton with conventional tillage and no cover crop. There are three irrigation rates, replicated three times in the circle, a base (1.0B) rate, and +/-30% rate (1.3B, 0.7B). There are five varieties planted in this test including root-knot nematode susceptible varieties: DP 1646B2SF, NG 4545B2XF, and PHY 490W3FE; and slightly tolerant FM 1911GLT, and tolerant ST 4946GLB2. Soil samples were taken 10-11 September in all plots and assayed for root-knot nematode. The root-knot nematode counts were LOG10(RK+1) transformed for analysis.

RESULTS AND DISCUSSION:

The cotton that was rotated with winter wheat/summer fallow had significantly lower root-knot nematode densities (355/500 cm^3 soil for cotton with no cover and conventional tillage). The 1.3B irrigation rate had higher root-knot nematode density (11,823/5—cm^3

soil) than the 0.7B rate (6,491/500 cm^3 soil), and the 1.0B rate was intermediate (6,669/500 cm^3 soil). The five varieties were analyzed with regards to nematode density, only in the two continuous cotton wedges, since the nematode density was so low in the cotton/wheat rotation. DP 1646B2XF and PHY 490W3FE had higher root-knot nematode densities than FM 1911GLT and ST 4946GLB2 (Table 2). The third susceptible variety, NG 4545B2XF had higher root-knot nematode densities than ST 4946GLB2.

Table 2. Root-knot nematode density (RK)500 cm^3 soil at the end of the season and transformed nematode density (LRK) for five cotton varieties in two continuous cotton systems.

Variety	RK	LRK
DP 1646B2XF	13,723	4.00 a[1]
FM 1911GLT	8,996	3.45 bc
NG 4545B2XF	13,233	3.83 ab
PHY 490W3FE	21,904	4.10 a
ST 4946GLB2	2,979	3.19 c

[1]Least square means followed by the same letter are not significantly different at P=0.05.

TITLE:

Effect of root-knot nematode and irrigation rate on cotton varieties at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Ira Yates and Madison Cartwright, Extension Assistants

MATERIALS AND METHODS:

Plot size: 35 feet long, 2-rows wide. Randomized complete block design with 4 replications/variety/irrigation rate.

Irrigation rates: base (1.0B) and 30% over (1.33B) or under (0.67B) this rate.

RESULTS AND DISCUSSION:

Plant stands were better (>2.1 plants/foot of row) for the higher yielding varieties (Table 1). The top yielding varieties across all three irrigation rates were ST 4946GLB2 and PHY 480W3FE, and experimental lines were PX2B12W3FE and PX4A69W3FE. Root-knot susceptible varieties (PHY 490W3FE, NG 5007B3XF, FM 2398GLTP and FM 1830GLT averaged 28% lower yield than the partially nematode resistant ST 4946GLB2.

Table 1. Effect of cultivar and irrigation rate on lint yield, turnout, and plant stand in Lamesa.

	Lint yield (lbs/acre)					Plants/foot row		
Cultivar[b]	0.67B	1.0B	1.3B	mean	MS[a]	0.67B	1.0B	1.3B
PX2B12W3FE	713	898	1,197	936	a	3.1	3.4	3.3
ST 4946GLB2	653	852	1,200	902	a	3.1	3.0	3.1
PX4A69W3FE	642	862	1,183	896	a	2.3	2.4	2.5
PHY 480W3FE	637	808	1,112	852	ab	2.8	2.9	3.0
FM 1621GL	522	719	1,105	782	bc	2.2	2.3	2.3
PX3C06W3FE	566	702	987	752	bcd	2.7	2.9	2.9
PHY 350W3FE	529	682	1,030	747	cd	3.2	3.2	3.6
PX2B04W3FE	493	676	1,019	730	cde	3.2	3.3	3.2
MONEXP4	592	643	928	721	cde	1.6	2.3	2.0
PX2B10W3FE	496	673	981	717	cde	3.1	3.1	3.0
MONEXP2	499	626	998	708	cde	1.6	1.8	1.7
MONEXP1	494	628	964	695	cde	1.9	2.0	2.3
PHY 490W3FE	520	636	902	686	cde	2.6	2.5	2.7
DP 1823NRB2XF	521	645	866	677	def	1.5	1.7	1.5
NG 5007B3XF	507	592	901	666	def	2.0	1.8	1.9
DP 1747NRB2XF	467	636	874	659	d-g	2.1	2.4	2.3
FM 2398GLTP	444	636	881	654	d-g	2.6	2.7	2.8
BX1972GLTP	477	612	824	638	efg	1.8	1.9	2.0
FM 1830GLT	469	557	718	581	fg	1.6	1.8	1.8
MONEXP3	419	504	813	579	fg	1.0	1.1	1.2
PHY 417WRF	419	557	696	557	g	2.0	1.8	1.9
MSD[a] (0.05)	88	125	222	103		0.4	0.4	0.5

[a]MSD is the minimum significant difference between cultivars. Means followed by the same letter are not significantly different at P=0.05 with Waller-Duncan mean separation (MS).
[b]BX are experimental lines for BASF, DP is Deltapine, FM is Fibermax, MON are experimental lines for Bayer CropSciences, NG is NexGen, PHY is Phytogen, PX are experimental lines for Phytogen, and ST is Stoneville.

TITLE:

Effect of nematicide seed treatments and Velum Total on cotton yield with moderate root-knot nematode populations at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Terry Wheeler – Professor
Cecil Haralson and Zach Hilliard – Research Assistants

MATERIALS AND METHODS:

Plot size: 4 rows wide, 36 feet long, four replications, RCBD

RESULTS AND DISCUSSION:

All treatments resulted in excellent plant stands (2.4 to 2.8 plants/foot row). Root-knot nematode pressure was moderate for the test area. All the products had higher yield than the non-treated check (None), though none of the differences were significant due to high variability in the test area. Copeo + Velum Total (10 oz and 14 oz/acre) and Aeris + Velum Total (10-oz/acre) had the highest yields. Copeo is applied to all Stoneville and Fibermax varieties (included in the cost of the bag of seed). Velum Total costs approximately $1.90/ounce, so a 10-oz treatment would cost around $19/acre and a 14-oz treatment would cost around $26.60/acre. While Velum Total at 14 and 18 oz rates had higher yields than the non-treated check, they were most effective when combined with a seed treatment nematicide like Aeris or Copeo. The 10-oz rate of Velum Total was very effective when combined with either Aeris or Copeo.

Table 1. Effect of seed treatment nematicides and Velum Total on cotton.

Treatment	**Plants/ foot row**	**Root-knot Nematode/ 500 cm^3 soil**	**Lint yield (lbs/acre)**
None	2.54	1,140	659
Copeo	2.47	5,430	759
Velum Total 14-oz	2.48	4,650	706
Velum Total 18-oz	2.53	1,590	748
Aeris+Velum Total 10oz	2.53	2,520	829
Aeris	2.38	4,950	749
Copeo+Velum Total 10-oz	2.48	2,640	865
Copeo+Velum Total 14-oz	2.69	3,030	815
Aeris+Copeo	2.81	2,160	706
BioST Nematicide 100	2.58	780	739

TITLE:

Performance of PhytoGen varieties as affected by irrigation levels at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Wayne Keeling – Professor
Justin Spradley and Ray White – Research Assistants
Brice Delong – Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size: 4 rows by 30 feet, 4 replications

Planting Date: May 16

Varieties:

DP 1646B2XF	FM 1911GLT
NG 4545GLT	PHY 250W3FE
PHY 300W3FE	PHY 320W3FE
PHY 340W3FE	PHY 350W3FE
PHY 430W3FE	PHY 440W3FE
PHY 480W3FE	PHY 490W3FE
PHY 210W3FE (PX2A31W3FE)	
PHY 39W3FE (PX2BX4W3FE)	
PX3B07W3FE	

Herbicides:
Trifluralin 1.3 pt/A – April 12
Roundup 1 qt/A – June 19
Roundup + Outlook 1 qt/A – July 23
Roundup 1 qt/A – August 22
ETX 1.25 oz/A + Ethephon 3 pt/A – October 10
ETX 1.25 oz/A – October 26

Fertilizer: 115-35-0

Irrigation in-season: LEPA

	Dry	Low	Base	High
Preplant	2.0”	3.8”	3.8”	3.8”
In Season	0.0”	4.2”	6.3”	8.4”
Total	0.0”	8.0”	10.1”	12.2”

Harvest Date: November 19 and 20

RESULTS AND DISCUSSION:

Twelve commercial and experimental PhytoGen Enlist varieties and three competitive varieties were evaluated under dryland and three levels of center-pivot irrigation in 2019. Obtaining consistent stands was difficult due to lack of rain and hot, dry winds in May and early June. When averaged across varieties, lint yields ranged from 294 lbs/A for dryland up to 1033 lbs/A for the highest irrigation treatment. When averaged across irrigation levels, the highest yielding group included PHY 320W3FE and PX3B07W3FE, which were similar to FM 1911GLT (Table 1). Root-knot nematode levels favored varieties with higher levels of resistance. Lint quality, as measured by loan value, increased with higher irrigation levels. When averaged across irrigation levels, loan values ranged from 51.93 to 54.49 cents/lb (Table 2). Total revenues (yield x loan value) increased with higher irrigations and were correlated to highest yielding varieties (Table 3).

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

	In-season Irrigation Levels				
Variety	**Dry (0.0)**	**Low (4.2)**	**Base (6.3)**	**High (8.4)**	**Average**
	------------------ lbs/A------------------				
DP 1646B2XF	306	508	285	364	**365 H**
FM 1911GLT	462	779	1047	1382	**917 A**
NG 4545B2XF	560	565	474	663	**565 G**
PHY 250W3FE	254	580	903	1137	**718 CDE**
PHY 300W3FE	241	520	613	1004	**594 FG**
PHY 320W3FE	260	1122	877	1241	**874 AB**
PHY 340W3FE	220	658	783	1074	**683 DEF**
PHY 350W3FE	250	958	857	1062	**781 BCD**
PHY 430W3FE	245	607	1149	1139	**784 BCD**
PHY 440W3FE	233	687	965	1060	**736 CDE**
PHY 480W3FE	289	764	1073	1053	**794 BC**
PHY 490W3FE	233	778	763	917	**672 EF**
PHY 210W3FE	264	484	622	1295	**666 EFG**
PHY 39W3FE	292	814	905	913	**730 CDE**
PX3B07W3FE	309	844	1282	1188	**905 A**
Average	**294 D**	**711 C**	**840 B**	**1033 A**	**--**

Table 2. Effect of variety and irrigation level on loan value (cents/lb).

Variety	Dry (0.0)	Low (4.2)	Base (6.3)	High (8.4)	Average
	In-season Irrigation Levels				
	------------------cents/lb-----------------				
DP 1646B2XF	52.93	53.32	50.40	54.49	**52.78 ABC**
FM 1911GLT	52.78	54.38	53.18	52.07	**53.10 A**
NG 4545B2XF	49.38	50.43	51.85	52.30	**50.98 EF**
PHY 250W3FE	50.40	53.75	52.60	53.19	**52.48 ABC**
PHY 300W3FE	50.24	51.98	51.38	52.19	**51.44 DE**
PHY 320W3FE	51.46	51.06	52.83	51.93	**51.81 CDE**
PHY 340W3FE	48.95	49.68	49.65	53.00	**50.31 F**
PHY 350W3FE	50.59	51.38	51.36	52.48	**51.45 DE**
PHY 430W3FE	48.23	49.70	53.25	52.65	**50.95 EF**
PHY 440W3FE	51.94	52.80	54.10	53.55	**53.09 A**
PHY 480W3FE	51.53	49.37	53.48	53.20	**51.89 CDE**
PHY 490W3FE	51.77	53.18	54.55	51.97	**52.86 AB**
PHY 210W3FE	50.04	52.94	51.25	53.68	**51.97 BCD**
PHY 39W3FE	51.60	53.13	52.62	51.55	**52.22 ABCD**
PX3B07W3FE	51.88	52.22	54.70	53.13	**52.98 A**
Average	**50.91 C**	**51.95 B**	**52.48 AB**	**52.76 A**	**--**

Table 3. Effect of variety and irrigation level on revenue ($/A).

Variety	Dry (0.0)	Low (4.2)	Base (6.3)	High (8.4)	Average
	In-season Irrigation Levels				
	--------------------$/A--------------------				
DP 1646B2XF	162	271	145	198	**194 I**
FM 1911GLT	244	424	556	719	**485 A**
NG 4545B2XF	276	284	247	346	**288 H**
PHY 250W3FE	128	312	476	605	**380 CDEF**
PHY 300W3FE	121	271	313	521	**306 GH**
PHY 320W3FE	134	572	464	642	**452 AB**
PHY 340W3FE	107	327	389	570	**348 FG**
PHY 350W3FE	126	488	445	557	**404 BCDE**
PHY 430W3FE	118	303	612	600	**408 BCD**
PHY 440W3FE	121	363	522	563	**392 CDEF**
PHY 480W3FE	148	377	576	559	**415 BC**
PHY 490W3FE	121	411	416	475	**355 DEFG**
PHY 210W3FE	132	256	319	696	**350 EFG**
PHY 39W3FE	150	431	478	469	**382 CDEF**
PX3B07W3FE	161	440	701	634	**483 A**
Average	**150 D**	**369 C**	**444 B**	**544 A**	**--**

TITLE:

Performance of FiberMax and Stoneville varieties as affected by subsurface drip irrigation levels at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Wayne Keeling – Professor
Justin Spradley and Ray White – Research Assistants
Brice DeLong - Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size: 4 rows by 40 feet, 3 replications

Planting Date: May 23

Varieties:
FM 1621GL (BX 1921GL)
FM 2398GLTP (BX 1971GLTP)
BX 1972GLTP, FM 1320GL
FM 1830GLT, FM 1888GL
FM 1911GLT, FM 2322GL
FM 2498GLT, FM 2574GLT
ST 4946GLB2, ST 5471GLTP

Herbicides:
Trifluralin 24 oz/A
Caparol 26 oz/A
Roundup 32 oz/A + Dual 16 oz/A
Roundup 32 oz/A
ETX 1.25 oz/A + Ethephon 3 pt/A – October 26

Fertilizer: 100-34-0

Irrigation in-season:

	Low	Base	High
Preplant	3.2”	3.2”	3.2”
In Season	4.3”	5.3”	6.6”
Total	7.5”	8.5”	9.8”

Harvest Date: November 27

RESULTS AND DISCUSSION:

Twelve varieties, including three experimentals, seven commercial FiberMax and two commercial Stoneville varieties, were evaluated under three levels of subsurface drip irrigation at AG-CARES in 2018. Lint yields ranged from 1345 to 2041 lbs/A with increasing irrigation levels. When averaged across irrigation levels, highest yields were produced with ST 4946GLB2, FM 2498GLT, and FM 1621GL (Table 1). When averaged across varieties, fiber quality expressed as loan value trended higher from the low to base irrigation but was similar for base and high irrigation levels. When averaged across irrigation levels, all varieties produced similar loan values. Gross revenues ($/A) increased with increasing irrigations levels and varieties that produced highest yield produced highest gross revenue.

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

Cultivar	Irrigation Levels Low (3.9)	Base (5.7)	High (7.5)	Average
		------------------ lbs/A------------------		
FM 1621GL	1380	2118	2353	**1950 A**
FM 2398GLTP	1430	2002	1789	**1740 ABCD**
BX 1972GLTP	1264	1582	1948	**1597 CD**
FM 1320GL	1314	1731	1872	**1638 CD**
FM 1830GLT	1352	1872	2167	**1797 ABC**
FM 1888GL	1333	1591	2100	**1674 CD**
FM 1911GLT	1250	1680	2260	**1729 BCD**
FM 2322GL	1304	1685	1676	**1555 D**
FM 2498GLT	1448	1873	2373	**1898 AB**
FM 2574GLT	1235	1499	2049	**1594 CD**
ST 4946GLB2	1479	1861	2039	**1792 ABC**
ST 5471GLTP	1361	1836	1876	**1690 BCD**
Average	**1345 C**	**1777 B**	**2041 A**	**--**
		------------------cents/lb-----------------		
FM 1621GL	47.93	52.92	53.10	**51.32 A**
FM 2398GLTP	51.88	52.87	52.83	**52.53 A**
BX 1972GLTP	50.78	54.58	53.67	**53.01 A**
FM 1320GL	52.65	52.03	50.93	**51.87 A**
FM 1830GLT	52.60	52.20	51.87	**52.22 A**
FM 1888GL	51.07	50.00	50.88	**50.65 A**
FM 1911GLT	43.42	50.60	53.58	**49.20 A**
FM 2322GL	51.42	53.65	51.42	**52.16 A**
FM 2498GLT	51.23	52.15	53.98	**52.46 A**
FM 2574GLT	51.37	53.08	52.85	**52.43 A**
ST 4946GLB2	49.08	51.82	49.43	**50.11 A**
ST 5471GLTP	50.30	53.62	51.10	**51.67 A**
Average	**50.31 A**	**52.46 A**	**52.14 A**	**--**
		--------------------$/A--------------------		
FM 1621GL	662	1122	1249	**1010 A**
FM 2398GLTP	742	1055	944	**913 ABC**
BX 1972GLTP	642	864	1044	**849 BC**
FM 1320GL	694	899	961	**850 BC**
FM 1830GLT	714	974	1115	**934 AB**
FM 1888GL	684	796	1069	**849 BC**
FM 1911GLT	551	841	1211	**867 BC**
FM 2322GL	669	906	862	**812 C**
FM 2498GLT	742	977	1280	**999 A**
FM 2574GLT	637	797	1092	**841 BC**
ST 4946GLB2	730	967	1013	**903 ABC**
ST 5471GLTP	684	984	949	**872 BC**
Average	**679 C**	**931 B**	**1065 A**	**--**

TITLE:

Results of the irrigated cotton variety performance test at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Jane K. Dever, Carol M. Kelly, and Valerie M. Morgan; Professor, Research Scientist, and Research Specialist

MATERIALS AND METHODS:

Test:	Cotton variety, pivot irrigated
Planting Date:	June 6th
Design:	Randomized complete block, 4 replications
Plot Size:	2-row plots, 27ft
Planting Pattern:	Solid
Herbicide:	Trifluralin @1.3 pt/A applied pre-plant
Fertilizer:	130-35-0
Irrigations:	9.10 acre-in applied May-September
Harvest Aid:	N/A
Harvest Date:	December 4th

RESULTS AND DISCUSSION:

Cotton variety test

Texas A&M AgriLife Research, in conjunction with the AG-CARES location in Lamesa, provide an important service to seed companies and producers through a fee-based testing system that can evaluate a relatively large number of commercial and pre-commercial cotton varieties in small-plot replicated performance trials. This service allows varieties from different companies and seed developers to be tested together by an independent source. The small-plot replicated trials are intended to evaluate the genetic performance of lines independent of biotechnology traits, so the tests are managed as conventional varieties as opposed to herbicide or insecticide systems. Every effort is made to minimize the effects of insect and weed pressure. The same varieties are tested in five locations across the Southern High Plains, including the irrigated site at AG-CARES.

Lint yield is determined by the stripper-harvested plot weight and a lint percentage (gin turnout) determined from a ~600g grab sample collected randomly from the harvested plot material. Boll size, and pulled and picked lint percent are determined from a 50 boll sample obtained from 2 replications of each entry. Maturity and storm resistance ratings are a visual assessment of percent open bolls and a 1 (very loose, considerable storm loss) to 9 (very tight boll, no storm loss) storm resistance rating.

Forty-four cotton varieties from eight different seed companies and one university were submitted for variety testing at five locations, including the irrigated location at AG-CARES in Lamesa. International Seed Technology (IST), is a company testing conventional cotton varieties developed in Brazil. PCG varieties are conventional varieties from Premium Cotton Genetics, and BSD varieties are conventional varieties from Brownfield Seed and Delinting. Average yield was 993 pounds of lint per acre with a 19.3% test coefficient of variation and

224 pound least significant difference. The highest yielding variety was PHY 320 W3FE with a yield of 1228 pounds of lint per acre. This top yielder also had a 9.4 seed index, a micronaire of 3.8, upper half mean length (UHML) of 1.11 in., and a strength of 29.4 g/tex. The next 20 varieties in the test were not significantly different than the highest yielding variety (Table 1). The seed index for these varieties ranged from 8.4 to 11.8, and they had an average mic of 3.8, an average UHML of 1.12, and average strength of 30.3 g/tex. Phytogen was joined in the top tier by FiberMax, Deltapine, IST, PCG and NexGen brands. Yields for the test ranged from 1228 pounds of lint per acre to 774 pounds of lint per acre. Plant height ranged from 18-30inches with a test average of 23 inches. 9Relative maturity of the varieties as indicated by percent open bolls on a given date averaged 68%, with a range from 51-80%. Storm resistance ratings ranged from 3-6 with a test average of 4. There was quite a range of fiber quality throughout the test with mic ranging from 2.9 to 4.8, UHML from 1.05 to 1.21in., and strengths from 28.5 to 32.6 g/tex (Table 1A).

Table 1. Yield and agronomic property data from the irrigated regional cotton performance test at the AG-CARES farm, Lamesa, 2018.

				Agronomic Properties						% Open		
		% Turnout		% Lint		Boll	Seed	Lint	Seed per	Bolls	Storm	
Designation	Yield	Lint	Seed	Picked	Pulled	Size	Index	Index	Boll	17-Oct	Resistance	Height
PhytoGen PHY 320 W3FE	1228	26.5	37.8	39.2	30.3	5.3	9.4	6.4	32.4	63	5	23
FiberMax FM 2498GLT	1187	28.4	39.4	40.1	30.9	6.1	9.8	7.0	35.3	59	5	24
PhytoGen PHY 499 WRF	1167	27.8	40.1	39.0	31.3	5.4	9.6	6.6	32.0	66	4	27
PhytoGen PHY 480 W3FE	1164	27.2	37.8	40.6	31.2	5.1	8.7	6.2	33.5	69	5	25
PhytoGen PHY 210 W3FE	1149	28.7	38.8	40.0	30.9	5.0	9.9	7.1	28.5	80	6	19
PhytoGen PHY 300 W3FE	1134	25.8	37.5	39.4	30.8	4.9	8.5	6.0	32.4	70	6	18
Deltapine DP 1822 B3XF	1122	27.0	40.9	38.6	30.9	4.8	9.7	6.5	28.6	70	4	22
Deltapine DP 1612 B2XF	1113	27.7	39.9	38.0	30.8	5.0	9.3	6.2	30.5	74	4	19
PhytoGen PHY 350 W3FE	1113	26.4	40.1	37.0	28.6	5.4	11.3	7.2	28.4	63	5	24
FiberMax FM 1888GL	1094	26.8	41.0	37.2	29.9	7.0	11.2	7.0	36.9	68	5	24
International Seed Technology BRS 416	1076	27.0	40.1	38.8	30.2	4.3	8.7	5.9	28.1	60	3	27
PhytoGen PHY 250 W3FE	1072	27.5	37.7	37.3	29.0	5.5	9.1	5.8	36.0	76	6	19
Deltapine DP 1646 B2XF	1066	25.7	36.5	41.5	32.9	4.9	8.4	6.4	31.8	54	5	24
PhytoGen PHY 440 W3FE	1060	26.5	39.3	37.2	28.4	5.2	8.9	5.6	34.2	55	5	25
FiberMax FM 1911GLT	1051	27.6	38.8	39.1	30.3	6.9	11.8	8.2	32.7	72	6	18
PhytoGen PHY 490 W3FE	1033	24.8	37.8	37.5	29.3	4.9	8.8	5.7	32.3	55	4	24
PCG 713	1032	24.8	41.1	36.0	28.6	5.2	9.7	5.8	32.0	65	4	26
NexGen NG 4545 B2XF	1019	27.5	40.5	39.7	31.6	5.4	10.7	7.5	28.3	64	5	28
NexGen NG 3780 B2XF	1018	26.4	40.3	38.0	30.2	5.5	9.7	6.3	33.1	73	4	26
NexGen NG 4689 B2XF	1013	27.0	39.8	38.7	31.0	5.7	9.5	6.4	34.5	69	5	28
PhytoGen PHY 430 W3FE	1012	27.3	34.6	43.8	33.7	5.2	9.1	7.4	30.6	70	5	21
PhytoGen PHY 340 W3FE	995	27.0	38.8	35.9	27.8	4.7	8.7	5.4	30.8	74	5	21
NexGen NG 4777 B2XF	992	26.2	39.8	39.7	32.6	5.8	9.9	6.9	33.8	59	5	30
FiberMax FM 2574GLT	979	27.3	39.3	40.4	31.3	5.3	9.2	6.7	31.9	64	5	24
International Seed Technology BRS 286	976	24.2	38.2	36.1	28.7	5.0	10.0	6.0	30.3	76	3	25
International Seed Technology BRS 372	954	27.5	38.5	38.1	30.7	5.5	9.5	6.3	33.3	75	4	22
NexGen NG 3517 B2XF	952	25.0	38.8	37.2	29.5	6.0	9.6	6.0	36.9	75	4	27
Seed Source Genetics SSG UA 222	950	28.1	40.9	38.3	31.3	5.6	10.9	7.2	30.0	65	4	23
BS&D BSD 9X	941	26.6	41.1	37.5	29.4	5.6	10.4	6.6	31.3	74	5	22
Seed Source Genetics SSG UA 114X	932	26.2	41.9	37.7	30.8	5.9	10.3	6.7	33.4	74	3	24

Table 1. Yield and agronomic property data from the irrigated regional cotton performance test at the AG-CARES farm, Lamesa, 2018.

				Agronomic Properties						% Open		
		% Turnout		% Lint		Boll	Seed	Lint	Seed per	Bolls	Storm	
Designation	Yield	Lint	Seed	Picked	Pulled	Size	Index	Index	Boll	17-Oct	Resistance	Height
International Seed Technology BRS 335	929	25.4	38.0	36.3	28.4	5.1	9.4	5.6	33.1	65	4	26
Seed Source Genetics SSG UA 222X	927	28.0	42.4	37.4	31.4	5.7	10.5	6.8	31.6	56	4	25
Deltapine DP 1845 B3XF	915	27.1	40.2	38.5	30.3	5.2	8.4	5.7	35.1	51	5	23
Tamcot 73	913	27.7	41.8	37.2	30.6	5.6	9.4	6.0	34.6	79	5	19
PhytoGen PHY 764 WRF	904	24.4	39.0	37.9	29.7	5.1	10.1	6.6	29.3	65	4	24
Seed Source Genetics SSG UA 107	876	26.7	40.3	37.4	30.2	5.7	10.8	7.0	30.4	76	4	24
International Seed Technology BRS 293	873	25.5	39.3	37.0	29.7	6.0	10.3	6.4	34.7	66	4	24
BS&D TonBuster Elite	868	25.7	41.4	36.0	28.5	5.2	9.9	6.0	31.5	78	3	24
Deltapine DP 1820 B3XF	862	24.6	35.1	39.7	30.3	4.7	8.3	5.7	32.6	66	3	24
BS&D BSD 224	849	25.7	41.8	36.7	28.3	5.6	11.5	7.1	29.8	70	5	26
FiberMax FM 1830GLT	840	28.1	38.8	39.9	31.5	5.5	9.1	6.5	33.6	74	5	23
Tamcot G11	786	26.5	40.4	35.8	28.6	6.0	11.2	6.7	32.1	69	4	24
PhytoGen PHY 330 W3FE	775	24.0	35.1	39.0	29.4	6.1	7.9	5.4	43.7	63	5	24
PCG 700	774	24.7	40.9	37.0	28.8	5.3	9.5	6.1	32.5	78	5	18
Mean	993	26.5	39.3	38.2	30.2	5.4	9.7	6.4	32.4	68	4	23
c.v.%	19.3	4.3	4.6	1.8	2.4	10.0	6.6	7.4	12.1	11.7	18.8	14.2
LSD 0.05	224	1.3	2.1	1.1	1.2	0.9	1.1	0.8	6.6	9	1	4

Table 1A. Fiber quality results from the irrigated regional cotton performance test at the AG-CARES farm, Lamesa, 2018.

Designation	Micronaire	Length	Uniformity	Strength	Elongation	Rd	+b	Leaf	Color Grade
PhytoGen PHY 320 W3FE	3.8	1.11	80.9	29.4	7.1	77.6	8.0	4	31-1
FiberMax FM 2498GLT	4.5	1.16	80.4	30.3	5.8	78.8	7.5	4	31-1,41-1
PhytoGen PHY 499 WRF	3.6	1.12	81.7	30.5	7.6	76.5	7.9	5	31-2,41-1
PhytoGen PHY 480 W3FE	3.7	1.12	80.9	30.0	7.4	76.9	7.5	5	31-2,41-1
PhytoGen PHY 210 W3FE	4.8	1.11	81.6	31.3	5.8	77.8	7.0	4	41-1
PhytoGen PHY 300 W3FE	3.6	1.09	80.2	29.6	6.8	76.8	7.9	4	31-2,41-1
Deltapine DP 1822 B3XF	3.7	1.18	80.0	31.5	6.0	78.2	7.8	3	31-1,31-2
Deltapine DP 1612 B2XF	3.9	1.10	79.3	30.1	7.0	74.7	7.5	6	41-1,41-2
PhytoGen PHY 350 W3FE	3.5	1.13	80.1	29.7	6.9	79.4	7.8	3	21-2,31-1
FiberMax FM 1888GL	3.6	1.13	81.1	32.0	5.4	77.9	6.8	5	41-1
International Seed Technology BRS 416	3.9	1.10	79.2	29.6	6.4	76.4	7.9	4	31-2,41-4
PhytoGen PHY 250 W3FE	4.2	1.09	80.0	29.8	5.8	78.8	6.9	3	31-2,41-1
Deltapine DP 1646 B2XF	3.2	1.16	79.4	29.7	7.3	79.0	7.8	4	31-1
PhytoGen PHY 440 W3FE	2.9	1.19	79.6	31.0	5.8	77.5	7.4	5	31-2,41-1
FiberMax FM 1911GLT	3.4	1.15	80.8	31.6	6.2	78.9	7.4	3	31-1,31-2
PhytoGen PHY 490 W3FE	3.3	1.12	80.7	30.5	6.8	77.2	7.8	4	31-1,41-1
PCG 713	3.5	1.12	79.8	31.0	7.0	76.3	8.2	4	31-2
NexGen NG 4545 B2XF	4.1	1.09	80.5	29.4	5.5	77.3	8.6	4	31-2,31-3
NexGen NG 3780 B2XF	4.7	1.09	80.4	30.2	7.7	76.6	8.0	4	41-1
NexGen NG 4689 B2XF	4.1	1.10	78.5	30.0	5.2	76.4	8.0	3	31-2,41-1
PhytoGen PHY 430 W3FE	4.2	1.05	80.2	29.9	7.4	75.7	8.7	3	31-2,32-2
PhytoGen PHY 340 W3FE	3.9	1.11	79.5	29.9	6.7	77.0	7.5	4	31-2,41-1
NexGen NG 4777 B2XF	4.0	1.10	79.0	29.7	5.7	76.7	8.3	3	31-1,31-2
FiberMax FM 2574GLT	4.0	1.14	79.7	31.0	5.8	77.4	7.0	5	41-1
International Seed Technology BRS 286	3.9	1.07	78.9	30.8	6.9	77.2	7.5	4	31-2,41-1
International Seed Technology BRS 372	4.0	1.07	80.4	31.3	6.7	75.8	7.6	4	41-1
NexGen NG 3517 B2XF	3.7	1.16	80.1	31.5	6.2	76.7	7.4	3	31-2,41-1
Seed Source Genetics SSG UA 222	4.2	1.14	80.7	31.8	8.0	75.3	7.2	6	41-1,41-2
BS&D BSD 9X	4.3	1.12	80.0	31.0	5.5	76.6	6.9	4	41-1,41-2
Seed Source Genetics SSG UA 114X	4.5	1.11	81.0	30.4	6.9	76.0	7.3	4	41-1

Table 1A. Fiber quality results from the irrigated regional cotton performance test at the AG-CARES farm, Lamesa, 2018.

Designation	Micronaire	Length	Uniformity	Strength	Elongation	Rd	+b	Leaf	Color Grade
International Seed Technology BRS 335	3.6	1.11	80.2	28.5	6.9	77.6	7.7	5	31-1,41-1
Seed Source Genetics SSG UA 222X	4.1	1.17	80.0	30.9	7.0	76.5	7.8	5	31-2,41-1
Deltapine DP 1845 B3XF	3.1	1.21	79.6	30.5	6.8	78.6	7.1	5	31-2
Tamcot 73	4.0	1.12	81.5	31.4	6.9	75.6	7.1	5	31-1,51-1
PhytoGen PHY 764 WRF	3.5	1.16	80.8	32.6	6.7	76.3	7.5	4	41-1
Seed Source Genetics SSG UA 107	4.1	1.13	81.5	32.0	6.2	78.2	7.6	2	31-2
International Seed Technology BRS 293	3.6	1.09	80.6	32.2	7.2	75.2	8.1	4	31-2,41-1
BS&D TonBuster Elite	4.4	1.08	77.4	28.8	7.4	75.0	7.4	5	41-1,41-2
Deltapine DP 1820 B3XF	3.3	1.14	80.3	30.5	6.7	78.5	7.7	5	31-1,31-2
BS&D BSD 224	4.4	1.12	79.5	31.2	6.3	76.5	7.0	5	41-1
FiberMax FM 1830GLT	4.0	1.15	80.0	31.1	6.2	76.8	6.9	4	41-1
Tamcot G11	3.8	1.13	79.5	31.0	6.6	75.6	8.0	4	41-1
PhytoGen PHY 330 W3FE	3.9	1.11	80.2	29.4	6.4	76.7	7.7	4	31-2,41-1
PCG 700	3.7	1.11	79.6	30.4	6.0	76.5	7.6	4	31-2,41-1
Mean	3.8	1.12	80.1	30.5	6.5	76.9	7.6	4	
c.v.%	9.0	2.4	1.3	3.2	6.4	1.6	5.0	25.8	
LSD 0.05	0.6	0.05	1.8	1.7	0.7	2.1	0.6	2	

TITLE:

Results of the root-knot nematode (RKN) cotton variety performance test at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Jane K. Dever, Terry A. Wheeler, Carol M. Kelly, and Valerie M. Morgan; Professor, Professor, Research Scientist, and Research Specialist

MATERIALS AND METHODS:

Test:	Root-Knot Nematode Variety
Planting Date:	May 14th
Design:	Randomized complete block, 4 replications
Plot Size:	2-row plots, 30ft
Planting Pattern:	Solid
Herbicide:	Prowl® @3.0 pt/A + Roundup® @ 1qt/A applied pre-plant
Fertilizer:	130-35-0
Irrigations:	9.6 acre-in applied May-September
Harvest Aid:	ET®X @1.25oz/A + Ethephon @ 3pt/A applied Oct. 10th ET®X @1.25oz/A applied on Oct.26th
Harvest Date:	December 3rd

RESULTS AND DISCUSSION:

Some locations at the AG-CARES facility provide an excellent opportunity to evaluate a number of commercial, pre-commercial; and breeding strains in small-plot replicated trials under root-knot nematode (RKN) pressure. Texas A&M AgriLife Research provides a fee-based testing service for seed companies to evaluate their products in the same test with other varieties, and allows producers access to independently generated performance data in production situations that may resemble their own.

RKN Variety Test

Lint yield is determined by the stripper-harvested plot weight and a lint percentage (gin turnout) determined from a ~600g grab sample collected randomly from the harvested plot material. Boll size, and pulled and picked lint percent are determined from a 50 boll sample obtained from 2 replications of each entry. Maturity and storm resistance ratings are a visual assessment of percent open bolls and a 1 (very loose, considerable storm loss) to 9 (very tight boll, no storm loss) storm resistance rating.

Thirty-six cotton varieties and experimental strains from multiple seed companies were submitted for variety testing in a field where root-knot nematodes are known to be present. Average yield was 850 pounds of lint per acre with a 19.5% test coefficient of variation and 194 pound least significant difference. Yields for the test ranged from 1058 pounds of lint per acre to 650 pounds of lint per acre. PHY 350 W3FE was the top yielding variety with a storm resistance of 5 and a seed index of 10.2. This top yield came with a micronaire of 5.1, upper half mean length (UHML) of 1.11 in., and a strength of 29.4 g/tex. It was followed by 14 varieties and experimental strains that were not significantly different in terms of yield that represented CPS and Phytogen, as well as the check variety ST 4946GLB2. This group of varieties had an average micronaire of 4.7, UHML of 1.11 in., and strength of 30.1 g/tex (Table 2A). PX2B04W3FE allowed the lowest level of nematode reproduction with an RKN count of zero in 2018 while obtaining a yield of 865 pounds of lint per acre. PX2B04W3FE, not only had the lowest nematode counts, but had the second longest UHML at 1.15 in. combined with a mic of 4.7 and strength of 31.4 g/tex (Table 2A). PHY 320 W3FE had the second lowest level of nematode reproduction (LRK, 1.16) and yielded 844 pounds of lint per acre, followed by PX2BX4W3FE (LRK, 1.25) with a yield of 888 pounds (Table 2).

Table 2. Yield and agronomic property data from the irrigted root-knot nematode cotton performance trail at the AG-CARES research farm, Lamesa, 2018.

		Agronomic Properties								% Open				
		% Turnout		% Lint		Boll	Seed	Lint	Seed per	Bolls	Storm		Nematode Ratings	
Designation	Yield	Lint	Seed	Picked	Pulled	Size	Index	Index	Boll	13-Sep	Resistance	Height	Rk	LRK
PhytoGen PHY 350 W3FE	1058	30.6	39.6	39.9	32.6	5.2	10.2	7.2	28.5	66	5	28	4560	3.6282
PhytoGen PX2B12W3FE	1048	30.0	40.3	37.1	29.9	5.2	9.5	6.1	31.6	59	6	24	670	2.0051
Stoneville ST 4946GLB2 check	997	30.1	40.5	37.0	30.8	6.2	11.4	7.1	32.3	61	5	27	2550	3.1977
CPS 17251 B2XF	996	29.4	37.8	40.1	32.8	5.8	9.3	6.8	34.2	24	5	29	845	2.2336
PhytoGen PX4A64W3FE	984	33.0	38.2	40.4	33.2	5.2	10.9	8.1	26.0	46	7	24	420	1.8964
PhytoGen PX2BX1W3FE	923	27.7	38.3	35.1	28.5	5.4	10.5	6.2	30.4	58	7	22	270	1.8307
PhytoGen PX3B09W3FE	912	33.7	41.2	38.9	30.6	4.9	9.1	6.4	29.5	75	6	21	3720	2.5460
PhytoGen PHY 440 W3FE	909	29.5	38.1	37.9	30.1	5.3	9.6	6.4	31.5	43	6	25	780	2.8278
PhytoGen PHY 480 W3FE	909	29.7	36.9	37.7	30.3	5.6	9.5	6.3	33.0	73	5	25	170	1.7359
PhytoGen PX2BX3W3FE	904	27.8	38.5	36.1	28.8	4.9	10.0	6.3	28.5	63	7	22	570	2.0902
PhytoGen PX3C06W3FE	893	28.5	36.5	38.1	28.5	4.9	8.4	5.9	31.2	70	5	26	240	1.8615
PhytoGen PX2B10W3FE	888	27.2	39.5	37.4	29.7	5.1	10.4	6.6	29.2	65	7	22	410	1.9412
PhytoGen PX2BX4W3FE	888	27.5	38.2	37.4	29.3	5.4	9.7	6.3	32.0	60	7	21	240	1.2519
PhytoGen PX4A69W3FE	882	30.9	37.3	38.8	31.7	5.6	9.7	6.8	31.8	65	6	25	1020	2.8541
PhytoGen PX2B04W3FE	865	27.7	38.7	35.6	28.2	5.3	10.5	6.3	29.7	66	7	22	0	0.0000
FiberMax FM 2398GLTP	855	31.3	37.0	41.0	33.1	5.7	9.7	7.4	31.6	64	5	24	10260	3.7629
BASF BX 1972GLTP	849	28.3	44.0	35.1	29.7	5.5	10.4	6.0	31.8	63	6	25	9660	3.7249
Americot AMX 1817 B3XF	847	30.4	36.8	38.6	31.5	5.4	8.9	6.3	33.1	53	6	27	12870	3.9454
PhytoGen PHY 320 W3FE	844	29.5	37.5	36.8	29.7	5.1	9.6	6.1	30.7	73	5	24	120	1.1601
PhytoGen PX2BX2W3FE	841	28.8	38.2	36.9	29.4	4.8	9.3	5.9	29.8	53	7	22	200	1.8107
FiberMax FM 1621GL	832	31.5	37.6	39.7	32.3	5.8	9.8	7.2	32.0	58	5	26	2130	3.0609
BASF BX 1975GLTP	831	30.9	36.4	38.7	31.5	5.6	9.1	6.4	33.7	69	4	25	2460	3.3545
FiberMax FM 1911GLT check	819	29.9	36.5	39.0	30.8	6.2	12.1	8.3	29.4	60	7	24	3400	3.0591
Deltapine DP 1747NR B2XF	818	29.9	37.7	39.2	32.0	5.5	8.9	6.5	33.6	50	5	27	3630	2.6002
PhytoGen PHY 430 W3FE	813	31.9	37.0	39.6	31.3	4.7	8.5	6.1	30.5	70	6	24	2500	3.1650
PhytoGen PX3B07W3FE	808	31.4	39.3	38.7	30.8	5.0	9.1	6.3	30.2	75	5	21	1920	3.1582
FiberMax FM 2498GLT	792	30.4	37.7	39.9	33.5	6.6	10.6	7.6	34.7	50	6	25	7440	3.8388
Brownfield Seed and Delinting BSD 598	791	28.9	41.8	37.0	30.3	5.1	9.6	6.1	31.0	61	5	26	16500	4.2025
FiberMax FM 2011GL check	771	29.7	38.7	38.0	31.3	6.4	10.9	7.4	33.0	63	5	27	1890	3.2349
Stoneville ST 4550GLTP	757	31.2	35.8	40.4	33.2	5.3	8.7	6.5	32.6	50	5	28	2120	3.0997

Table 2. Yield and agronomic property data from the irrigted root-knot nematode cotton performance trail at the AG-CARES research farm, Lamesa, 2018.

		Agronomic Properties								% Open				
		% Turnout		% Lint		Boll	Seed	Lint	Seed per	Bolls	Storm		Nematode Ratings	
Designation	Yield	Lint	Seed	Picked	Pulled	Size	Index	Index	Boll	13-Sep	Resistance	Height	Rk	LRK
Americot AMX 1818 B3XF	751	27.2	39.2	35.4	28.2	5.2	9.7	5.8	31.9	63	6	30	13380	3.9125
Monsanto 17R931NR B3XF	743	29.2	36.4	39.3	31.7	4.8	8.7	6.1	30.8	63	6	29	1230	2.9353
Deltapine DP 1558NR B2RF check	718	29.6	36.7	38.8	31.0	5.8	9.4	6.5	34.5	42	5	26	1350	2.9742
BASF BX 1976GLTP	702	30.8	38.5	37.3	31.0	5.7	10.2	6.7	31.9	49	5	27	8580	3.8973
BASF BX 1974GLTP	699	32.5	36.8	40.6	33.0	5.2	9.0	6.7	31.8	74	5	25	3060	3.2809
Brownfield Seed and Delinting BSD 224	650	27.8	41.4	35.7	28.7	5.4	10.7	6.4	30.3	68	6	24	7380	3.7053
Mean	850	29.8	38.3	38.1	30.8	5.4	9.7	6.6	31.3	60	6	25		
c.v.%	19.5	4.5	4.7	1.7	2.7	4.6	4.7	5.8	5.9	18.8	13.5	8.3		
LSD 0.05	194	1.6	2.1	1.1	1.4	0.4	0.8	0.6	3.1	13	1	2		
												MSD (0.05)	7300	1.3300

Table 2A. Fiber quality results from the irrigated root-knot nematode cotton performance test at the AG-CARES research farm, Lamesa, 2018.

Designation	Micronaire	Length	Uniformity	Strength	Elongation	Rd	+b	Leaf	Color Grade
PhytoGen PHY 350 W3FE	5.1	1.11	81.8	29.4	6.9	74.4	7.0	3	41-2
PhytoGen PX2B12W3FE	4.7	1.09	80.4	29.6	7.2	75.2	7.2	4	41-1
Stoneville ST 4946GLB2 check	5.2	1.09	82.5	30.2	7.3	74.2	7.2	4	41-1,51-1
CPS 17251 B2XF	5.0	1.12	81.2	30.0	7.1	75.5	7.0	3	41-1,41-2
PhytoGen PX4A64W3FE	4.5	1.06	80.5	28.9	7.4	75.1	7.5	3	41-1,41-2
PhytoGen PX2BX1W3FE	4.8	1.16	80.9	31.0	6.0	75.8	6.9	3	41-1
PhytoGen PX3B09W3FE	4.8	1.07	80.4	29.5	6.7	74.9	7.1	4	41-1,41-2
PhytoGen PHY 440 W3FE	4.4	1.14	81.4	31.7	6.7	74.7	6.9	4	41-1,41-2
PhytoGen PHY 480 W3FE	4.7	1.08	82.1	30.0	7.9	74.1	7.4	3	41-1,41-2
PhytoGen PX2BX3W3FE	4.5	1.12	80.6	29.5	6.4	74.8	7.2	4	41-1,41-2
PhytoGen PX3C06W3FE	4.9	1.08	79.9	28.8	6.2	73.0	6.6	4	41-2,51-1
PhytoGen PX2B10W3FE	4.6	1.14	81.1	30.0	6.5	75.3	7.1	5	41-1,41-2
PhytoGen PX2BX4W3FE	4.6	1.12	80.5	30.3	6.2	74.2	7.0	4	41-1,41-2
PhytoGen PX4A69W3FE	4.7	1.05	81.1	31.2	8.3	75.1	7.5	3	41-1
PhytoGen PX2B04W3FE	4.7	1.15	82.0	31.4	5.9	76.1	6.7	5	41-1,41-2
FiberMax FM 2398GLTP	5.4	1.09	81.2	28.7	6.3	76.1	7.3	3	41-1
BASF BX 1972GLTP	4.6	1.10	81.1	29.3	7.1	74.6	5.9	4	41-2,51-1
Americot AMX 1817 B3XF	5.0	1.08	80.9	29.5	7.1	74.4	7.6	3	41-1
PhytoGen PHY 320 W3FE	4.9	1.09	83.5	30.3	7.1	73.6	6.8	4	41-2,51-1
PhytoGen PX2BX2W3FE	4.7	1.10	80.3	30.1	6.7	75.2	7.1	4	41-1,41-2
FiberMax FM 1621GL	5.1	1.10	82.3	30.0	5.6	72.6	6.7	4	41-2,51-1
BASF BX 1975GLTP	5.0	1.08	81.5	29.2	7.4	73.8	7.6	3	41-1,41-2
FiberMax FM 1911GLT check	4.8	1.10	81.7	30.3	5.6	75.7	7.1	3	41-1,41-2
Deltapine DP 1747NR B2XF	5.0	1.07	81.0	29.1	7.1	74.0	7.1	5	41-2
PhytoGen PHY 430 W3FE	5.0	1.03	81.4	29.6	7.8	70.2	7.8	4	41-1,51-4
PhytoGen PX3B07W3FE	4.8	1.09	80.4	30.6	7.2	73.0	7.0	5	41-2,51-1
FiberMax FM 2498GLT	5.7	1.10	81.9	30.0	6.1	76.0	6.8	2	41-1,41-2
Brownfield Seed and Delinting BSD 598	4.9	1.07	80.9	28.6	6.2	72.7	6.4	2	41-2,51-1
FiberMax FM 2011GL check	4.6	1.09	80.8	28.8	5.7	75.6	7.2	3	41-1
Stoneville ST 4550GLTP	4.3	1.08	81.5	31.4	7.4	72.5	7.3	4	41-2,51-1

Table 2A. Fiber quality results from the irrigated root-knot nematode cotton performance test at the AG-CARES research farm, Lamesa, 2018.

Designation	Micronaire	Length	Uniformity	Strength	Elongation	Rd	+b	Leaf	Color Grade
Americot AMX 1818 B3XF	4.8	1.13	82.8	32.2	7.2	75.4	7.1	3	41-1,41-2
Monsanto 17R931NR B3XF	4.4	1.09	81.8	31.0	7.7	74.4	7.3	4	41-1,41-2
Deltapine DP 1558NR B2RF check	5.0	1.09	81.1	30.5	6.7	74.3	7.4	3	41-1,41-2
BASF BX 1976GLTP	5.2	1.11	81.2	31.0	5.8	77.2	6.6	2	41-1
BASF BX 1974GLTP	4.7	1.08	81.4	28.1	7.0	75.4	7.6	2	41-1
Brownfield Seed and Delinting BSD 224	5.0	1.08	81.7	29.4	4.9	76.9	7.0	2	41-1
Mean	4.8	1.09	81.3	29.9	6.7	74.6	7.1	3	
c.v.%	3.4	1.3	0.7	2.9	4.8	1.8	4.4	26.3	
LSD 0.05	0.3	0.02	0.9	1.5	0.5	2.3	0.5	1	

TITLE:

Replicated agronomic cotton evaluation (RACE) trial at AG-CARES, Lamesa, TX, 2018.

AUTHORS:

Murilo Maeda – Extension Cotton Specialist
Robert Wright and Danny Carmichael – Extension Cotton Technician and AG-Cares Manager

MATERIALS AND METHODS:

Plot Size:	4 rows by 700 – 900 feet, 3 replications
Planting Date:	June 20, 2018
Varieties:	Deltapine 1646 B2XF Deltapine 1549 B2XF NexGen 3640 XF NexGen 4792 XF NexGen 4777 B2XF NexGen 4545 B2XF FiberMax 2574 GLT FiberMax 1830 GLT FiberMax 1911 GLT FiberMax 1888 GL B2XF = Bollgard II® XtendFlex™ XF = XtendFlex™ GL = GlyTol® LibertLink® GLT = GlyTol® LibertyLink® TwinLink®
Seeding Rate:	25,000 Seed Acre^{-1}, 40 inch
Defoliation:	Due to late planting date and low yield potential, trial was not defoliated, but instead was let to go to a desiccating freeze.
Irrigation in-season:	Dryland/Rain-fed. Approx. 11.54 in. total (Based on NOAA data)
Harvest Date:	November 28, 2018

RESULTS AND DISCUSSION:

A standard lineup of 10-12 commercially available cotton varieties were evaluated across 6 locations in the Southern High Plains region Texas. This trial represents one of the two dryland locations for the 2018 growing season. Plots were divided into 2 main blocks in the field according to herbicide technologies available and were replicated three times within each block. The plots were maintained in a manner consistent with regional cotton producers, and no variety was treated different in any way, except for herbicides applied to control weeds (ie. GL and GLT varieties were treated with Liberty, while B2XF and

XF varieties were treated with XtendiMax). This particular trial's yield potential was limited by two main factors: lack of significant degree day accumulation because of the fairly late planting date (approx. 300-600 fewer DD60s than earlier planted trials), and lack of substantial rainfall during growing season (note in Figure 1 that rainfall events did not pick up until mid-October, after last effective bloom date). Each plot was stripper harvested and weighed on site. A small sample was then acquired and sent to the TTU FBRI for ginning and fiber analysis. While significant differences were noted in some quality categories, there was no significant difference in loan value, and lint yield and value per acre (Table 1).

Figure 1. Cumulative rainfall and DD60s in Dawson County from June 20, 2018 to October 31, 2018.

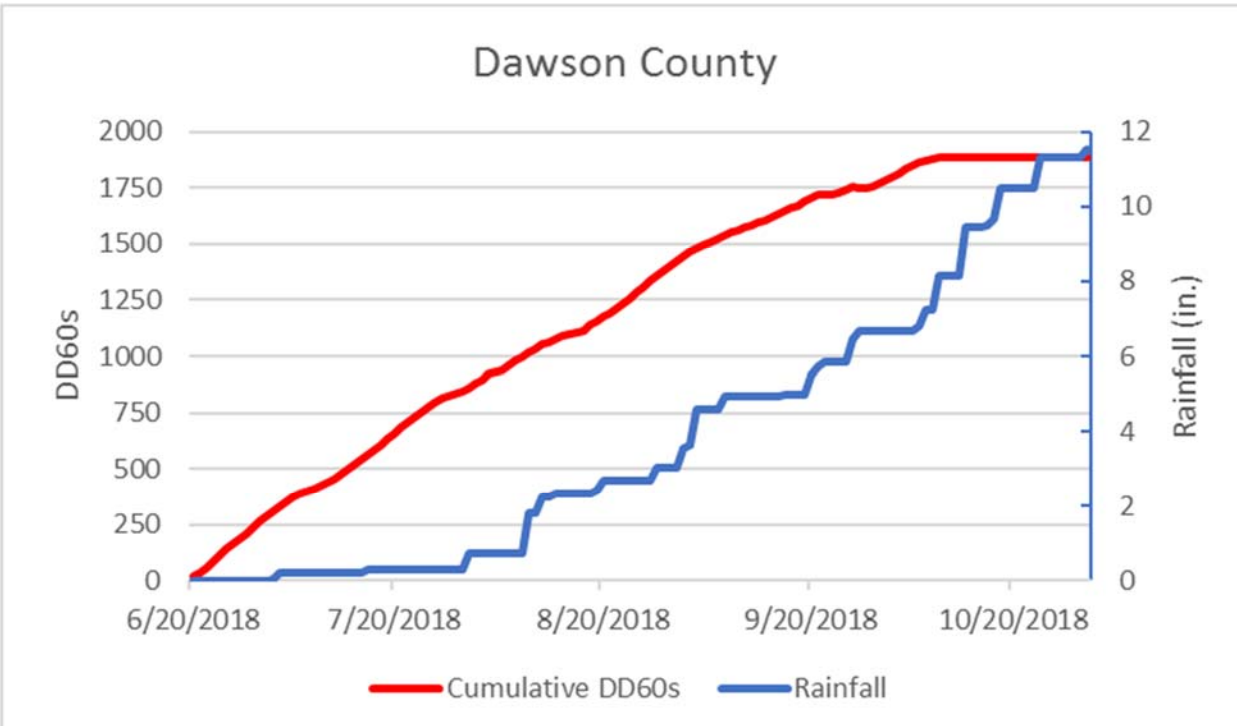


Table 1. Yield and quality analysis for Dawson County dry RACE trial, 2018.

Variety	Lint Yield lbs/acre		Bales Acre	Turnout %		Mic		Length in.		Unif %		Strength g/tex		Loan Value (cents/lb)		Lint Value ($/Acre)	
NG4792	273	a	0.57	0.35	a	4.3	a	1.11	d	80.2	ab	31.4	a	54.4	a	148	a
DP1646	271	a	0.56	0.36	a	3.3	d	1.21	a	80.8	a	29.9	a	52.5	a	143	a
DP1549	269	a	0.56	0.37	a	3.5	cd	1.11	d	78.6	d	29.6	a	53.1	a	143	a
NG3640	250	a	0.52	0.37	a	4.1	a	1.14	b-d	80.8	a	31.6	a	54.1	a	136	a
NG4777	238	a	0.50	0.36	a	4.2	a	1.13	cd	80.0	ab	29.8	a	53.1	a	127	a
NG4545	229	a	0.48	0.34	a	4.2	a	1.12	d	79.0	cd	29.6	a	54.4	a	124	a
FM1830	228	a	0.48	0.38	a	4.1	a	1.18	a	80.5	ab	30.9	a	54.5	a	124	a
FM1911	225	a	0.47	0.31	a	3.9	a-c	1.17	ab	79.7	bc	30.7	a	54.3	a	122	a
FM2574	217	a	0.45	0.33	a	3.6	b-d	1.20	a	80.4	ab	30.9	a	54.8	a	119	a
FM1888	193	a	0.40	0.37	a	3.9	ab	1.17	a-c	80.2	ab	30.9	a	54.4	a	105	a
Mean	239		0.50	0.35		3.9		1.15		80.0		30.5		54.0		129	
STDEV	44.54			0.04		0.39		0.04		0.84		1.16		1.47		23.93	
CV, %	18.6			10.0		10.0		3.8		1.0		3.8		2.7		18.5	
p-value	0.4345			0.4164		0.001		0.0004		0.008		0.2201		0.6467		0.5662	
LSD	NS			NS		0.44		0.046		0.923		NS		NS		NS	

Means within a column with the same letter are not significantly different at the 0.05 probability level.

Cv: Coefficient of Variation in %, LSD: least Significant Difference at 0.05 probability level, NS: Not Significant.

Lint loan values were calculated from the 2018 Upland Cotton loan valuation model from Cotton Incorporated using a $0.52/lb base price.

Mic = Micronaire, Unif = Uniformity

NG = NexGen, FM = Fibermax, DP = Deltapine

TITLE:

Impact of cotton cropping systems and nitrogen management strategies on the productive capacity of soil and cotton lint yield, AG-CARES, Lamesa, TX 2018.

AUTHORS:

Katie Lewis – Assistant Professor
Wayne Keeling – Professor
Dustin Kelley – Research Associate
Amee Bumguardner – Research Associate
Joseph Burke – Graduate Research Assistant

MATERIALS AND METHODS:

Objective 1 – Cotton Cropping Systems and Soil Quality

Location:	AG-CARES, Lamesa, TX
Plot Size:	16 rows by 250 ft, 3 replications
Design:	Randomized complete block
Row Spacing:	40”
Cover Crop Seeding Dates:	2 December 2014; 4 November 2015; 12 December 2016; 17 November 2017; and, 4 December 2018
Termination:	10 April 2015; 11 March 2016; 3 April 2017; and, 27 March 2018
Cotton Planting Dates:	13 May 2015; 24 May 2016; 5 May 2017; and, 15 May 2018
Cotton Harvest:	28 October 2015; 22 November 2016; 7 November 2017; and, 19 November 2018
Variety:	DP 1321 B2RF planted at 53,000 seed/acre; 2018 DP 1646 B2XF planted at 53,000 seed/acre
Fertility:	120 lb N/A as 32-0-0 and 113 lb/A 10-34-0
Rainfall:	12.4” (2015); 13” (2016); 10.5” (2017); and, 6” (2018)
Irrigation:	7.1” (2015); 5.1” (2016); 8.0” (2017); and, 11.6” (2018)

This research was aimed at evaluating the effects of incorporating single and mixed species cover crops into long-term reduced tillage continuous cotton. More specifically it determined the impact of cover crops and tillage on soil health parameters [soil organic C (SOC), soil pH, and nutrient availability] and cotton yield. Management practices being demonstrated include: 1) conventional, winter fallow; 2) reduced tillage (no-till) - rye (*Secale cereal* L.) cover crop; and, 3) reduced tillage (no-till) – mixed species cover crop. Mixed cover crop species included hairy vetch (*Vicia villosa* Roth), radish (*Raphanus sativus* L.), winter pea (*Pisum sativum* L.), and rye. Conventional tillage and reduced tillage with rye cover crop treatments were established in 1998 and the mixed species cover was seed in 2014 in 8 of 16 rows of the rye cover crop plots. Cover crops were planted using a no-till drill on 2 December 2014, 4 November 2015, 12 December 2016, 17 November 2017, and 4 December 2018 and were chemically terminated 10 April

2015, 11 March 2016, 3 April 2017, and 27 March 2018 using Roundup PowerMAX (32 oz/acre). Prior to termination, above ground biomass of cover crops were harvested from a 1 m^2 area to calculate herbage mass (dry weight basis), nitrogen (N) uptake, and C:N ratios. Soil core samples were collected following cover crop termination each year to a depth of 24 inches from each plot and analyzed for SOC, total N, nitrate-N, Mehlich III extractable macronutrients, and sodium (Na), and pH and electrical conductivity (EC). Additional samples were collected at this time to a 6-inch depth and analyzed using the Soil Health Test. After soil sampling, cotton (DP 1321 B2RF) was planted 13 May 2015, 24 May 2016, 5 May 2017, and (DP 1646 B2XF) 15 May 2018 at a seeding rate 53,000 seed/acre. Cotton was harvested on 28 October 2015, 22 November 2016, 7 November 2017, and 19 November 2018. After cotton harvest the no-till plots were drilled with cover.

Soil moisture measurements were collected via neutron attenuation with access tubes installed within each plot to a depth of approximately 60 inches. Readings were taken at 7.9-inch increments and every two weeks throughout the year unless rainfall inhibited our ability to get into the field.

Additional locations where soil quality is being monitored include: 1) AG-CARES, Lamesa, TX (conventional tillage/continuous cotton; reduced tillage, wheat/fallow/cotton rotation; and, reduced tillage, continuous cotton with rye cover); and, 2) Helms Farm near Halfway, TX (cotton/grain sorghum rotation, cotton/wheat rotation, and cotton following wheat cover all under conventional and reduced tillage). Soil samples are collected to a 24-inch depth (0-6”, 6-12”, and 12-24” increments) once per year and analyzed for organic C. Aggregate stability is determined using a dry sieving technique and reported as mean weight diameter.

Objective 2 – Nitrogen Management following a Cover Crop

Location:	AG-CARES, Lamesa, TX
Plot Size:	4 rows by 40 ft, 40” row spacing
Design:	Randomized complete block with 4 replications
Cotton	
Planting Dates:	16 May 2018; replanted on 7 June 2018
Cotton Harvest:	26 November 2018
Variety:	DP 1522 B2RF planted at 53,000 seed/acre
Fertility:	120 lb N/A as 32-0-0 and 113 lb/A 10-34-0 applied through
the	
	pivot in 4 applications of 30 lb N/A
Rainfall:	6”
Irrigation:	11.6”

A second trial was initiated this year to evaluate the effect of N fertilizer application time on lint yield of cotton (DP 1522 B2XF planted 7 June 2018) following a rye cover crop, in rotation with wheat, and in a conventional tillage/winter fallow system. The N treatments were replicated within each cropping system, and included: 1) check, AG-CARES practice (described above); 2) additional 30 lb N/A applied at preplant; 3) additional 30 lb N/A applied three weeks after emergence; and, 4) additional 30 lb N/A applied at pinhead square plus 2 weeks. This research serves as preliminary data to help explain yield reductions following a rye cover crop. Cotton in this trial was defoliated on 3 October 2018 and harvested 17 November 2018.

RESULTS AN DISCUSSION:

Objective 1 – Cotton Cropping Systems and Soil Quality
Soil Characterization

Soil organic C (SOC) was greater with the no-till, mixed cover crop treatment at the 0-6" depth followed by the no-till, rye cover crop and conventional tillage treatments prior to planting cotton in May 2016, 2017, and 2018 (Fig. 1). However, in 2015, the no-till with rye cover crop treatment resulted in greater SOC compared to the conventional tillage treatment. From 2015 to 2017, a greater increase in SOC has been determined for the no-till, mixed cover treatment compared to the no-till, rye cover treatment. This may be the result of greater microbial biomass and activity with a mixed cover crop compared to a single species cover crop. In 2018, there was a decrease of soil organic C in all treatments. This decrease most likely resulted from decreased cover crop biomass production in 2018, and the dry winter of 2017 and 2018 (Fig. 2).

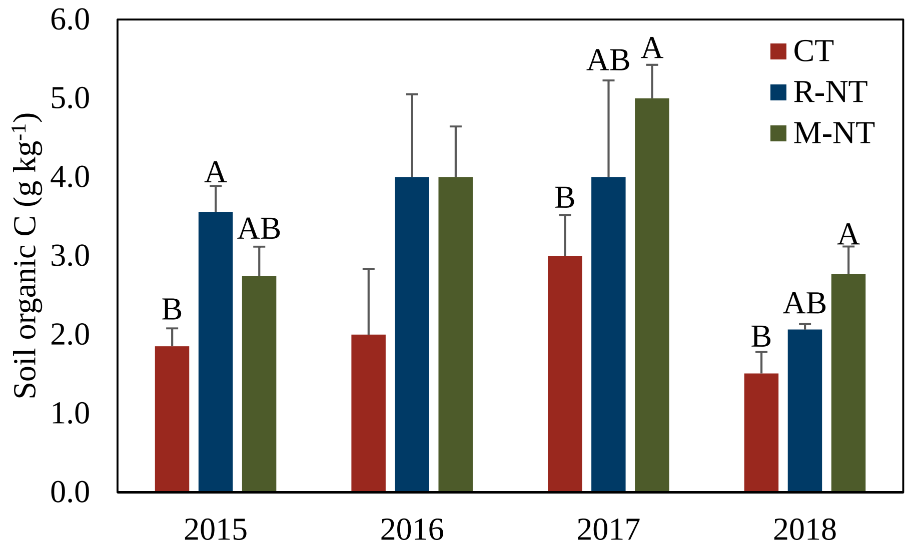


Figure 1. Soil organic C levels under conventional tillage, no-till with rye cover, and no-till with mixed cover management practices at Lamesa, TX. Bars represent standard deviation of the Fsample mean. Mean values with the same letter within year are not significantly different at $P < 0.05$.

Total N and nitrate-N were generally greater under no-till compared to conventional tillage at the 0-6" depth (Table 1). Sulfur (S) was greater in the no-till compared to the conventional tillage at the 6-12" and 12-24" depths. At each depth, pH was decreased with conservation management practices compared to the conventional system. Electrical conductivity was greater in the no-till treatments compared to the control at all three depths.

Cover Crop Herbage Mass

Herbage mass was not significantly different between no-till with rye cover and no-till with mixed cover crop treatments in 2015, 2016, and 2018 but differences were determined in 2017 with the rye cover crop treatment producing greater above ground biomass (4,172 lb/acre, dry weight basis) compared to the mixed cover crop treatment (3,529 lb/acre; Fig. 2). In 2015, 2016, and 2018 the rye cover crop tended to produce more herbage mass than the mixed cover crop treatment. Cover crops harvested in 2016 were seeded about a month earlier than cover crops harvested in 2015 and 2017, which provided adequate time for crop establishment prior to colder temperatures. Cover crops harvested in 2018 had the longest growing season of the four years but due to limited rainfall during the growing season it produced reduced biomass.

Table 1. Soil pH and electrical conductivity (EC) and extractable macronutrient under conventional tillage (winter fallow), no-till with rye cover, and no-till with mixed cover at depths of 0-6”, 6-12”, and 6-24”. Samples were collected prior to planting cotton in 2018. Means within soil parameter and depth followed by the same letter are not significantly different at $P < 0.05$.

Management	pH	EC	TN	NO_3-N	P	K	Ca	Mg	S
Practice	----	μmhos cm^{-1}	mg kg^{-1}						
	Depth: 0 - 6"								
CT	7.6 a	183	276 b	1.9	41	227	593	552	13
R-NT	7.1 b	192	427 a	3.4	30	291	578	522	21
M-NT	7.1 b	210	382 a	3.2	39	274	571	554	20
	Depth: 6 - 12"								
CT	7.7 a	165	275	1.4	31	213	594 a	551 b	16 b
R-NT	7.4 b	229	258	1.2	18	216	496 b	541 b	24 ab
M-NT	7.4 b	272	288	1.0	20	235	552 a	592 a	37 ab
	Depth: 12 - 24"								
CT	7.7 a	466	322	10.1	7	215	819	731	59 b
R-NT	7.4 b	520	354	10.9	9	207	691	748	72 a
M-NT	7.4 b	589	403	9.1	8	217	737	792	84 a

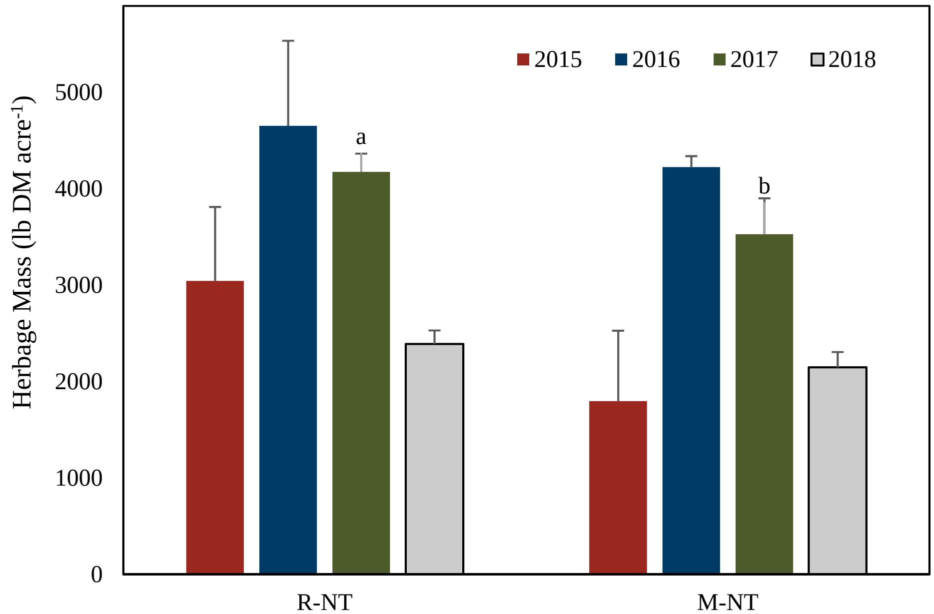


Figure 2. Herbage mass of rye and mixed cover crops harvested in 2015, 2016, 2017, and 2018 with the no-till treatments at Lamesa, TX. Bars represent standard error of the sample mean. Mean values with the same letter within year are not significantly different at $P < 0.05$.

Cotton Lint Yield

Lint yields were greater in the conventional tillage treatment followed by no-till, mixed cover and no-till, rye cover treatments in 2016 and 2017 (Fig. 3). Lint yields were not different between the conventional tillage and no-till with mixed cover crop treatments in any year but were significantly reduced when cotton was planted in terminated rye cover compared to the conventional tillage treatment in 2016 and 2017. One benefit of cover crops I recently heard discussed at the 2018 ASA meeting was reduced variability from one year to the next. Additional analyses need to be conducted, but based on standard deviation, this has not been observed in our study area.

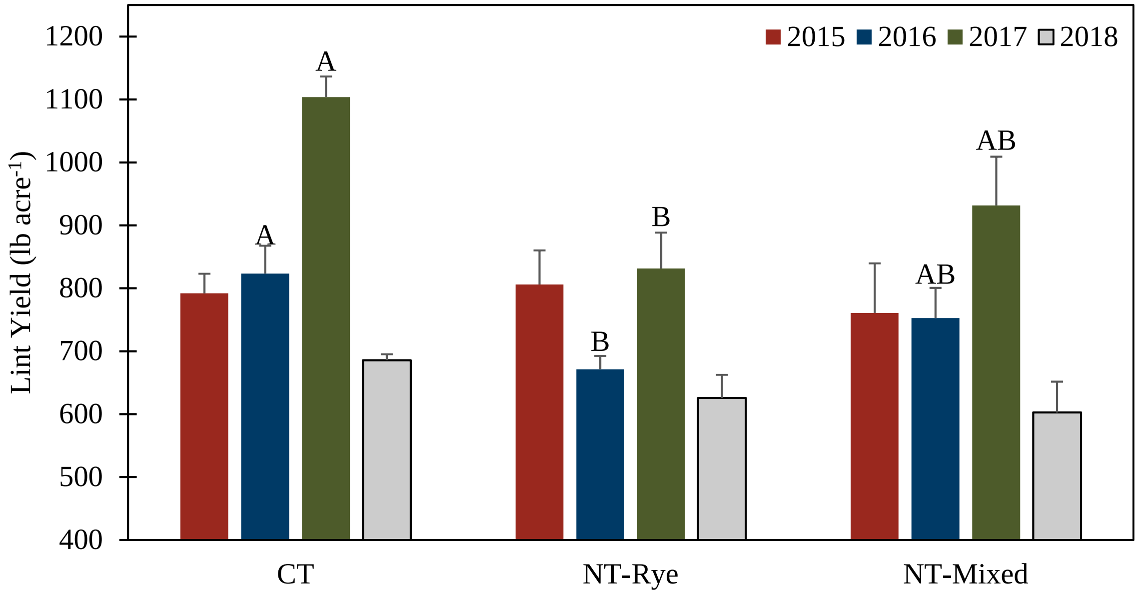


Figure 3. Lint yield with conventional tillage (CT), no-till with rye cover (NT-Rye), and no-till with mixed cover (NT-Mixed) treatments in Lamesa, TX for 2015, 2016, 2017, and 2018. Bars represent standard deviation of the sample mean. Mean values within year with the same letter are not significantly different at $P < 0.1$.

Stored Soil Moisture

Stored soil moisture was greatest in the conventional tillage treatment (CT) prior to cover crop termination in 2015, 2016, and 2017 compared to the no-till treatments (Fig. 4). However, in 2018 stored soil moisture was greatest in the no-till treatments compared to the conventional tillage prior to cover crop termination. During the cropping season, soil moisture was greatest in the no-till treatments (NT-Mixed and NT-Rye) where greater soil cover provided by cover crop residue likely increased water capture and reduced evaporation losses. Organic matter and reduced tillage can improve soil structure increasing infiltration and percolation while decreasing evaporation from the soil surface. The no-till treatments were better able to respond to precipitation events possibly through increased infiltration and moisture storage. Water infiltration and soil water holding capacity have likely increased over the 19-year period, which enables greater water capture and retention with cover crops.

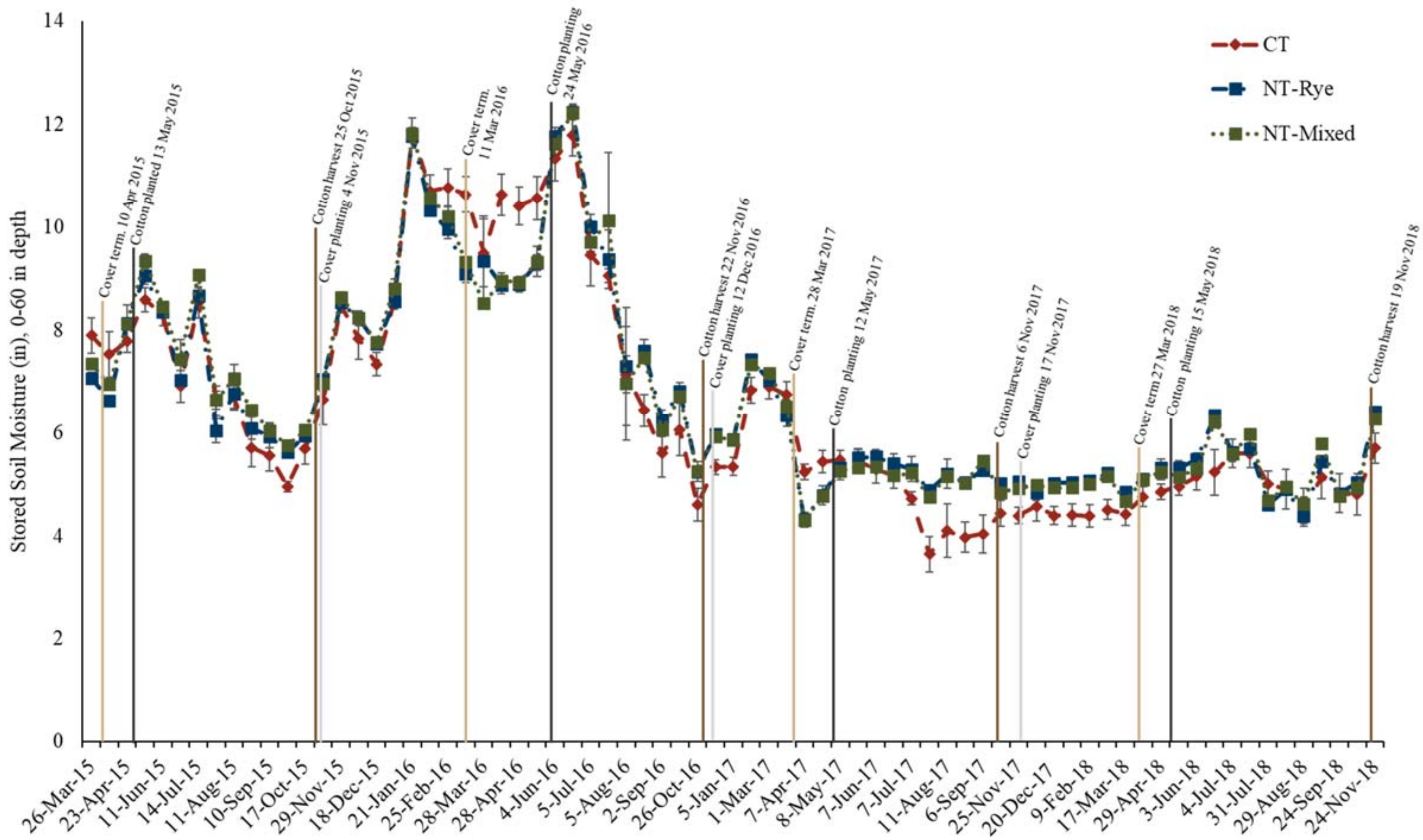


Figure 4. Stored soil moisture measured from March 2015 to October 2017 to a depth of 60 inches under conventional tillage (CT), no-till with mixed cover (NT-Mixed), and no-till with rye cover (NT-Rye) in Lamesa, TX. Bars represent standard deviation of the sample mean.

Cropping Systems and Soil Quality

At Lamesa, soil quality parameters are being compared between continuous cotton (conventional tillage/winter fallow), continuous cotton with a rye cover crop, and a wheat-fallow-cotton rotation under two different irrigation levels (high – base level +33%; low – base level -33%). Conservation practices were implemented in 2013, and the continuous cotton has been in place since 1998. Greater SOC was determined in the 6-12 and 12-24-inch depths under high irrigation with the continuous cotton with rye cover crop system compared to the continuous cotton with conventional tillage and the wheat-cotton rotation regardless of the stage of the rotation. This is likely the result of greater plant residue being produced on an annual basis with the rye cover crop compared to the wheat rotation. However, under low irrigation using a cover crop did not consistently result in greater SOC as it did under high irrigation. Even though it is expected that an increase in SOC would result in greater aggregate formation and stability, this is not what was determined. Under low irrigation, aggregate formation and stability was greatest in the conventional tillage system compared to the continuous cotton system with a rye cover at the 0-6, 6-12, and 2-24” depths.

Table 2. Mean weight diameter of soil collected from the AG-CARES, Lamesa, TX, location from 0-48” depth in April 2018 from continuous cotton, a wheat/cotton rotation, and continuous cotton with a rye cover crop under low and high irrigation levels. Means within depth and irrigation followed by the same letter are not significantly different at $P < 0.05$.

	Soil depth (inch)			
	0-6	6-12	12-24	24-48
	MWD (mm)			
Low irrigation				
Cont. cotton	0.71 ab	0.87 a	0.89 a	0.84
Rot. (C'17-W'18)	0.65 c	0.65 c	0.63 c	0.71
Rot. (W'17-C'18)	0.75 a	0.76 ab	0.88 ab	0.89
Cont. cotton (rye cov.)	0.68 bc	0.69 bc	0.77 bc	0.77
High irrigation				
Cont. cotton	0.65	0.87 a	0.94 a	0.81
Rot. (C'17-W'18)	0.67	0.60 b	0.60 c	0.63
Rot. (W'17-C'18)	0.71	0.80 a	0.84 b	0.64
Cont. cotton (rye cov.)	0.65	0.78 a	0.86 ab	0.77

Objective 2 – Nitrogen Management following a Cover Crop

The significance of the cropping system and N treatment interaction was tested and determined to be significant for yield and nitrogen use efficiency (NUE) ($P = 0.0003$ and $P = 0.0001$, respectively), and for this reason, N treatments were compared within cropping systems. Lint yield differences were determined within the continuous cotton (winter fallow) and continuous cotton with a rye cover crop but within the wheat/fallow/cotton system (Table 3). In the continuous cotton system an additional 30 lb N/A applied preplant increased lint yield compared to other treatments and the check, but differences were not determined between the check and 30 lb N/A added at emergence + 3 weeks and pinhead square + 2 weeks. For the continuous cotton with a rye cover crop system, applying 30 lb N/A 3 weeks after emergence resulted in the greatest yield followed by 30 lb N/A applied preplant. There was no yield difference between the check and the 30 lb N/A applied at 2 weeks after pinhead square. Similar trends were observed for NUE. These are preliminary results; however, they do indicate that the timing of N application can potentially influence N mineralization/immobilization processes following a cover crop.

Table 3. Lint yield and nitrogen use efficiency (NUE) from AG-CARES, Lamesa, TX, in 2018 from cropping systems of continuous cotton (CC), continuous cotton with a rye cover, and a wheat/fallow/cotton rotation. Means within system followed by the same letter are not significantly different at $P < 0.05$.

Nitrogen Management	**Cont. Cotton (CC)**	**CC, Rye Cover**	**Wheat/Cotton**
	------------------------------Lint yield (lb/A)------------------------------		
Farm Practice (120 lb N/A)	641 bc	683 c	1101
Preplant (+30 lb N/A)	808 a	830 b	1048
Emerg + 3 wks (+30 lb N/A)	686 b	975 a	1155
PHS + 2 wks (+30 lb N/A)	605 c	786 bc	1072
P -value	0.001	0.009	0.061
	---------------------NUE, over check (lb lint/lb N)---------------------		
Farm Practice (120 lb N/A)	---	---	---
Preplant (+30 lb N/A)	5.59 a	4.90 b	-1.76
Emerg + 3 wks (+30 lb N/A)	1.52 b	9.73 a	1.81
PHS + 2 wks (+30 lb N/A)	-1.18 c	3.44 b	-0.97
P -value	0.0001	0.009	0.062

By implementing reduced tillage and cover crops, SOC has increased from 0.2% to 0.4%. This increase has been a slow process taking nearly 20 years. While benefits of conservation practices to soil have been observed (e.g. decreased pH and increased SOC), cotton lint yield has not been consistent from one year to the next. Water deficits are observed prior to cover crop termination; however, following cotton planting, the deficit is made up either with irrigation or rainfall. Preliminary research has demonstrated that N immobilization may be the reason for reduced lint yield for cotton planted into rye cover. Increasing the length of time between termination and planting cotton and increasing the amount of N fertilizer applied shortly after emergence may have a positive impact on cotton growth and development by reducing the amount of time required to release N (net mineralization).

TITLE:

Cover crop management with wheat and rye at AG-CARES, Lamesa, TX, 2017 and 2018.

AUTHORS:

Ray White – Research Assistant
Wayne Keeling – Professor
Katie Lewis – Assistant Professor
Justin Spradley – Research Assistant
Brice DeLong – Graduate Research Assistant

MATERIALS AND METHODS:

Plot Size:	4 rows by 40-50 feet, 4 replications
Cover Crop Seeding Date:	December 12, 2016 & November 17, 2017
Cover Crop Terminations:	March 27 & April 10, 2017 & 2018
Cotton Planting Date:	May 24, 2017 & May 16, 2018
Variety	NexGen 4545 B2XF, Deltapine 1646 B2XF
Herbicides:	2,4-D 1 qt/A Prowl 3 pt/A Roundup PowerMax 1 qt/A Roundup PowerMax 1qt/A ETX 1.25 oz/A + Ethephon 3 pt/A – October 10 ETX 1.25 oz/A – October 26
Fertilizer:	2017 - 138-40-0 2018 - 115-35-0

Irrigation:

	2017	2018
Preplant	0.0”	0.5”
In Season	9.1”	11.1”
Total	9.1”	11.6”

Harvest Date: October 20, 2017 & November 14, 2018

RESULTS AND DISCUSSION:

Rye herbage mass was greater than wheat at the spring collection date. At the first termination timing in 2017, rye tended to produce more herbage than wheat but seeding rate had no effect within species. At the late termination timing, herbage production was not affected by cover crop species or seeding rate (Fig. 1). Soil water content was greatest with conventional tillage at the 12-24” soil depth. Differences were not determined between cover crop treatments at all depths and the conventional tillage at the upper two depths (Fig. 2). Cotton populations were at an acceptable range with all treatments for optimum production (Fig.3). Cotton yields were not greater with cover crops compared to conventional tillage in either year. Early termination tended to have less of a negative impact on cotton yield than late termination (Fig 4).

These results indicate that planting 30 lbs/A of wheat or rye with an early termination prior to heading minimizes soil moisture loss and maintains yields compared to conventional practices.

Figure 1. Effect of cover crop species, planting rate, and termination date on aboveground biomass production at three collection dates.

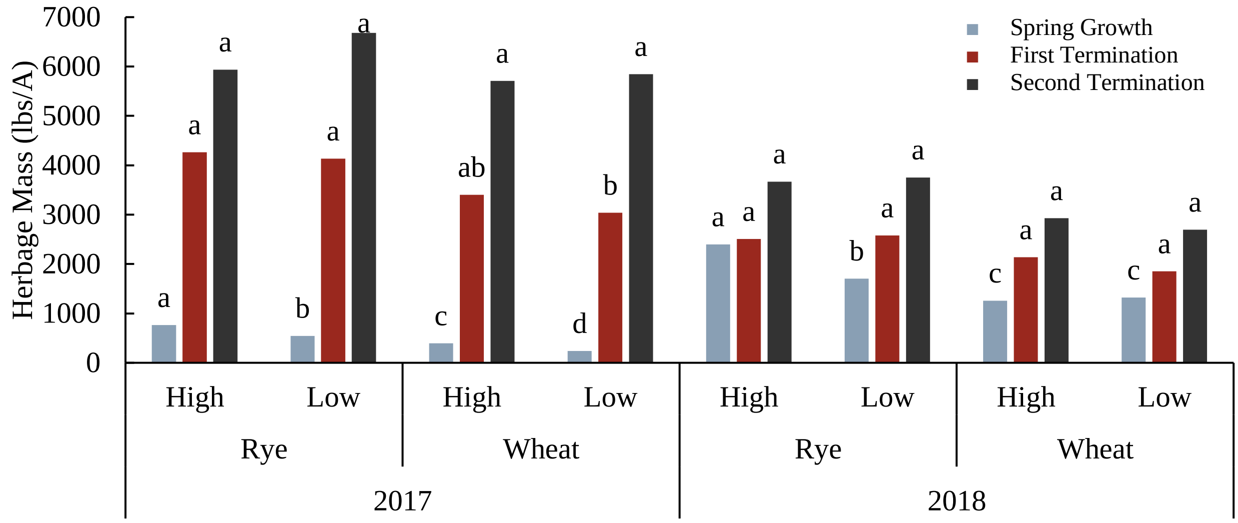


Figure 2. Effect of cover crop species, planting rate, and termination date on gravimetric water content at cotton planting at three depths.

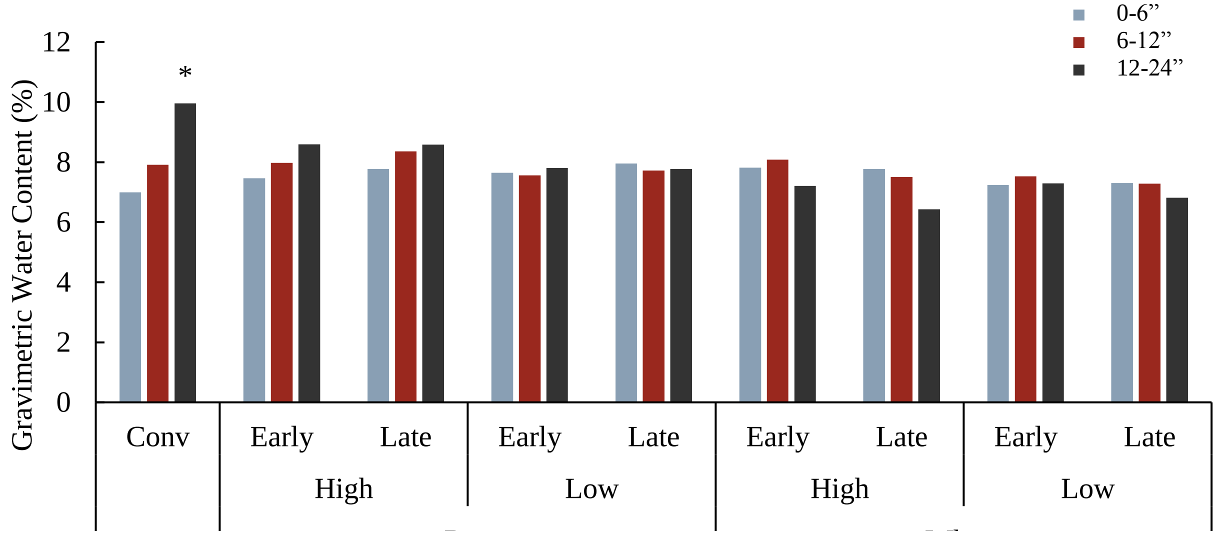


Figure 3. Effect of cover crop species, planting rate, and termination date on cotton plant populations.

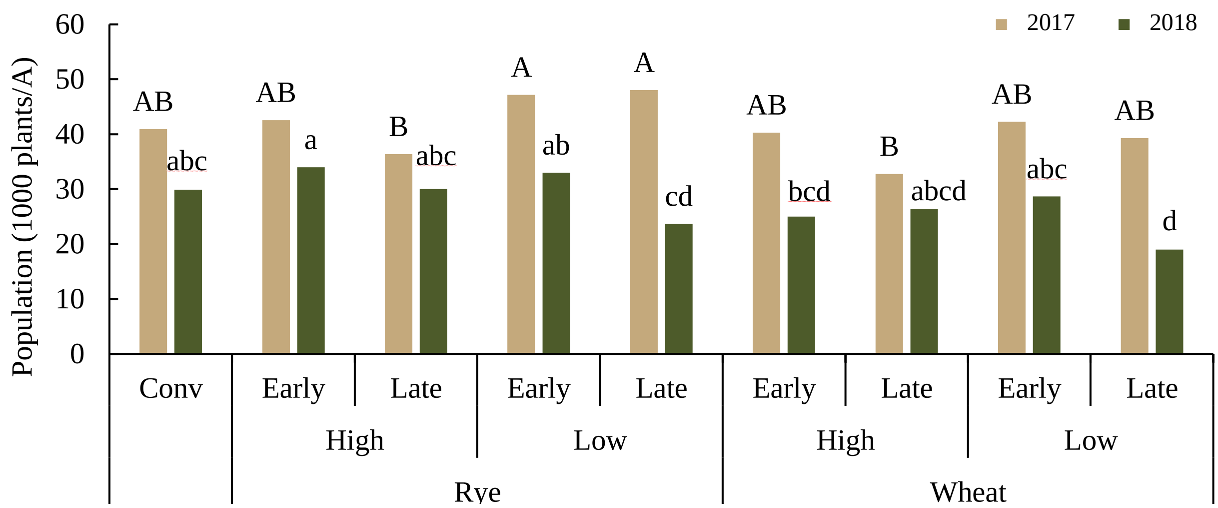
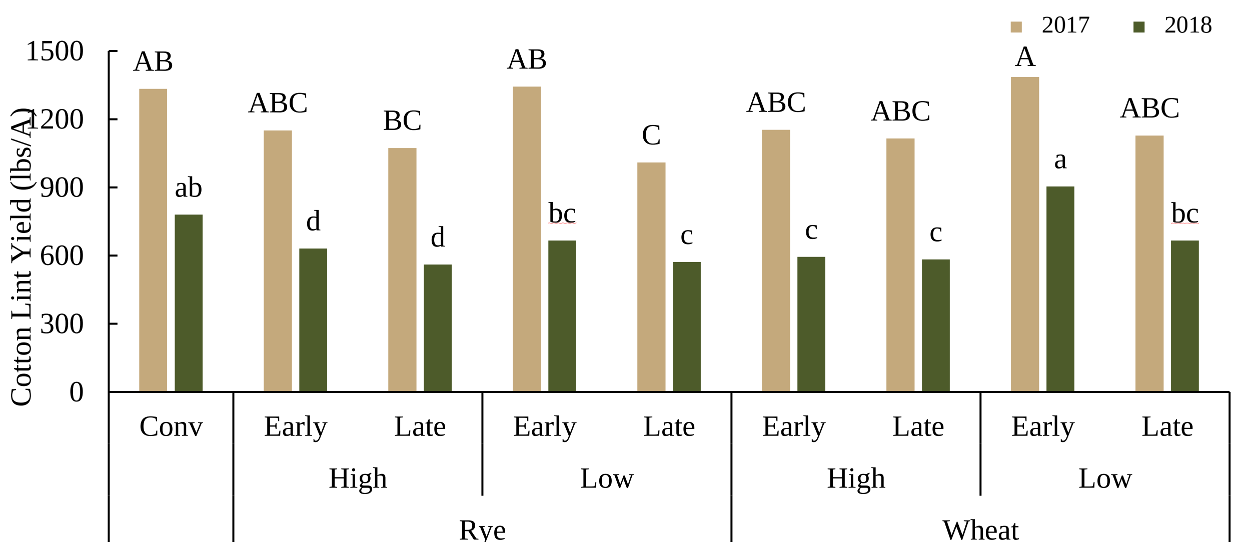


Figure 4. Effect of cover crop termination timing on cotton lint yield.



TITLE:

Cotton yield response to manual square removal mimicking cotton fleahopper infestations as influenced by irrigation level and cultivar treatments, Lamesa, TX, 2018.

AUTHORS:

Megha Parajulee – Professor, Faculty Fellow, and Regents Fellow
Abdul Hakeem – Asst. Research Scientist
Wayne Keeling - Professor

MATERIALS AND METHODS:

Plot Size: 4 rows by 300 feet, 3 replications

Planting date: May 21

Fertilizer: 115-35-0

Cultivars: FiberMax 1911 GLT and Deltapine 1646 B2XF

Irrigation:

	Low	High
Preplant	3.8”	3.8”
In Season	4.2”	8.4”
Total	8.0”	12.2”

Cotton fleahopper: Two treatments [*Control* (zero square removal), and *Manual removal* (100% squares removed manually three weeks into squaring]

Herbicides:
Prowl 3 pt/A – April 12
Gramoxone 1 qt/A + Caparol 26 oz/A – May 21
Roundup 1 qt/A – June 19
Roundup + Outlook 1 qt/A – July 23
Roundup 1 qt/A – August 22
ETX 1.25 oz/A + Ethephon 3 pt/A – October 10
ETX 1.25 oz/A – October 26

Treatment date: July 17 at fleahopper susceptible stage

Harvest date: October 1 (hand-harvested)

Effect of manual removal of early stage fruits versus control was evaluated on two cotton cultivars, FM 1911 GLT and DP 1646 B2XF, as influenced by irrigation water level. Two seasonal irrigation levels, *High* (12.2 inches) and *Low* (8.0 inches) were evaluated under a center pivot irrigation system. Experimental design consisted of two square abscission treatments (*manual removal of 100% squares to mimic severe cotton fleahopper infestation* versus *control*), two water levels (*high* versus *low*), and two cultivars (*FM 1911 GLT* versus *DP 1646 B2XF*), replicated three times and deployed in a randomized complete block design (total 24 plots). In order to mimic a natural early-season acute infestation of cotton fleahoppers and severe damage to the squaring cotton, a 10-ft section was flagged in each plot and treatments were applied. Square abscission treatments, 1) *control* (zero square removal) and 2) *manual removal* (removal of 100% squares from the plant), were deployed when cotton was highly vulnerable to fleahopper injury (2-3 weeks into cotton squaring). No squares were removed from control plots. The test plots were monitored for the occurrence of any other insects, but no such occurrences were observed throughout the growing season. Test plots were harvested on October 1, 2018 and ginning was done on November 17. Fiber samples have been sent to Cotton Incorporated for HVI analysis.

RESULTS AND DISCUSSION:

As expected, 'High' water increased overall yield by about 50% (1,182 lb/acre) compared to that in 'Low' water regime (792 lb/acre). Both cotton cultivars, DP 1646 B2XF and FM 1911 GLT, showed similar response to the irrigation water treatment, partly attributed to a significant water supplement through rain events during the boll maturation stage. Removal of pre-flower squares did not render any lint yield reduction regardless of the irrigation water regime or cultivar type. Early season drought and late season frequent rain events complicated the scope of the study. It is generally expected that the 'Low' water treatment will be more significantly impacted by a severe shedding of pre-flower squares, but the yield was similar in our study in 2018. In addition, there was much greater yield variation in 'Low' water treatment plots compared to that in 'High' water treatment plots (Fig. 1). In 'High' water treatment plots, manual removal resulted in numerically higher lint yield, suggesting that the sufficient water availability increases the compensatory potential of cotton plants. Previous studies demonstrated that the square removal (>20%) by cotton fleahoppers significantly reduced the lint yield, but the impact was greater in water-stressed production situation. We will continue to investigate the intricate cultivar-water relationship on cotton's compensatory potential.

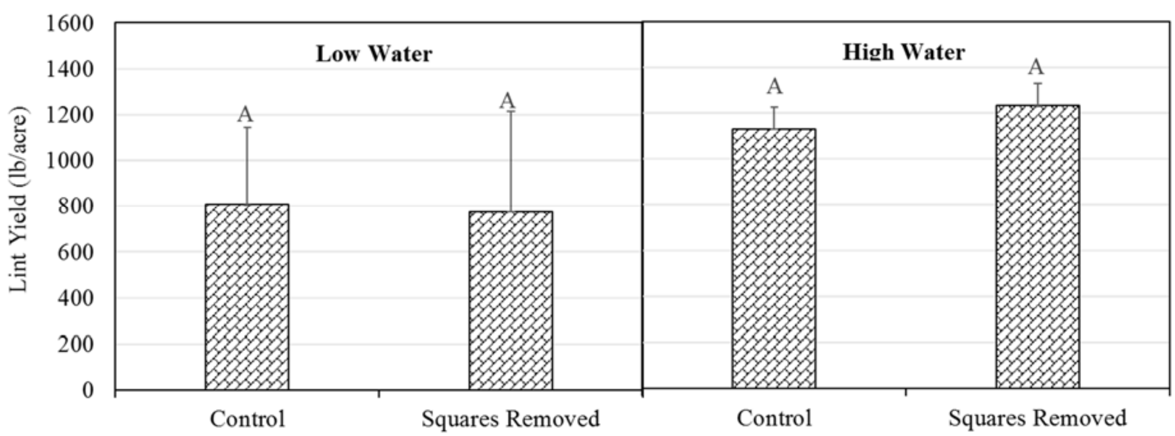


Figure 1. Average lint yield following manual removal of 100% squares prior to first flower versus control plots under high and low irrigation regimes, Lamesa, Texas, 2018.

	January			February		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	5	22	-	30	77	-
2	5	22	-	25	55	-
3	8	30	-	26	60	-
4	16	55	-	29	76	-
5	18	51	-	20	67	-
6	22	54	-	20	71	-
7	32	63	-	22	38	-
8	29	61	-	22	54	-
9	28	64	-	22	64	-
10	30	77	-	20	78	-
11	37	76	-	20	44	-
12	19	50	-	21	41	-
13	18	52	-	24	50	-
14	18	47	-	26	64	-
15	22	57	-	37	80	-
16	14	55	-	45	78	-
17	9	32	-	36	50	-
18	9	39	-	36	61	-
19	18	50	-	37	77	-
20	18	68	-	45	73	-
21	28	77	-	23	74	0.02
22	24	58	-	22	30	-
23	20	54	-	25	42	0.19
24	19	59	-	26	43	-
25	19	60	-	22	50	-
26	20	56	-	21	68	-
27	29	70	-	21	67	-
28	21	57	-	22	68	-
29	22	63	-			
30	23	60	-			
31	23	70	-			

	March			April		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	69	40	-	41	62	-
2	63	30	-	38	84	-
3	69	30	-	45	64	-
4	76	37	-	36	66	-
5	81	44	-	50	85	-
6	64	30	-	34	83	-
7	62	26	-	27	49	-
8	61	26	-	33	92	-
9	69	30	-	38	70	-
10	84	40	-	42	74	-
11	84	40	-	53	93	-
12	44	61	0.01	59	95	-
13	33	64	-	48	77	-
14	37	69	-	39	62	-
15	45	80	-	34	71	-
16	50	74	-	44	90	-
17	45	74	-	59	91	-
18	47	77	0.03	48	71	-
19	42	63	0.03	45	72	-
20	28	66	-	48	71	-
21	34	78	-	48	60	-
22	50	92	-	38	70	-
23	56	89	-	41	79	-
24	50	81	-	50	88	-
25	58	86	0.04	40	58	-
26	62	74	-	43	81	-
27	43	65	0.91	61	74	-
28	42	65	0.01	52	84	-
29	41	65	-	59	84	0.04
30	45	69	-	58	88	-
31	56	83	-			

	May			June		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	85	55	-	106	66	-
2	90	62	-	107	65	-
3	87	59	-	97	66	-
4	85	59	-	89	58	-
5	78	46	-	92	60	-
6	86	46	-	102	69	-
7	90	50	-	101	67	-
8	95	55	-	104	67	-
9	95	61	-	95	67	-
10	97	60	-	97	67	-
11	100	61	-	98	68	-
12	105	63	-	83	101	-
13	99	64	-	68	97	-
14	97	66	-	71	95	-
15	94	61	-	73	95	-
16	91	61	-	69	93	0.17
17	96	61	-	66	81	0.24
18	100	61	-	66	93	-
19	99	61	-	70	93	-
20	93	55	0.90	63	90	0.01
21	72	58	-	68	96	-
22	80	61	-	74	99	-
23	86	65	-	74	100	-
24	89	63	-	78	107	-
25	92	65	-	63	93	-
26	99	64	-	75	99	-
27	103	64	-	76	101	-
28	101	65	-	76	100	-
29	100	68	-	70	99	0.06
30	103	64	-	69	95	0.01
31	106	65	-			

	July			August		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	70	96	0.32	65	95	-
2	68	90	0.07	72	82	-
3	67	96	0.01	83	98	-
4	70	99	-	76	96	-
5	70	90	-	73	95	-
6	72	90	-	69	93	-
7	68	91	-	69	98	-
8	68	90	-	69	93	-
9	67	92	-	66	89	0.15
10	65	90	-	69	85	0.08
11	69	95	-	65	84	-
12	70	97	0.32	64	83	-
13	70	94	-	65	87	-
14	74	93	0.01	68	93	-
15	75	95	-	69	94	-
16	72	97	-	69	96	-
17	75	98	-	73	97	0.20
18	75	103	-	69	78	0.61
19	79	105	-	64	90	0.07
20	77	103	-	66	87	-
21	76	102	-	65	91	-
22	75	104	-	71	93	-
23	74	95	-	72	96	-
24	71	89	-	74	97	-
25	68	98	-	76	98	-
26	69	88	0.04	73	96	-
27	70	88	0.01	74	99	-
28	73	98	-	74	98	-
29	75	100	-	72	95	-
30	68	85	-	71	96	-
31	62	90	-	73	97	-

	September			October		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	72	92	-	65	81	-
2	68	88	0.03	65	84	-
3	65	85	0.60	67	90	-
4	62	87	0.24	66	86	0.02
5	68	85	-	64	88	0.72
6	67	83	-	57	69	-
7	64	73	1.05	57	78	-
8	63	82	-	62	70	0.46
9	65	80	-	50	70	1.23
10	64	85	-	40	68	-
11	59	83	-	48	58	0.01
12	59	83	-	55	71	0.03
13	66	86	-	51	69	0.36
14	65	87	-	34	62	0.01
15	64	83	-	32	42	0.18
16	67	84	-	35	44	0.14
17	63	86	-	45	57	-
18	68	87	-	44	47	0.65
19	68	88	-	47	71	0.02
20	67	86	0.46	47	67	-
21	62	68	0.35	40	68	-
22	54	76	-	43	72	-
23	49	83	-	49	66	-
24	52	87	-	44	56	0.41
25	63	90	-	47	72	-
26	50	65	1.08	45	77	-
27	54	72	-	47	80	-
28	60	86	-	47	77	-
29	54	80	-	45	84	-
30	64	85	-	53	65	-
31				41	53	0.35

	November			December		
Day	Min Temp	Max Temp	Precipitation	Min Temp	Max Temp	Precipitation
1	34	58	-	45	62	-
2	42	70	-	30	54	-
3	44	66	-	30	52	-
4	35	62	-	26	51	-
5	49	75	-	23	53	-
6	44	78	-	32	45	-
7	43	52	-	32	34	0.09
8	40	48	0.01	20	36	0.25
9	37	52	-	13	37	0.15
10	35	53	-	19	50	0.03
11	34	55	-	31	55	-
12	25	40	0.01	32	60	-
13	22	43	-	35	48	0.08
14	25	56	-	27	53	-
15	31	70	-	24	66	-
16	31	69	-	36	59	-
17	32	50	-	34	54	-
18	29	38	-	37	56	0.01
19	25	58	-	32	63	0.01
20	24	54	-	35	53	-
21	30	59	-	24	72	-
22	32	60	-	41	67	-
23	45	67	-	26	51	-
24	42	74	-	34	68	-
25	33	54	-	29	56	-
26	23	54	-	43	63	0.32
27	26	69	-	33	45	0.01
28	40	78	-	27	32	-
29	43	77	-	25	37	-
30	45	70	-	26	44	-
31				29	46	-