

## **COMPARISON OF TWELVE COTTON VARIETIES UNDER CENTER PIVOT IRRIGATION AND DRYLAND CROP PRODUCTION**

**Manda G. Cattaneo**

**Texas AgriLife Extension Service, Seminole, Texas**

**Mark S. Kelley**

**Texas AgriLife Extension Service, Lubbock, Texas**

**Randy K. Boman**

**Texas AgriLife Extension Service, Lubbock, Texas**

**Terry Millican**

**Texas AgriLife Extension Service, Seminole, Texas**

**Cooperators: Jud Chevront and Rick Orson**

### **Introduction**

Gaines County is the largest producer of cotton in the state of Texas. Approximately thirty-five percent of the cotton planted in Gaines County is under dryland production. The remaining cotton is produced under center pivot irrigation with a majority of the fields produced with minimal amounts of irrigation water. In 2008 approximately 137,985 of the 244,240 acres of cotton planted in Gaines County were failed due to excessively dry conditions, hail, wind and blowing sanding. Therefore, growers deem it necessary to evaluate variety performance in order to maintain yields and net profits at a time when water availability is scarce and input cost are drastically increasing. New cotton varieties are continually being produced and marketed by various seed companies. The quick turn round in varieties has resulted in a limited amount of on-farm tests to evaluate these new varieties when they first enter the marketplace. As a result growers have limited data to base their seed selections on. Variety selection is one of the most important decisions a grower makes during a year. Variety selections should be based on yield and fiber qualities. Therefore, two large plot on-farm trials were conducted in Gaines County to evaluate twelve cotton varieties. The objectives of this research were to evaluate the performance of commercially available cotton varieties in fields with varying levels of water and compare the net returns between varieties in fields under center pivot irrigation and dryland production. Yield and fiber qualities were used to determine the net value per acre for each variety.

### **Materials and Methods**

Field trials were conducted in Gaines County, TX in 2008. Trial 1 had a seeding rate of 4.3 seed per row-foot and was planted on 16 May with 5 lb of Temik 15G placed in the furrow at planting. Trial 2 had a seeding rate of 2.75 seed per row-foot and was planted on 14 May. No Temik 15G was applied. Plots had 36 and 40 inch row spacing, respectively. Trial 1 was irrigated using a pivot irrigation system and Trial 2 was produced under dryland cropping practices in a plant 2 rows and skip 1 row pattern. Plots were 12-rows and 8-rows wide, respectively, and extended the length of the field. Twelve varieties were evaluated in each trial. Plots were arranged in a randomized complete block design with 3 replications. Within each test, the production practices were the same for all varieties. Both fields had a non-damaging level of the root-knot nematode (*Meloidogyne incognita*). Trial 1 and Trial 2 were harvested on 13 November and 28 October, respectively. On 24 October temperatures dropped below 30°F. All plots were weighed separately using a Lee weigh wagon. Sub-samples were taken from each plot. All sub-samples were weighed and then ginned using a sample gin with a lint cleaner, burr extractor and stick machine. Ginned lint was weighed and lint and seed turnouts were calculated. Lint yield and seed yield was determine by multiplying the respective turn out with field plot weights. Approximately 50 gram lint samples were randomly collected for fiber quality analysis. Fiber analysis was conducted by the Texas Tech University Fiber & Biopolymer Research Institute and Commodity Credit Corporation (CCC) lint loan values were determined for each plot. Lint value was determined by multiplying the loan value with the lint yield. Seed value was determined using a value of \$200/ton for seed. Ginning Cost was determined using \$3.00/cwt ginning cost. Seed and technology cost was calculated using the 2008 Seed Cost Comparison Worksheet courtesy of the Plains Cotton Growers Inc. Net value was determined by adding lint value and seed value and subtracting ginning cost and seed fees and technology fees. Statistical analysis of data was conducted using SAS 9.1 for windows, using PROC GLM.

**Results and Discussion**

Table 1. Harvest Results from Trial 1 under center pivot irrigation.

Entry <sup>1</sup>	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan Value <sup>2</sup>	Lint value	Seed Value <sup>3</sup>	Total value	Ginning Cost <sup>4</sup>	Seed/technology cost	Net Value <sup>5</sup>	
	----- %	----- %	----- lb/acre	----- lb/acre	----- lb/acre	----- \$/lb	----- \$/acre	----- \$/acre	----- \$/acre	----- \$/acre	----- \$/acre	----- \$/acre	
NG 3348B2RF	39.3	59.3	2582	1007	1515	0.5568	560.67	151.56	712.22	77.45	55.01	579.76	a
FM 1740B2F	38.4	51.5	2435	935	1255	0.5662	529.79	125.49	655.28	73.04	59.96	522.28	b
FM 1880B2F	34.8	54.6	2473	860	1349	0.5723	491.74	134.90	626.64	74.19	59.96	492.49	b
DP 161B2RF	34.1	53.7	2235	764	1202	0.5685	434.13	120.27	554.40	67.06	58.42	428.92	c
DP 174RF	37.2	51.9	2003	746	1039	0.5667	422.27	103.88	526.15	60.10	49.79	416.26	cd
AM 1532B2RF	35.4	53.5	2063	732	1108	0.5742	419.95	110.76	530.70	61.89	56.94	411.87	cd
DP 141B2RF	33.8	54.3	2171	733	1177	0.5692	417.46	117.72	535.18	65.12	58.42	411.64	cd
PHY 375WRF	37.6	51.6	1928	726	993	0.5700	413.45	99.33	512.79	57.84	57.76	397.19	cd
PHY 485WRF	34.7	55.5	2039	708	1132	0.5667	401.24	113.22	514.46	61.17	57.76	395.52	cd
AT Summit B2RF	34.5	55.7	2007	695	1119	0.5702	396.29	111.88	508.17	60.22	54.19	393.76	cd
ST 5458B2RF	35.9	51.7	1991	714	1029	0.5710	407.69	102.88	510.57	59.74	59.43	391.40	cd
ST 4498B2RF	35.3	53.4	2000	707	1068	0.5487	387.49	106.82	494.31	59.99	59.43	374.88	d
Test average	35.9	53.9	2161	777	1165	0.5667	440.18	116.56	556.74	64.82	57.26	434.66	
CV, % <sup>6</sup>	4.5	5.3	5.1	5.3	5.9	1.8	5.3	5.9	5.3	5.1	--	6.5	
OSL <sup>7</sup>	0.0047	0.1048	<0.0001	<0.0001	<0.0001	0.2019	<0.0001	<0.0001	<0.0001	<0.0001	--	<0.0001	
LSD <sup>8</sup>	2.7	NS	186	70	117	NS	39.69	11.66	50.19	5.58	--	47.53	

<sup>1</sup>DP = Deltapine, NG = NexGen, FM = Fibermax, PHY = Phytogen, AM = Americot, AT – AllTex, ST = Stoneville. <sup>2</sup> Value for lint based on CCC loan value from grab samples and FBRI HVI results. <sup>3</sup>Seed value was determined using a value of \$200/ton for seed. <sup>4</sup>Ginning Cost were determined using \$3.00/cwt ginning cost. <sup>5</sup>For net value/acre, means within a column with the same letter are not significantly different at the 0.05 probability level. <sup>6</sup>CV - coefficient of variation. <sup>7</sup>OSL - observed significance level, or probability of a greater F value. <sup>8</sup>LSD - least significant difference at the 0.05 level.

Table 2. HVI fiber property results from Trial 1 under center pivot irrigation.

Entry <sup>1</sup>	Micronaire	Staple	Uniformity	Strength	Elongation	Leaf	Rd	+b	Color grade	
	units	32 <sup>nds</sup> inches	%	g/tex	%	grade	reflectance	yellowness	color 1	color 2
AM 1532B2RF	4.0	36.8	81.2	27.4	10.3	1.7	79.6	8.3	2.3	1.0
AT Summit B2RF	4.2	35.9	80.5	27.9	10.3	1.3	81.3	7.9	2.0	1.0
DP 141B2RF	4.1	35.2	80.5	27.8	10.7	1.3	79.6	8.7	2.0	1.0
DP 161B2RF	4.2	35.9	80.8	26.7	11.2	1.7	79.0	8.4	2.7	1.0
DP 174RF	4.1	35.7	79.9	27.1	10.3	1.7	79.9	8.2	2.3	1.0
FM 1740B2F	4.4	36.6	81.4	27.4	10.9	1.3	79.6	8.1	2.3	1.0
FM 1880B2F	4.4	35.3	80.5	27.2	11.3	1.3	80.6	8.3	2.0	1.0
NG 3348B2RF	4.1	35.4	80.0	27.2	10.3	1.0	79.8	8.3	2.3	1.0
PHY 375WRF	4.5	35.8	79.8	26.7	10.3	1.0	80.2	8.3	2.3	1.0
PHY 485WRF	4.5	36.0	80.4	28.3	10.2	1.3	78.4	8.9	2.3	1.0
ST 4498B2RF	4.0	35.5	79.8	27.2	10.8	1.0	77.1	9.7	2.0	1.7
ST 5458B2RF	4.1	36.1	80.1	27.6	10.2	1.0	79.1	8.2	2.3	1.0
Test average	4.2	35.9	80.4	27.4	10.6	1.3	79.5	8.5	2.2	1.1
CV, % <sup>2</sup>	7.6	2.4	1.3	5.1	6.3	43.5	2.0	7.1	--	--
OSL <sup>3</sup>	0.4183	0.5068	0.6844	0.9669	0.4222	0.7692	0.2598	0.1149	--	--
LSD <sup>4</sup>	NS	NS	NS	NS	NS	NS	NS	NS	--	--

<sup>1</sup>DP = Deltapine, NG = NexGen, FM = Fibermax, PHY = Phytogen, AM = Americot, AT – AllTex, ST = Stoneville. <sup>2</sup>CV - coefficient of variation. <sup>3</sup>OSL - observed significance level, or probability of a greater F value. <sup>4</sup>LSD - least significant difference at the 0.05 level.

Table 3. Harvest Results from Trial 2 under dryland production.

Entry <sup>1</sup>	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan Value <sup>2</sup>	Lint value	Seed Value <sup>3</sup>	Total value	Ginning Cost <sup>4</sup>	Seed/technology cost	Net Value <sup>5</sup>
	----- % -----	----- % -----	----- lb/acre -----	----- lb/acre -----	----- lb/acre -----	----- \$/lb -----	----- \$/acre -----	----- \$/acre -----	----- \$/acre -----	----- \$/acre -----	----- \$/acre -----	----- \$/acre -----
DP 174RF	34.6	44.9	1184	410	531	0.5435	223.63	53.09	276.72	35.52	36.25	204.95 a
DP 161B2RF	31.6	48.6	1242	393	603	0.5710	224.33	60.33	284.66	37.26	42.53	204.87 a
PHY 375WRF	33.5	44.7	1166	390	522	0.5450	213.14	52.22	265.36	34.98	42.05	188.33 ab
DP 141B2RF	31.8	48.0	1177	373	565	0.5557	207.28	56.48	263.76	35.29	42.53	185.94 ab
ST 4498B2RF	31.7	46.1	1143	364	529	0.5560	202.61	52.94	255.55	34.27	43.27	178.02 bc
FM 1740B2F	34.8	46.3	1059	368	491	0.5473	201.96	49.07	251.03	31.77	43.65	175.61 bc
AM 1532B2RF	31.0	47.5	1092	337	517	0.5657	191.10	51.71	242.81	32.74	41.45	168.61 bcd
FM 1880B2F	31.6	49.9	1061	335	529	0.5638	188.97	52.93	241.90	31.83	43.65	166.42 bcd
PHY 485WRF	30.5	47.3	1128	344	532	0.5418	187.16	53.22	240.38	33.83	42.05	164.50 bcd
ST 5458B2RF	33.9	47.3	1054	357	499	0.5162	184.99	49.92	234.92	31.62	43.27	160.03 cd
NG 3348B2RF	31.7	47.6	1034	327	493	0.5443	178.35	49.30	227.65	31.01	40.05	156.60 cd
AT Summit B2RF	31.0	48.5	992	308	481	0.5390	166.78	48.11	214.89	29.75	39.45	145.70 d
Test average	32.3	47.2	1111	359	524	0.5491	197.52	52.44	249.97	33.32	41.68	174.97
CV, % <sup>6</sup>	1.7	2.1	6.0	7.0	6.9	2.5	6.8	6.9	6.7	5.9	--	8.5
OSL <sup>7</sup>	<0.0001	<0.0001	0.0040	0.0017	0.0247	0.0055	0.0005	0.0244	0.0015	0.0040	--	0.0012
LSD <sup>8</sup>	0.9	1.7	112	42	61	0.0229	22.79	6.11	28.39	3.36	--	25.30

<sup>1</sup>DP = Deltapine, NG = NexGen, FM = Fibermax, PHY = Phytogen, AM = Americot, AT – AllTex, ST = Stoneville. <sup>2</sup> Value for lint based on CCC loan value from grab samples and FBRI HVI results. <sup>3</sup>Seed value was determined using a value of \$200/ton for seed. <sup>4</sup>Ginning Cost were determined using \$3.00/cwt ginning cost. <sup>5</sup>For net value/acre, means within a column with the same letter are not significantly different at the 0.05 probability level. <sup>6</sup>CV - coefficient of variation. <sup>7</sup>OSL - observed significance level, or probability of a greater F value. <sup>8</sup>LSD - least significant difference at the 0.05 level.

Table 4. HVI fiber property results from Trial 2 under dryland production.

Entry <sup>1</sup>	Micronaire	Staple	Uniformity	Strength	Elongation	Leaf	Rd	+b	Color grade	
	units	32 <sup>nds</sup> inches	%	g/tex	%	grade	reflectance	yellowness	color 1	color 2
AM 1532B2RF	4.3	35.6	80.5	28.0	10.2	2.3	78.0	8.6	2.7	1.0
AT Summit B2RF	4.3	34.0	81.0	26.9	10.5	1.7	77.1	8.7	3.0	1.0
DP 141B2RF	4.0	35.9	79.7	29.2	10.3	3.3	77.9	8.0	3.0	1.0
DP 161B2RF	4.4	36.0	80.1	30.7	9.6	2.0	78.2	8.2	3.0	1.0
DP 174RF	4.6	34.4	79.8	27.5	10.6	2.3	76.9	8.7	3.0	1.0
FM 1740B2F	4.7	34.1	80.7	28.3	9.7	1.0	78.5	8.6	2.7	1.0
FM 1880B2F	4.3	35.4	80.5	29.5	9.6	2.0	78.6	8.3	2.7	1.0
NG 3348B2RF	4.4	35.0	80.3	28.6	9.9	3.7	75.8	8.7	3.0	1.0
PHY 375WRF	4.5	34.1	80.6	27.8	10.0	1.7	77.4	8.5	3.0	1.0
PHY 485WRF	4.5	34.7	81.5	29.9	11.7	2.3	75.6	9.1	3.0	1.3
ST 4498B2RF	4.4	35.2	81.8	30.9	11.4	3.3	76.8	8.8	3.0	1.0
ST 5458B2RF	4.8	33.6	78.7	28.3	9.9	2.0	75.2	9.3	3.0	1.3
Test average	4.4	34.9	80.4	28.8	10.3	2.3	77.2	8.6	2.9	1.1
CV, % <sup>2</sup>	3.4	1.1	0.8	1.8	2.9	34.9	1.0	3.1	--	--
OSL <sup>3</sup>	0.0002	<0.0001	0.0012	<0.0001	<0.0001	0.0177	<0.0001	0.0002	--	--
LSD <sup>4</sup>	0.3	0.6	1.1	0.9	0.5	1.4	1.3	0.5	--	--

<sup>1</sup>DP = Deltapine, NG = NexGen, FM = Fibermax, PHY = Phytogen, AM = Americot, AT = AllTex, ST = Stoneville. <sup>2</sup>CV - coefficient of variation. <sup>3</sup>OSL - observed significance level, or probability of a greater F value. <sup>4</sup>LSD - least significant difference at the 0.05 level.

In Trial 1, lint yield ranged from 695 to 1007 lb/acre (average of 777 lb lint/acre) (Table 1), while in Trial 2, lint yield ranged from 308 to 410 lb/acre (average of 359 lb lint/acre) (Table 3). In Trial 1, net value ranged from \$375 to \$580/acre (difference of \$205/acre) (Table 1), while in Trial 2, net value ranged from \$146 to \$205/acre (difference of \$59) (Table 3).

NexGen 3348B2RF ranked 1<sup>st</sup> of 12 varieties in Trial 1 (center pivot irrigated), but ranked 11<sup>th</sup> in Trial 2 (dryland production) (Table 1 & 3). Fibermax 1740B2RF and Fibermax 1880B2RF ranked 2<sup>nd</sup> and 3<sup>rd</sup> in Trial 1, but ranked 6<sup>th</sup> and 8<sup>th</sup>, respectively, in Trial 2. Deltapine 174RF, and Deltapine 161B2RF ranked 1<sup>st</sup> and 2<sup>nd</sup> in Trial 2, but ranked 5<sup>th</sup> and 4<sup>th</sup> in Trial 1. Phytogen 375WRF and Deltapine 141B2RF ranked 3<sup>rd</sup>, and 4<sup>th</sup> in Trial 2, but ranked 8<sup>th</sup> and 7<sup>th</sup> in Trial 1. Americot 1532 B2RF, Phytogen 485WRF, All-Tex Summit B2RF, and Stoneville 5458B2RF net values were not significantly different than the lowest net values in both of the trials (Table 1 & 3). Variety selection is one of the most important decisions a producer must make. Water use is one factor that can significantly impact variety performance. Continued evaluations of these varieties are needed.

### **Acknowledgements**

We would like to acknowledge and thank Jud Chevront and Rick Orson for planting, maintaining and harvesting these trials. We would also like to thank Jody Anderson for his assistance in planting and harvesting these trials and Ronnie Wallace for assisting us in measuring plot acreages.