

Systems Agronomic and Economic Evaluation of Transgenic and Conventional Varieties in the Texas High Plains

February, 2004

Dr. Randy Boman, Extension Agronomist-Cotton
Mr. Mark Kelley, Extension Program Specialist-Cotton
Mr. Mark Stelter, Extension Assistant-Cotton

Texas Cooperative Extension
Lubbock, TX

Small-plot cotton variety testing generally includes evaluation of genetic components but not genetics in concert with management programs. Characteristics commonly evaluated in small-plot testing include lint yield, turnout percentages, fiber quality, and earliness. Current small-plot variety testing programs are generally inadequate in scale and design to investigate the economic impact of new transgenic varieties with value-added traits. The objective of this project was to evaluate the profitability of various transgenic cotton varieties when compared to conventional types in producers' fields. Three replications of each variety were included at each location. Plot size was of sufficient size to enable the combining of all replications of each individual variety into a single module at harvest. Each individual variety had at least three acres total (approximately one acre per plot with three replications equals three acres total). Plot weights were determined at harvest using a boll buggy equipped with integral electronic scales. Modules were followed through the commercial ginning process to determine lint turnout, USDA fiber quality, and loan value. Expenses for each herbicide system (Roundup Ready and conventional) were tracked. Three producer-cooperator locations were utilized for this project. Trials were planted in Crosby, Parmer, and Yoakum counties. The Crosby County site was destroyed twice (the original planting and the replant) by high intensity thunderstorm/hail events. The Yoakum County site was lost by a high wind event in mid-June, a date too late to replant. In the extremely high-yielding but short-season environment at the 4000 ft elevation Parmer County location, several varieties statistically produced the same net value. This location experienced adverse growing conditions during late May and June. However, crop conditions were much more favorable during July and August. Even though record high temperatures were encountered in October, several varieties produced low micronaire. Within the statistical "upper tier" of net returns, three varieties produced the same net value (FiberMax 989BR, FiberMax 960BR, and FiberMax 958). The two varieties generating the highest net income were Bollgard/Roundup Ready "stacked" types (FiberMax 989BR and FiberMax 960BR). Two of the top five varieties were conventional types (FiberMax 958 and FiberMax 966). The Paymaster 2266RR stripper variety was the only "Roundup Ready only" type that was among the top five varieties for net value/acre. Results from the 2003 production season at this location in the Texas High Plains indicate that some transgenic Roundup Ready and Bollgard/Roundup Ready "stacked gene" varieties were highly competitive with conventional varieties in terms of production economics. These data indicate that substantial differences can be obtained in terms of net value/acre due to variety/technology selection. Net value/acre ranged from a low of \$552.45 for Deltapine 5415RR to \$794.03 for FiberMax 989BR, a difference of \$241.58. It should be noted that no inclement weather was encountered at the Muleshoe location prior to harvest. Minimal pre-harvest losses were noted with the open boll picker-type varieties. Additional multi-site and multi-year applied research is needed to evaluate varieties across a series of environments.



Systems Agronomic and Economic Evaluation of Transgenic and Conventional Varieties in the Texas High Plains

February, 2004

Dr. Randy Boman, Extension Agronomist-Cotton
Mr. Mark Kelley, Extension Program Specialist-Cotton
Mr. Mark Stelter, Extension Assistant-Cotton

Texas Cooperative Extension
Lubbock, TX

Introduction

Small-plot cotton variety testing generally includes evaluation of genetic components but not genetics in concert with management programs. Characteristics commonly evaluated in small-plot testing include lint yield, turnout percentages, fiber quality, and earliness.

Over the last several years, High Plains cotton producers have increased planted acres of transgenic cottons (Roundup - and Buctril-herbicide tolerant and Bt insect-resistant types) from approximately 300 thousand in 1997 to approximately 2 million in 2001. Industry continues to increase the number of herbicide-tolerant, insect-resistant, and "stacked gene" varieties. The proliferation of transgenic varieties in the marketplace for 2001 was substantial and is expected to continue over the next few years. New transgenic varieties continue to be marketed in the High Plains. More transgenic varieties in both picker and stripper type cottons are expected to be released by seed companies. Glufosinate herbicide tolerant varieties (Liberty Link from Bayer CropScience) are currently in development and should be available in 2004. Additional "stacked" Bt gene products (Bollgard 2) from Monsanto are also anticipated as well as the Roundup Ready Flex gene system. Current small-plot variety testing programs are inadequate in scale and design to investigate the economic impact of new transgenic varieties with value-added traits.

The objective of this project was to evaluate the profitability of various transgenic cotton varieties when compared to conventional types in producers' fields in the Texas High Plains.

Materials and Methods

For scientific validity, three replications of each variety were included at each location. Plot size was of sufficient size to enable the combining of all replications of each individual variety into a single module at harvest. Each individual variety had at least three acres total (approximately one acre per plot with three replications = three acres total). A forced randomization was used at each location. This was a requirement due to the potential for drift of Roundup WeatherMax to adjacent non-herbicide tolerant varieties. For example, the Roundup Ready varieties were planted in a contiguous block, with a fill variety between the next herbicide systems. Varieties within the next herbicide system were then

planted, with a fill variety between the last system. Varieties were randomized in each replication and herbicide system, but the forced randomization due to herbicide system was maintained. All fill varieties were treated with conventional herbicides and were not used for data acquisition.

Preplant incorporated and/or preemergence herbicide applications were made at the discretion of the producer-cooperator. Broadcast over-the-top herbicide applications were made using project equipment and project personnel or by the cooperator. Strike-Zone ammonium sulfate/drift retardant was used with broadcast Roundup WeatherMax applications in order to reduce drift potential to non-Roundup Ready varieties. Due to the fact that Strike Zone is rather expensive (\$3.50/acre), cost for basic ammonium sulfate (\$0.31/acre) was used to determine Roundup Ready systems costs. Post-directed herbicide applications were made by the producer-cooperator with the guidance of project personnel. Weed species spectrum was determined by project personnel working with the cooperator. Control of weed escapes (hoeing and/or spot spraying) was performed by project personnel and cooperator employees and records were kept by herbicide system to facilitate economic analysis.

In-season plant mapping data were derived from mapping 10 representative plants/plot on each mapping date. First position fruit retention, node of first fruiting branch, plant height, nodes above white flower, and overall plant development were tracked throughout the growing season. Plot weights were determined at harvest using a boll buggy with integral electronic scales and grab samples were obtained from each plot. Modules were followed through the ginning process to determine lint turnout, USDA fiber quality, and loan value. Ginners were asked to gin each module separately and to tie off any remnant bales obtained in the ginning process in order to determine more precisely the turnout and lint yields. Data were then converted to a per acre basis and appropriate statistical analyses were performed.

Three producer-cooperator locations were utilized for this project.

Site Information:

Location 1 – Muleshoe (Parmer County)

Clean tillage following corn

Irrigation: Low elevation spray, straight rows

Plot size: 10 30-inch rows/plot

Area: Variable (0.7 to 1.5 acres/plot), 3 replications of each variety

Planted: May 5, 2003 at 4.6 seed/per row-ft

Harvest aid program: October 9, 2 pt/acre Prep + 1 pt/acre Def +
2 oz/acre Activator 90 (non-ionic surfactant - NIS) followed
by 20 oz/acre Gramoxone Max + 2 oz/acre Activator 90 on October 21

Harvested: November 5, 11, 17, and 18, 2003 using a John Deere 7455 commercial stripper. A field cleaner was used.

Blanket Weed Control Program: \$23.36/acre

Dominant weed species: pigweed, kochia, johnsongrass, cocklebur, volunteer corn, spurred anoda, silverleaf nightshade

The whole field was treated with 2 pt/acre of Treflan preplant incorporated. An additional 1 pt/acre of Direx (diuron) was applied across all varieties at planting. One post directed application of 1 qt/acre Direx was made across all varieties on August 1 with a cultivation.

Specific herbicide systems costs included:

Roundup Ready varieties: 22 oz/acre Roundup WeatherMax + 17 lb of StrikeZone per 100 gallons of spray solution, applied at 15 GPA on June 9 over-the-top.

All non-Roundup Ready varieties were sprayed with Fusion at 12 oz/acre at 15 GPA on June 25 for grassy escapes.

Hoe costs were \$4.80 per acre for Roundup Ready varieties and \$9.96 per acre for conventionals. This is based on \$6.00/hr and 0.8 hours/acre on Roundup Ready varieties and 1.66 hours/acre for conventionals.

Temik was applied in-furrow at planting at 3.5 lb/acre.

Orthene was applied at 2 oz/acre for thrips and grasshopper control on June 3. Applications for lygus control included Ammo at 2.13 oz/acre on July 1. On July 10 2.56 oz/acre of Ammo was applied for lygus species and 4 oz/acre Orthene was applied for grasshoppers. Centric was applied at 1.5 oz/acre on August 1 for aphids. Karate Z was applied with ULV crop oil on August 13 at 3.88 oz/acre for bollworms. An additional application was made on September 5 which included Karate Z at 3.88 oz/acre with COC for bollworms. This location was in an active boll weevil eradication zone, but no applications were made by the Texas Boll Weevil Eradication Foundation.

Plant growth regulator applications included PGR IV at 1 oz/acre applied on June 3. Pentia was applied at 6 oz/acre on July 1, and 4 oz/acre on July 10. Pix was applied on July 24 at 14 oz/acre.

Varieties planted at this site included:

1. Paymaster 1199RR (picker type)
2. Paymaster 2326RR (stripper type)
3. Paymaster 2266RR (stripper type)
4. Deltapine 5415RR (picker type)
5. Paymaster 2167RR (stripper type)
6. Stoneville 4892BR (picker type)
7. FiberMax 960BR (picker type)
8. FiberMax 989BR (picker type)
9. FiberMax 819RR (picker type)
10. Beltwide Cotton Genetics 28R (picker type)
11. FiberMax 819 (picker type)
12. FiberMax 958 (picker type)
13. FiberMax 966 (picker type)

Modules were ginned at the Muleshoe Co-op Gin. Unfortunately, a module fire destroyed the Paymaster 2167RR module while in the field, so data from that variety were lost.

Location 2 – Cone (Crosby County)

Appling Farm, near Cone (Crosby County)

Reduced tillage following cotton

Irrigation: LEPA, circular rows

Plot Size: 8 40-inch rows/plot

Area: Variable (0.8 to 1.6 acres/plot), 3 replications of each variety

Planted: May 13, 2003

Varieties planted at Cone

1. Paymaster 2326RR (stripper type)
2. Deltapine 5415RR (picker type)
3. Deltapine 555BG/RR (picker type)
4. FiberMax 960BR (picker type)
5. FiberMax 819RR (picker type)
6. Beltwide Cotton Genetics 28R (picker type)
7. Stoneville 5303R (picker type)
8. All-Tex Atlas RR (stripper type)
9. AFD 2485 (picker type)
10. Paymaster HS26 (stripper type)
11. FiberMax 958 (stripper type)
12. All-Tex TopPick (picker type)
13. AFD Raider 271 (stripper type)

This site was destroyed by a high intensity thunderstorm event on June 5. High winds, rain and hail completely destroyed the stand. It was decided to replant the trial to a differing variety mix on June 16.

Varieties replanted at Cone (2nd planting)

1. Paymaster 2326RR (stripper type)
2. Paymaster 2167RR (stripper type)
3. Paymaster 2266RR (stripper type)
4. Paymaster 2379RR (stripper type)
5. FiberMax 819RR (picker type)
6. Stoneville 2454R (stripper type)
7. All-Tex Xpress RR (stripper type)
8. AFD 3511R (stripper type)
9. Paymaster HS26 (stripper type)
10. AFD Raider 202 (stripper type)
11. AFD Raider 271 (stripper type)
12. AFD 2485 (picker type)
13. FiberMax 958 (picker type)

Unfortunately, this site was destroyed for a second time by a hailstorm which occurred on October 5. No salvageable yield remained.

Location 3 – Tokio (Yoakum County)

Rickey Bearden Farm, Tokio (Yoakum County)

Clean-tillage following cotton

Irrigation: Low elevation spray, straight rows

Plot Size: 12 40-inch rows/plot

Area: Variable (1.1 to 2.2 acres/plot), 3 replications of each variety

Planted: May 14, 2003

Varieties planted at Tokio

1. FiberMax 989BR (picker type)
2. Paymaster 2326RR (stripper type)
3. Paymaster 2266RR (stripper type)
4. Paymaster 2344BG/RR (stripper type)
5. Deltapine 444BG/RR (picker type)
6. Deltapine 555BG/RR (picker type)
7. Deltapine 468BG2/RR (picker type)
8. FiberMax 960BR (picker type)
9. FiberMax 819RR (picker type)
10. Beltwide Cotton Genetics 24R (picker type)
11. Beltwide Cotton Genetics 28R (picker type)
12. Stoneville 5303R (picker type)
13. Stoneville 4892BR (picker type)
14. Stoneville 5599BR (picker type)
15. AFD 3602R (picker type)
16. All-Tex TopPick (picker type)
17. AFD 2485 (picker type)
18. FiberMax 958 (picker type)

Unfortunately, this site was destroyed on June 9 by a 75 mph wind storm which tracked across Yoakum County. The storm lasted approximately 30 minutes and due to blowing sand, the stand was severely damaged and/or blown out. The cooperators destroyed the remaining stands in replications 2 and 3 and replanted alternate crops on the site. However, the variety plots in replication 1 recovered somewhat and the cooperators harvested the area. Yield variability was such that lint and seed yields were not taken. However, grab samples were taken from three locations within each variety and gin turnout and HVI data are provided in Table 8. FiberMax 958 was lost due to being sprayed with Roundup WeatherMax by cooperators personnel.

Results

Agronomic and economic results from the surviving project (Muleshoe) are provided by variety in Tables 1-5. Summaries of the systems costs and expenses by variety are provided in Tables 6-7. Fiber quality and loan value observations were obtained from the surviving replication at location 3 (Tokio) and the results are provided in Table 8.

Location 1 - Muleshoe

The Muleshoe site encountered significant adverse early season weather. Cotton adjacent to the trial was destroyed. The cool, damp conditions resulted in lack of vigorous early season growth. Some varieties tended to fare better through these conditions, including all Paymaster stripper types and most FiberMax varieties. The early, mid-season, and late-season growth characteristics are presented in Tables 1 and 2. Plant stands averaged about 51,000 plants/acre. Lowest stand counts were obtained

with the Paymaster 1199RR, Beltwide Cotton Genetics 28R, Paymaster 2266RR, and Paymaster 2326RR varieties. No differences for mid-season plant heights, total fruiting nodes, or total mainstem nodes were noted. Node of first sympodium was different for some varieties. Picker varieties tended to fruit on node 7 or greater, while the stripper types initiated fruiting branches on node 6. The node of first sympodium was higher for FiberMax 819, FiberMax 819RR, FiberMax 958, and FiberMax 960BR when compared to several other varieties. Height to node ratios tended to be 1 inch or less which is indicative of the early season stress factors which affected the trial. No apparent trends were noted in development among Roundup Ready and "stacked gene" (Bollgard with Roundup Ready) compared to conventional varieties. Significant differences were noted for mid-season first position fruit retention. It was noted that several FiberMax varieties had lower retention than some other varieties. No differences were noted for second and third position fruit retention. Total fruit retention (all positions) indicated that several of the FiberMax varieties had lower retention on July 24. Nodes above white flower (NAWF) tended to be greater for picker varieties on July 28 (Table 3). The same trend continued on August 7. By August 20, all varieties had reached cutout (defined as NAWF=5). Counts were taken on October 14 to determine percent open boll. The later maturing picker type varieties (Deltapine 5415RR and Stoneville 4892BR) tended to have a lower percentage of open bolls, 7.8 and 7.4% respectively, when compared to earlier maturing stripper types (Paymaster 2326RR with 41.9% and Paymaster 2167RR with 36.8%). Days to cutout ranged from 92-104 with the picker varieties generally taking longer. This fact was critical, as time to maturity was longer for several of these types, which resulted in low micronaire in the harvested lint.

Commercial turnouts of field-cleaned bur cotton averaged 28.1% and ranged from 25.1% for Deltapine 5415RR to 30.4% for FiberMax 960BR (Table 4). Bur cotton yields/acre ranged from 4273 lb/acre for Paymaster 1199RR to 5844lb/acre for FiberMax 989BR. Lint yields ranged from 1194 lb/acre for Deltapine 5415RR to 1677 lb/acre for FiberMax 989BR. Lint loan values derived from USDA-AMS classing results of the bales obtained in the project show that values ranged from \$0.4940 for Deltapine 5415RR to \$0.5421 for Paymaster 2326RR. Loan value discounts were attributed to low micronaire, uniformity, and bark contamination incidence for some bales in some variety modules (Table 5). Although several picker varieties produced higher lint yields, the discounts for low micronaire were noted. Both Paymaster stripper varieties produced lint which did not have discounts for low micronaire, although they were near the breaking point at 3.5. The later maturity (days to cutout=104, August 17) was greatest for Deltapine 5415RR and Beltwide Cotton Genetics 28R, and those varieties produced the lowest micronaire in the trial. Due to a micronaire of 2.8 and a staple of 35.8, Deltapine 5415RR received the deepest discount of -665 points. After totaling lint and seed value per acre and subtracting out ginning costs and system-specific costs (Tables 6 and 7), the net value/acre ranged from a low of \$552.45 for Deltapine 5415RR to \$794.03 for FiberMax 989BR (Table 4), a difference of \$241.58.

Within the statistical "upper tier" of net returns, three varieties produced the same net value (FiberMax 989BR, FiberMax 960BR, and FiberMax 958). Two varieties generating the highest net income were Bollgard/Roundup Ready "stacked" types (FiberMax 989BR and FiberMax 960BR) Two of the top five varieties were conventional types (FiberMax 958 and FiberMax 966). The Paymaster 2266RR stripper variety was the only Roundup Ready only type that was among the top five varieties for net value/acre.

Location 3 – Tokio

Grap samples were taken at three locations within each variety from the surviving replication at Tokio. The samples were subsequently ginned on a sample gin located at the Texas Agricultural Experiment Station in Lubbock to determine lint and seed turnout. The resulting lint samples were taken to the International Textile Center (ITC) for HVI analysis and CCC loan values were assigned. The samples within each variety were averaged and the results are presented in Table 8. FiberMax 958 was lost due to being sprayed with Roundup WeatherMax by cooperator personnel.

Summary and Conclusions

In the extremely high-yielding but short-season environment at the 4000 ft elevation Muleshoe location, several varieties statistically produced the same net value. This location experienced adverse growing conditions during late May and June. However, crop conditions were much more favorable during July and August. Even though record high temperatures were encountered in October, several varieties produced low micronaire. Within the statistical "upper tier" of net returns, three varieties produced the same net value (FiberMax 989BR, FiberMax 960BR, and FiberMax 958). The two varieties generating the highest net income were Bollgard/Roundup Ready "stacked" types (FiberMax 989BR and FiberMax 960BR). Two of the top five varieties were conventional types (FiberMax 958 and FiberMax 966). The Paymaster 2266RR stripper variety was the only "Roundup Ready only" type that was among the top five varieties for net value/acre.

Results from the 2003 production season at this location in the Texas High Plains indicate that some transgenic Roundup Ready and Bollgard/Roundup Ready "stacked gene" varieties were highly competitive with conventional varieties in terms of production economics. These data indicate that substantial differences can be obtained in terms of net value/acre due to variety selection. Net value/acre ranged from a low of \$552.45 for Deltapine 5415RR to \$794.03 for FiberMax 989BR, a difference of \$241.58. It should be noted that no inclement weather was encountered at the Muleshoe location prior to harvest. Minimal pre-harvest losses were noted with the open boll picker-type varieties. Additional multi-site and multi-year applied research is needed to evaluate varieties across a series of environments.

Table 1. Early and Mid season stand count results, Muleshoe, TX 2003.

Variety	15-May		30-Jul	
	Plants/row-ft	Plants/acre	Plants/row-ft	Plants/acre
BCG28R	3.0	52,272	2.7	46,261
DP5415RR	3.4	58,893	3.3	57,615
FM819	2.7	47,161	3.0	51,807
FM819RR	2.7	47,974	2.8	48,903
FM958	3.1	54,131	3.1	54,131
FM960BR	2.6	45,302	3.1	54,014
FM966	3.0	52,969	3.3	57,005
FM989BR	2.7	46,464	2.8	48,003
PM1199RR	2.5	43,444	2.4	42,602
PM2167RR	3.2	55,408	3.4	58,545
PM2266RR	2.8	48,555	2.6	45,273
PM2326RR	3.1	52,853	2.6	46,029
ST4892BR	3.1	54,015	3.1	53,434
Test avg.	2.9	50,726	2.9	51,048
CV, %	7.0	7.1	7.4	7.2
OSL	0.0002	0.0006	0.0002	<0.0001
LSD (0.05)	0.3	6,091	0.4	6,207

CV - coefficient of variation, percent

OSL - observed significance level, or probability of a greater F value at the 0.05 level.

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

Seeding rate of 15 lbs/acre (adjustments made according to seed size)

Table 2. Mid-season plant map results on 7-24-03, Muleshoe, TX 2003.

Variety	Plant height inches	Node of 1st sympodium node number	Fruiting nodes total/plant	Mainstem nodes total/plant	Height/node ratio	Fruit retention			
						First position percent	Second position percent	Third+ position percent	Total reproductive percent
BCG28R	13.3	6.8	8.6	14.4	0.93	87.3	88.9	93.3	88.7
DP5415RR	13.4	7.3	8.5	14.8	0.91	83.4	82.6	86.7	83.5
FM819	14.5	7.8	9.4	16.2	0.90	80.0	84.4	91.8	83.8
FM819RR	15.3	7.6	9.2	15.8	0.98	74.8	80.8	91.9	80.1
FM958	14.4	7.7	8.9	15.6	0.92	75.5	77.8	93.6	79.9
FM960BR	14.9	7.5	9.2	15.7	0.95	75.9	81.6	92.7	81.2
FM966	13.6	7.2	8.7	14.9	0.91	67.6	83.3	88.5	77.2
FM989BR	15.4	7.4	8.8	15.2	1.01	65.2	77.9	97.8	76.4
PM1199RR	14.4	6.5	10.0	15.5	0.93	82.8	86.1	93.0	86.8
PM2167RR	14.0	6.2	10.0	15.2	0.92	69.1	85.6	91.5	80.3
PM2266RR	14.8	6.4	9.7	15.1	0.98	71.7	75.5	89.8	77.4
PM2326RR	14.2	6.0	8.8	13.9	1.03	71.2	77.9	94.4	78.2
ST4892BR	14.7	7.2	8.5	14.7	1.00	87.6	85.4	95.6	88.0
Test avg.	14.4	7.0	9.1	15.2	0.95	76.3	82.1	92.3	81.7
CV, %	6.8	6.0	7.5	5.0	4.8	8.5	7.6	6.8	4.5
OSL	0.2371	<0.0001	0.0966	0.0654	0.0198	0.0024	0.3194	0.7851	0.0026
LSD (0.05)	NS	0.7	NS	NS	0.08	11.0	NS	NS	6.3

Numbers in table represent an average of 18 plants per variety (6 plants/variety/rep with 3 reps).

CV - coefficient of variation, percent

OSL - observed significance level, or probability of a greater F value at the 0.05 level.

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

Table 3. Nodes above white flower (NAWF) and open boll counts, Muleshoe, TX 2003.

Variety	NAWF			Open boll 14-Oct percent	Days to cutout	Cutout date
	28-Jul	7-Aug	20-Aug			
BCG28R	7.7	6.7	4.4	22.5	104	17-Aug
DP5415RR	8.0	6.5	4.6	7.8	104	17-Aug
FM819	8.3	6.4	3.3	27.0	100	13-Aug
FM819RR	9.0	6.7	4.4	23.4	103	16-Aug
FM958	7.5	5.6	3.0	19.1	97	10-Aug
FM960BR	8.1	5.7	3.0	14.1	97	10-Aug
FM966	6.9	5.2	3.0	32.5	95	8-Aug
FM989BR	7.1	5.6	2.9	19.7	97	10-Aug
PM1199RR	8.1	6.3	4.5	28.3	103	16-Aug
PM2167RR	6.6	4.6	2.8	36.8	92	5-Aug
PM2266RR	7.0	5.5	3.3	32.9	97	10-Aug
PM2326RR	6.8	5.4	3.4	41.9	97	10-Aug
ST4892BR	7.7	6.0	3.7	7.4	100	13-Aug
Test avg.	7.6	5.9	3.6	24.1	99	12-Aug
CV, %	7.7	10.1	18.2	30.1	--	--
OSL	0.0012	0.0061	0.0068	<0.0001	--	--
LSD (0.05)	1.0	1.0	1.1	12.2	--	--

NAWF numbers in table represent an average of 30 plants per variety (10 plants/variety/rep with 3 reps).

CV - coefficient of variation, percent

OSL - observed significance level, or probability of a greater F value at the 0.05 level.

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

Table 4. Economic results from the Muleshoe systems project, 2003.

Variety	Commercial turnout	Bur cotton yield	Lint yield	Seed yield	Seed	Lint loan value	Lint value	Seed value	Total value	Ginning cost	Systems cost	Net value	
	%	lb/acre	lb/acre	lb/acre	lb/bale	\$/lb	\$/acre	\$/acre	\$/acre	\$/acre	\$/acre	\$/acre	
FM 989BR	28.7	5844	1677	2383	682	0.5103	856.16	148.98	1005.15	131.49	79.63	794.03	a
FM 960BR	30.4	5314	1615	2186	650	0.5240	846.55	136.67	983.22	119.57	80.01	783.65	a
FM 958	29.8	5027	1498	2002	641	0.5336	799.75	125.16	924.92	113.12	47.87	763.92	ab
FM 966	29.2	4867	1419	1978	669	0.5416	768.75	123.66	892.41	109.52	51.82	731.08	bc
PM 2266RR	26.5	5255	1390	2227	769	0.5393	749.93	139.23	889.16	118.24	43.34	727.58	bc
ST 4892BR	28.0	5471	1532	2190	686	0.5103	781.74	136.88	918.63	123.10	75.52	720.01	c
PM 2326RR	26.5	5051	1340	2073	743	0.5421	726.41	129.58	855.99	113.64	43.29	699.06	cd
FM 819	28.1	4824	1357	1841	651	0.5248	712.21	115.09	827.30	108.54	45.23	673.53	de
FM 819RR	29.0	4622	1338	1701	610	0.5198	695.88	106.32	802.21	104.01	53.73	644.47	ef
BCG 28R	26.4	4944	1306	2024	744	0.5052	660.17	126.54	786.71	111.24	52.12	623.35	f
PM 1199RR	29.4	4273	1254	1691	647	0.5337	669.68	105.72	775.40	96.16	57.76	621.48	f
DP 5415RR	25.1	4760	1194	1985	798	0.4940	589.85	124.05	713.90	107.12	54.33	552.45	g
Test average	28.1	5021	1410	2023	691	0.5232	738.09	126.49	864.58	112.98	57.05	694.55	
LSD (0.05)	--	297	83	119	--	--	42.94	7.44	50.34	6.69	--	43.66	
CV, %	--	3.5	3.5	3.5	--	--	3.4	3.5	3.4	3.5	--	3.7	

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

LSD - least significant difference, NS - not significant.

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

Assumes:

\$2.25/cwt ginning cost.

\$125/ton for seed.

Value for lint based on CCC loan value from commercially ginned bales and USDA-AMS classing results.

Table 5. USDA-AMS classing results of commercially ginned bales, Muleshoe, TX, 2003.

Variety		Color 1	Color 2	Staple	Leaf	Mic	Remarks	rd	+b	Length	Strength	Unif	Loan
		units	units	32nds	units	units	bales	%	units	100ths	g/tx	%	\$/lb
BCG28R	Mean	1.0	1.0	35.7	1.1	3.0	0/10 bales	83	9.3	1.11	25.9	79.9	0.5052
	Std Dev	0.0	0.0	0.7	0.3	0.1		0.9	0.2	0.01	0.7	1.3	0.0134
DP 5415RR	Mean	1.0	1.0	35.8	1.4	2.8	0/9 bales	84	9.5	1.11	27.0	79.7	0.4940
	Std Dev	0.0	0.0	0.4	0.5	0.2		0.5	0.2	0.01	0.7	1.2	0.0179
FM 819	Mean	1.2	1.0	36.1	2.0	3.2	0/9 bales	84	7.8	1.13	29.0	80.2	0.5248
	Std Dev	0.7	0.0	0.3	0.5	0.1		1.0	0.2	0.01	0.7	1.0	0.0078
FM 819RR	Mean	1.0	1.0	35.4	2.0	3.2	1/10bales	83	8.1	1.10	28.5	80.7	0.5198
	Std Dev	0.0	0.0	0.5	0.0	0.1		0.5	0.2	0.01	0.4	0.9	0.0116
FM 958	Mean	1.3	1.0	36.1	2.0	3.3	0/10 bales	83	7.9	1.12	30.1	80.4	0.5336
	Std Dev	0.5	0.0	0.8	0.0	0.1		0.8	0.1	0.02	1.8	0.9	0.0100
FM 960BR	Mean	1.0	1.0	34.0	1.9	3.4	0/10 bales	83	8.3	1.06	30.2	80.6	0.5240
	Std Dev	0.0	0.0	0.0	0.3	0.1		0.4	0.1	0.01	1.8	0.7	0.0021
FM 966	Mean	1.1	1.0	36.1	2.0	3.3	0/10 bales	84	7.8	1.12	30.2	81.1	0.5416
	Std Dev	0.3	0.0	0.3	0.0	0.1		0.7	0.1	0.01	2.3	0.8	0.0081
FM 989BR	Mean	1.1	1.0	35.1	1.4	3.2	4/10 bales	83	8.5	1.09	29.2	79.1	0.5103
	Std Dev	0.3	0.0	0.3	0.5	0.1		1.0	0.2	0.01	0.8	0.8	0.0107
PM 1199RR	Mean	1.1	1.0	34.8	1.4	3.4	0/9 bales	83	9.1	1.08	28.1	81.9	0.5337
	Std Dev	0.3	0.0	0.4	0.5	0.0		1.1	0.2	0.01	0.8	0.8	0.0094
PM 2266RR	Mean	1.1	1.0	34.4	2.0	3.5	0/8 bales	82	8.4	1.07	28.5	82.1	0.5393
	Std Dev	0.4	0.0	0.9	0.0	0.1		0.6	0.1	0.02	1.3	0.4	0.0149
PM 2326RR	Mean	1.2	1.0	34.2	1.9	3.5	0/9 bales	82	8.6	1.06	27.9	82.1	0.5421
	Std Dev	0.4	0.0	0.4	0.3	0.1		0.3	0.2	0.01	1.6	0.6	0.0084
ST 4892BR	Mean	1.0	1.0	34.7	1.8	3.1	0/10 bales	82	10.4	1.08	27.9	81.1	0.5103
	Std Dev	0.0	0.0	0.5	0.4	0.1		0.3	0.1	0.01	0.4	0.8	0.0078

Table 6. Expenses incurred for the Muleshoe systems trial, 2003.											
	Variety	Seed cost/bag	Tech fees/bag	Total cost/bag	Seed & tech fee/ac	Herb apps	Herb app cost/ac	Roundup WeatherMax cost/ac	Fusion cost/ac	Hoe cost cost/ac	Systems cost/ac
1	PM 2326RR	43.95	27.60	71.55	24.89	1	3.50	10.10	0.00	4.80	43.29
2	PM 2167RR	47.95	28.80	76.75	23.62	1	3.50	10.10	0.00	4.80	42.02
3	PM 2266RR	47.95	25.30	73.25	24.94	1	3.50	10.10	0.00	4.80	43.34
4	PM 1199RR	70.95	42.20	113.15	39.36	1	3.50	10.10	0.00	4.80	57.76
5	DP 5415RR	70.95	50.30	121.25	35.93	1	3.50	10.10	0.00	4.80	54.33
6	FM 960BR	68.95	104.70	173.65	61.61	1	3.50	10.10	0.00	4.80	80.01
7	FM 989BR	68.95	102.50	171.45	61.23	1	3.50	10.10	0.00	4.80	79.63
8	FM 819RR	68.95	50.30	119.25	35.33	1	3.50	10.10	0.00	4.80	53.73
9	BCG 28R	65.00	46.70	111.70	33.72	1	3.50	10.10	0.00	4.80	52.12
10	ST 4892BR	72.00	104.70	176.70	57.12	1	3.50	10.10	0.00	4.80	75.52
11	FM 819	63.95	0.00	63.95	18.24	1	3.50	0.00	13.53	9.96	45.23
12	FM 958	63.95	0.00	63.95	20.88	1	3.50	0.00	13.53	9.96	47.87
13	FM 966	63.95	0.00	63.95	24.83	1	3.50	0.00	13.53	9.96	51.82
					30" inch rows	3.50/ac		June 9 over-the-top of all Roundup Ready varieties	June 25 over the top of conv.	6.00/hr	Time spent Hoeing
					4.6 seed/row-ft			57.00/gal			0.80 hr/ac on RR
					80,000 seed/ac			Roundup WeatherMax rate at 22 oz/ac	144.32/gal	1.66 hrs/ac on conv.	Total hours hoeing = 48.75
								includes AMS at 0.31/ac	Fusion rate at 12 oz/ac		
	Base weed control program			chem cost	app cost	total cost					
	Pre- and At-planting										
	15-Feb 2 pt/acre Treflan PPI			6.87	3.50	10.37					
	5-May 1 pt/acre Direx at plant			2.66		2.66					
	Post-directed layby										
	1-Aug 1 qt/acre Direx			5.33		5.33					
	1-Aug Cultivation with layby				5.00	5.00					
	Total blanket weed control program					23.36					
	PGR program										
	3-Jun 1 oz/acre PGR-4			1.53	3.50	5.03					
	1-Jul 6 oz/acre Pentia			4.28	3.50	7.78					
	10-Jul 4 oz/acre Pentia			2.85	3.50	6.35					
	24-Jul 14 oz/acre Pix			9.33	3.50	12.83					
	Insecticide program										
	5-May 3.5 lb/acre Temik at plant			11.62		11.62					
	3-Jun 2 oz/acre Orthene for thrips with PGR-4 (see above)			1.26		1.26					
	1-Jul 2.13 oz/acre Ammo for lygus with Pentia and Activator 90 (see above)			2.34		2.34					
	10-Jul 2.56 oz/acre Ammo for lygus with Pentia and Activator 90 (see above)			2.82		2.82					
	4 oz/acre Orthene for grasshoppers with Pentia and Activator 90 (see above)			2.53		2.53					
	1-Aug 1.5 oz/acre Centric for aphids			7.57	3.50	11.07					
	13-Aug 3.88 oz/acre Karate Z for bollworms with ULV oil (Shield Brite)			11.67	3.50	15.17					
	5-Sep 3.88 oz/acre Karate Z for bollworms with crop oil			11.67	3.50	15.17					
	Boil Weevil Eradication Program assessment (no applications were required)						12.00				
	Harvest aid program										
	9-Oct 32 oz/acre Prep + 16 oz/acre Def 6 with 2 oz/acre Activator 90			18.70	3.50	22.20					
	21-Oct 20 oz/acre Gramoxone Max with 2 oz/acre Activator 90			5.86	3.50	9.36					
	Total blanket input cost (\$/acre)						160.89				

Table 7. Seed and technology expenses* for the Muleshoe systems trial, 2003.

Variety	Seed/lb	Seed/50lb bag	Acres planted /bag	Seed and tech fee/ \$ bag	Seed and tech fee/ \$ acre
1 PM 2326RR	4600	230,000	2.88	71.55	24.89
2 PM 2167RR	5200	260,000	3.25	76.75	23.62
3 PM 2266RR	4700	235,000	2.94	73.25	24.94
4 PM 1199RR	4600	230,000	2.88	113.15	39.36
5 DP 5415RR	5400	270,000	3.38	121.25	35.93
6 FM 960BR	4510	225,500	2.82	173.65	61.61
7 FM 989BR	4480	224,000	2.80	171.45	61.23
8 FM 819RR	5400	270,000	3.38	119.25	35.33
9 BCG 28R	5300	265,000	3.31	111.70	33.72
10 ST 4892BR	4950	247,500	3.09	176.70	57.12
11 FM 819	5610	280,500	3.51	63.95	18.24
12 FM 958	4900	245,000	3.06	63.95	20.88
13 FM 966	4120	206,000	2.58	63.95	24.83

*Trial was planted at 80,000 seed/acre in 30-inch rows.

Table 8. Gin turnout and HVI fiber property results from the Tokio systems project, 2003.

Variety	Lint turnout	Seed turnout	Micronaire	Staple	Uniformity	Strength	Elongation	Leaf	Rd	+b	Color grade		Loan
	percent	percent	units	32 ^{nds} inches	%	g/tex	%	grade	reflectance	yellowness	color 1	color 2	\$/lb of lint
All-Tex TopPick	26.0	43.7	4.3	37.0	82.9	30.6	6.1	1.3	76.1	8.1	3.0	1.0	0.5620
FM 819RR	24.5	35.7	3.8	36.2	83.5	30.9	5.5	1.0	76.1	7.5	3.7	1.0	0.5533
DP 468BG2/RR	21.8	40.0	3.5	36.2	81.0	29.2	6.2	1.0	77.1	8.1	3.0	1.0	0.5530
AFD 2485	25.6	37.3	4.3	35.7	81.8	32.1	4.1	1.7	75.5	7.9	3.7	1.0	0.5500
DP 555BG/RR	26.9	37.7	3.6	34.8	80.8	28.3	5.0	1.0	76.9	8.1	3.0	1.0	0.5495
DP 444BG/RR	25.6	36.7	4.0	34.6	82.7	28.2	6.3	1.0	75.5	8.2	3.7	1.0	0.5397
FM 960BR	27.3	39.9	4.2	33.8	82.5	33.5	4.2	1.7	76.2	8.0	3.3	1.0	0.5397
BCG 28R	22.1	33.4	4.2	35.0	81.9	28.5	5.4	1.0	73.8	8.1	4.0	1.0	0.5393
ST 4892BR	28.8	41.5	4.1	34.7	83.3	29.4	6.1	2.0	72.9	8.8	4.0	1.0	0.5380
ST 5303R	26.4	40.3	4.5	34.1	84.0	32.0	5.2	1.0	76.2	8.1	3.5	1.0	0.5380
ST 5599BR	27.8	41.8	4.1	34.2	81.3	30.1	4.9	1.7	73.2	8.7	4.0	1.0	0.5337
AFD 3602R	28.6	44.8	4.6	34.1	81.7	30.6	4.8	1.0	74.4	8.1	4.0	1.0	0.5315
PM 2266RR	22.7	38.5	4.4	33.7	83.6	30.4	6.9	1.7	73.6	7.8	4.0	1.0	0.5312
BCG 24R	28.7	42.7	4.7	33.5	82.5	28.9	6.9	1.0	76.4	8.0	3.3	1.0	0.5218
FM 989BR	23.5	37.4	3.4	34.5	80.3	29.6	4.9	1.7	76.1	7.9	3.7	1.0	0.5185
PM 2326RR	25.0	41.1	4.9	33.5	83.1	30.6	6.3	1.7	73.3	8.6	4.0	1.0	0.5092
PM 2344BG/RR	24.5	40.5	5.0	33.3	83.0	30.0	6.2	2.0	73.1	7.5	4.0	1.0	0.4868
Test average	25.6	39.6	4.2	34.6	82.3	30.2	5.6	1.4	75.1	8.1	3.6	1.0	0.5350

Numbers represent an average of three grab samples taken from surviving replication (rep 1) taken at harvest.