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RETURN ON INVESTMENT OF COTTON VARIETIES IN THE SOUTH DELTA OF MISSISSIPPI DURING THE 2002 GROWING SEASON

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Abstract

Use of cotton varieties containing the Bollgard™ technology has increased since its introduction in 1996. There has been a further need in the cotton industry to reduce input costs, increase yield, improve fiber quality, provide an efficient means of pest control and increase net dollar returns. However, little information exists evaluating the multi-dimensions from technologies that include the impacts from the individual cotton variety. The objectives were to compare performance and net dollar returns of technology containing cotton products (BG/RR™ and Roundup Ready™ varieties) to conventional cotton varieties. The objective was to further explore the performance of the new Delta and Pine Land Company variety DP 555 BG/RR™. DP 555 BG/RR™ provided one of the highest yields across all locations during 2002 while offering the greatest net returns. This was due partially to the high yield and good fiber properties. When comparing the performance of the technology containing products to conventional products in the south Mississippi Delta in 2002, the BG/RR™ products provided a higher net return followed by the conventional and Roundup Ready™ products at $465, $425 and $366 per acre.

Introduction

Since 1996, growers have been facing poor market prices and increasing overhead budgets that has prompted them to reluctantly rely upon government assistance programs to maintain the integrity of their operation, (Smith and Richardson, 2001). Parvin and Cook (2000) indicated a .91% increase in overhead costs from 1998 to 1999 in the Mississippi Delta. To remain solvent, growers have opted to adopt new practices like technology-enhanced products.

The great driving force in accepting new cotton technologies has been driven primarily by reducing production costs and risks while offering effective pest control according to Kalactzandonakes and Sutornpithug (2001). They state that synergies with other technologies and strategies also exist as with enhancing the adoption of no-till or ultra narrow row concepts. They indicate growers must be willing to learn the entire system and consider it in a multi-disciplinary fashion that is stochastic. They discourage only evaluating one variable at a time since the system possesses a bundle approach. These authors cite that growers use Bollgard™ containing products to reduce foliar insecticide sprays, reduce labor and capital input, provide more effective pest control while reducing the impacts to beneficial insects and improving timing on irrigation. Regarding Roundup Ready products, they list the attributes as being fewer herbicide applications, less labor and equipment costs, reduced production risks and improved weed control and assisted in the adoption of technologies and strategies that could not be considered under conventional systems. According to these authors, growers have adopted BG/RR, or stacked gene systems, because it combines all of the benefits listed above into one package. This technology has allowed growers to focus on agronomic issues and minimize uncertainty to their long term profitability.

Many researchers (Cook et al., 2000; Frisvold et al., 2000; Oppenhuizen et al., 2001; Parvin et al., 2000; Carlson et al., 1998; and Bryant et al., 1997) have shown the economic benefits resulting from Bollgard™ technology. Cook et al. (2000) and Cook and Scott (2001) only show economic benefits under high to moderate *Heliothis spp*. infestation levels. However, other documentation indicates a benefit regardless of population. Frisvold et al. (2000) indicated a gain of $18.4 million increase across the belt from those who used a Bollgard product as opposed to a loss of $0.3 million from non-users. Oppenhuizen et al. (2001) shows a $49.80/Ac increase by Bollgard™ containing products over their conventional counterparts. Other information further indicates a $51 to $79/Ac increase economically from the contributions of Bollgard technology (Carlson et al., 1998 and Bryant et al., 1996). Layton et al., (2000) shows improved *Heliothis spp*. control than with conventional insecticide programs in the Mississippi Delta. Mills et al. (2000) reported that BG/RR™ cotton varieties in Mississippi savings that ranged from $20.88 to $32.00/Ac which includes the technology fees. In 2001, Mills showed an advantage of $18.90/Ac with an increase in lint cotton of 66 Lbs/ac over the conventional products. Carpenter and Gianassi (2000) state that BG/RR™ cotton varieties has increased cotton production by 173 million Lbs. across the cotton belt, reduced pesticide use by two million Lbs. and increased revenues by $178 million. Information from White et al. (2000) indicated that Roundup Ready™ cotton was more profitable to growers by reducing labor and management $ 72.55 for Roundup Ready™ compared to conventional products. No-Till or reduced tillage systems has been shown by Parvin et al. (2000) to increase returns by as much as $63.47/Ac. Bradley (2001) shows a similar trend with increased returns with no-till systems but he fur-

ther showed the benefits of using Roundup™ and Roundup™ containing varieties in this system. No information has been found that compares the contribution of the variety in the complete system regarding the specific technology. Smith et al. (1999) and Presley et al. (1999) do show gross dollars per acre contribution of individual varieties with Lege et al., 2002, making strong references to net returns by variety.

With declining prices, escalating overhead costs and concerns about fiber quality, variety selection has become a major issue among growers. Delta and Pine Land Company is introducing a new variety, DP 555 BG/RR™, in 2003 that could offer growers a new tool to potentially address these concerns. This variety is a mid-season product with excellent yield potential and good fiber properties that could potentially provide growers and mills with desired results.

Materials and Methods

Three Mississippi locations were established throughout the South Delta comparing the performance of BG/RR™ and Roundup Ready™ cotton varieties while three additional locations were developed to evaluate technology-containing products to conventional products. The locations included Greenwood, Rolling Fork, Scott, Tchula, Carter and Winterville, MS.

All trials were established with three replicates, and four rows per plot. Row lengths varied from 500 feet to greater than 1,000 feet. Trials were designed where individual treatments could be made relative to appropriate technology or conventional programs.

Pesticide treatments included Roundup Ultra Max ™ as the herbicide treatment for products containing the Roundup™ tolerant gene. This process consisted of at least one Roundup™ application over-the-top with most locations receiving one post-over-the top followed by one post-direct application. All locations received a lay-by application but with no in-season tillage. Conventional products received a conventional pre-emergence, two post-direct applications, one lay-by application and standard tillage practices. Bollgard™ containing products were treated as its technology called for relative to *Heliothis spp*. control. Conventional products were treated with conventional insecticides for the control of *Heliothis spp*.

The 16 technology treatments included the following early and full products:

Technology Treatment List.

Early Season BG/RR	Full Season BG/RR	Early Season RR	Full Season RR
DP 451B/RR	DP 555 BG/RR	SG 521 R	DP 5415 RR
SG 215 BG/RR	DP 449 BG/RR	DP 436 RR	FM 989 RR
SG 501 BR	DP 458 B/RR	PM 1199 R	FM 991 RR
PM 1218 BG/RR	FM 989 BG/RR	ST 4793 RR	
ST 4892 BG/RR			

The nine conventional treatments consisted of the following early and full products:

Conventional Treatment List.

Early Season Conventional Products	Full Season Conventional Products
SG 747	DP 565
SG 105	Delta PEARL
PSC 355	DP 491
STV 474	FM 966
	FM 958

Trials were harvested using grower equipment and seedcotton weights were measured with a boll buggy equipped with load cells; seedcotton samples were collected and ginned on a microgin equipped with lint cleaners to determine turnout. High Volume Instrumentation (HVI) was used to measure the following quality parameters: staple, micronaire, color grade, strength, leaf grade, and uniformity.

Gross dollars per acre were calculated using a price of $0.50 per pound. Loan chart values were used to calculate the premiums and deductions relative to fiber quality. Current (2003) seed prices and Monsanto's 2002 technology fees were used in calculating net values. The insecticide and herbicide costs were estimated using MSU-ES Economic Publication for assessing cost analysis.

Results and Discussion

Gross Dollar Values of BG/RR™ and Roundup Ready™ Cotton Varieties

Gross values calculated at $0.50 per pound showed DP 555 BG/RR having the greatest crop value followed by PM 1218 BG/RR with SG 521 R grossing the third highest crop value at $579, $547 and $540 per acre, respectively. The lowest crop values arose from STV 4793 RR, FM 989 RR and FM 991 RR at $480, $447 and $439 per acre, respectively. FM 989BR ranked in the lower middle section of treatments at $520 per acre. SG 501BR, STV 4892BG/RR, SG 215 BG/RR, DP 451B/RR and DP 458 B/RR were greater in crop value than FM 989 BG/RR at $537, $536, $530 and $523 per acre, respectively. With exception of SG 521 R, BG/RR varieties provided a greater gross dollar value than varieties containing the Roundup™ only gene (Figure 1).

Yield (Lbs per Acre); BG/RR™ and Roundup Ready™ Cotton Varieties

The highest yielding treatment was PM 1218 BG/RR followed by DP 555 BG/RR at 1154 Lbs/Ac and 1145 Lbs/Ac. Despite the yield of PM 1218 BG/RR, its quality prevented it from rising above DP 555 BG/RR in gross dollar value. The lowest yielding treatments were STV 4793 RR, FM 989 RR and FM 991 RR at 957, 873 and 862 Lbs/Ac respectively. SG 215 BG/RR, STV 4892 BG/RR and SG 501 BR ranked in yield below that of PM 1218 BG/RR and DP 555 BG/RR at yields 1119, 1114, and 1108 Lbs/Ac, respectively. Because of the grade differences, yield could not improve their ranking relative to gross dollars. FM 989 BG/RR showed a lower yield but due to improved fiber properties the gross dollar ranking increased above the lower yielding and/or poorer qualities of STV 4793 RR, FM 989 RR and FM 991 RR. However, the quality and yield of FM 989 BG/RR was not good enough to elevate it above varieties like SG 215 BG/RR, DP 451B/RR or DP 458 B/RR (Figure 1).

% Turnout of BG/RR™ vs. Roundup Ready™ Cotton Varieties

DP 555 BG/RR showed the greatest turnout at 36% followed by PM 1218 BG/RR, DP 5415 RR, STV 4892 BG/RR and DP 458 B/RR at 34.5, 34.1, 34.0 and 34.0% (Table 1).

Staple of BG/RR™ vs. Roundup Ready™ Cotton Varieties

The varieties ranked from longest staple lengths to the shortest as follows: FM 991 RR, FM 989 RR, DP 451 B/RR, DP 436 RR, FM 989 BG/RR, STV 4793R, DP 449 BG/RR, DP 555 BG/RR, DP 5415 RR, STV 4892 BG/RR, and SG 215 BG/RR (Table 1).

Strength of BG/RR™ vs. Roundup Ready™ Cotton Varieties

Treatments with the greatest strength included FM 989 RR, FM 991 RR, DP 449 BG/RR, FM 989 BG/RR, PM 1199 R, DP 5415 RR, STV 4793 RR, DP 458 BG/RR, STV 4892 BG/RR, SG 501 BR, DP 436 RR, and DP 555 BG/RR accordingly. Treatments showing the poorest strength were PM 1218 BG/RR and SG 215 BG/RR (Table 1).

Gross Dollar Values of BG/RR ™ and Conventional Cotton Varieties

The varieties ranked from the highest crop values to the lowest as follows: FM 966, DP 555 BG/RR, STV 4892 BG/RR, FM 958, STV 474, PSC 355, SG 747, SG 501BR, SG 215 BG/RR, and Delta PEARL, SG 105, PM 1218 BG/RR, DP 565, DP 449 BG/RR, DP 451 B/RR, DP 458 B/RR, FM 989 BG/RR (Figure 2).

Gross Dollar Values of Roundup Ready ™ and Conventional Cotton Varieties

FM 966, DP 491, FM 958, STV 474, PSC 355 and SG 747 provided the highest gross dollar value per acre followed by SG 521 R, Delta Pearl, SG 105, DP 565, DP 5415R, DP 436 RR, PM 1199 R, STV 4793 RR, FM 989 RR and FM 991 RR (Figure 3).

Yield (Lbs/Ac) of BG/RR ™ and Conventional Cotton Varieties

The highest yielding treatments were DP 555 BG/RR and STV 4892 BG/RR followed by DP 491 and FM 966 at 1320, 1312, 1295 and 1291 Lbs/Ac respectively. Despite the high yields of DP 555 BG/RR and STV 4892 BG/RR, fiber differences kept them from rising above FM 966 in crop value. FM 989 BG/RR yielded 1203 Lbs/Ac but gave the lowest gross dollar value at $566.00/Ac indicating that despite a good yield its fiber quality affected overall crop value ranking (Figure 2).

Yield (Lbs/Ac) of Roundup Ready™ and Conventional Cotton Varieties

DP 491, FM 966, STV 474, SG 747, PSC 355, FM 958 and SG 521 R gave the highest yields at 1295, 1291, 1288, 1288, 1286, 1239 and 1221 Lbs/Ac respectively. Only one Roundup Ready™ variety trended to the upper grouping in yield. Despite some varieties, such as DP 491, yielding higher than FM 966, fiber properties of FM 966 improved its ranking in gross dollar values (Figure 3).

% Gin Turnout of Conventional vs. BG/RR™ vs Roundup Ready™ Cotton Varieties

Treatment DP 555 BG/RR, Delta Pearl, DP 491, and PM 1218 BG/RR gave the highest turnouts, respectively (Table 2).

Staple of Conventional vs. BG/RR™ vs. Roundup Ready™ Cotton Varieties
Staple lengths were greatest in DP 491, FM 958, Delta Pearl, FM 966, PSC 355, FM 989 RR, DP 451B/RR, FM 989 BG/RR, DP 565 and FM 991 RR at levels of 38.78, 37.19, 37.09, 36.84, 36.45, 36.42, 37.59, 36.06, 37.26 and 36.0 respectively. No treatment reached a level of deduction except of SG 215 BG/RR that fell below a staple length of 34.0 (Table 2).

Micronaire of Conventional vs. BG/RR™ vs. Roundup Ready™ Cotton Varieties
The lowest micronaire levels occurred with FM 989 RR, DP 565, FM 991 RR, DP 491, DP 436 RR, FM 989 BG/RR and SG 521 R, respectively. No treatment reached a level of deduction relative to micronaire. The highest micronaire level was found with PM 1218 BG/RR (Table 2).

Strength of Conventional vs. BG/RR™ vs. Roundup Ready™ Cotton Varieties
The greatest strength levels were found with FM 989 RR, DP 491 and FM 966 at 32.87, 32.72 and 32.61 respectively. Varieties at the 31 strength level included PSC 355, FM 958, FM 991R, DP 5415 RR, and DP 449 BG/RR. Treatments in the strength of 30 range included FM 989 BG/RR, SG 105, DP 565, DP 458 B/RR and Delta Pearl. The lowest strength levels occurred with SG 215 BG/RR and PM 1218 BG/RR (Table 2).

Acres/Bag of BG/RR™ vs. Roundup Ready ™ Cotton Varieties: Acres per Bag Greatly Influences Net Return Because it Directly Influences the Amount Paid in Technology Fees
The greatest number of acres covered per bag of seed is with DP 555 BG/RR and DP 458 B/RR while the lowest acres covered are with FM 989 RR, FM 991 RR, FM 989 BG/RR, PM 1218 BG/RR, SG 521 R and DP 449 BG/RR (Tables 3a, 3b).

Acres/Bag of BG/RR™ vs. Conventional Varieties
Varieties covering the greatest number of acres were DP 555 BG/RR, DP 458 BG/RR, DP 565, DP 491 and Delta Pearl respectively (Tables 4a, 4b).

Acres/Bag of Roundup Ready™ vs. Conventional Varieties
Treatments covering the greatest acre base include DP 565, DP 491 and Delta Pearl (Tables 5a, 5b).

Production Cost of BG/RR vs. Roundup Ready™ Cotton Varieties
The cost of production with stacked gene varieties was $140.00/Ac as opposed to $182.00/Ac for the Roundup Ready varieties (Tables 3a, 3b).

Production Cost of Conventional vs. BG/RR ™ Cotton Varieties
The cost of production with BG/RR varieties was $140.00/Ac as opposed to $200.00/Ac for the conventional varieties (Tables 4a, 4b).

Production Cost of Conventional vs. Roundup Ready ™ Cotton Varieties
The cost of production with Roundup Ready varieties was $182.00/Ac as opposed to $200.00/Ac for the conventional varieties (Tables 5a, 5b).

Net Return of BG/RR™ vs. Roundup Ready™ Cotton Varieties
The net return was greatest with the DP 555 BG/RR and PM 1218 BG/RR at $437.00 and $408.00/Ac respectively. SG 501 BR, DP 451 B/RR, and SG 215 BG/RR provided the nest highest level of return at $398.00, $395.00 and $392.00/Ac. Respectively. From the summary across all BG/RRand Roundup Ready varieties, the BG/RR provided $126.00/Ac more net returns than Roundup Ready varieties (Tables 3a, 3b and Figure 5).

Net Return of BG/RR™ vs. Conventional Cotton Varieties
The greatest net returns included DP 555 BG/RR and STV 4892 BG/RR at $526.00/Ac and $506.00/Ac. Other high net return treatments were FM 966, SG 501BR, DP 215 BG/RR, DP 451B/RR and PM 1218 BG/RR at $473.00, $461.00, $460.00 and $458.00/Ac respectively. Despite the high dollars/Ac with FM 966, DP 555 BG/RR and STV 4892 BG/RR improved performance by as much as $43.00/Ac. From the summary across all BG/RR™ and conventional varieties, the BG/RR ™provided $40.00/Ac more net returns than conventional varieties (Tables 4a, 4b and Figure 4).

Net Return of Roundup Ready ™ vs. Conventional Cotton Varieties
FM 966, DP 491, FM 958, SG 521 R, STV 474, SG 747 and Delta Pearl showed the greatest net returns at $483.00, $445.00, $439.00, $433.00, $421.00, $418.00 and $402.00 respectively. The only Roundup Ready™ variety that competed with the conventional products, in terms of net returns was SG 521 R. From the summary across all Roundup Ready ™and conventional varieties, the conventional varieties provided $59.00/Ac more net returns than Roundup Ready™ products (Tables 5a, 5b and Figure 4).

Conclusion

DP 555 BG/RR and PM 1218 BG/RR showed the greatest net return on a per acre basis when compared to other BG/RR™ and Roundup Ready ™ treatments. In trials evaluating the net returns comparing BG/RR™ and conventional varieties showed that DP 555BR and STV 489BR gave greater net advantages than other BG/RR™ and conventional varieties. All conventional varieties offered a higher net return than Roundup Ready™ varieties with the exception of SG 521 R. BG/RR™ varieties offered greater net return than conventional varieties followed by the Roundup Ready™ varieties. FM 989 RR, FM 991 RR and STV 4793 RR were the poorest performing products relative to yield and gross dollar values. FM 966 and DP 491 provided the greatest net returns in the conventional line up.

Acknowledgement

Bollgard™ technology is a trademark of Monsanto Co.
Roundup Ready ™ technology is a trademark of Monsanto Co.
BG/RR ™ technology is a trademark of Monsanto Co.
Fiber Max cotton varieties are a trademark of Bayer Ag. Company.
Delta and Pine Land cotton varieties are a trademark of Delta and Pine Land Company.
Stoneville cotton varieties are a trademark of Stoneville Pedigree Seed Company.

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Table 1. Fiber summary comparing BG/RR ™and Roundup Ready ™ cotton varieties from Tchula, Greenwood & Carter.

TREATMENT	% Turnout	Staple (1/32 in.)	Micronaire	Strength (gram/txt.)
DP 555 BG/RR	36.8	35.2	4.48	28.7
SG 521 R	32.1	34.5	4.39	28.5
SG501 BR	32.7	34.7	4.65	29.2
PM 1218 BG/RR	34.5	34.6	4.93	27.5
SG 215 BG/RR	32.7	33.8	4.57	27.0
STV 4892 BG/RR	34.0	35.0	4.72	29.2
DP 436 RR	30.8	35.7	4.36	29.0
DP 451 B/RR	31.4	35.7	4.47	28.3
PM 1199 R	33.7	35.3	4.62	30.0
DP 5415 RR	34.1	35.1	4.56	29.6
STV 4793 RR	33.9	35.3	4.55	29.3
FM 989 BG/RR	32.9	35.4	4.41	30.1
DP 458 B/RR	34.0	35.0	4.62	29.3
FM 989 RR	33.0	35.7	4.25	31.0
FM 991 RR	32.3	36.0	4.36	30.6
DP 449 BG/RR	32.7	35.3	4.37	30.2

Table 2. Fiber data summary of conventional, BG/RR ™ and Roundup Ready™ cotton varieties from Tchula, Greenwood & Carter.

Treatment	% Turnout	Staple (1/32 in.)	Micronaire	Strength (gram/txt.)
DP 555 BG/RR	37.58	35.61	4.63	29.53
DELTA PEARL	35.32	37.09	4.73	30.18
DP 491	35.06	38.78	4.32	32.72
PM 1218 BG/RR	34.84	34.94	4.98	27.64
FM 958	34.47	37.19	4.59	31.48
DP 5415 RR	34.15	35.64	4.42	31.43
STV 4892 BG/RR	34.13	35.31	4.67	29.78
FM 966	33.89	36.84	4.48	32.61
DP 458 B/RR	33.84	35.27	4.58	30.23
STV 474	33.64	35.68	4.53	29.89
SG747	33.59	35.64	4.66	28.79
PM 1199 RR	33.57	35.61	4.58	29.94
STV 4793 RR	33.43	35.61	4.49	29.98
PSC 355	32.90	36.45	4.74	31.81
FM 989 RR	32.88	36.42	4.20	32.87
DP 449 BG/RR	32.87	35.75	4.42	31.16
SG 501 BR	32.85	34.97	4.58	29.83
DP 565	32.79	36.07	4.29	30.49
SG 215 BG/RR	32.71	34.05	4.66	27.24
SG 521 R	32.58	34.69	4.39	28.56
FM 989 BG/RR	32.50	36.06	4.38	30.68
SG 105	32.40	35.85	4.51	30.67
FM 991 RR	31.70	36.00	4.30	31.44
DP 451 B/RR	30.99	36.13	4.41	28.73
DP 436 RR	30.96	35.86	4.33	29.38

Table 3a. Net returns of BG/RR™ and Roundup Ready™ cotton varieties from Tchula, Greenwood & Carter.

	DP 555 BG/RR	PM 1218 BG/RR	SG 501 BR	STV 4892 BG/RR	DP 451 B/RR	SG 215 BG/RR	DP 458 B/RR	DP 449 BG/RR
Crop Revenue								
Lint Yield (lbs/acre) in 1000	1.15	1.2	1.1	1.1	1.1	1.1	1.0	1.0
Crop Value ($/acre)	579	547	537	536	530	535	523	522
Assumptions								
Seed size (#/lb) in 1000	6.2	4.4	4.97	4.8	5.2	4.6	5.7	4.8
Seeding Rate								
lbs/acre	8.9	12.4	11.1	11.5	10.6	12.0	9.6	11.5
seed/acre in 1000	55.2	54.9	55.2	55.2	55.1	55.2	55.2	55.0
# acres planted/bag	5.7	4.0	4.5	4.4	4.7	4.2	5.2	4.3
Total BW/TBW sprays/acre	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total Foliar Insecticide sprays/acre	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Seed($/acre)	21.0	16.7	15.4	16.4	15.1	16.9	13.7	16.5
Costs								
Tech Fee(s) ($/acre)	39.3	39.9	40.6	42.8	36.0	43.3	39.2	45.4
Insecticide Costs ($/acre)	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9
Herbicide Costs($/acre)	34	34	34	34	34	34	34	34
Total Costs ($/acre)	142	139	139	142	134	143	135	144
Net Return ($/acre)	437	408	398	394	396	392	388	378

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

Table 3b. Net returns of BG/RR™ and Roundup Ready™ cotton varieties from Tchula, Greenwood & Carter.

	FM 989 BG/RR	DP 436 RR	SG 521 R	PM 1199 RR	DP 5415 RR	STV 4793 RR	FM 989 RR	FM 991 RR
Crop Revenue								
Lint Yield (lbs/acre) in 1000	983	1.1	1.0	1.0	995	957	873	862
Crop Value ($/acre)	520	540	518	517	495	480	447	439
Assumptions								
Seed size(#/lb) in 1000	4.2	4.4	5.1	5.1	5.6	4.9	4.2	4.8
Seeding Rate								
lbs/acre	13.1	12.6	10.9	10.8	10.6	11.2	13.1	11.5
seed/acrein 1000	55.0	55.1	55.0	55.1	59.4	55.0	55.0	55.2
# acres planted/bag	3.8	4.0	4.6	4.6	4.7	4.5	3.8	4.3
Total BW/TBW sprays/acre	1.2	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Total Foliar Insecticide sprays/acre	4.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Costs								
Seed($/acre)	18.7	17.7	14.6	15.4	15.1	16.0	17.7	16.5
Tech Fee(s) ($/acre)	43.2	11.5	10.0	11.0	11.02	10.7	11.1	11.7
Insecticide Costs ($/acre)	48.9	121	121	121	121	121	121	121
Herbicide Costs($/acre)	34	34	34	34	34	34	34	34
Total Costs ($/acre)	144	184	179	181	181	181	181	183
Net Return ($/acre)	376	356	339	336	314	299	264	256

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

Table 4a. Net returns of BG/RR™ and conventional cotton varieties from Scott, Winterville & Rolling Fork.

	DP 555 BG/RR	STV 4892 BG/RR	FM 966	SG 501 BR	SG 215 BG/RR	DP 451 B/RR	PM 1218 BG/RR	DP 449 BG/RR	DP 491
Lint Yield (lbs/acre) in 1000	1.32	1.3	1.3	1.2	1.2	1.2	1.24	1.2	1.3
Crop Value ($/acre)	669	648	684	612	604	594	597	594	646
Assumptions									
Seed size (#/lb)(1000)	6.2	4.8	4.8	5.0	4.6	5.2	4.4	4.8	5.4
Seeding Rate									
lbs/acre	9	11.5	11.5	11.1	12.0	10.6	12.4	11.5	10.2
seed/acre(1000)	55.2	55.2	55.0	55.2	55.2	55.1	54.9	55.0	55.1
# acres planted/bag	5.7	4.4	4.3	4.5	4.2	4.7	4.0	4.3	5.0
Total BW/TBW sprays/acre	1.2	1.2	5.8	1.2	1.2	1.2	1.2	1.2	5.8
Total Foliar Insecticide sprays/acre	4.6	4.6	8.7	4.6	4.6	4.6	4.6	4.6	8.7
Costs									
Seed ($/acre)	21	16.4	15.1	15.4	17	15.1	16.7	16.5	15.5
Tech Fee(s) ($/acre)	39	42	0	41	43	37	40	45	0
Insecticide Costs($/acre)	49	49	121	49	49	49	49	49	121
Herbicide Costs($/acre)	34	34	65	34	34	34	34	34	65
Total Costs ($/acre)	143	142	201	139	143	134	139	144	201
Net Return ($/acre)	526	506	483	473	461	460	458	450	445

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

Table 4b. Net returns of BG/RR™ and conventional cotton varieties from Scott, Winterville & Rolling Fork.

	FM 958	DP 458 B/RR	FM 989 BG/RR	STV 474	SG 747	DP 565	DELTA PEARL	SG 105
Lint Yield (lbs/acre) in 1000	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.2
Crop Value ($/acre)	640	568	566	624	620	596	602	598
Assumptions								
Seed size (#/lb)	4.4	5.8	4.2	4.7	4.8	5.4	5.5	4.6
Seeding Rate								
lbs/acre	12.4	9.6	13.1	11.7	11.5	10.1	10	11.9
seed/acre(1000)	54.9	55.2	55.0	55.0	54.9	54.8	55.3	55.0
# acres planted/bag	4.4	5.2	3.8	4.3	4.2	5.0	5.0	4.2
Total BW/TBW sprays/acre	5.8	1.2	1.2	5.8	5.8	5.8	5.8	5.8
Total Foliar Insecticide sprays/acre	8.7	4.6	4.6	8.7	8.7	8.7	8.7	8.7
Costs								
Seed ($/acre)	14.8	13.6	18.7	16.7	15.9	14.3	14.2	15.9
Tech Fee(s) ($/acre)	0	39	43	0	0	0	0	0
Insecticide Costs($/acre)	121	49	49	121	121	121	121	121
Herbicide Costs($/acre)	65	34	34	65	65	65	65	65
Total Costs ($/acre)	201	135	144	203	202	200	200	202
Net Return($/acre)	439	433	422	421	418	396	402	396

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

Table 5a. Net returns from conventional and Roundup Ready ™cotton varieties from Scott, Winterville and Rolling Fork.

	FM 966	DP 491	FM 958	SG 521 R	STV 474	SG 747	DP 565	DELTA PEARL
Lint Yield (lbs/acre) in 1000	1.29	1.3	1.24	1.22	1.29	1.29	1.17	1.2
Crop Value ($/acre)	684	646	640	617	624	620	596	602
Assumptions								
Seed size (#/lb) in 1000	4.8	5.4	4.4	4.4	4.7	4.8	5.4	5.5
Seeding Rate								
lbs/acre	11.5	10.2	12.4	12.6	11.7	11.5	10.1	10
seed/acre in 1000	55.0	55.1	54.9	55.1	55.0	54.9	54.8	55.3
# acres planted/bag	4.3	5.0	4.4	4.0	4.3	4.2	5.0	5.0
Total BW/TBW sprays/acre	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Total Foliar Insecticide sprays/acre	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Costs								
Seed ($/acre)	15.1	15.5	14.8	17.7	16.7	15.9	14.3	14.2
Tech Fee(s) ($/acre)	0	0	0	11.5	0	0	0	0
Insecticide Costs($/acre)	121	121	121	121	121	121	121	121
Herbicide Costs($/acre)	64.9	64.89	64.89	33.7	64.9	64.9	64.9	64.9
Total Costs ($/acre)	201	201	201	184	203	202	200	200
Net Return ($/acre)	483	445	439	433	421	418	396	402

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

Table 5b. Net returns from conventional and Roundup Ready ™cotton varieties from Scott, Winterville & Rolling Fork.

	SG 105	DP 5415 RR	DP 436 RR	PM 1199 RR	STV 4793 RR	FM 989 RR	FM 991 RR
Lint Yield (lbs/acre) in 1000	1.2	1.2	1.12	1.08	1.08	1.12	939
Crop Value ($/acre)	598	572	568	557	547	502	476
Assumptions							
Seed size (#/lb) in 1000	4.6	5.6	5.1	5.1	4,9	4.2	4.8
Seeding Rate							
lbs/acre	11.9	10.6	10.9	10.8	11.2	13.1	11.5
seed/acre in 1000	55.0	59.4	55.1	55.1	55.0	55.0	55.2
# acres planted/bag	4.2	4.7	4.6	4.6	4.5	3.8	4.3
Total BW/TBW sprays/acre	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Total Foliar Insecticide sprays/acre	8.7	8.7	8.7	8.7	8.7	8.7	8.7
Costs							
Seed($/acre)	15.9	15.1	14.6	15.4	16	17.7	16.5
Tech Fee(s) ($/acre)	0	11.02	9.9	10.6	10.7	11.1	11.7
Insecticide Costs($/acre)	121	121	121	121	121	121	121
Herbicide Costs ($/acre)	64.9	33.7	33.7	33.7	33.7	33.7	33.7
Total Costs ($/acre)	202	181	179	181	181	184	183
Net Return ($/acre)	396	391	389	376	366	318	293

Lint yield average of three DPL AST's in South Delta of Ms.
Crop Value based on CCC loan chart +/- premiums and discount @ $0.50/Lb.
Seed size is average of range published in 2003 DPL Product Guide.
Total insecticide sprays based on data from Oppenhuizen et. al. 2001 for same geography.
Seed cost based on suggested retail price for 2003.
Tech fees based on Monsanto Co. 'Cotton Technology Fee Sheet 2002' for Ms.
Estimated insecticide costs from MSU-ES Economic Bulletin for 2003.
Estimated herbicide costs from MSU-ES Economic Bulletin for 2003.
Net return is derived from crop value – total seed costs, insect control, tech fees and herbicide costs and tillage.

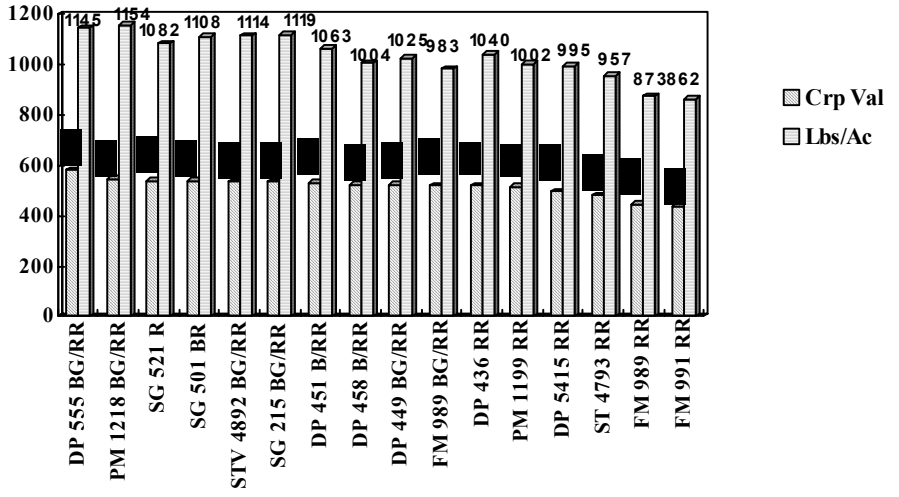

Figure 1. Yield (Lbs/Ac) and gross dollars per acre of BG/RR ™ and Roundup Ready™ cotton varieties from Tchula, Greenwood & Carter.

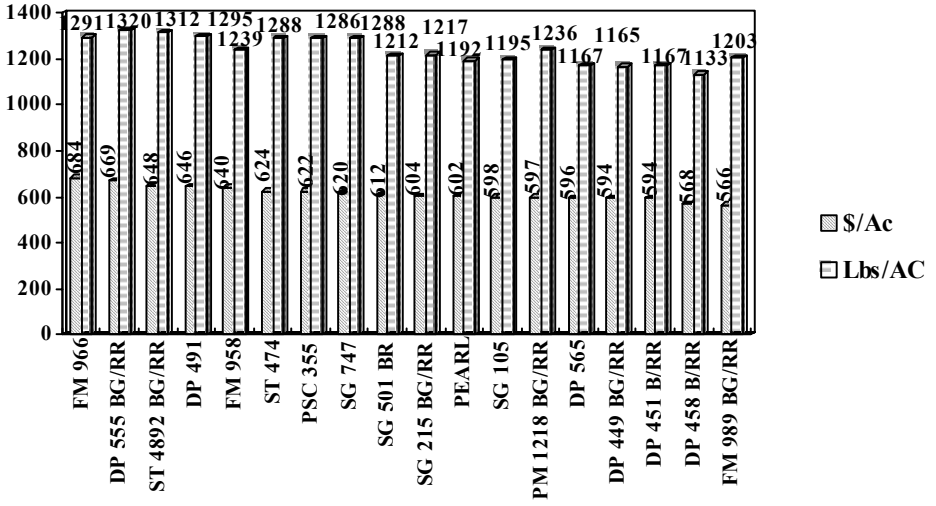

Figure 2. Yield (Lbs/Ac) and gross dollars per acre of BG/RR ™ and conventional cotton varieties from Scott, Winterville and Rolling Fork.

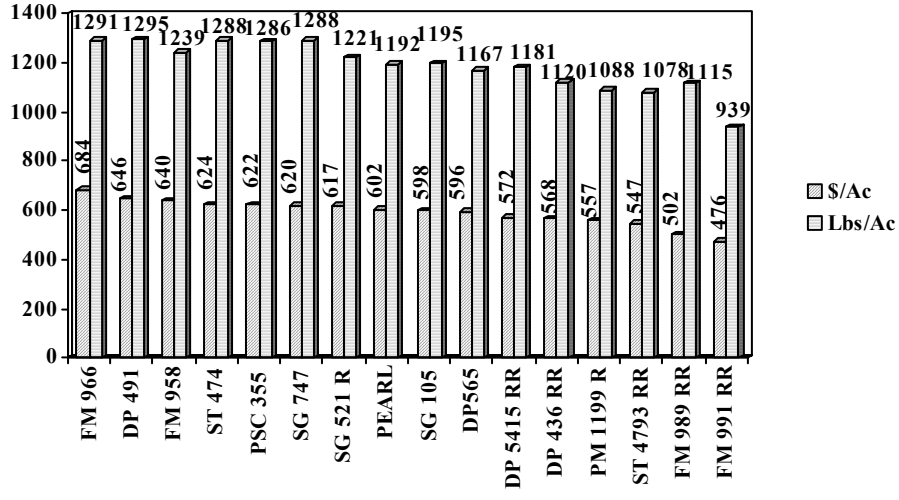

Figure 3. Yield (Lbs/Ac) and gross dollars per acre of Roundup Ready™ and conventional cotton varieties from Scott, Winterville & Rolling Fork.

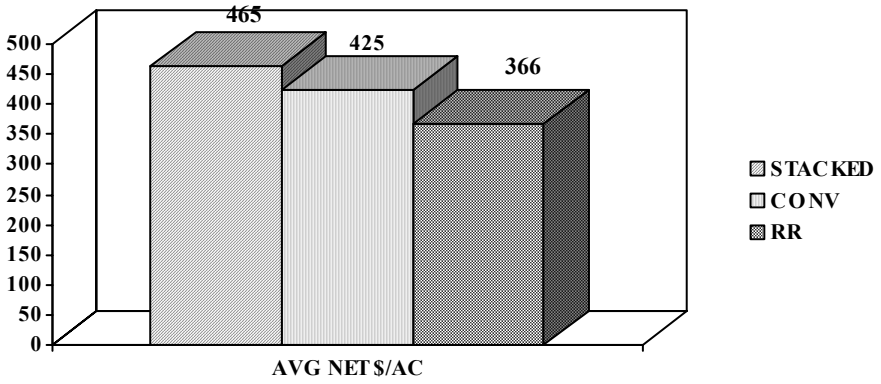

Figure 4. Average net returns across cotton varieties at three Delta Locations (Scott, Winterville & Rolling Fork).

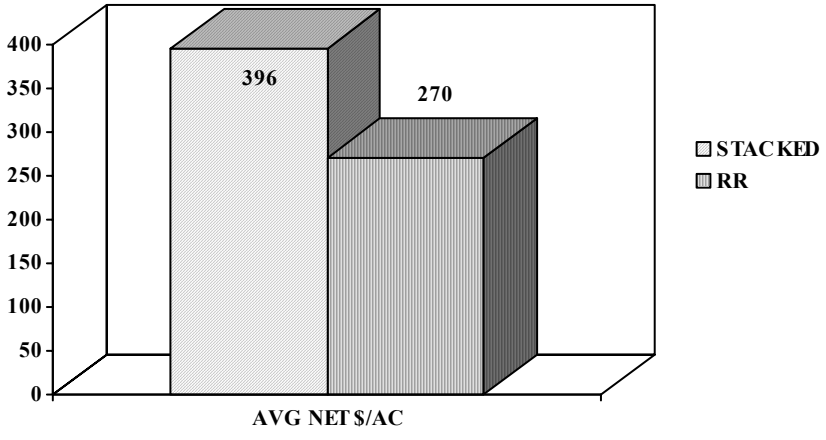

Figure 5. Average net returns across cotton varieties at three Delta Locations (Tchula, Carter & Greenwood).