2012 UGA Uniform Cotton Variety Performance Evaluation Program

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The UGA Cotton Variety Performance Evaluation Program was a huge success in 2012, with more than 25 individual trials throughout Georgia's cotton belt. The success of this program was largely attributable to the dedication of our UGA County Extension Agents, our 2012 industry leaders (Americot, Bayer CropScience, Dow AgroSciences and Monsanto Company), the Georgia Cotton Commission, Cotton Incorporated and cooperating growers. The implementation of this program has undoubtedly helped to address a primary need of Georgia cotton growers and will make an incalculable impact on the 2013 growing season and beyond. A special thanks to all who participated in or contributed to this program, including all cooperating growers.

Program Description

The UGA Extension Cotton Agronomists established this variety testing program in 2010. Our 2012 industry representatives (Americot, Bayer CropScience, Dow AgroSciences and Monsanto Company) were asked to provide commercially available cotton varieties that they considered their best-adapted varieties for Georgia. This uniform list of CORE varieties was planted in replicated trials in growers' fields throughout Georgia's cotton belt, as arranged by the county agents. The trials were replicated and managed or maintained by the grower with the assistance of participating county Extension agents to achieve realistic and statistically sound results.

A seed cotton sample of each variety was collected at harvest and ginned at the UGA Microgin to provide a realistic value for lint percentage and fiber quality. Additionally, the design of this program allowed for a much broader assessment of variety performance across a wide range of yield environments, ranging from less than 675 to more than 1,778 lbs./A environments in 2012 alone. This approach allows a consistent assessment of variety performance across a wide range of yield environments, which encompasses factors such as planting date, harvest date, grower management, soil types, rainfall amounts/timing/patterns, degree of irrigation, etc. Additionally, this method provides evidence to support performance of a variety in particular situations; some varieties may be less consistent performers across the entire host of environments, but may be competitive in certain situations or specific yield environments. In these cases, growers could justify planting such varieties; however, it is very important to position these varieties only in similar environments where they are likely to be competitive.

Variety Selection Considerations

There are several factors a grower may consider when selecting a cotton variety to plant. Variety selection is extremely important to a grower's profitability, as this decision sets the maximum genetic yield potential for a particular field for a given year. Other practices primarily help to preserve that genetic potential throughout the season. In the 2012 UGA On-Farm Cotton Variety Performance Evaluation Program, it was clear that improper variety selection could cost a grower an average of $100 to $340 per acre, depending on error in variety selection. Variety selection decisions in and of themselves do not cost the grower anything; however, substantial losses could result from improper selection and planting.

Growers should also consider the most yield-limiting factor in their fields when making variety decisions. Yield-limiting factors could include any agronomic or production practice, and could influence how a particular variety performs. The most common yield-limiting factor in South Georgia is water. In Georgia, we often observe that some varieties are only competitive in high-yield potential or heavily irrigated situations where water can be applied at appropriate amounts and in a timely manner. These same varieties may not be the best performers in fields with larger pivots that struggle to apply appropriate rates in a timely manner. Yields in dryland environments largely depend on rainfall amounts, frequency and timing. Soil type also determines water availability to the crop, which could also influence which varieties are most competitive in these situations. Lastly, growers should always observe technology packages, seed quality information, and seed treatments of particular brands and varieties to ensure that these factors meet their needs.

Individual Trial Information

On-farm replicated variety trials were planted in growers' fields in each of the counties listed in Table 1. The participation of county agents, cooperating growers and the UGA Microgin were all critical to the success of this program, and their cooperation was truly appreciated. Local county agents are a valuable resource when it comes to variety selection, and growers should look to their expertise for these and other agronomic decisions.

Table 1. On-farm trials that included all of the CORE varieties. These trials are listed by number in ascending order based on the trial average (yield environment). These trial numbers can be correlated to those listed in the following tables.

Trial Number	County	Environment	Trial Average (lbs./A)
	On-Farm Trials Managed According to a Roundup Ready Flex System		
1	Colquitt	Dryland	1045
2	Ben Hill	Dryland	1057
3	Jeff Davis	Dryland	1146
4	Early	Dryland	1206
5	Irwin	Irrigated	1208
6	Berrien	Dryland	1219
7	Lowndes	Dryland	1231
8	Jeff Davis	Irrigated	1330
9	Wayne	Dryland	1344
10	Worth	Irrigated	1369
11	Echols	Dryland	1437
12	Evans	Irrigated	1597
13	Burke	Dryland	1739
14	Pulaski	Irrigated	1778
	On-Farm Trials Managed According to a Liberty-Based System		
1	Jeff Davis	Dryland	675
2	Pulaski	Dryland	871
3	Effingham	Dryland	1033
4	Midville	Dryland	1138
5	Colquitt	Dryland	1169
6	Appling	Dryland	1252
7	Decatur	Dryland	1254
8	Berrien	Dryland	1331
9	Midville	Irrigated	1470
10	Tattnall	Irrigated	1500
11	Effingham	Irrigated	1568

Table 2. Lint yields of CORE varieties analyzed by location and across locations. Individual trials or locations are listed by number from left to right in ascending order based on the individual trial average. These trial numbers can be correlated to those described in Table 1. Variety yields within a column (location) that are highlighted in bold font are not significantly different from the top yielding variety (the top yielding variety is underlined) according to Fisher's Protected LSD at $P \leq 0.05$. The percent of trials that a particular variety was the top yielder, or was statistically no different than the top yielder, is listed in the far right columns.

	Trial Number																
Variety	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	Average Yield Over All Trials	Top Yielding Variety	N.S. from Top Yielding Variety
	Lint Yield (Lbs/A)															% of Trials	
DP 1252 B2RF	973	**1250**	**1221**	1329	**1366**	**1457**	**1236**	**1485**	**1549**	**1436**	**1591**	**1850**	1882	**1926**	**1468**	36	79
DP 1137 B2RF	759	**1363**	**1201**	1253	**1389**	**1372**	**1396**	**1461**	1400	**1521**	**1486**	**1784**	**2080**	**1943**	**1458**	36	79
DP 1050 B2RF	1120	**1232**	**1215**	1151	**1326**	**1470**	**1340**	**1439**	**1490**	**1567**	**1482**	**1741**	1858	**1909**	**1453**	14	79
PHY 499 WRF	**1185**	1013	**1183**	**1601**	1266	1291	**1269**	**1404**	1357	1398	**1495**	1682	**1933**	**1843**	**1423**	7	57
ST 5458 B2RF	**1307**	1043	**1164**	1151	1123	1114	**1280**	1291	**1505**	**1431**	1414	1559	1710	1723	1344	7	36
FM 1944 GLB2	1118	1048	**1175**	1012	1225	1195	1231	1269	**1410**	1390	1424	1550	1583	**1873**	1322	0	21
FM 1740 B2F	965	1036	1104	1043	1163	993	**1375**	1276	1221	**1502**	1371	1496	1647	**1839**	1288	0	21
AM 1511 B2RF	**1184**	911	**1157**	1333	1148	1198	963	1347	1284	1168	1440	1576	1584	1592	1277	0	14
PHY 565 WRF	905	968	**1138**	1072	1078	1160	1214	1259	1280	1312	1381	1400	1668	1743	1256	0	7
DP 0912 B2RF	965	761	**1152**	1151	1123	1256	1025	1254	1257	1083	1425	1548	1556	1597	1225	0	7
PHY 375 WRF	1012	935	892	1173	1081	904	1212	1146	1030	1248	1303	1377	1633	1565	1179	0	0
Trial Average	1045	1057	1146	1206	1208	1219	1231	1330	1344	1369	1437	1597	1739	1778			
P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.003	<.0001	<.0001	0.0011	0.0061	<.0001	<.0001	<.0001	<.0001		

Table 3. Lint yields of CORE varieties analyzed by location and across location. Individual trials or locations are listed by number from left to right in ascending order based on the individual trial average. These trial numbers can be correlated to those described in Table 1. Means within a column (location) that are underlined and in bold font indicate that that variety was (numerically) one of the top three varieties in that particular trial. The percent of trials that a particular variety was the top yielding variety (underlined), or within the top two or three yielding varieties, is listed in the far right columns.

Variety	Trial Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Average Yield Over All Trials	Top Yielding Variety	Within the Top 2	Within the Top 3
	Lint Yield (Lbs./A)															% of Trials		
DP 1252 B2RF	973	**1250**	**1221**	**1329**	**1366**	**1457**	1236	**1485**	**1549**	1436	**1591**	**1850**	**1882**	**1926**	**1468**	36	64	79
DP 1137 B2RF	759	**1363**	**1201**	1253	**1389**	**1372**	**1396**	**1461**	1400	**1521**	**1486**	**1784**	**2080**	**1943**	**1458**	36	64	79
DP 1050 B2RF	1120	**1232**	**1215**	1151	**1326**	**1470**	**1340**	**1439**	**1490**	**1567**	**1482**	**1741**	1858	**1909**	**1453**	14	21	79
PHY 499 WRF	**1185**	1013	1183	**1601**	1266	1291	1269	1404	1357	1398	1495	1682	**1933**	1843	1423	7	21	21
ST 5458 B2RF	**1307**	1043	1164	1151	1123	1114	1280	1291	**1505**	1431	1414	1559	1710	1723	1344	7	14	14
FM 1944 GLB2	1118	1048	1175	1012	1225	1195	1231	1269	1410	1390	1424	1550	1583	1873	1322	0	0	0
FM 1740 B2F	965	1036	1104	1043	1163	993	**1375**	1276	1221	**1502**	1371	1496	1647	1839	1288	0	7	14
AM 1511 B2RF	**1184**	911	1157	**1333**	1148	1198	963	1347	1284	1168	1440	1576	1584	1592	1277	0	7	14
PHY 565 WRF	905	968	1138	1072	1078	1160	1214	1259	1280	1312	1381	1400	1668	1743	1256	0	0	0
DP 0912 B2RF	965	761	1152	1151	1123	1256	1025	1254	1257	1083	1425	1548	1556	1597	1225	0	0	0
PHY 375 WRF	1012	935	892	1173	1081	904	1212	1146	1030	1248	1303	1377	1633	1565	1179	0	0	0
Trial Average	1045	1057	1146	1206	1208	1219	1231	1330	1344	1369	1437	1597	1739	1778				

Table 4. Lint yields of CORE varieties for Liberty-based systems analyzed by location and with locations combined. Individual trials or locations are listed from left to right by number in ascending order based on the individual trial average. These trial numbers can be correlated to those described in Table 1. Means within a column (location) that are underlined and in bold font are not significantly different from the top yielding variety (underlined) according to Fisher's Protected LSD at $P \leq 0.05$. The percent of trials that a particular variety was the top yielder, or was statistically no different than the top yielder, is listed in the far right columns.

	Trial Number											Average Yield Over All Trials	Top Yielding Variety	N.S. from Top Yielding Variety
Variety	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**			
	Lint Yield (Lbs./A)												% of Trials	
PHY 499 WRF	**798**	**995**	**1275**	**1381**	**1274**	**1376**	**1319**	1353	**1578**	**1958**	**1714**	**1366**	55	91
FM 1944 GLB2	**759**	829	1039	1083	**1372**	**1383**	**1303**	**1494**	**1650**	1423	**1682**	1274	36	64
PHY 565 WRF	635	916	1132	1245	1169	1280	**1281**	1266	1435	1711	1541	1238	0	9
FM 1845 LLB2	651	830	1004	1080	**1231**	1187	**1366**	1318	**1471**	1322	1590	1186	9	27
ST 5445 LLB2	626	843	904	976	1047	1259	1115	1434	**1611**	1435	**1653**	1173	0	9
PHY 375 WRF	585	898	1041	1088	1096	1205	**1243**	1308	1271	1467	1460	1151	0	9
ST 4145 LLB2	670	787	836	1109	992	1074	1151	1141	1275	1186	1337	1051	0	0
Trial Average	675	871	1033	1138	1169	1252	1254	1331	1470	1500	1568			
P-value	0.0168	<.0001	<.0001	<.0001	0.0027	<.0001	0.0294	<.0001	0.0051	<.0001	0.0002	<.0001		

Table 5. Lint yields of CORE varieties for Liberty-based systems analyzed by location and with locations combined. Individual trials or locations are listed by number in ascending order based on the individual trial average. These trial numbers can be correlated to those described in Table 1. Means within a column (location) that are underlined and in bold font indicate that that variety was one of the top three varieties in that particular trial. The percent of trials that a particular variety was the top yielding variety (underlined), or within the top two or three yielding varieties, is listed in the far right columns.

	Trial Number											Average Yield Over All Trials	Top Yielding Variety	Within the Top 2
Variety	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**			
	Lint Yield (Lbs./A)												% of Trials	
PHY 499 WRF	**798**	**995**	**1275**	**1381**	**1274**	**1376**	**1319**	1353	1578	**1958**	**1714**	**1366**	55	82
FM 1944 GLB2	**759**	829	1039	1083	**1372**	**1383**	1303	**1494**	**1650**	1423	**1682**	**1274**	36	55
PHY 565 WRF	635	**916**	**1132**	**1245**	1169	1280	1281	1266	1435	**1711**	1541	1238	0	36
FM 1845 LLB2	651	830	1004	1080	1231	1187	**1366**	1318	1471	1322	1590	1186	9	9
ST 5445 LLB2	626	843	904	976	1047	1259	1115	**1434**	**1611**	1435	1653	1173	0	18
PHY 375 WRF	585	898	1041	1088	1096	1205	1243	1308	1271	1467	1460	1151	0	0
ST 4145 LLB2	670	787	836	1109	992	1074	1151	1141	1275	1186	1337	1051	0	0
Trial Average	675	871	1033	1138	1169	1252	1254	1331	1470	1500	1568			

Interpretation of Results

The UGA On-Farm Cotton Variety Performance Evaluation Program illustrates variety performance in the environments represented in each respective year. This and other information is also represented in the online UGA Cotton Variety Performance Calculator, which can be found at www.ugacotton.com. The results illustrated in both of these resources only represent current variety performance, and do not intend to predict variety performance in 2013 and beyond.

There are two methods of data analysis presented in the tables (observing non-significance from the top yielder, or observing the top two or three performing varieties within a particular location). Keep in mind that it is always better to observe variety performance with as much data, and with as many locations / years of data, as possible. It is difficult, and unwise, to make proper variety selections based on information derived from a single trial or only a few trials. Naturally, growers want to see which varieties performed best at the location(s) nearest to their farm. However, it is important to keep in mind that rainfall and weather variation from field-to-field and year-to-year can be quite large. An individual variety's performance can vary greatly between trials and can usually be related to rainfall or other yield-limiting or environmental factors. Most varieties, if placed in specific environments, can perform very well; however, the frequency in which a variety performs at or near the top is the primary indicator of stability, which is the best predictor of how a variety may perform across planting dates, harvest dates, grower management, rainfall patterns or amounts, degree of irrigation, etc. Observing variety performance for consistency and stability over a range of environments will usually provide growers with better information from which to make their decisions.

A wide range of environments is illustrated in the tables above, which provides a much more robust approach when analyzing variety performance. When observing the data in this report, there are several things to consider. An initial response may be to look at overall average yields across all trials. This may be an indicator of overall performance; however, there is a wide range of yield environments, even among the dryland environments in 2012. First look for varieties that suggest a high degree of stability (ones that frequently perform at or near the top in a wide range of yield environments). Secondly, some varieties may only perform well in particular environments, which may suggest the type of environment that a variety should be planted in order to be competitive. Although the varieties that illustrated a high degree of stability in 2012 performed well across a wide range of environments, occasionally a variety may only consistently perform in higher yield environments, which would indicate that that variety may be competitive when grown in irrigated environments with higher yield potential. A similar effect has been observed in previous years for varieties that have better performance in lower yield environments, suggesting that these varieties may only be competitive in dryland environments with lower yield potential.

Most growers have some fields that are very productive, which are usually irrigated (with little to no constraints for timely water application) and have better soils. These same growers may also have some fields that are less productive on average (sandier soils, dryland, etc.). This is where variety positioning becomes more important.

As seen in Tables 2 and 3, the 14 Roundup Flex systems trials captured yield environments (trial averages) ranging from 1,045 to 1,778 lbs./A during 2012. It is important to consider that the lowest environment captured in the 2012 program was more than 1,000 lbs./A, which is unusual, primarily due to frequent and more-than-adequate rainfall across most of Georgia's cotton belt experienced during 2012. In most years, some level of heat stress and/or episodic drought is experienced, resulting in several yield environments ranging from 500 to 1,000 lbs./A, which provide a better assessment for true dryland variety performance. Therefore, observing multi-year data would be a good strategy for determining dryland (or low yield potential) variety decisions for 2013. DP 1252 B2RF, DP 1137 B2RF and DP 1050 B2RF were in the top three varieties and were statistically no different from the number one variety in 79 percent of the trials. DP 1252 B2RF and DP 1137 B2RF both were in the top two varieties in 64 percent of trials, and were the top variety in 36 percent of trials. PHY 499 WRF and ST 5458 B2RF were statistically the same as the number one variety in 57 and 36 percent of trials, respectively.

The Liberty-based variety trials (Tables 4 and 5) captured 11 yield environments ranging from 675 to 1,578 lbs./A during 2012. PHY 499 WRF was the most common top-yielding variety (55 percent of trials), and was statistically no different from the top yielding variety in 91 percent of trials. FM 1944 GLB2 was the top-yielding variety in 36 percent of trials, and was statistically similar to the top variety in 64 percent of trials. PHY 499 WRF, FM 1944 GLB2 and PHY 565 WRF were within the top two varieties in 82, 55 and 36 percent of trials, respectively. FM 1944 GLB2 was in the statistically highest-yielding group in six out of seven trials where yield environments ranged from 1,169 to 1,568 lbs./A; however,

it was infrequently in the top-yielding group in lower-yield environments. **These findings illustrate the importance of positioning varieties only in environments where they are likely to be competitive.**

Variety decisions can often be complex, but should be made using as many replicated trials, environments and years as possible. Your local county agent is an excellent resource for more information about this program and should be consulted when making variety selection decisions.

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