

2022 UGA

On-Farm Cotton Variety EVALUATION PROGRAM

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The UGA On-Farm Cotton Variety Evaluation Program continues to be a successful program with 22 individual trials throughout the cotton producing regions of Georgia. This program would not be possible without the UGA County Extension Agents, our industry partners (Americot, BASF Corporation, Bayer CropScience, Corteva Agrisciences, Nutrien, and WinField United), the Georgia Cotton Commission, Cotton Incorporated, and grower cooperators. Since the implementation of this program it has made a tremendous impact on variety selection for our growers from year to year.

Program Description

In 2010, the UGA Cotton Agronomists implemented this variety testing program. Our industry partners were asked to provide their most well-suited varieties for Georgia. Additionally, the most planted variety from 2021 was evaluated (DP 1646 B2XF). Historically, the 12 varieties evaluated in this trial have accounted for nearly 75% of the planted acreage in Georgia in the same year. These varieties were planted in replicated trials in growers' fields throughout cotton producing regions of Georgia, through coordination with the county agents. The trials were managed and replicated by the grower with the assistance of the coordinating county agent to achieve realistic and statistically sound results.

Seed cotton samples from each variety were collected upon harvest of each trial and ginned at the UGA MicroGin to provide realistic values for lint percentage and fiber quality. A major benefit of this program is that it includes a wide range of yield environments, with trial averages ranging from 797 to 1,750 lb per acre in 2022. This approach allows for a consistent assessment across yield environments which account for multiple factors including planting date, harvest date, grower management, soil types, rainfall amounts/timing/patterns, degree of irrigation, etc. Not only that, but it could provide evidence that some varieties perform better in certain situations or yield environments. This could justify planting a certain variety, but it is of paramount importance to place these varieties only where they are competitive.

Variety Selection Considerations

Choosing a cotton variety is the most important single decision a grower makes, as many other management decisions are influenced as a result. Trait packages can directly influence nematode, insect, disease, and weed management strategies. Additionally, other variety characteristics including leaf pubescence or growth habit can influence these decisions as well. Not to mention that varieties differ in response to plant growth regulators. Although variety selection influences all of these decisions, the biggest decision that is influenced is the maximum genetic potential of that variety for a particular field in a given year. In the 2022 UGA On-Farm Cotton Variety Evaluation Program, it was determined that, on average, improper variety selection could cost a grower approximately \$205 of potential return per acre. This was calculated based on the average price of cotton in 2022 and the difference between the top and bottom yielding variety in this trial in the same year. Although the variety selection decision does not directly cost the grower anything, substantial losses could occur from improper variety selection and planting.

When choosing a variety, growers must consider the most yield limiting factor in their field. Growers may experience multiple yield limiting factors in a single field, which could include any agronomic practice or influences of nematodes, diseases, insects, or weeds. However, one of the most yield limiting factors in Georgia is the ability to utilize irrigation in a timely manner. Not unique to this year's trials, there are varieties that perform better in irrigated environments. Dryland cotton production is far more dependent on rainfall, and there might be varieties that perform better in those environments. Soil type also influences the availability of water, which is why it is beneficial to have these trials in both dryland and irrigated environments across different soil types. Additionally, other factors have a direct impact on yield potential in certain fields. Growers should take trait packages (nematode, disease, insect, or herbicide tolerance), seed quality information, and seed treatments into account so that their needs are met for their specific production environments.

Individual Trial Information

On-farm replicated variety trials were planted in growers' fields in each of the counties listed in Table 1. These counties can also be found highlighted in Figure 1. Additional information on planting, defoliation, and harvest dates, growing degree day (DD-60s) accumulation from planting to defoliation, and rainfall/irrigation from planting to defoliation can be found in Tables 2 and 3. Weather stations were again incorporated into the program in 2022, giving us the ability to measure growing degree days (DD-60s) and rainfall/irrigation throughout the season. DD-60s were calculated using the formula below:

$$DD60 = \frac{(^{\circ}F_{max} + ^{\circ}F_{min})}{2} - 60$$

Each year, the participation of county agents, grower cooperators, and the UGA MicroGin make this program possible, and their cooperation is always appreciated. When evaluating variety selection, growers should look to their local UGA county agent for their expertise in this area, as well as other production decisions throughout the growing season.

Table 1. On-farm variety trial locations for 2022.

Trial Number	County	Environment	Trial Average (lb/acre)
1	Wilcox	Dryland	797
2	Tift	Dryland	910
3	Macon	Dryland	925
4	Oconee	Dryland	1,040
5	Telfair	Irrigated	1,074
6	Toombs	Irrigated	1,110
7	Lowndes	Dryland	1,111
8	Sumter	Irrigated	1,135
9	Cook	Irrigated	1,139
10	Miller	Irrigated	1,222
11	Mitchell	Irrigated	1,240
12	Jeff Davis	Irrigated	1,243
13	Tattnall	Dryland	1,263
14	Worth	Irrigated	1,286
15	Seminole	Irrigated	1,368
16	Burke	Dryland	1,397
17	Bulloch	Irrigated	1,412
18	Dooly	Irrigated	1,432
19	Pulaski	Irrigated	1,459
20	Burke	Irrigated	1,468
21	Colquitt	Irrigated	1,491
22	Jenkins	Irrigated	1,750

Note. Trials are listed by number in ascending order based on trial average. These trial numbers can be correlated to those in the following tables.

Interpretation of Results

Although the UGA On-Farm Cotton Variety Evaluation program is conducted each year, it only demonstrates variety performance in each respective year. Therefore, these results illustrate variety performance in 2022 and do not intend to predict variety performance for future years. To determine variety stability, it is best to evaluate variety performance over multiple years with as much data as possible. It is difficult to make proper variety decisions based on one year of data or a single trial.

Although the On-Farm Variety Evaluation Program helps provide data on variety performance across a wide range of environments, the Statewide Variety Testing Program can also assist in variety selection. They have the ability to look at far more varieties, so this can assist with decisions on newer varieties or varieties that haven't been tested in the on-farm program. The statewide variety testing results for cotton over the past few years can be found online:

<https://swvt.uga.edu/>

Naturally, growers are inclined towards basing decisions on the trial locations closest to their farms, however geographically close locations can greatly vary in yield based on crop management. For example, the lowest yielding location in 2022 was in Wilcox County with an average yield of 797 lb per acre, and a nearby location in Pulaski County yielded nearly twice as much (1,459 lb per acre). Environment and management both play huge roles in variety performance. Although certain varieties may perform better in certain environments, the frequency at which varieties are one of the higher yielding varieties can be an indicator of that variety's stability. Noting performance and stability across a wide range of environments can provide growers with great information for variety decisions.

The two methods of data analysis presented include observing above-average-performing varieties, and statistical significance of lint yield when averaged across all locations. An extremely wide range of environments was represented in the 2022 On-Farm Cotton Variety Evaluation Program, which is demonstrated in Table 1. Yield environments ranged from 797 to 1,750 lb per acre and included both irrigated and dryland environments across the cotton-producing regions of Georgia. With this wide range of environments represented, growers should be able to determine which variety has the best fit in their environment.

Table 4 shows yields for all 22 environments in 2022, with yields averaged over all locations. The top-yielding variety across all environments was DG 3799 B3XF, and it also consistently performed (yielded) above each location average (86% of the time). Also of note when looking across all locations is that six of the numerically highest-yielding varieties all performed above the location average over 50% of the time.

Table 5 shows the locations that yielded below the overall trial average of 1,240 lb per acre. The top-yielding variety in below-average locations was NG 3195 B3XF, yielding above the location average 70% of the time. There were seven other varieties in the top-yielding group for below-average locations, including DG 3799 B3XF, ST 5091 B3XF, DP 1646 B2XF, DP 2127 B3XF, AR 9831 B3XF, DP 2038 B3XF, and AR 9371 B3XF. In terms of variety stability, the top-yielding group in below-average-yield environments performed above the location average 40% to 80% of the time.

The locations that yielded above the overall average saw trends similar to that of the overall results (Table 6). The top-yielding variety in above-average-yield environments was DG 3799 B3XF, performing above average 92% of the time. In above-average-yield environments in 2022, DP 2038 B3XF was extremely consistent, yielding above

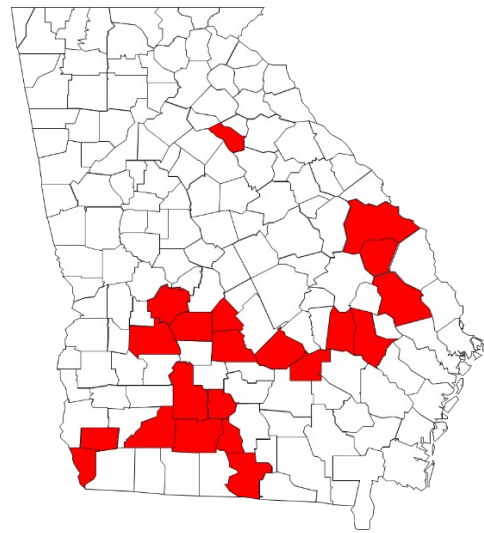


Figure 1. Counties represented in the 2022 On-Farm Variety Evaluation Program. Counties with a trial are highlighted in red.

average 100% of the time. Relative to stability, this was followed by AR 9831 B3XF (75%), DP 2127 B3XF (67%), ST 5091 B3XF (67%), DP 1646 B2XF (50%), and ST 4595 B3XF (50%). This indicates that the seven numerically highest-yielding varieties in above-average-yield environments yielded above average 50% of the time or more.

Turnout and fiber quality parameters for each variety, averaged across all locations, is found in Table 7. Statewide, 2022 was an excellent year in terms of fiber quality which can largely be attributed to the phenomenal harvest conditions we had. The samples taken from the 2022 On-Farm Evaluation Program and ginned at the UGA Microgin mirror that. Averaged across locations, no variety was in the discount range relative to micronaire, fiber strength for every variety was strong to very strong, uniformity was intermediate, and color grades were standard for what we expect to see in Georgia. Interestingly, all varieties were in the premium range with respect to micronaire with the exception of one: DP 2127 B3XF. Although it was still in the base range, this data shows that it may tend to have higher micronaire. As these varieties represented the majority of cotton production in 2022, and will be planted on many acres in 2023, these parameters bode well for cotton producers in our state.

Variety selection is a complex decision, and should be made using data from replicated trials as well as multiple years and environments. Your local UGA county extension agent is an excellent resource for this, and other production decisions as well. They can provide more information and should be consulted when making this important decision.

Table 2. Planting, defoliation, and harvest dates, as well as cumulative DD-60s from planting to defoliation for each variety trial location in 2022.

Trial Number											
	1	2	3	4	5	6	7	8	9	10	11
Planting Date	6/10	5/11	6/2	6/2	5/3	5/9	5/3	5/8	5/10	6/3	5/18
Defoliation Date	11/8	10/11	10/14	10/14	10/4	9/17	9/26	10/6	10/5	11/14	11/1
Harvest Date	1/3/23	11/1	11/20	11/14	10/20	9/22	10/13	10/28	10/24	12/7	11/22
DD-60s	2673	3392	2516	2303	2945	2705	3085	2728	*	3266	3180

Trial Number											
	12	13	14	15	16	17	18	19	20	21	22
Planting Date	5/18	5/16	5/24	6/10	5/5	5/17	5/11	5/12	5/11	5/4	5/20
Defoliation Date	10/5	10/22	10/11	11/18	9/16	10/7	10/17	9/23	10/5	10/25	10/15
Harvest Date	10/27	10/29	11/2	12/17	9/28	11/8	11/18	10/4	10/25	11/9	11/3
DD-60s	2804	2993	2753	2696	2604	2879	*	2744	2760	3269	2753

Note. Trial number corresponds to Table 1. If an * is present, there was a weather station malfunction.

Table 3. Rainfall/irrigation from planting to defoliation for each variety trial location in 2022.

Trial Number											
	1	2	3	4	5	6	7	8	9	10	11
Rainfall/Irrigation (inches)											
May	-	*	-	-	3.22	2.16	3.8	5.39	*	*	1.74
June	1.89	*	4.92	0.87	4.17	6.55	5.17	4.2	*	*	4.82
July	3.32	*	5.18	6.94	4.04	9.76	4.11	8.5	*	*	7.21
August	4.1	*	3.74	2.98	3.98	6.33	7.46	6.9	*	*	9.74
September	3.1	*	1.62	1.79	3.82	2.41	2.92	3.8	*	*	1.72
October	1.87	*	1.82	0.62	0	-	-	0	*	*	2.46
November	0.02	*	-	-	-	-	-	-	*	*	0
Total	14.3	*	17.28	13.2	19.23	27.21	23.46	28.79	*	*	27.69

Table 3. Rainfall/irrigation from planting to defoliation for each variety trial location in 2022 (continued).

	Trial Number										
	12	13	14	15	16	17	18	19	20	21	22
	Rainfall/Irrigation (inches)										
May	0.76	5.19	1.79	-	2.74	1.95	*	5.04	3.4	4.69	1.72
June	1.10	3.55	2.37	1.28	2.74	2.02	*	6.21	3.54	2.53	2.52
July	8.00	9.84	7.87	4.67	5.6	5.39	*	9.27	7.35	9.14	2.67
August	9.94	14.42	4.26	6.33	5.62	7.13	*	6.58	7.37	5.03	9.82
September	3.17	2.67	1.87	3.33	2.92	1.35	*	1.87	2.92	0	6.34
October	0.00	0.11	0	2.67	-	0	*	-	0	0.18	1.8
November	-	-	-	1.27	-	-	*	-	-	-	-
Total	22.97	35.78	18.16	19.55	19.62	17.84	*	28.97	24.58	21.57	24.87

Note. Trial number corresponds to Table 1.

If a “-” is present, cotton wasn’t in the field during that time. The locations with * for the month had weather station malfunctions.

Table 4. Lint yields of 12 varieties evaluated in 2022 analyzed across location.

Trial Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Variety	Lint Yield (lb/acre)												
DG 3799 B3XF	826	1174	938	767	1147	1040	1151	1275	1196	1363	1201	1355	1313
DP 2038 B3XF	886	814	979	1114	1072	1037	1082	1109	1090	1259	1312	1299	1311
ST 5091 B3XF	661	890	946	1021	1220	1189	1192	1192	1171	1333	1318	1232	1272
AR 9831 B3XF	683	1090	909	1050	107	1127	1182	1203	1118	1163	1197	1377	1338
DP 2127 B3XF	903	635	908	1327	1023	1221	1154	1132	1003	1297	1323	1227	1370
DP 1646 B2XF	833	847	762	1000	1220	1057	1140	1142	1375	1295	1443	1155	1123
NG 3195 B3XF	860	1107	929	1219	1061	1170	1163	1125	1228	1213	1223	1225	1282
ST 4595 B3XF	838	617	985	1039	1056	1190	1028	1061	1130	1279	1313	1137	1297
AR 9371 B3XF	790	1001	983	1066	909	1122	1047	1155	1140	1187	1123	1198	1202
NG 4190 B3XF	747	956	969	1031	1105	998	1006	1135	1063	1055	1116	1163	1278
PHY 400 W3FE	853	825	889	1021	1004	1023	1049	1063	1030	1182	1266	1220	1156
PHY 545 W3FE	686	968	902	825	1065	1141	1137	1024	1118	1035	1049	1332	1219
Trial Average	797	910	925	1040	1074	1110	1111	1135	1139	1222	1240	1243	1263

Table 4. Lint yields of 12 varieties evaluated in 2022 analyzed across location (continued).

Trial Number	14	15	16	17	18	19	20	21	22	Average Yield Over All Trials	LSD ($p = 0.1$)	Above Trial Average
Variety	Lint Yield (lb/acre)									% of Trials		
DG 3799 B3XF	1351	1620	1508	1694	1633	1460	1671	1581	1949	1328	a	86
DP 2038 B3XF	1416	1554	1406	1435	1486	1478	1473	1572	1897	1276	b	73
ST 5091 B3XF	1201	1400	1409	1465	1580	1610	1458	1426	1848	1274	bc	68
AR 9831 B3XF	1269	1467	1470	1435	1303	1463	1526	1768	1839	1272	bc	64
DP 2127 B3XF	1340	1356	1389	1461	1597	1553	1499	1427	1778	1269	bc	59
DP 1646 B2XF	1581	1476	1423	1462	1377	1527	1449	1456	1673	1264	bc	55
NG 3195 B3XF	1260	1309	1373	1308	1367	1457	1527	1428	1618	1248	bcd	41
ST 4595 B3XF	1284	1289	1417	1375	1419	1541	1494	1461	1803	1230	cde	45
AR 9371 B3XF	1228	1261	1370	1457	1411	1425	1487	1536	1706	1218	de	41
NG 4190 B3XF	1189	1206	1358	1373	1384	1395	1364	1518	1650	1185	ef	27
PHY 400 W3FE	1178	1303	1340	1285	1298	1386	1338	1265	1641	1164	f	9
PHY 545 W3FE	1134	1179	1296	1191	1324	1215	1324	1457	1596	1146	f	18
Trial Average	1286	1368	1397	1412	1432	1459	1468	1491	1750			

Note. Trials are listed from left to right in order of increasing lint yield by location, with trial numbers being found in Table 1. Varieties that yielded above the trial average are bolded for each location. Overall average yields, statistical significance, and percent of the time a given variety performed above the trial average is listed in the far-right columns.

Table 5. Lint yields of 12 varieties evaluated in 2022 analyzed across below-average-yielding locations (< 1,240 lb/acre).

Trial Number	1	2	3	4	5	6	7	8	9	10	Average Yield Over All Trials	LSD (p=0.1)	Above Trial Average
Variety	Lint Yield (lb/acre)										% of Trials		
NG 3195 B3XF	860	1107	929	1219	1061	1170	1163	1125	1228	1213	1108	a	70
DG 3799 B3XF	826	1174	938	767	1147	1040	1151	1275	1196	1363	1088	ab	80
ST 5091 B3XF	661	890	946	1021	1220	1189	1192	1192	1171	1333	1081	ab	70
DP 1646 B2XF	833	847	762	1000	1220	1057	1140	1142	1375	1295	1067	abc	60
DP 2127 B3XF	903	635	908	1327	1023	1221	1154	1132	1003	1297	1060	abcd	50
AR 9831 B3XF	683	1090	909	1050	1007	1127	1182	1203	1118	1163	1053	abcd	50
DP 2038 B3XF	886	814	979	1114	1072	1037	1082	1109	1090	1259	1044	abcd	40
AR 9371 B3XF	790	1001	983	1066	909	1122	1047	1155	1140	1187	1040	abcd	60
ST 4595 B3XF	838	617	985	1039	1056	1190	1028	1061	1130	1279	1022	bcd	40
NG 4190 B3XF	747	956	969	1031	1105	998	1006	1135	1063	1055	1007	cd	40
PHY 400 W3FE	853	825	889	1021	1004	1023	1049	1063	1030	1182	994	d	10
PHY 545 W3FE	686	968	902	825	1065	1141	1137	1024	1118	1035	990	d	30
Trial Average	797	910	925	1040	1074	1110	1111	1135	1139	1222			

Note. Trials are listed from left to right in order of increasing lint yield by location, with trial numbers being found in Table 1. Varieties that yielded above the trial average are bolded for each location. Overall average yields, statistical significance, and percent of the time a given variety performed above the trial average is listed in the far-right columns.

Table 6. Lint yields of 12 varieties evaluated in 2022 analyzed across above-average-yielding locations (> 1,240 lb/acre).

Trial Number	11	12	13	14	15	16	17	18	19	20	21	22
Variety	Lint Yield (lb/acre)											
DG 3799 B3XF	1201	1355	1313	1351	1620	1508	1694	1633	1460	1671	1581	1949
DP 2038 B3XF	1312	1299	1311	1416	1554	1406	1435	1486	1478	1473	1572	1897
AR 9831 B3XF	1197	1377	1338	1269	1467	1470	1435	1303	1463	1526	1768	1839
DP 2127 B3XF	1323	1227	1370	1340	1356	1389	1461	1597	1553	1499	1427	1778
ST 5091 B3XF	1318	1232	1272	1201	1400	1409	1465	1580	1610	1458	1426	1848
DP 1646 B2XF	1443	1155	1123	1581	1476	1423	1462	1377	1527	1449	1456	1673
ST 4595 B3XF	1313	1137	1297	1284	1289	1417	1375	1419	1541	1494	1461	1803
AR 9371 B3XF	1123	1198	1202	1228	1261	1370	1457	1411	1425	1487	1536	1706
NG 3195 B3XF	1223	1225	1282	1260	1309	1373	1308	1367	1457	1527	1428	1618
NG 4190 B3XF	1116	1163	1278	1189	1206	1358	1373	1384	1395	1364	1518	1650
PHY 400 W3FE	1266	1220	1156	1178	1303	1340	1285	1298	1386	1338	1265	1641
PHY 545 W3FE	1049	1332	1219	1134	1179	1296	1191	1324	1215	1324	1457	1596
Trial Average	1240	1243	1263	1286	1368	1397	1412	1432	1459	1468	1491	1750

	Average Yield Over All Trials	LSD (p=0.1)	Above Trial Average
Variety	% of Trials		
DG 3799 B3XF	1528	a	92
DP 2038 B3XF	1470	b	100
AR 9831 B3XF	1454	bc	75
DP 2127 B3XF	1443	bc	67
ST 5091 B3XF	1435	bc	67
DP 1646 B2XF	1429	bc	50
ST 4595 B3XF	1403	cd	50
AR 9371 B3XF	1367	de	25
NG 3195 B3XF	1365	de	17
NG 4190 B3XF	1333	ef	17
PHY 400 W3FE	1306	fg	8
PHY 545 W3FE	1276	g	8

Note. Trials are listed from left to right in order of increasing lint yield by location, with trial numbers being found in Table 1. Varieties that yielded above the trial average are bolded for each location. Overall average yields, statistical significance, and percent of the time a given variety performed above the trial average are listed in the second section (bottom) of this table.

Table 7. Turnout and fiber quality data averaged across all 2022 On-Farm Variety Evaluation locations.

Variety	Turnout	Color	Staple	Mic	Strength	Leaf	Rd	+B	Trash	Length	Uniformity	Loan Value (¢/lb)
DP 1646 B2XF	40.60%	41-1	39	4.0	29.5	2.9	77.9	7.2	0.4	1.22	82.10	54.56
DP 2038 B3XF	44.12%	31-2	36	4.2	29.4	2.5	77.9	7.8	0.3	1.12	81.63	54.38
DP 2127 B3XF	41.33%	31-2	36	4.5	29.4	2.3	77.4	7.7	0.3	1.13	82.86	54.36
ST 4595 B3XF	41.03%	41-1	37	4.2	29.4	3.3	76.7	7.4	0.5	1.17	82.23	54.16
ST 5091 B3XF	41.10%	31-2	37	4.0	30.0	3.0	77.9	7.3	0.4	1.16	81.62	54.10
PHY 400 W3FE	40.14%	41-1	37	3.9	30.7	3.0	77.1	7.5	0.4	1.15	81.30	54.22
PHY 545 W3FE	40.51%	31-2	36	4.0	30.4	3.2	76.3	8.4	0.5	1.12	82.44	54.31
NG 3195 B3XF	40.84%	41-1	36	4.3	30.0	2.7	77.7	7.2	0.4	1.13	82.48	54.71
NG 4190 B3XF	39.31%	41-1	37	4.0	29.4	3.0	77.3	7.2	0.4	1.16	82.85	54.56
DG 3799 B3XF	41.45%	41-1	37	4.2	31.2	3.0	76.4	8.0	0.4	1.17	81.88	54.82
AR 9371 B3XF	40.15%	31-2	37	4.2	29.3	2.5	77.6	7.6	0.3	1.14	82.64	54.46
AR 9831 B3XF	40.65%	41-1	37	4.3	30.0	2.6	77.2	7.6	0.3	1.14	81.61	54.46

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