

2020 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 24 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 2019 was evaluated (DP 1646 B2XF), along with the variety that won the 2019 trial (DG 3615 B3XF). According to USDA estimates, the 12 varieties evaluated in 2020 accounted for nearly 75% of the planted acreage in Georgia in the same year (USDA 2020). 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 Micro-gin to provide realistic values for lint percentage and fiber quality. A major benefit of this program is that a wide range of yield environments, with trial averages ranging from 640 to 1,369 lb per acre in 2020. 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 2020 UGA On-Farm Cotton Variety Evaluation Program, it was determined that, on average, improper variety selection could cost a grower anywhere between \$80 to \$100 per acre. Although these decisions do 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. 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 2020. Trials are listed by number in ascending order based on trial average. These trial numbers can be correlated to those in the following tables.

Trial Number	County	Environment	Trial average (lb/acre)
1	Colquitt	Dryland	640
2	Toombs	Dryland	669
3	Berrien	Dryland	850
4	Macon	Dryland	866
5	Grady	Dryland	949
6	Atkinson	Dryland	954
7	Early	Irrigated	974
8	Screven	Irrigated	1011
9	Coffee	Irrigated	1037
10	Bulloch	Irrigated	1088
11	Ben Hill	Dryland	1098
12	Brooks	Dryland	1132
13	Sumter	Irrigated	1141
14	Worth	Irrigated	1142
15	Tift	Dryland	1150
16	Pulaski	Irrigated	1160
17	Turner	Dryland	1160
18	Burke	Dryland	1173
19	Appling	Irrigated	1174
20	Cook	Irrigated	1186
21	Burke	Irrigated	1266
22	Oconee	Dryland	1282
23	Colquitt	Irrigated	1303
24	Jeff Davis	Irrigated	1369

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 2020 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 at <https://swvt.uga.edu/>.

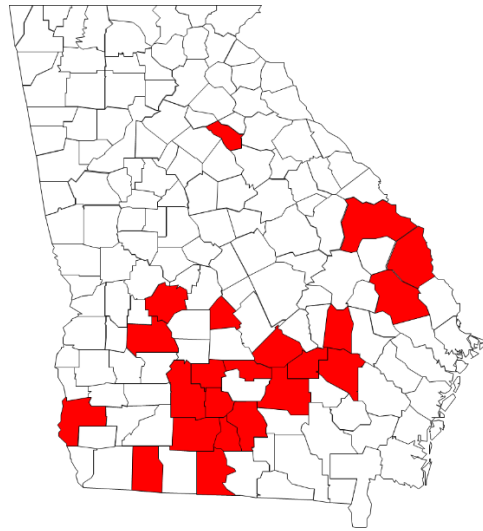


Figure 1. Counties highlighted in red represent trial participation in the 2020 On-Farm Variety Evaluation Program.

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 2020 was in Colquitt County with an average yield of 640 lb per acre, and the second highest yielding location was also in Colquitt County, which yielded nearly double the lowest location (1,302 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 2020 On-Farm Cotton Variety Evaluation Program, which is demonstrated in Table 1. Yield environments ranged from 640 to 1,371 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 2 shows yields for all 24 environments in 2020, with yields averaged over all locations. The top-yielding variety across all environments was DG 3799 B3XF, and it also consistently performed above average, with it yielding above the location average 79% of the time. Other varieties in the top-yielding group were DG 3615 B3XF and DP 2038 B3XF, which yielded above the location average 71 and 75% of the time across all locations, respectively. Also of note when looking across all locations is that, numerically speaking, the top seven yielding varieties all performed above the location average more than 50% of the time.

When looking at the locations that yielded below the overall average (1,074 lb per acre), there was no statistical difference when averaged across those locations (Table 3). However, there were standouts in terms of stability across the lower-yielding locations. The most stable variety across the below-average locations was ST 4990 B3XF, which yielded above the location average 78% of the time. DP 2038 B3XF and DG 3615 B3XF yielded above the location average 67% of the time, and DG 3799 B3XF, DP 2055 B3XF, and NG 5711 B3XF yielded above the location average 56% of the time.

The locations that yielded above the overall average saw a little more separation, with trends similar to that of the overall results (Table 4). The top-yielding variety in above-average-yield environments was DG 3799 B3XF, followed by DG 3615 B3XF and DP 2038 B3XF. DG 3799 B3XF was the most consistent performer in high-yielding environments as well, yielding above the location average 93% of the time. Relative to stability, this was followed by DP 2038 B3XF (73%), DG 3615 B3XF and ST 4990 B3XF (67%), and NG 5711 B3XF (60%). Five out of the top six varieties yielded above the location average over 50% of the time in high-yielding environments.

Turnout and fiber quality parameters for each variety, averaged across all locations, are found in Table 5. State-wide, 2020 was an excellent year in terms of fiber quality with the exception of extraneous-matter calls due to environmental conditions. The samples taken from the 2020 On-Farm Evaluation Program and ginned at the UGA Microgin mirror that, except there were no extraneous-matter calls regardless of location or variety. No variety was in the discount range relative to micronaire, fiber strength for every variety was consistently strong, uniformity was intermediate to high, reflectance was relatively high, and yellowness was relatively low. As these varieties represented nearly three quarters of production in Georgia in 2020, and will be planted on many acres in 2021, 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 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. Lint yields of 12 varieties evaluated in 2020 analyzed across 24 locations.

Trial Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Variety	Lint Yield (lb/acre)												
DG 3799 B3XF	644	604	719	859	1149	1057	1158	871	1257	1210	1118	1281	1225
DG 3615 B3XF	594	586	948	915	982	1031	1002	757	1267	1273	993	1153	1307
DP 2038 B3XF	754	744	835	958	899	1113	949	1093	1061	1138	1132	927	1220
ST 4990 B3XF	689	714	1026	891	883	1090	977	933	1109	1038	1143	1100	1112
DP 2055 B3XF	717	721	835	919	860	999	966	1067	924	1115	1204	1122	1113
NG 4936 B3XF	679	792	854	900	899	891	959	959	1132	1006	1152	1265	1045
NG 5711 B3XF	734	729	836	780	962	995	928	1032	994	1134	1191	1256	1148
DP 1646 B2XF	773	715	844	926	932	952	947	1143	801	1023	1064	1101	1158
ST 5471 GLTP	451	613	753	960	897	885	1027	934	998	1038	1088	1178	1022
PHY 545 W3FE	606	687	696	674	1059	836	896	1149	1051	1088	814	1194	1219
PHY 400 W3FE	430	613	849	788	895	804	1009	1229	974	936	1080	984	1065
CP 9608 B3XF	616	504	1001	820	976	794	874	970	872	1051	1191	1029	1064
Trial Average	640	669	850	866	949	954	974	1011	1037	1088	1098	1132	1141

Table 2. Lint yields of 12 varieties evaluated in 2020 analyzed across 24 locations (continued).

Trial Number	14	15	16	17	18	19	20	21	22	23	24
Variety	Lint Yield (lb/acre)										
DG 3799 B3XF	1282	1317	1107	1170	1270	1215	1196	1418	1504	1414	1524
DG 3615 B3XF	1267	1121	1281	1063	1331	1122	1134	1484	1459	1524	1462
DP 2038 B3XF	1200	1165	1237	1366	1290	1253	1292	1424	1267	1219	1447
ST 4990 B3XF	1175	1182	1217	1119	1165	1128	1213	1315	1356	1339	1399
DP 2055 B3XF	1107	1116	1165	1207	1143	1335	1265	1184	1196	1300	1400
NG 4936 B3XF	1081	1094	1234	1116	1157	1118	1211	1342	1336	1360	1343
NG 5711 B3XF	1034	1199	1081	1385	1167	1266	1255	1135	1093	1169	1353
DP 1646 B2XF	1181	1149	1173	1192	1115	1292	1092	1295	1138	1455	1345
ST 5471 GLTP	1232	1110	1118	1122	1124	1103	1206	1329	1410	1360	1333
PHY 545 W3FE	1008	1278	1013	1236	1137	1206	1064	978	1093	1168	1298
PHY 400 W3FE	985	1021	1163	1009	1090	1033	1188	1216	1302	1216	1188
CP 9608 B3XF	1155	1043	1134	931	1092	1023	1112	1077	1229	1106	1333
Trial Average	1142	1150	1160	1160	1173	1174	1186	1266	1282	1303	1369

Table 2. Lint yields of 12 varieties evaluated in 2020 analyzed across 24 locations (continued).

	Average Yield Over <i>All Trials</i>	LSD (p = 0.1)	Above Trial Average
Variety			% of Trials
DG 3799 B3XF	1149	a	79
DG 3615 B3XF	1127	ab	71
DP 2038 B3XF	1124	abc	75
ST 4990 B3XF	1096	bcd	67
DP 2055 B3XF	1083	bcd	50
NG 4936 B3XF	1080	bcd	54
NG 5711 B3XF	1077	bcd	58
DP 1646 B2XF	1075	cd	46
ST 5471 GLTP	1054	de	33
PHY 545 W3FE	1019	ef	42
PHY 400 W3FE	1003	f	21
CP 9608 B3XF	1000	f	17

Note. Trial number corresponds to Table 1.

Bolded text indicates varieties that yielded above the trial average for each location.

Yields with the same LSD letter are statistically similar.

Table 3. Lint yields of 12 varieties evaluated in 2020 analyzed across below-average-yielding locations (< 1,074 lb/acre).

Trial Number	1	2	3	4	5	6	7	8	9	Average Yield Over <i>All Trials</i>	LSD (p = 0.1)	Above Trial Average
Variety	Lint Yield (lb/acre)									% of Trials		
DP 2038 B3XF	754	744	835	958	899	1113	949	1093	1061	934	a	67
ST 4990 B3XF	689	714	1026	891	883	1090	977	933	1109	924	a	78
DG 3799 B3XF	644	604	719	859	1149	1057	1158	871	1257	924	a	56
DG 3615 B3XF	594	586	948	915	982	1031	1002	757	1267	898	a	67
NG 4936 B3XF	679	792	854	900	899	891	959	959	1132	896	a	56
DP 1646 B2XF	773	715	844	926	932	952	947	1143	801	892	a	44
DP 2055 B3XF	717	721	835	919	860	999	966	1067	924	890	a	56
NG 5711 B3XF	734	729	836	780	962	995	928	1032	994	888	a	56
PHY 545 W3FE	606	687	696	674	1059	836	896	1149	1051	850	a	44
PHY 400 W3FE	430	613	849	788	895	804	1009	1229	974	844	a	22
ST 5471 GLTP	451	613	753	960	897	885	1027	934	998	835	a	22
CP 9608 B3XF	616	504	1001	820	976	794	874	970	872	825	a	22
Trial Average	640	669	850	866	949	954	974	1011	1037			

Note. Trials are listed from left to right in order of increasing lint yield by location, with trial numbers corresponding to those in Table 1.

Bolded text indicates varieties that yielded above the trial average 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. Yields with the same LSD letter are statistically similar.

Table 4. Lint yields of 12 varieties evaluated in 2020 analyzed across above-average-yielding locations (> 1,074 lb/acre).

Trial Number	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Variety	Lint Yield (lb/acre)														
DG 3799 B3XF	1210	1118	1281	1225	1282	1317	1107	1170	1270	1215	1196	1418	1504	1414	1524
DG 3615 B3XF	1273	993	1153	1307	1267	1121	1281	1063	1331	1122	1134	1484	1459	1524	1462
DP 2038 B3XF	1138	1132	927	1220	1200	1165	1237	1366	1290	1253	1292	1424	1267	1219	1447
NG 5711 B3XF	1134	1191	1256	1148	1034	1199	1081	1385	1167	1266	1255	1135	1093	1360	1343
DP 2055 B3XF	1115	1204	1122	1113	1107	1116	1165	1207	1143	1335	1265	1184	1196	1339	1399
ST 4990 B3XF	1038	1143	1100	1112	1175	1182	1217	1119	1165	1128	1213	1315	1356	1300	1400
ST 5471 GLTP	1038	1088	1178	1022	1232	1110	1118	1122	1124	1103	1206	1329	1410	1455	1345
NG 4936 B3XF	1006	1152	1265	1045	1081	1094	1234	1116	1157	1118	1211	1342	1336	1169	1353
DP 1646 B2XF	1023	1064	1101	1158	1181	1149	1173	1192	1115	1292	1092	1295	1138	1360	1333
PHY 545 W3FE	1088	814	1194	1219	1008	1278	1013	1236	1137	1206	1064	978	1093	1168	1298
CP 9608 B3XF	1051	1191	1029	1064	1155	1043	1134	931	1092	1023	1112	1077	1229	1216	1188
PHY 400 W3FE	936	1080	984	1065	985	1021	1163	1009	1090	1033	1188	1216	1302	1106	1333
Trial Average	1088	1098	1132	1141	1142	1150	1160	1160	1173	1174	1186	1266	1282	1303	1369

	Average Yield Over All Trials	LSD ($p = 0.1$)	Above Trial Average
Variety	% of Trials		
DG 3799 B3XF	1283	a	93
DG 3615 B3XF	1265	a	67
DP 2038 B3XF	1238	ab	73
NG 5711 B3XF	1203	b	60
DP 2055 B3XF	1201	b	47
ST 4990 B3XF	1198	b	67
ST 5471 GLTP	1192	b	47
NG 4936 B3XF	1179	b	47
DP 1646 B2XF	1178	b	40
PHY 545 W3FE	1120	c	40
CP 9608 B3XF	1102	c	20
PHY 400 W3FE	1101	c	13

Note. Trials are listed from left to right in order of increasing lint yield by location, with trial numbers corresponding to those in Table 1.

Bolded text indicates varieties that yielded above the trial average 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 of the table (bottom). Yields with the same LSD letter are statistically similar.

Table 5. Turnout and fiber quality data averaged across all 2020 On-Farm Variety Evaluation locations.

Variety	Turnout	Staple	Mic	Strength	Leaf	Rd	+B	Trash	Length	Uniformity
DP 1646 B2XF	38.00%	38.17	4.25	29.75	2.83	77.46	7.73	0.32	1.19	81.70
DP 2038 B3XF	40.67%	35.39	4.43	28.91	2.39	77.59	7.92	0.25	1.10	80.81
DP 2055 B3XF	37.83%	37.87	4.41	30.48	2.35	77.93	7.87	0.26	1.19	81.75
NG 5711 B3XF	37.64%	37.00	4.32	30.06	2.59	77.20	8.14	0.30	1.15	81.48
NG 4936 B3XF	36.08%	37.50	4.37	29.93	2.36	77.73	7.46	0.27	1.17	82.65
PHY 400 W3FE	37.77%	36.59	4.18	31.66	2.73	77.08	7.95	0.34	1.14	81.72
PHY 545 W3FE	38.13%	35.48	4.37	30.10	2.90	76.04	8.29	0.38	1.11	82.29
ST 4990 B3XF	36.13%	37.27	4.43	30.20	2.32	77.84	7.37	0.25	1.17	82.92
ST 5471 GLTP	36.24%	36.17	4.29	30.32	2.61	77.68	7.73	0.30	1.12	81.28
CP 9608 B3XF	38.63%	36.26	4.28	28.87	2.91	76.51	8.11	0.36	1.13	81.33
DG 3615 B3XF	38.25%	36.87	4.34	31.23	2.57	77.04	8.50	0.28	1.15	81.33
DG 3799 B3XF	37.98%	36.70	4.30	31.35	2.57	77.45	8.50	0.29	1.15	81.18

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