Texas Corn Producers Board
Preliminary Final Report, December 15, 2017

Title: **Assessing Baseline Agronomics & Water Dynamics of Dryland Corn--Texas High Plains**

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Preliminary Summary (Dec. 15, 2017)

This is a preliminary report with an update to come by Dec. 21. Some information may not be finalized until after the Christmas break. We have worked through the economic analysis approach and template with DeDe, and I will have most of that information in next week's report. Ron does not have all the data analyzed for the fourth field site. Calvin is reporting plant population, yield, and test weight for the Lubbock site, and will add other field parameters and statistical analysis. Also, Tom Isakeit will be assessing Fumonisin in the Lubbock samples like he did for Jourdan's Bushland site.

I will tie these together in next week's report. On behalf of the collaborators, this has been an interesting "first look" at dryland corn in the Texas High Plains with time spent in the field, thinking about what we saw in this research effort, and pondering our thoughts on how this could be viable option for producers under the right circumstances.

Bushland Field Site

Jourdan Bell and Qingwu Xue

Fumonisin analyses completed by Thomas Isakeit

Replicated field trials consisting of 3 hybrids (198-00DGVT2P, P0805AM and P0339AM) were planted at Bushland on May 5 and June 28 at 18,000 seeds per acre. Purchased seed contained the refuge in the bag (RIB) so non-Bt seeds were removed as seed was packaged for planting. Plots were planted using a 4-row cone planter on 30 inch rows. Plots were 4-30 inch rows by 20 feet and blocked by planting date. Plots were thinned to their respective populations of 6,000, 9,000, 12,000, and 15,000 seeds per acre when plants reached V3. The first planting date was significantly affected by high June temperatures (Fig. 1) and negligible early season precipitation. In addition to temperature and water stress, plots received hail damage from a storm on July 2. At that time, the first planting date was in a late vegetational stage (~V11), and the second planting date was at V2-V3. Low yields in the first planting date are partially due to the hail storm. The second planting date recovered from hail damage. It is not believed that variability in yields is attributed to the hail damage because the growing point was located below the soil surface at this stage. In season water use (stored soil water + precipitation) was 11.26- and 15.04- inches for planting dates one and two, respectively (Table 1). Yields were significantly different between planting dates ($p<0.0001$), but there were no significant differences between hybrids or planting densities within planting dates as a result of high levels of variability between plots (Fig. 2). Fumonisin levels for all plots were tested by Dr. Thomas Isakeit. There were also no significant differences between hybrids and densities due to sample variability, but there were differences between planting dates. Overall, fumonisin levels were significantly greater in the first planting date due to hail damage in addition to temperature and water stress through the tasseling stage. Fumonisin levels ranged from 0- to 140- ppm within the first planting date and 3- to 52 within the second planting date (Fig. 2). Representative ears are in figures 4-9, and field images are figures 10-11.

Table 1. 2017 Precipitation and Total Water Use at Bushland.

	Precipitation	**Total Water Use**
Planting Date	--------inches--------	
5/5/2017	10.57	11.26
6/28/2017	14.37	15.04

*Total water use includes precipitation + stpred Soil water for planting date 2 averaged across all hybrids due to a lack of significant difference between individual hybrids

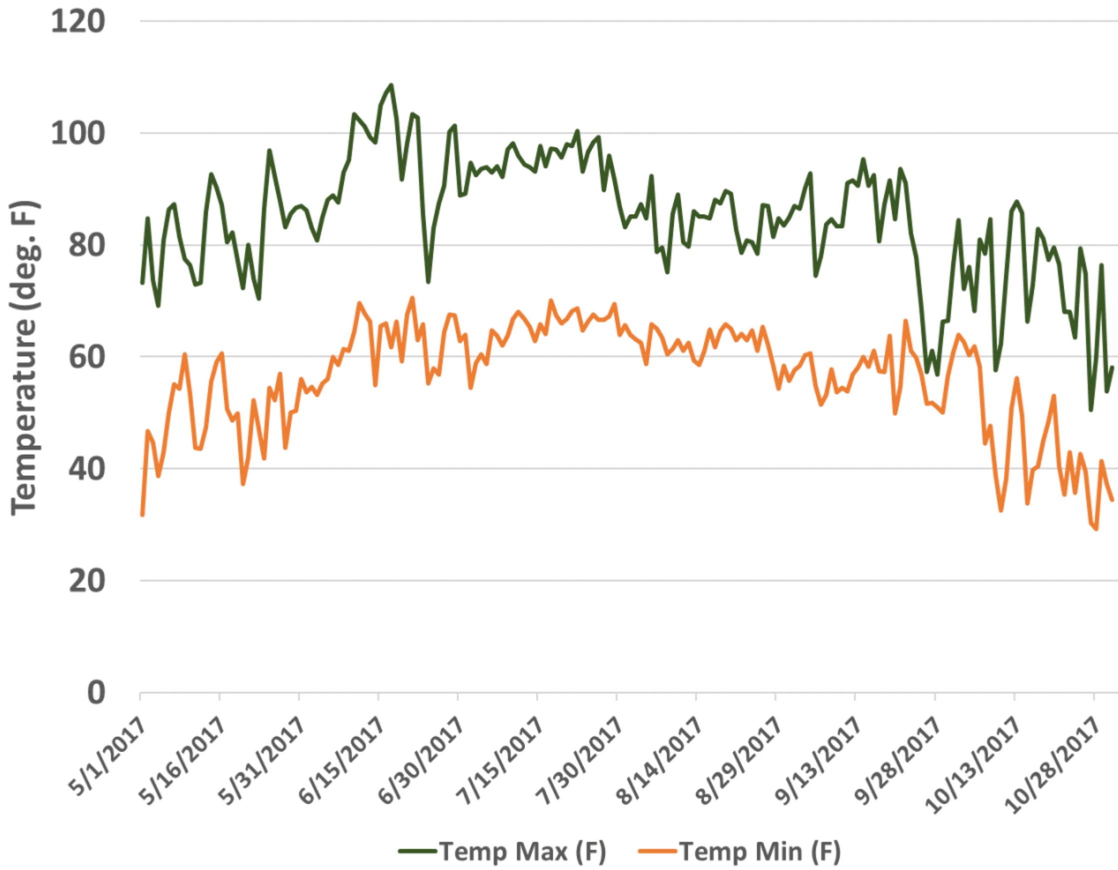

Figure 1. 2017 Daily max and min temperature at Bushland.

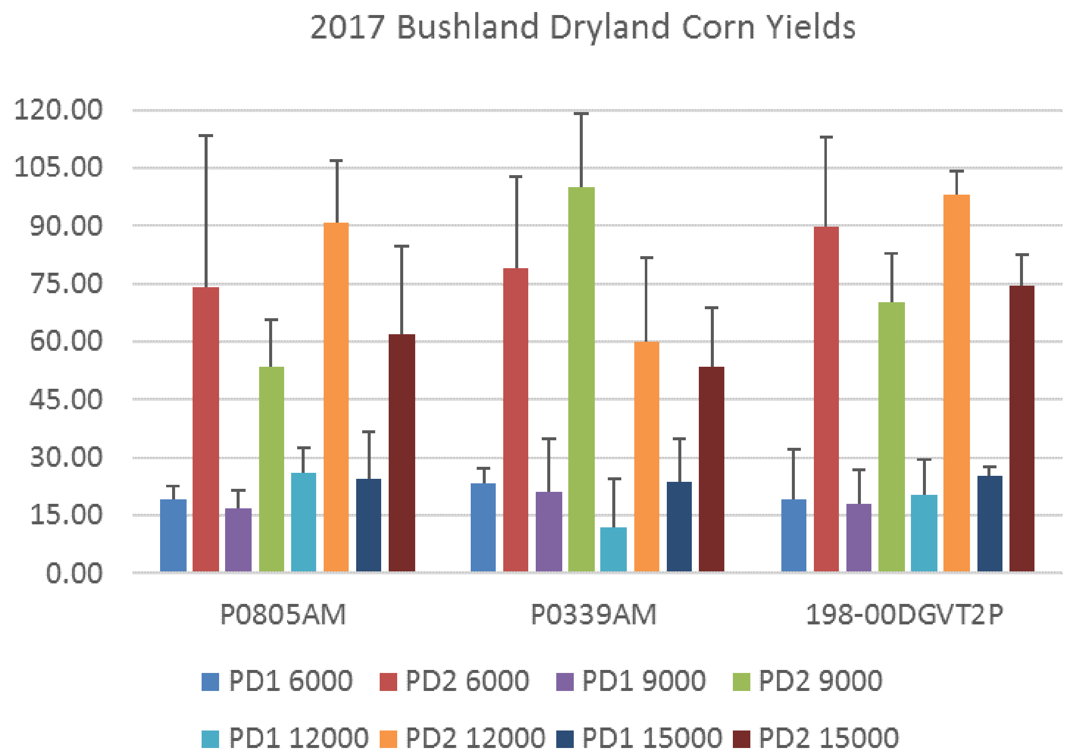

Figure 2. 2017 Bushland dryland corn plot yields.

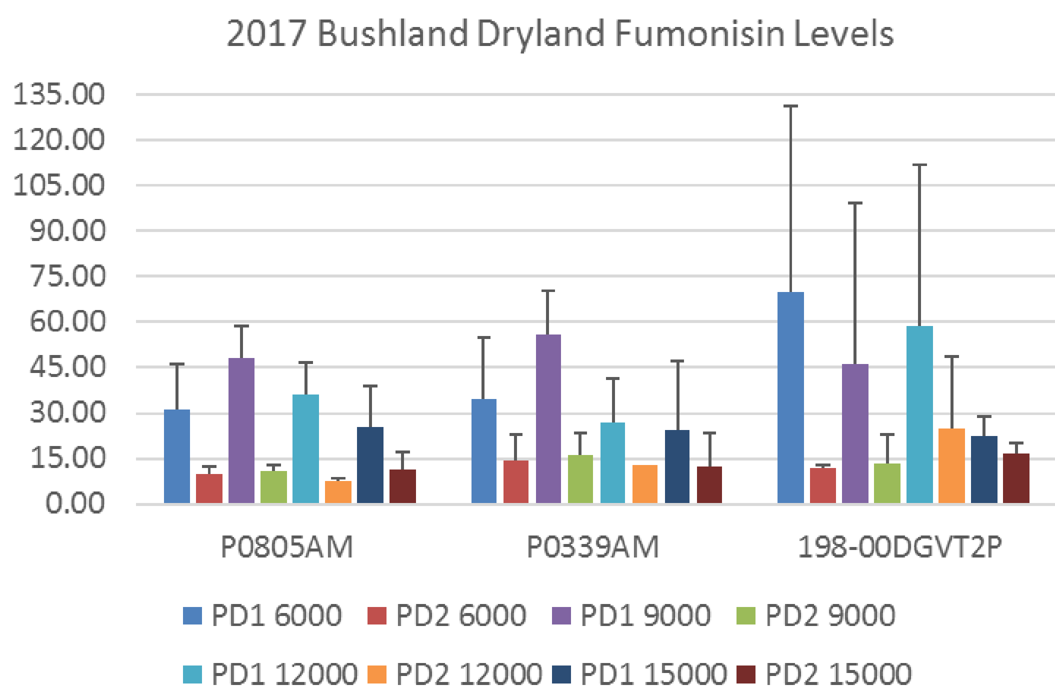

Figure 3. 2017 Bushland dryland corn plot fumonisin levels.

Figure 4. Harvested ears from Bushland 2017 Dryland Corn: PD1 P0339 at 12,000 seeds/ac

Figure 5. Harvested ears from Bushland 2017 Dryland Corn: PD1 P00805 at 9,000 seeds/ac

Figure 6. Harvested ears from Bushland 2017 Dryland Corn: PD1 198-00DGVT2P at 6,000 seeds/ac

Figure 7. Harvested ears from Bushland 2017 Dryland Corn: PD2 P0805 at 15,000 seeds/ac

Figure 8. Harvested ears from Bushland 2017 Dryland Corn: PD2 P0339 at 12,000 seeds/ac

Figure 9. Harvested ears from Bushland 2017 Dryland Corn: PD2 198-00DGVT2P at 6,000 seeds/ac

Figure 10. May 5 planting date on August 17

Figure 11. June 20 planting date on August 17.

Lubbock Field Site

Calvin Trostle

The Lubbock trials were planted on May 2 and June 30. Water estimates will be reported. The first trial date was heavily affected by diseased ears (Fumonisin assessment to come from Tom Isakeit) and was also drifted on heavily by the farmer's Gramoxone spray which killed some smaller plants (and thus reduced plant population slightly). Most plants recovered within 2 to 3 weeks so I do not believe there was a major reduction of yield. Field data for corn is highly variable as noted among individual plot data. The lowest population had noticeably reduced yield, but in the range of 9,000 plants per acre yields were not increased significantly above this population.

Lubbock, TX 2017		Date 1, Planted May 2			Date 2, Planted June 30		
Hybrid	Target Plants per Acre	Popu-lation Plants/A †	Yield @ 15.5% H2O Bu/A	Test Weight Lbs./bu	Popu-lation Plants/A	Yield @ 15.5% H2O Bu/A	Test Weight Lbs./bu
Channel 198-00	6,000	5,800	20.9	55.0	5,900	30.7	55.3
(98 days	9,000	7,800	23.6	55.7	9,200	44.3	53.3
from	12,000	8,800	23.5	54.5	11,700	40.9	52.1
planting)	15,000	11,900	27.6	54.9	14,800	47.7	52.7
Pioneer 0339AM	6,000	4,700	18.8	55.4	6,600	29.7	55.1
(103 days	9,000	6,500	21.8	56.2	9,500	47.9	55.0
from	12,000	10,100	27.0	56.6	12,500	52.7	55.7
emergence)	15,000	11,600	23.4	56.8	14,900	52.5	55.0
Pioneer 0805AM	6,000	4,700	18.7	58.1	6,300	47.0	58.0
(108 days	9,000	7,600	27.5	58.3	9,400	46.5	57.0
from	12,000	10,200	27.8	58.0	12,100	52.6	58.0
emergence)	15,000	12,800	26.6	56.7	13,500	52.5	57.5

Averages by Population	5,100	19.5	56.2	6,300	35.8	56.1
	7,300	24.3	56.8	9,400	46.2	55.1
	9,700	26.1	56.4	12,100	48.7	55.3
	12,100	25.8	56.1	14,400	50.9	55.1

Statistical analyses to be applied.

†Population reduded slightly by heavy Gramoxone drift in mid-June.

2017 High Plains On-farm Replicated Dryland Corn Trials

Ronnie Schnell, College Station
Calvin Trostle, Lubbock/Jourdan Bell, Amarillo

Methods

Replicated field studies were installed at 4 locations in the southern High Plains of Texas in cooperation with County Extension Agents and growers. Locations include Dalhart, Stratford, Spade and Shallowater (Dallam, Sherman, Lamb and Lubbock counties). Seed rate treatments included 8,000, 11,000, 14,000, 17,000 and 20,000 seeds per acre for two corn hybrids (Pioneer P0157 and P0805) with relative maturity of 101 and 108. All plots were planted using commercial equipment common to the region. Planting dates and gps coordinates can be found in Table 1. Planters were 8 to 24-row planters with three locations on 30 inch spacing and one location (Shallowater) on 40 inch spacing. Planters were split between the two hybrids. Plots are 1,000 ft in length except for Shallowater where plot length was adjusted to a pivot providing plot lengths from 1,000 to 1,250 ft. The same hybrids were used at all locations. All other crop inputs (including herbicides, pest and disease control) were applied at the discretion of the producer. Soil type was determined for each location. In addition, rain gauges and soil moisture sensors were installed in one plot at each site (14,000 seeds/acre).

Table 1. Location and planting date of dryland corn trials.

Location	Plant Date	Harvest Date	Soil Type	Latitude	Longitude	Elevation (ft)
Dalhart	5/30/2017	11/1/17	Perico Fine Sandy Loam	36.12271	-107.38448	3,916
Stratford	6/14/2017	11/9/17	Sherm Clay Loam	36.34274	-101.91103	3,527
Shallowater	7/08/2017	12/2/17	Olton Clay Loam	33.71575	-101.97909	3,327
Spade	7/09/2017	11/22/17	Olton Loam/ Amarillo Fine Sandy Loam	33.91833	-102.10582	3,491

At each location prior to harvest, plant stand (population) was measured by counting plants from 10 ft of two rows. Yield components were measured by hand harvesting all ears from 10 consecutive plants in each plot. Ears per 10 plants were counted and primary ears measured to determine average kernel rows and kernels per row. Kernel size, weight and moisture were determined from grab samples during combine harvest. Whole plot yield was determined using weigh wagon or yield monitor and estimated from hand harvested samples and plant population. Yields were corrected to 15.5% moisture. ANOVA was used to analyze main affects (hybrid and seeding rate) by location. Regression analysis was used to determine yield response to increasing seeding rates if a significant rate affect was observed.

Results

Dalhart and Stratford were planted late-May to mid-June as planned dryland corn production. Shallowater and Spade were planted as dryland corn behind failed cotton in early July (Table 1). Plant stands were acceptable at all locations, as soil moisture was adequate or rains were received shortly after planting. No significant rain was received at Dalhart following planting until July 26. Plant stand was lower at Dalhart compared to other locations with stand ranging from 86 to 95% of target seed drop. All other locations exceeded 95% of target seed drop. Percent stand was not affected (p>0.05) by seeding rate at any location.

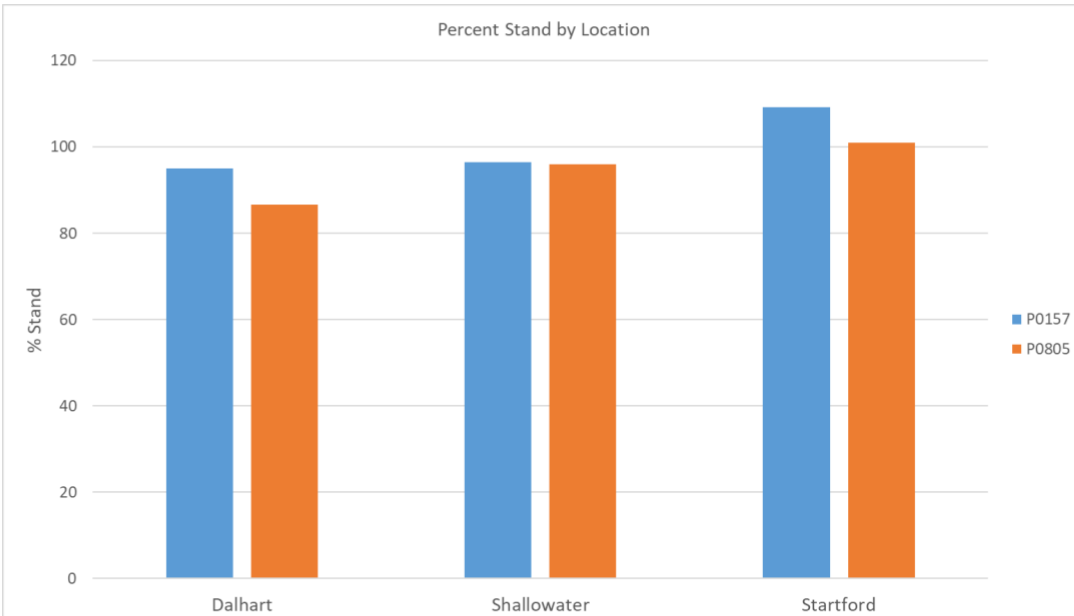

Figure 12. Percent stand for three locations and two hybrids average across five seeding rates.

Grain yield was measured for hand samples and for whole plots at each location using a grain wagon with scales. Grain yield (corrected to 15.5 % moisture) from whole plot measurements is presented to evaluate location, hybrid and seeding rate response. Grain yield was lower at Dalhart, averaging 34.2 bu/acre, and greatest at Stratford averaging 134.7 bu/acre. Grain yield at Shallowater averaged 47.5 bu/acre. Rainfall and length of growing season affected grain yield across locations. Late planted sites at Shallowater and Spade were terminated by frost when kernels had reached about 10% starch line progression, thus reducing overall grain yield. Frost shortly after dent (early starch line progression) could reduce grain by 25% or more (http://corn.agronomy.wisc.edu/Management/L041.aspx). Grain yield for Spade is not available at this time.

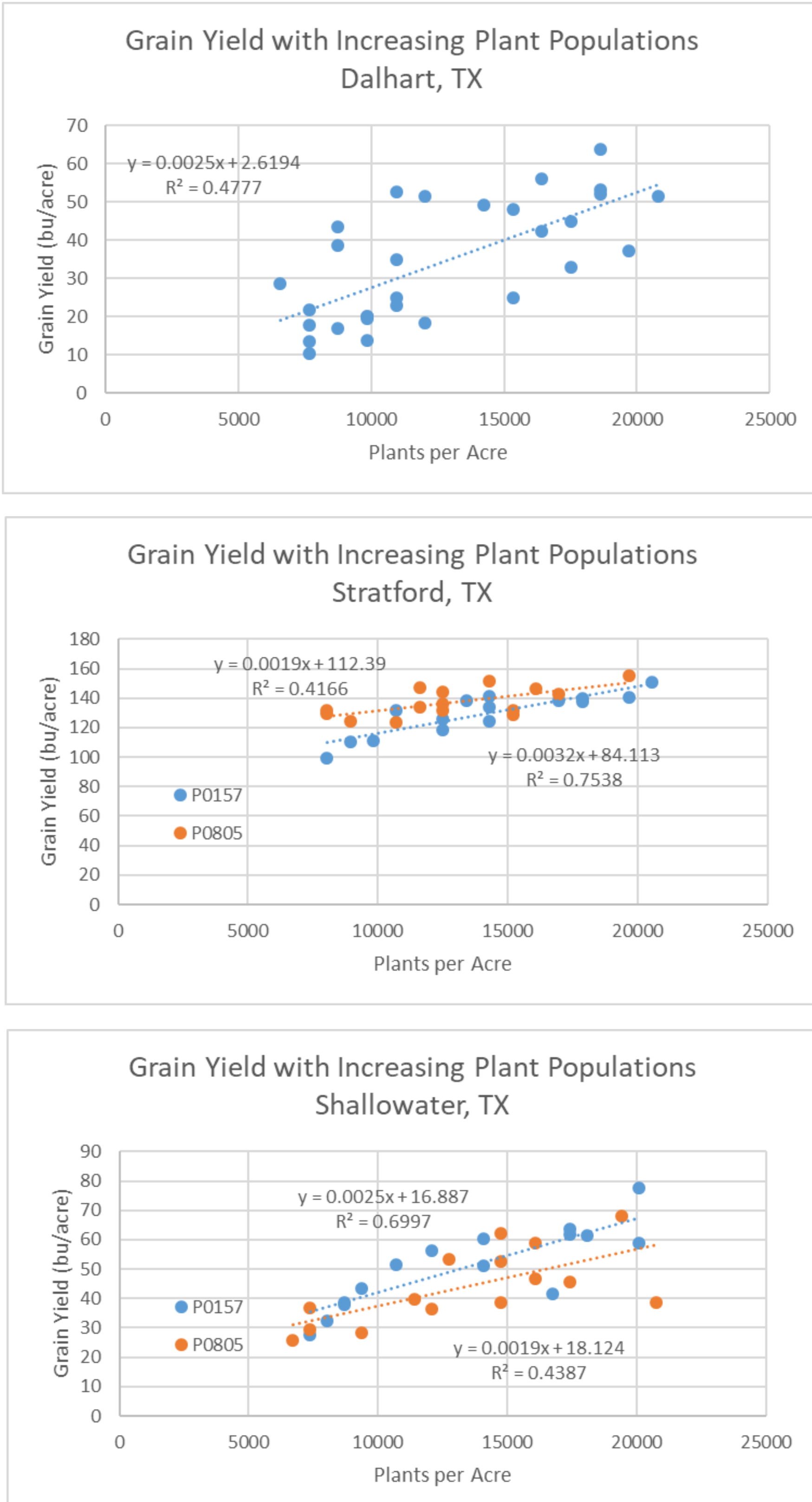

Figure 13. Grain yield in response to increasing plant populations at three locations with two hybrids.

Despite differences in grain yield across locations, grain yield response to increasing plant populations was observed at all sites (Figures 2). Overall, the response rate (increase in grain yield) to increasing plant populations was similar across locations and hybrids. Grain yields increased on average 2.5 bushels per 1,000 plants per acre, regardless of yield environment. Non-linear response curves were evaluated for each location and hybrid, yet nonlinear models did not much if any improvement compared to linear models. Therefore, linear response for grain yield is assumed within the plant populations used in the study. Target seeding rate of 20,000 per acre may not be high enough to produce flat or negative yield response.

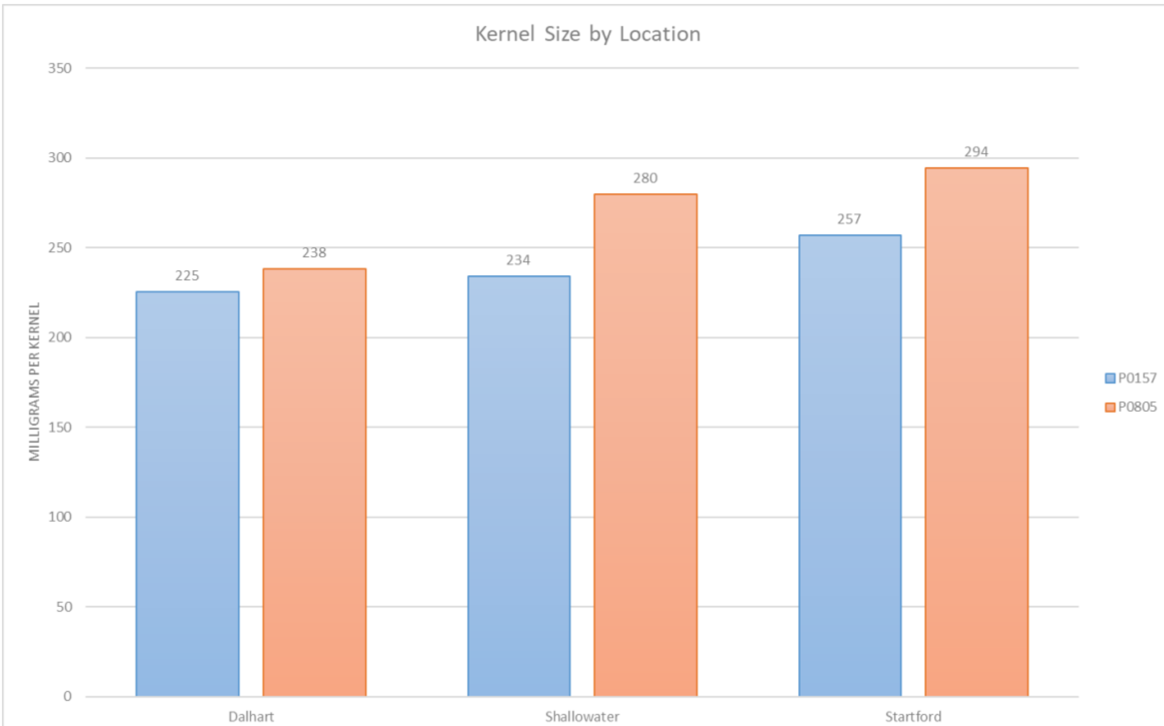

Figure 14. Kernel size by hybrid for three locations.

Ear size (kernels per ear) and kernel size (mg per kernel) contributed to variation in grain yield across locations and plant populations. Average ear size was 12 to 23% greater at Stratford compared to other locations (Figure 4). Average kernel size was 7-19% greater at Stratford compared other locations (Figure 3).The combination of greater ears size and kernel size contributed to significantly greater yields at Stratford. Fertilizer inputs were also greater at Stratford, especially nitrogen. Ear size did decline significantly with increasing plant populations. Yet, increase in ear numbers per acre with increasing plant populations efficiently compensated for reduced ear size.

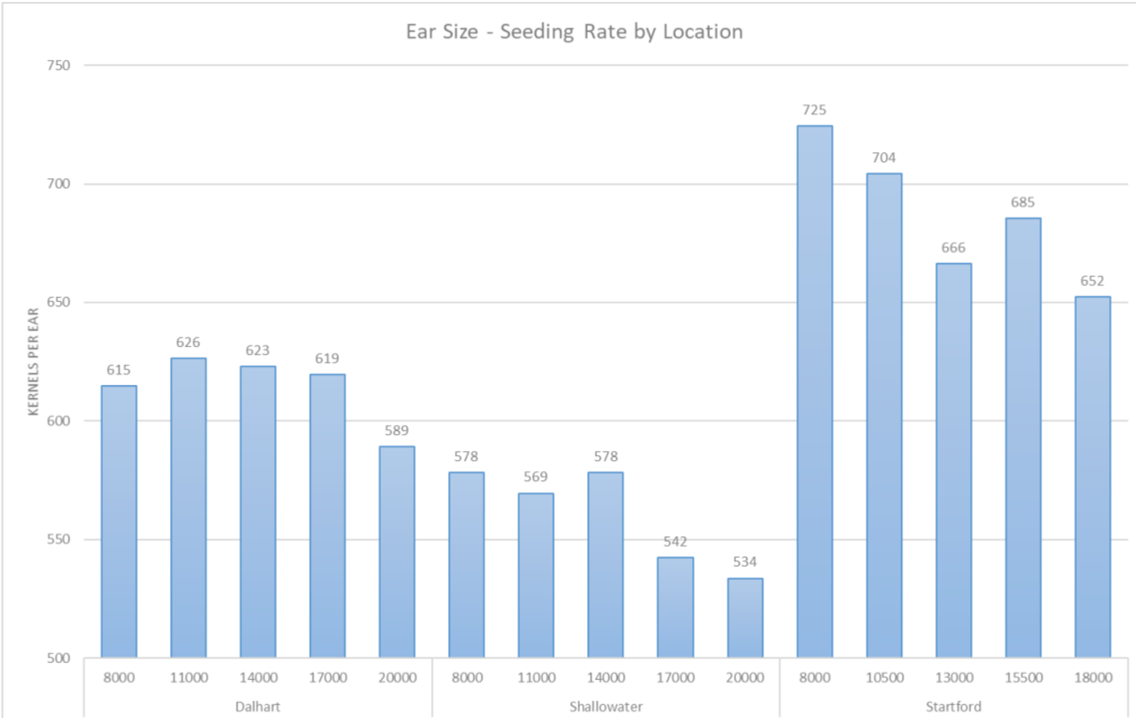

Figure 15. Average ear size for five seeding rates at three locations.

Where environmental conditions were more favorable, plants did produce multiple ears per plant (through secondary ears on the main culm and/or productive tillers) (Figures 5 and 6). With the exception of Stratford, more than one ear per plant was observed at plant populations below 14,000 plants per acre. At Stratford, multiple ears per plant were observed at all plant populations. However, multiple ears per plant, whether tiller ears or secondary ears, did not provide a yield advantage compared to higher plant populations. Overall, tillers indicate below optimum plant populations. Plant populations should be maintained to eliminate tiller production.

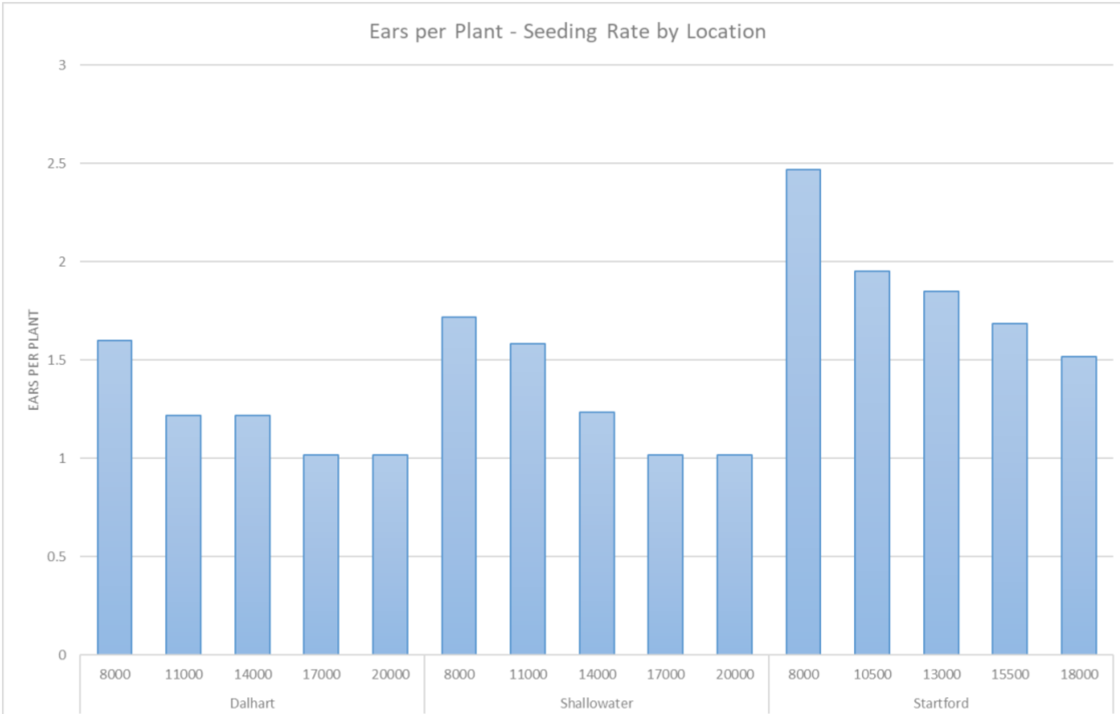

Figure 16. Ears per plant for five seeding rates and three locations.