

# 2018 Farm Management Competition Banquet Report

*“One of the best things about the TAPS competition is getting the team together and learning from each other as we discuss our management decisions,” said Ted Tietjen*

## Executive Board

### Chuck Burr

Extension Educator  
West Central Research and Extension Center  
Email: chuck.burr@unl.edu  
Phone: (308) 696-6783

### Daran Rudnick, PhD

Assistant Professor: Irrigation Management Specialist  
West Central Research and Extension Center  
Email: daran.rudnick@unl.edu  
Phone: (308) 696-6709

### Matt Stockton, PhD

Associate Professor: Agricultural Economist  
West Central Research and Extension Center  
Email: matt.stockton@unl.edu  
Phone: (308) 696-6713

## Project Team

### Tsz Him Lo

Ph.D. Graduate Student

### Jared Daily

Ph.D. Graduate Student and Program Coordinator

### Turner Dorr

Irrigation Research Technologist II

### Jacob Nickel

Irrigation Research Technician

### Devin Broadhead

Ag Economics Research Technologist I

### Hope Nakabuye

PhD Graduate Student

### Robert Tigner

Extension Educator

**Mission Statement:** To fully engage agriculturalists, scientists, educators, students, and industry in an innovative endeavor, to TAP into the University of Nebraska's potential to facilitate and create an environment for all stakeholders to work together in finding solutions through innovation, entrepreneurialism, technological adoption, new managerial applications, improved techniques and cutting edge methodologies for farm's, farm businesses, and farm families to maintain profitability, sustainability, and productivity.

## EXECUTIVE SUMMARY

The University of Nebraska Lincoln Testing Ag Performance Solutions (TAPS) farm management education and solutions program is winding down its second year. This most recent year has proven to be one of growth and continued excitement about this new and evolving program which was created to keep pace with ever increasing innovation and technical capacity of producers. This program represents an evolution of the Universities research and extension efforts, to meet these needs. With the many challenges related and faced by agricultural production there is a need for a deeper level of engagement among all the stakeholders.

This second year of the TAPS program has been successful and now includes a second contest for sorghum, to the ongoing corn contest. The program expanded to 28 teams (20 teams for corn and 8 teams for sorghum) with participants from Nebraska and Kansas representing 12 Nebraska Natural Resource Districts (NRDs) and 2 Kansas Groundwater Management Districts (Figure 1). The expansion of the TAPS program allowed for the inclusion of new and returning producers as well as non-producer teams, including writers for the Nebraska Farmer, Nebraska Department of Environmental Quality (NDEQ), and Nebraska Department of Natural Resources (NeDNR). The Nebraska Farmer is competing and documenting the decision making process for managing sorghum; whereas, NDEQ and NeDNR are competing in the corn competition. Producers and agency personnel competing and engaging with each other will bear fruit to a better understanding of challenges and identification of solutions that will lead to efficient and profitable agricultural production.

One of the key benefits of the TAPS program is that it encourages peer to peer exchange of ideas and innovation. For example, winners of the 2017 TAPS competition and participants of the 2018 TAPS competitions were asked to serve as speakers at the 2018 West Central Water and Crops Field Day on August 23, in North Platte, NE. Winners of the 2017 TAPS competition, Tim Schmeeckle and Roric Paulman, had packed rooms as they presented on their strategies that led to efficient and profitable production of corn. Whereas, the 2018 TAPS participants as part of a growers panel engaged an audience of 300 people as they discussed their management philosophy, how they utilize technology in their operation, and what they hope to get out of competing in TAPS.

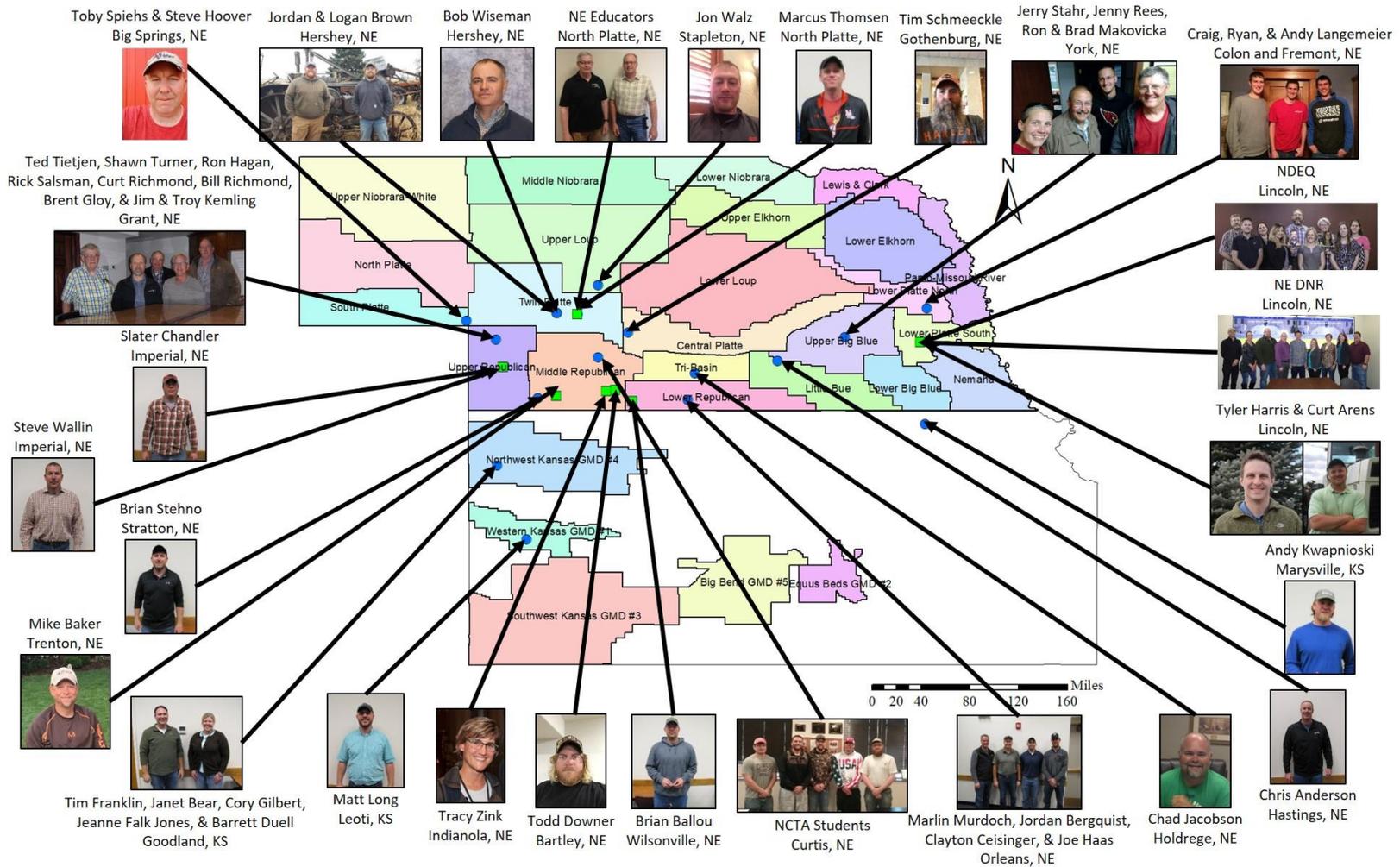
Not surprisingly many entities have contributed in many different ways, to this programs development and support. We are especially grateful to the Nebraska Corn Board, Nebraska Sorghum Board, and the National Sorghum Checkoff for their support of the TAPS program. In addition, we are very appreciative of the many different support organizations and entities that provided resources, new technology, technical assistance, and innovative approaches that were made available to the participants and observers of the TAPS program. The TAPS partners and sponsors are highlighted in the back of the booklet.

We thank all those who have actively participated and given of their time and/or treasure. We look forward to adding new partners in the coming seasons and anticipate the discovery of many new friends, innovations, and solutions that come from such an effort.

Sincerely,

*TAPS Executive Board*

# PARTICIPANTS



**Figure 1. Location of the 2018 TAPS Farm Management Competition participants. Blue circles indicate participants competing in the corn competition and the green squares represent those competing in the sorghum competition. The Nebraska Natural Resource Districts and Kansas Groundwater Management Districts' boundaries are also presented.**

## PROGRAM OVERVIEW

The 2nd Annual Sprinkler Irrigated Corn Farm Management Competition and the 1<sup>st</sup> Annual Sprinkler Irrigated Sorghum Farm Management Competition were established in 2018 under a Zimmatic by Lindsay Variable Rate Center Pivot at the West Central Research and Extension Center (WCREC) in North Platte, Nebraska. The corn competition included 20 farms (i.e., teams); whereas the sorghum competition had 8 farms. Each farm was a randomly assigned set of three experiment sized plots, totaling about one half of an acre (Figures 2 and 3). All farms were managed by WCREC personnel. However the yields, and costs from each farm were amplified to represent 3,000 harvested acres for the corn competition and 1,000 harvested acres for the sorghum competition. This amplification provided for the opportunity to market an amount of grain that was more representative of a modern farm of size.

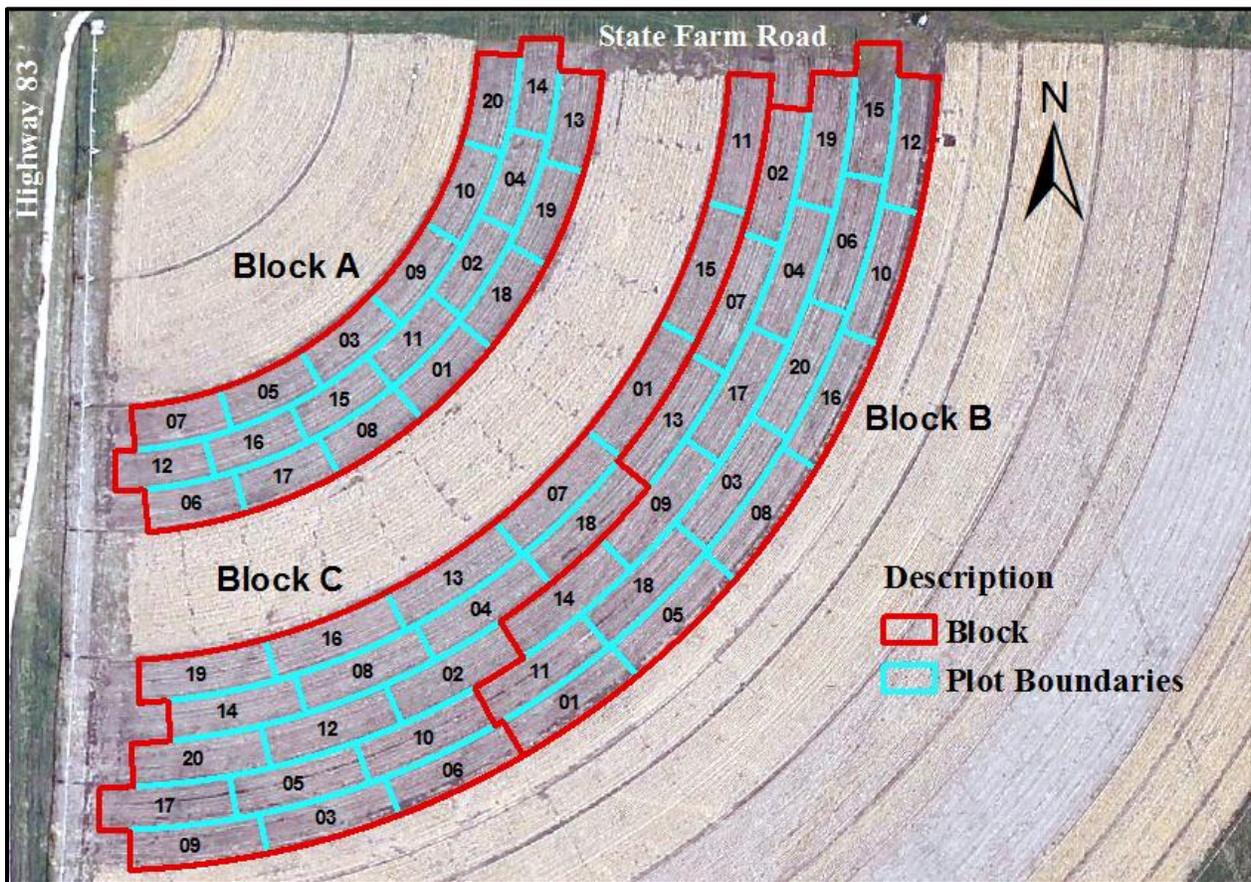
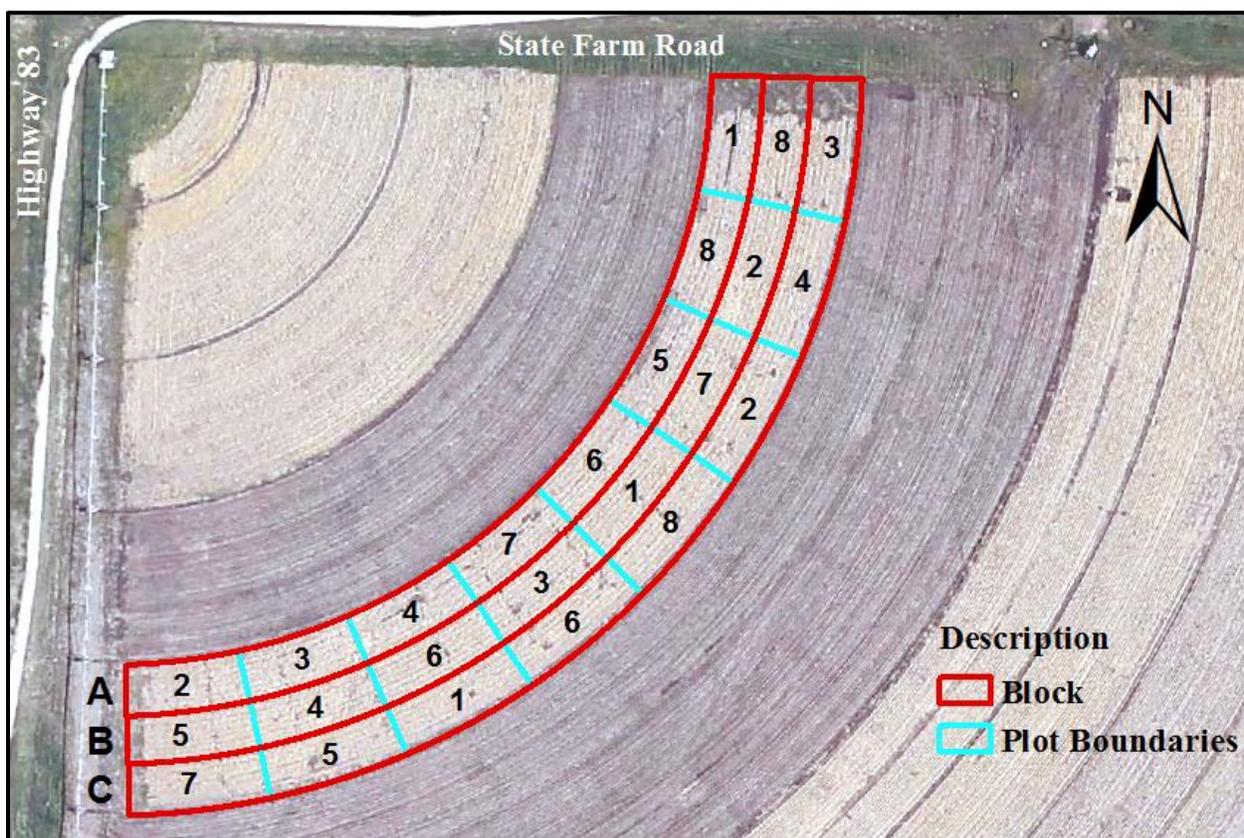


Figure 2. Farm ID's (i.e., treatments) for the 2018 Corn Farm Management Competition held at the West Central Research and Extension Center in North Platte, NE. Each team had a randomized plot located in blocks A, B, and C. The background Aircout imagery was collected by Flying M Aviation on May 5th, 2018.

Participants had control over six parameters:

**Irrigation Management** – The Zimmatic irrigation system (Lindsay Corporation, Omaha, NE) was operated every Monday and Thursday throughout the growing season. The participants had until 10 AM on the irrigation days to note whether they would like to irrigate using a form located on the competition website. If participants failed to indicate their intent to irrigate by 10 AM, no irrigation water was applied on that irrigation day. Irrigation depth per application could be between 0 and 1.0 inch in intervals of 0.05 inches. The variable cost to pump an acre-inch of water was \$7.80.



**Figure 3. Farm ID's (i.e., treatments) for the 2018 Sorghum Farm Management Competition held at the West Central Research and Extension Center in North Platte, NE. Each team had a randomized plot located in blocks A, B, and C. The background Aircscout imagery was collected by Flying M Aviation on May 5th, 2018.**

**Nitrogen Management** – Participants had to decide on the amount of pre-plant and/or in-season (via side-dress and/or fertigation) nitrogen fertilizer in the form of UAN 32%. All plots received a baseline 5 gallons per acre of starter fertilizer (10-34-0) at time of planting. Pre-plant and side-dress nitrogen was applied using a double-coulter liquid applicator that dribbled UAN 32% at an approximate depth of 1 inch and at a distance of 5 inches from the center of the crop row on both sides. Fertigation was applied through the center pivot using a variable rate injection pump (Agri-Inject, Yuma, CO) that maintained the system concentration as the irrigation system flow rate changed. Maximum application amount allowed was 180 lbs/acre for pre-plant, 180 lbs/acre for side-dress, and 30 lbs/acre for each fertigation event (i.e., total possible fertigation amount was 120 lbs/acre). Pre-plant, side-dress (V4-V6), and four fertigation events (V9, V12, VT/R1, and R2) were made available to the corn participants; whereas, pre-plant and four fertigation events (Stages 2, 3, 4, and 5) were made available to the sorghum participants. A custom application cost of \$7.00 per acre was charged for the pre-plant and side-dress applications and \$1.00 per fertigation application.

**Hybrid Selection and Seeding Rate** – Participants were responsible for selecting a hybrid as well as seeding rate. District sales managers (DSMs) of several seed companies (Pioneer, Dekalb, Channel, Hefty, Fontanelle, Dyna-Gro, and NuTech) provided a recommended list of 5 corn and 2 sorghum hybrids, with respective seeding rates, for the competition field. Participants had the option of selecting a DSM recommended hybrid or they could supply their own seed. If participants selected a recommended hybrid, the seed was provided by the respective DSM. The base corn hybrid for the competition was a 112-113 day maturity. The corn competition field was picked when this hybrid reached 18% moisture content. At time

of harvest, all hybrids were charged a drying cost of \$0.04 per point per bushel above 15.5% moisture content for corn and 14% for sorghum.

**Grain Marketing** – Participants were given the following options: spot (cash) sales, forward contract, basis contract with delivery at harvest, simple hedge to arrive, and futures contract, to market grain. Marketing was allowed between March 13<sup>th</sup> and November 15<sup>th</sup> for corn and November 22<sup>nd</sup> for sorghum. Participants were not allowed to speculate.

**Crop Insurance** – Participants were allowed to select a coverage package from the following options: Revenue Protection (either enterprise or optional units), Revenue Protection with Harvest Price Exclusion (either enterprise or optional units), and Yield Protection (either enterprise or optional units) at the levels of 65, 70, 75, 80, or 85%. These rates were for the Universities farm located at North Platte, NE. Hail and wind coverage options were also available. Indemnity payments were based on estimated field loss of Lincoln County, Nebraska.

**Other Management Decisions** – All other management decisions, such as pesticide use, tillage, residue management, etc., were fixed by the University and were the same for all plots (Farms). The actual physical management such as the operation of machinery, irrigation system, application of chemicals, and harvesting was conducted by the WCREC staff. Participants were allowed to observe, install their own equipment and/or collect additional data from their plots throughout the growing season at their own expense. However, no additional inputs, such as fertilizers, additives, etc. were allowed to be applied to the individual plots.

## DESCRIPTION OF AWARDS

Participants in their respective competitions competed for three awards, 1) Most Profitable Farm, 2) Highest Input Use Efficiency, and 3) Greatest Grain Yield. Cash awards of \$2,000, \$1,000, and \$500 (minus penalty) were granted for both the corn and sorghum competition winners, respectively. All awards were accompanied with an honorary plaque. Description of each award is presented below.

1. Most Profitable – included average yield from the plots, marketing decisions, and cost of production based on prescribed management decisions.
2. Highest Input Use Efficiency: Water-Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019)

$$WNIPI = \frac{\left(\frac{Y_{Farm} - Y_{Control}}{Y_{Control}}\right)}{\left(\frac{ET_{Control} + I_{Farm}}{ET_{Control}}\right) \times \left(\frac{ANU_{Control} + N_{Farm}}{ANU_{Control}}\right)}$$

where, “control” is a farm managed by UNL that receives no irrigation or N fertilizer (except for 10-34-0 at planting), “ET” is seasonal evapotranspiration, “I” is seasonal irrigation, “N” is total seasonal applied nitrogen, and “ANU” is aboveground nitrogen uptake. The farm with the highest value was determined the winner.

3. Greatest Grain Yield Award – adjusted by the winner’s percent of total possible profit. Total possible profit was the range of difference between the most and least profitable farms.

## TIMELINE

The 2018 corn and sorghum competitions started with a kick-off meeting on March 13<sup>th</sup> at WCREC in North Platte, NE, where the rules and regulations of the two competitions were described. Planting occurred on May 1<sup>st</sup> and May 24<sup>th</sup> for corn and sorghum, respectively. The crops reached physiological maturity on September 29<sup>th</sup> and October 10<sup>th</sup> and were harvested on October 23<sup>rd</sup> and November 14<sup>th</sup>, respectively. There was a formal field tour and barbeque on June 27<sup>th</sup> where participants were able to visit the field and observe differences among participants' plots. Figure 4 shows Ron Makovicka inspecting his corn plots. Although, participants were allowed to visit their plots anytime throughout the growing season. The primary in-season TAPS event was the West Central Water and Crops Field Day on August 23<sup>rd</sup>. The field day centered around the TAPS program and included a program overview, grower panel (Figure 5), and breakout sessions with last year's winners. The field events provided an opportunity for growers to interact with each other as well as UNL faculty and industry personnel. The competition officially ended on November 15<sup>th</sup> for corn and November 22<sup>nd</sup> for sorghum, which was the final day for the participants to market their grain.



**Figure 4. Ron Makovicka (York, NE) inspecting his TAPS corn plots on June 27<sup>th</sup>.**

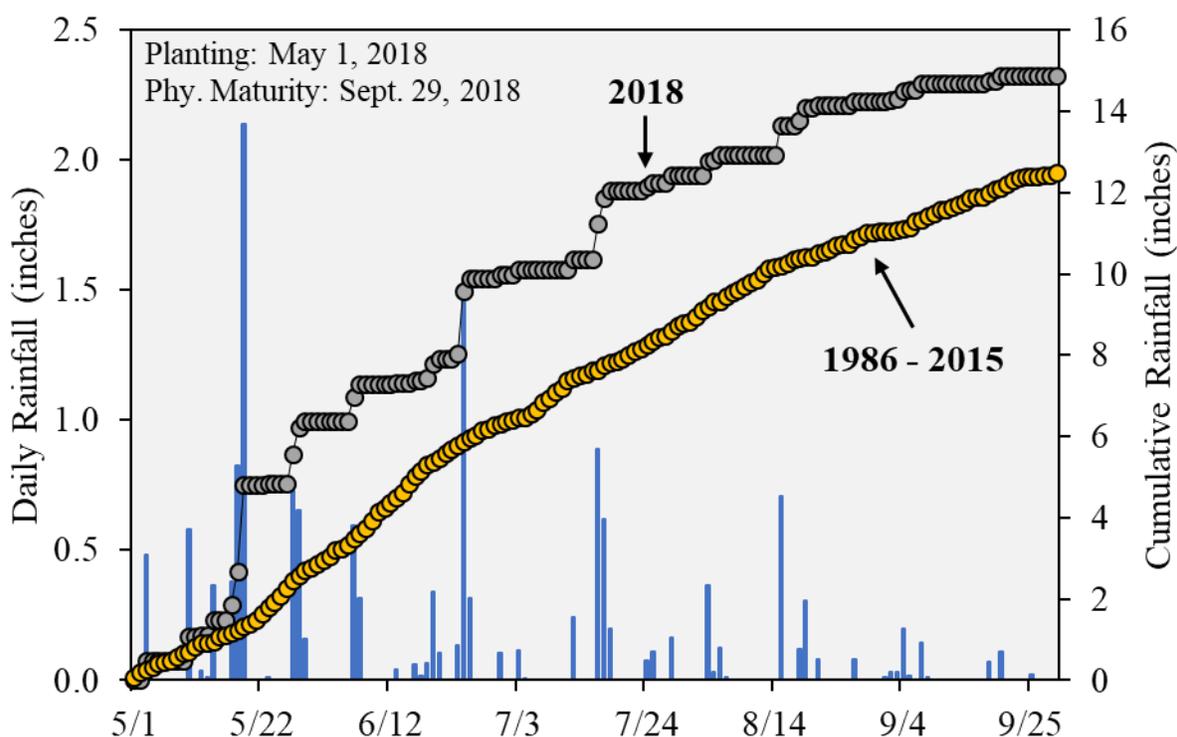


**Figure 5. The TAPS Participant Panel at the 2018 West Central Water and Crops Field Day in North Platte, NE, on August 23<sup>rd</sup>. Panelist included Jerry Stahr (York, NE), Matt Long (Leoti, KS), Andy Langemeier (Scribner, NE), Sam Radford (NDEQ, Lincoln, NE), Tracy Zink (Indianola, NE), and Tim Schmeeckle (Gothenburg, NE). Facilitator was Amy Kremen, Program Coordinator for the USDA-NIFA Funded Grant titled “Sustaining agriculture through adaptive management to preserve the Ogallala aquifer under a changing climate”.**

## MANAGEMENT DECISIONS

### *Weather Conditions*

The TAPS site at WCREC received above normal rainfall in 2018 (Figure 6). The seasonal rainfall from corn planting to physiological maturity (May 1 to Sept. 29) was 14.9 inches, which exceeded the long-term (1986-2015) average rainfall of 12.5 inches (High Plains Regional Climate Center's Automated Weather Data Network (HPRCC-AWDN; [www.hprcc.unl.edu/awdn](http://www.hprcc.unl.edu/awdn)). There were 53 days with rain of which 66% were below 0.25", 15% between 0.25" and 0.50", 15% between 0.50" and 1.0", and 4% exceeded 1.0". The growing season experienced mild temperatures with average maximum daily temperature of 75, 84, 85, 84, and 79°F for the months of May, June, July, August, and September.



**Figure 6.** Daily and cumulative rainfall (in.) from corn planting (May 1, 2018) to physiological maturity (Sept. 29, 2018), along with long-term (1986-2015) cumulative precipitation at the field site in North Platte, NE.

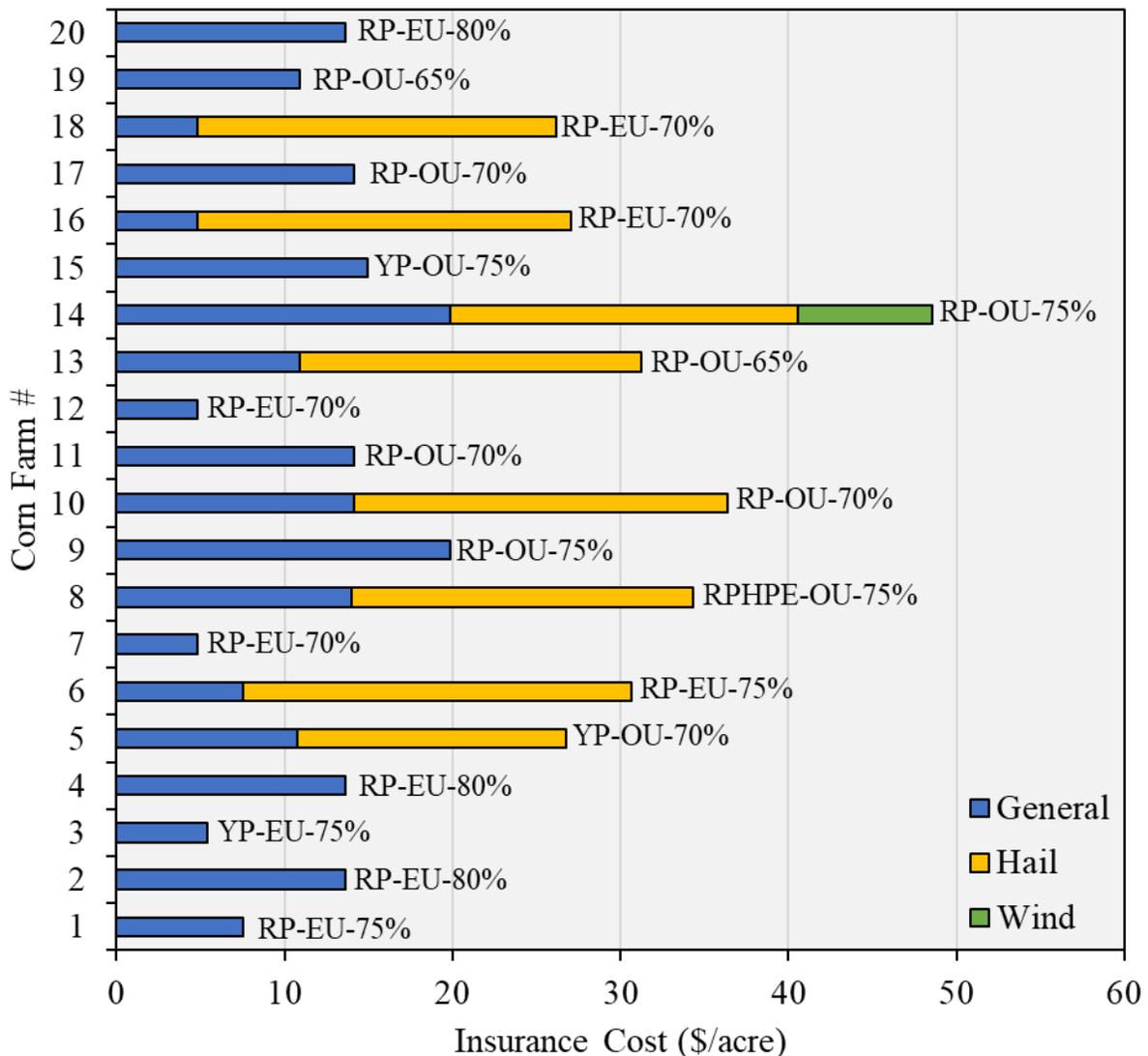
### *Crop Insurance*

Crop insurance is important for several reasons. First it can directly affect profitability as it provides loss coverage related to many types of incidents, including market losses and physical destruction of the crop. Secondly, it provides hedging like properties so that forward contracting and other mechanisms to make future pricing of yet unproduced grain less risky. Due to the nature of the grain markets which are both seasonal and cyclical, forward pricing when used properly provides a viable option in obtaining higher average annual prices. Therefore, crop insurance can be a critical tool to reduce risk and increase profitability.

All corn competitors bought crop insurance of some type (Figure 7). Sixteen of the nineteen purchased revenue protection (RP) policies with which averaged close to a 73% coverage. Half of those

that bought RP bought enterprise unit (EU) coverage with an average of 75% coverage at a costs of \$8.83/acre. The other half purchased operational units (OU) with an average costs of \$14.76/acre and 70% coverage. One farm bought RP with a harvest price exclusion or RPHPE for OU at 75% coverage at a cost of \$13.98/acre. The remaining three farms bought yield protection (YP) insurance. Two of these farms had OU coverage with one at the 70% level of protection and the other at the 75% level and a cost of \$10.77 and \$13.94/acre, respectively. The third farm of YP bought EU crop insurance for \$5.38/acre at a coverage rate of 75%.

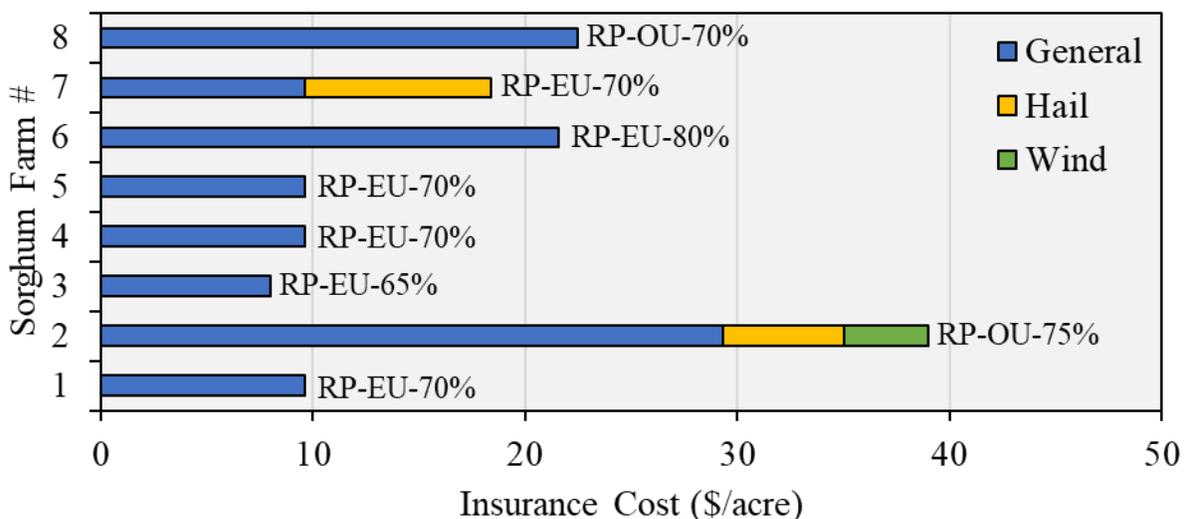
In addition to RP and YP insurance eight of the farms bought hail coverage at varying rates, with one of the eight also purchasing wind insurance. The highest cost for insurance was \$48.54/acre which included RP-OU-75%, hail and wind. The least costly coverage was a simple RP-EU-70% for \$4.86/acre.



**Figure 7. Cost for insurance as well as hail and wind coverage (\$ per acre) for the 20 teams competing in the corn farm management competition. The insurance package and coverage rate is noted next to each team. RP stands for revenue protection, YP for yield protection, EU for enterprise units, OU for operational units, and RPHPE for revenue protection with harvest price exclusion.**

All sorghum competitor's purchased revenue protection (RP) crop insurance (Figure 8). Two of the farms purchased operation units (OU) with the remaining buying enterprise units (EU). Those that enlisted RP-OU did so at the 70% and 75% coverage level which costs \$22.47 and \$29.32/acre, respectively. Those that bought RP-EU purchased policies at the 65, 70, and 80% level with costs of \$7.98, \$9.62, and \$21.54 per acre, respectively.

In addition to crop insurance two of the farms bought hail coverage, one at a cost of \$8.78/acre and the other at \$5.00/acre. Wind insurance was also purchased by one of those that purchased hail insurance at a cost of \$4.00/acre. The highest cost for insurance was \$39.02/acre which included RP-OU-75%, hail and wind. The least costly coverage was a simple RP-EU-65% for \$7.98/acre.

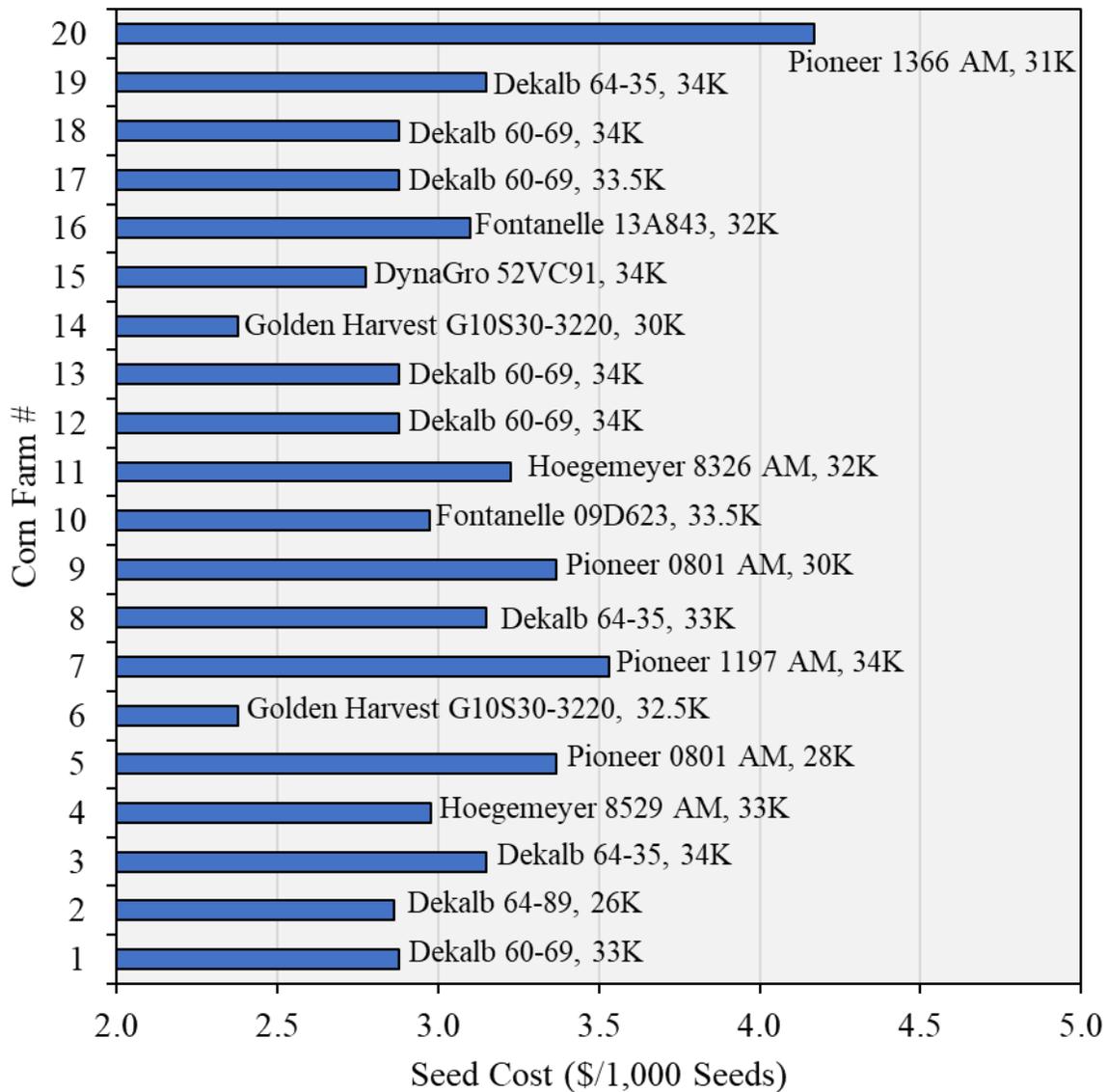


**Figure 8. Cost for insurance as well as hail and wind coverage (\$ per acre) for the 8 teams competing in the sorghum farm management competition. The insurance package and coverage rate is noted next to each team. RP stands for revenue protection, EU for enterprise units, and OU for operational units.**

### *Hybrid Selection and Seeding Rate*

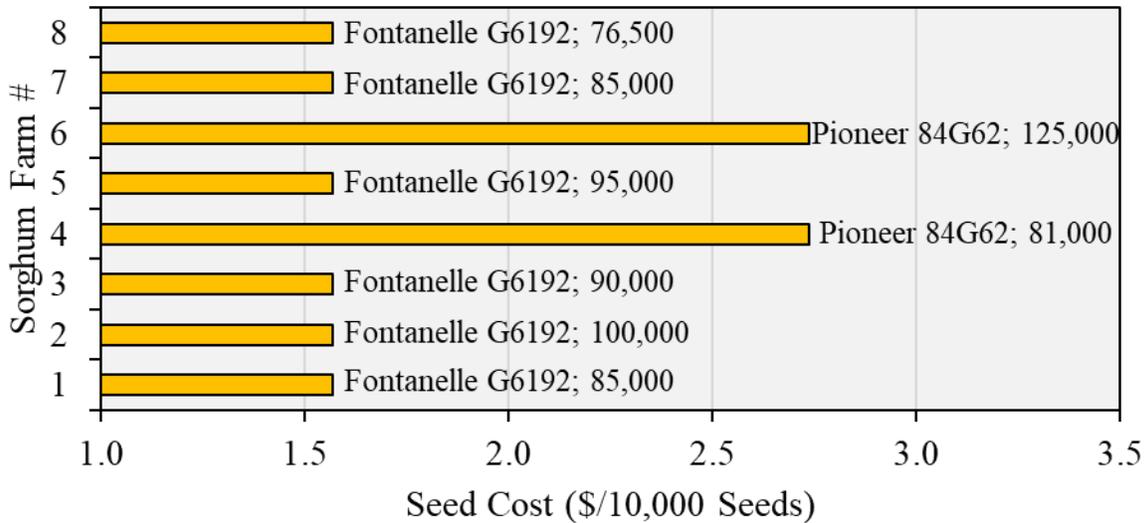
All corn participants with the exception of Farm 20 selected a seed from the recommended hybrid list provided by various district sale managers (DSMs). A total of 12 different hybrids were selected (Figure 9). The most common hybrid (Farms 1, 12, 13, 17, and 18) was Dekalb 60-69 RIB which has a 110 day maturity with an associated cost of \$230.17 per bag or \$2.88 per 1,000 seeds (Figure 9). The range in seed cost varied from \$2.38 (Golden Harvest 10S30-3220) to \$4.17 (Pioneer 1366 AM) per 1,000 seeds with an average cost being \$3.12 per 1,000 seeds. Consequently, the maximum difference in seed cost per acre would be \$46.54 at a seeding rate of 26,000 seeds per acre to \$60.86 at a seeding rate of 34,000 seeds per acre.

The seeding rate per acre selected by the corn teams ranged from 26,000 (Farm 2) to 34,000 (Farms 3, 7, 12, 13, 15, 18, and 19) with a median of 33,000 and average of 32,275. In general, most teams with the exception of Farms 2 and 5 planted above 30,000 seeds per acre. Considering seed cost and seeding rate the total seed cost per acre ranged from \$71.25 (Farm 15) to \$129.24 (Farm 20) with an average of \$98.25.



**Figure 9. Hybrid selection, cost, and seeding rate in thousands (K) for the corn competition.**

Only two hybrids, Pioneer 84G62 and Fontanelle G6192, were selected among the sorghum teams. Farms 1, 2, 3, 5, 7, and 8 selected Fontanelle G6192 and Farms 4 and 6 selected Pioneer 84G62 (Figure 10). Fontanelle lists their hybrid as having its best performance under intermediate dryland to irrigated conditions. Likewise, Pioneer rates their hybrid as highly suitable under irrigated conditions. Seed cost varied among the two hybrids, with the Fontanelle G6192 having a cost of \$1.57 per 10,000 seeds and Pioneer 84G62 having a cost of \$2.74 per 10,000 seeds. Unlike hybrid selection, there were considerable differences in seeding rate among the sorghum teams. Seeding rate per acre ranged from 76,500 (Farm 8) to 125,000 (Farm 6) with an average of 92,188. Consequently, total seed cost per acre ranged from \$12.00 (Farm 8) to \$34.22 (Farm 6) with an average of \$17.47.

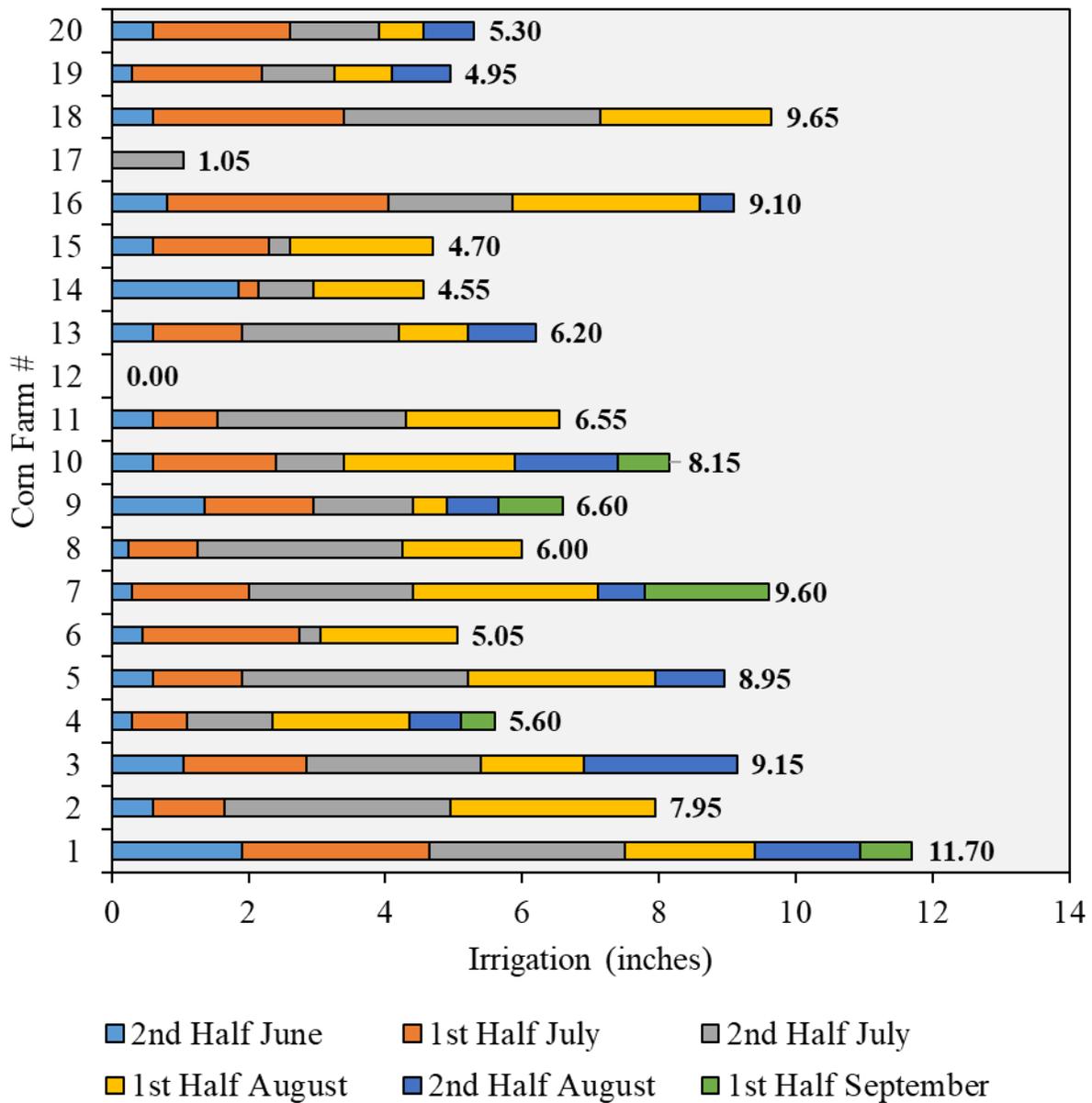


**Figure 10. Hybrid selection, cost, and seeding rate for the sorghum competition.**

### ***Irrigation Scheduling***

The irrigation system was first initiated on June 14<sup>th</sup> by the scheduling of irrigation from Corn Farms 1 and 14, and concluded on September 13<sup>th</sup> when the final irrigations were scheduled by Farms 4 and 9. With the exception of the control farm (Farm 12), the total irrigation applied among the corn teams ranged 1.05 (Farm 17) to 11.70 inches (Farm 1) with an average and median of 6.88 and 6.55 inches, respectively (Figure 11). All teams with the exception of Farm 17 applied irrigation in the second half of June, first half of July, and first half of August. Not considering Farms 12 and 17, on average, 11, 24, 26, and 27% of irrigation was applied during the second half of June, first half of July, second half of July, and first half of August, respectively. Following the first half of August, management strategy changed as seven teams (Farms 2, 6, 8, 11, 14, 15, and 18) terminated their irrigation and solely relied on stored soil water and precipitation for the remainder of the growing season. Whereas, Farms 3, 5, 13, 16, 19, and 20 terminated their irrigation in the second half of August, and Farms 1, 4, 7, 9, and 10 continued to irrigate into September. As expected, most teams concentrated their irrigation around the critical growth period from tasseling to blister, which occurred from middle to end of July.

Following the procedure outlined in Lo et al., (2019) the optimal estimated range of seasonal irrigation requirement to achieve maximum yield was between 7.5 and 8.0 inches. The optimal upper range was estimated using a model that was calibrated from the 2017 TAPS evapotranspiration data generated from a LI-COR eddy covariance station; whereas the lower range was based on maximum yield response of Pioneer 1197 (coincidentally highest yielding hybrid in the 2018 corn TAPS competition) in an adjacent field at WCREC in 2018. Understanding that maximum yield does not necessarily translate into maximum profit and that different hybrids may have different yield responses to irrigation, it is difficult to evaluate the economic outcome when irrigation is applied below the suggested range. However, the suggested range provides a good indication of the upper bound of water requirement. With that in mind, seven teams (Farms 1, 3, 5, 7, 10, 16, and 18) exceeded and 11 teams (Farms 4, 6, 8, 9, 11, 13, 14, 15, 17, 19 and 20) were below the estimated irrigation range.



**Figure 11. Cumulative irrigation (inches) for half months for the individual corn farms.**

Similar to corn, the sorghum irrigation season was initiated on June 14<sup>th</sup> with a scheduled irrigation event by Farm 6 and concluded on September 13<sup>th</sup> with irrigations applied by Farms 2 and 3. With the exception of the control farm (Farm 1) seasonal irrigation amounts ranged from 2.50 (Farm 8) to 5.25 inches (Farm 7) (Figure 12). Farm 8 was the most conservative in their irrigation scheduling and did not initiate irrigation until fertigation on July 12<sup>th</sup>. On the other hand, Farm 7 was more aggressive with irrigation scheduling and applied more irrigation in the second half of July and first half of August as compared to the other farms, but terminated irrigation on August 13<sup>th</sup>.

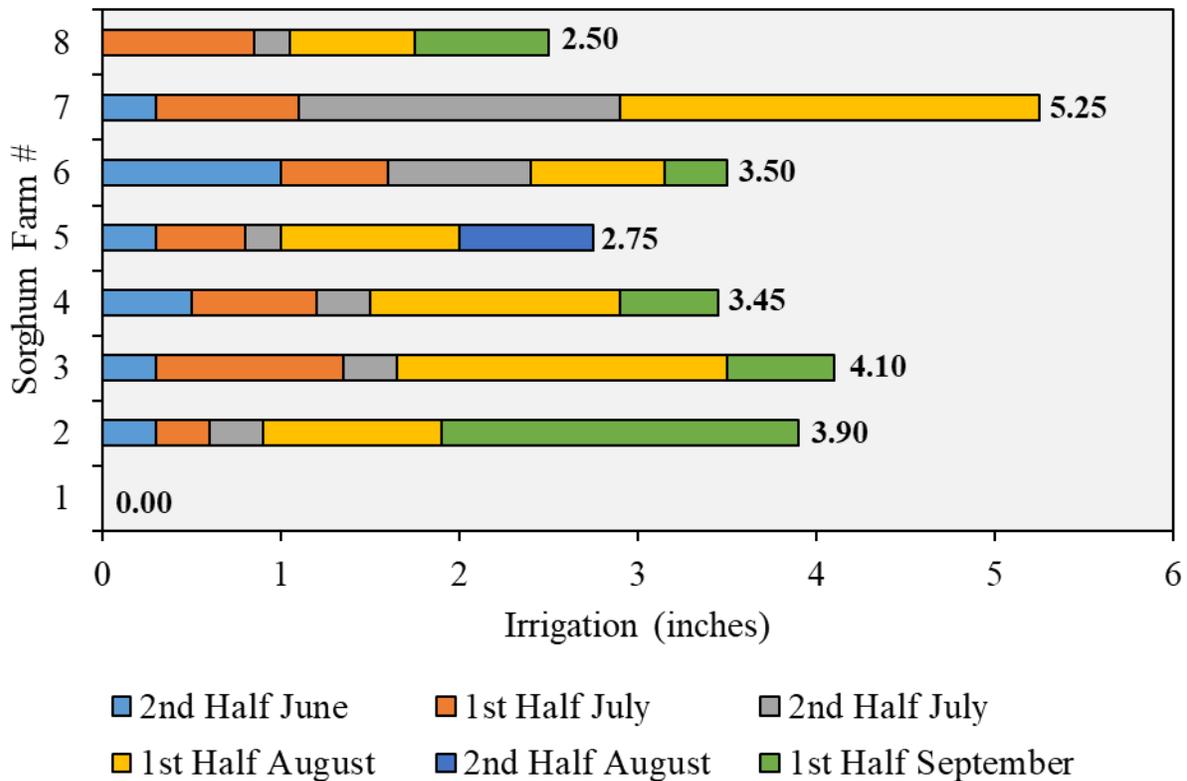
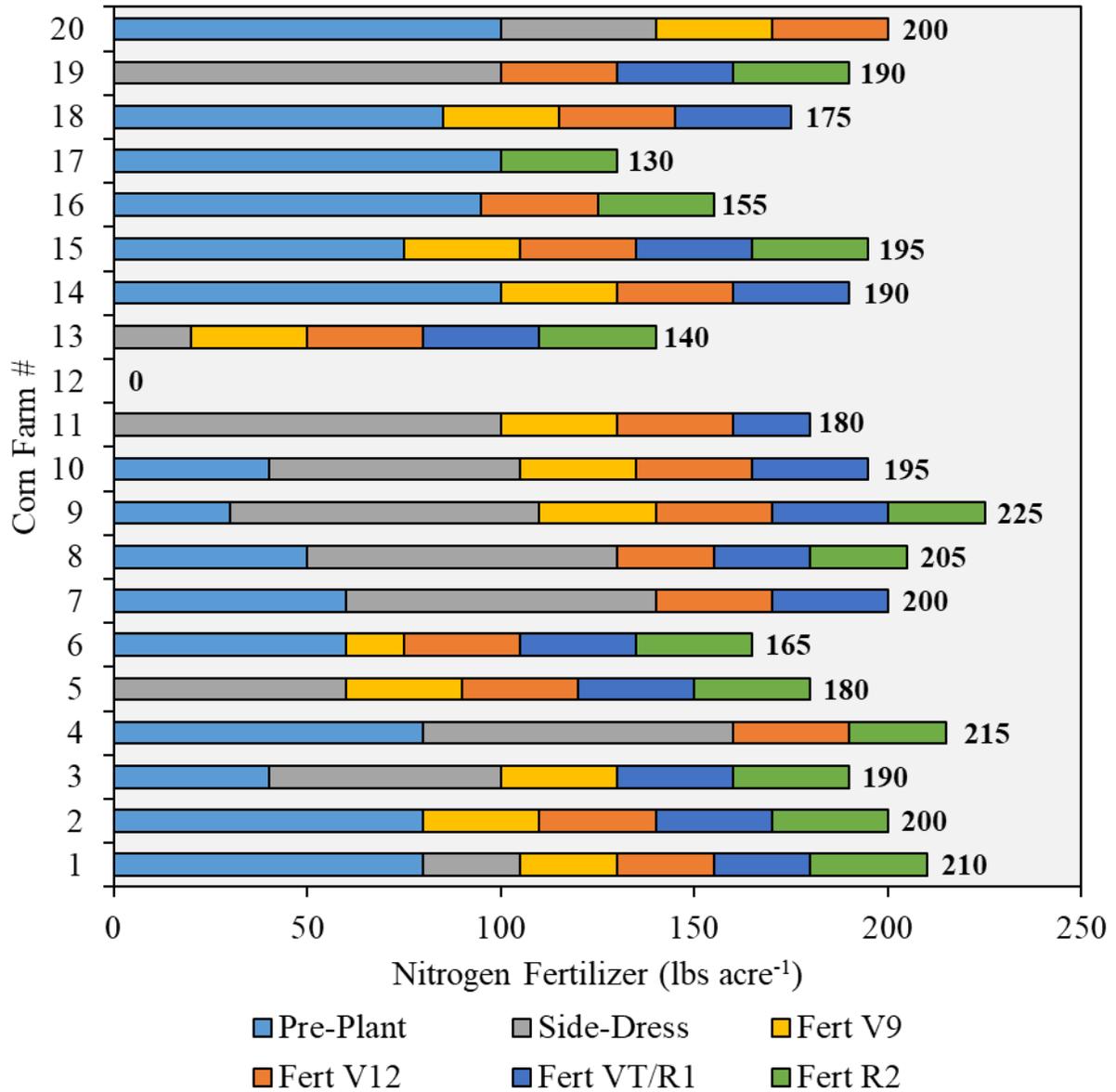


Figure 12. Cumulative irrigation (inches) for half months for the individual sorghum farms.

### Nitrogen Application

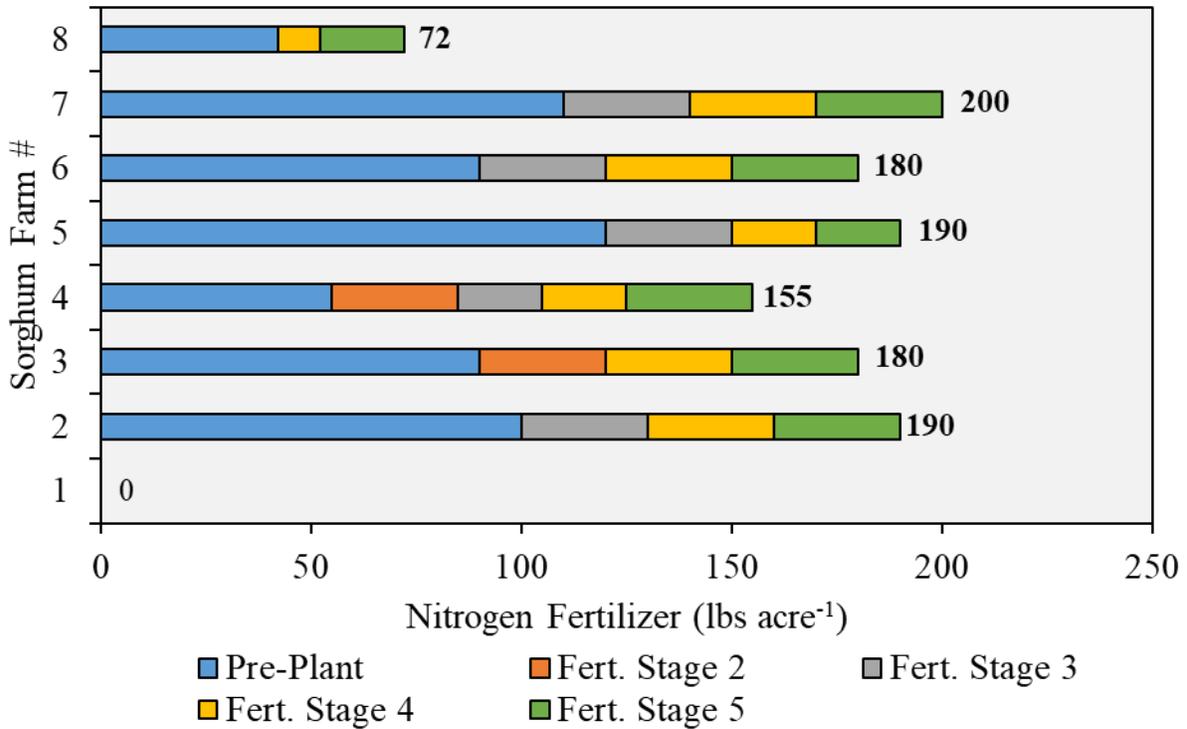
The amount and distribution of nitrogen fertilizer prescribed by the corn participant teams are shown in Figure 13. The total seasonal nitrogen fertilizer, not including the control farm (Farm 12), ranged from 130 (Farm 17) to 225 lbs/acre (Farm 9). All teams opted to split apply their nitrogen fertilizer, in which all teams applied a portion via fertigation (Figure 13). Total fertigation accounted for 23 (Farm 17) to 86% (Farm 13) of the total nitrogen applied. Four fertigation options were made available to the participants, of which seven teams opted to fertigate each time; whereas, eight teams only fertigated three times. The most commonly fertigated growth stage was V12, where all teams fertigated except for Farms 3, 12, and 17. Not all teams opted to apply their nitrogen as pre-plant or side-dress. Farms 5, 11, 13, and 19 did not apply pre-plant nitrogen and Farms 2, 6, 14, 15, 16, 17, and 18 did not apply side-dress nitrogen. Pre-plant accounted for 0 to 77% (Farm 17) and side-dress accounted for 0 to 56% (Farm 11) of the total nitrogen fertilizer. Interestingly, eight teams (Farms 1, 3, 4, 7, 8, 9, 10, and 20) applied nitrogen via pre-plant, side-dress, and fertigation, and therefore, incurred the highest application cost.

Similar to the irrigation section, a suggested upper limit for total nitrogen fertilizer was estimated using the UNL nitrogen algorithm (Shapiro et al., 2008). Prior to planting, the nitrogen algorithm was ran with the following information: soybean credit of 45 lbs/ac, nitrogen fertilizer cost of \$0.32 per lb, corn price of \$3.20 per bu, and yield goal of 235 bu/acre. The resulting recommended nitrogen application amount was 175 lbs/acre. However, the recommendation made by Ward Laboratories was 200 lbs/acre due to a lower soybean credit of 40 lbs/ac and a yield goal of 260 bu/ac, which was closer to last year’s TAPS winner. Assuming those two recommendations serve as the lower and upper bounds, there were four teams below (Farms 6, 13, 16, and 17), four teams above (Farms 1, 4, 8, and 9), and the remaining within.



**Figure 13. Nitrogen application method and amount (lbs per acre) for the individual corn farms.**

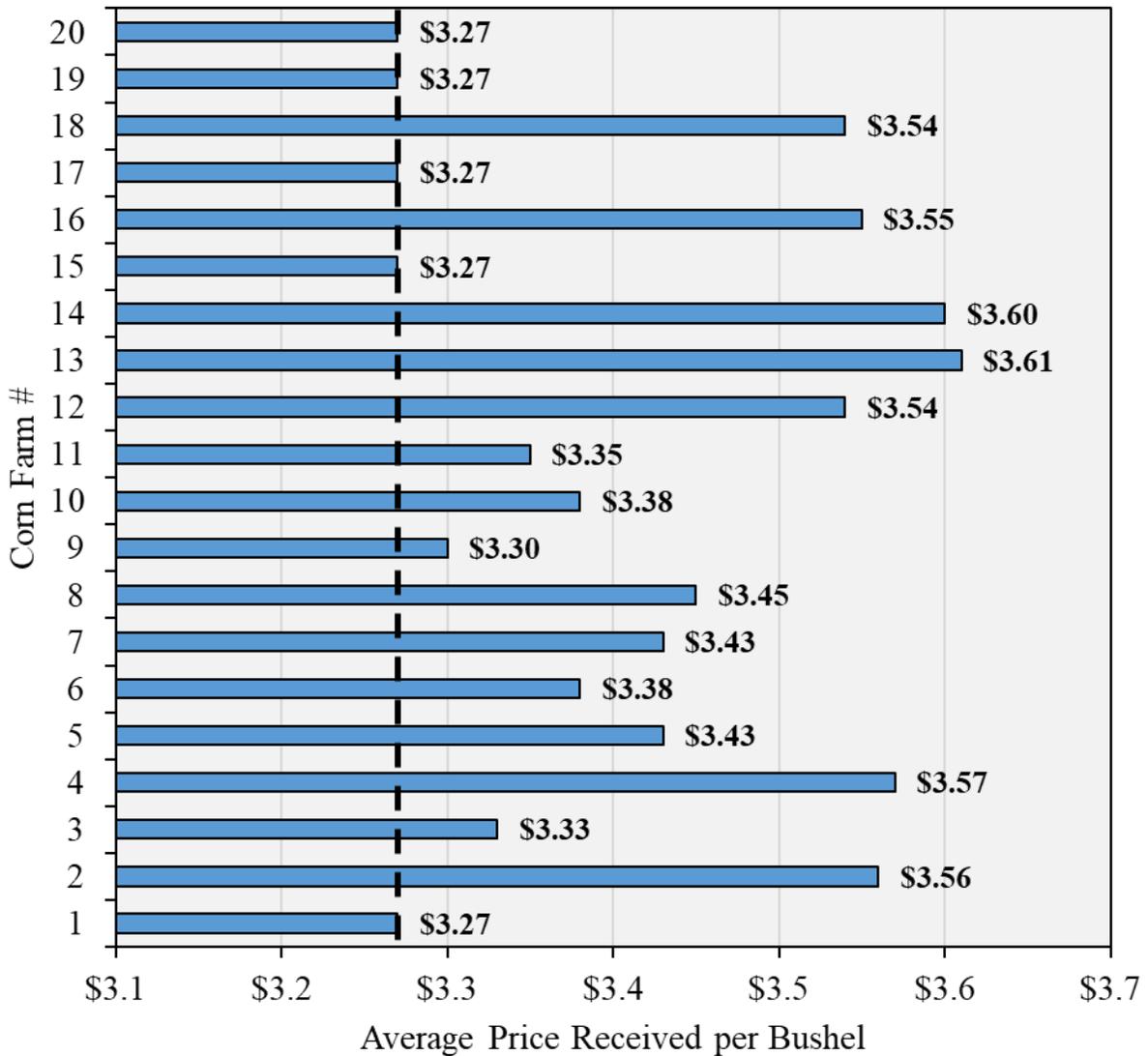
The amount and distribution of nitrogen fertilizer applied to the sorghum farms is shown in Figure 14. The sorghum participants had the option to apply nitrogen as pre-plant and/or fertigation. All teams opted to apply nitrogen using both methods; however, one farm (Farm 8) fertigated only 2 times, one farm (Farm 4) fertigated four times, and the rest fertigated three times. All farms opted to fertigate at growth stage 4 and 5; whereas only farms 3 and 4 fertigated at growth stage 2. Pre-plant nitrogen was applied eight days prior to planting and contributed between 35 and 63% of the total prescribed nitrogen.



**Figure 14. Nitrogen application method and amount (lbs per acre) for the individual sorghum farms.**

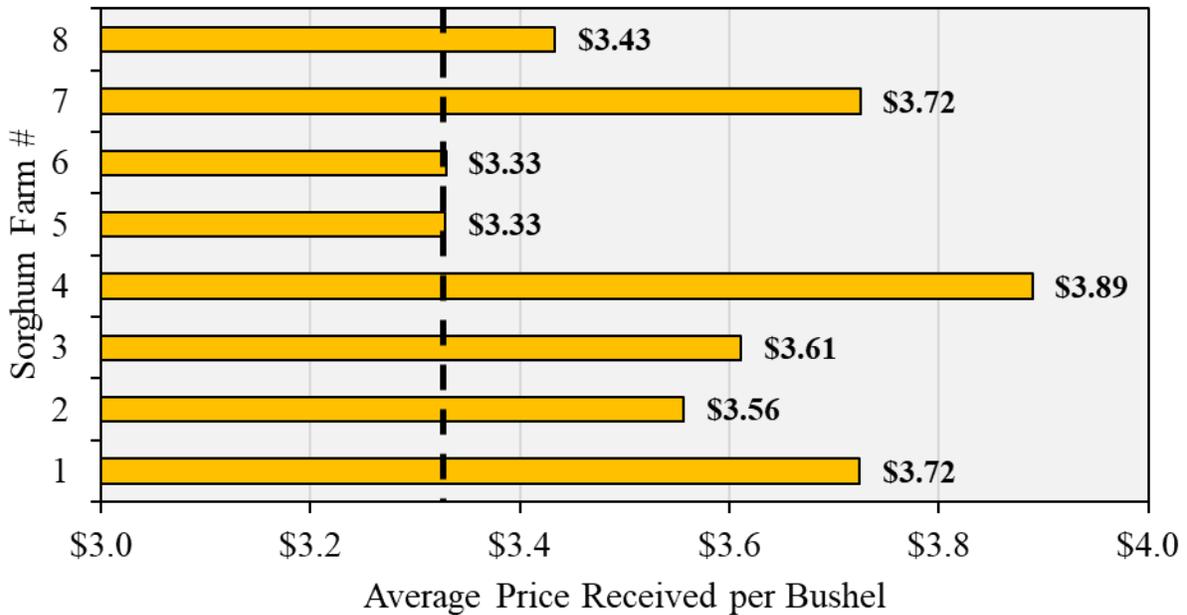
### ***Marketing***

Corn prices hit the high water mark in late spring, May of this year, 2018. Producers who forward contracted and used other pricing mechanisms early were able to take advantage of the market and secure a higher prices than those that waited. The final pricing point for the contest was \$3.26 plus a \$0.01 payment from the government due to the tariff situation. Figure 15 shows each of the average prices by farm. Farm 13 was able to capture \$0.34 a bushel over the base price for its 772,845 bushels of production netting an added value of \$262,767.30. Twenty percent of the farms (five of the twenty) did no marketing other than selling at harvest, the \$3.27 base price. The best any of these base priced farms could do in generating revenue was sixth highest which was due to high yields relative to many of the other farms. The top revenue generating team grossed \$989.32 per acre while the sixth highest revenue farm grossed \$908.94 per acre a difference of more than \$80.00 per acre.



**Figure 15. Average price received per bushel for the corn farm teams. The black dashed line represents the base price if grain was sold at market close value of \$3.27 per bushel.**

Grain sorghum prices followed a similar pattern as corn and five of the eight teams were able to capture some of the early year prices. However two of the farms did not premarket any grain and received only the base price of \$3.33. Farm 4 did the best in capturing the most value per bushel, making on average \$0.56 a bushel above the base price. This difference amounted to an additional \$100,268 for its 179,050 bushels of grain sorghum produced. Each of the farms average received market price per bushel is graphically illustrated in Figure 16. The farm with the highest revenue had a per acre revenue of \$696.64, while the farm with the highest revenue using the base price was \$607.23, nearly \$90.00 per acre less, or netting nearly \$90,000 more in revenue.



**Figure 16. Average price received per bushel for the sorghum farm teams. The black dashed line represents the base price if grain was sold at market close value of \$3.33 per bushel.**

## **RESULTS AND DISCUSSION**

### **Corn Competition:**

#### ***Greatest Grain Yield***

The individual corn farm grain yields ranged from 137.6 (control Farm 12) to 288.5 bu/acre (Farm 7) with an average of 258.1 bu/acre, not including the control farm. Favorable growing conditions allowed for high yielding corn. All farms with the exception of Farms 12 and 17 exceeded the field's APH of 225 bu/acre (Figure 17). The maximum yield of 288.5 bu/acre was grown with Hybrid Pioneer 1197 AM planted at a population of 34,000 seeds per acre, and belongs to the Perkins Group, Farm 7. Team members of the Perkins group include: Ted Tietjen, Shawn Turner, Ron Hagan, Rick Salsman, Bruce Young, Jim Kemling, Troy Kemling, Curt Richmond, Bill Richmond, and Brent Gloy. Congratulations Perkins group!

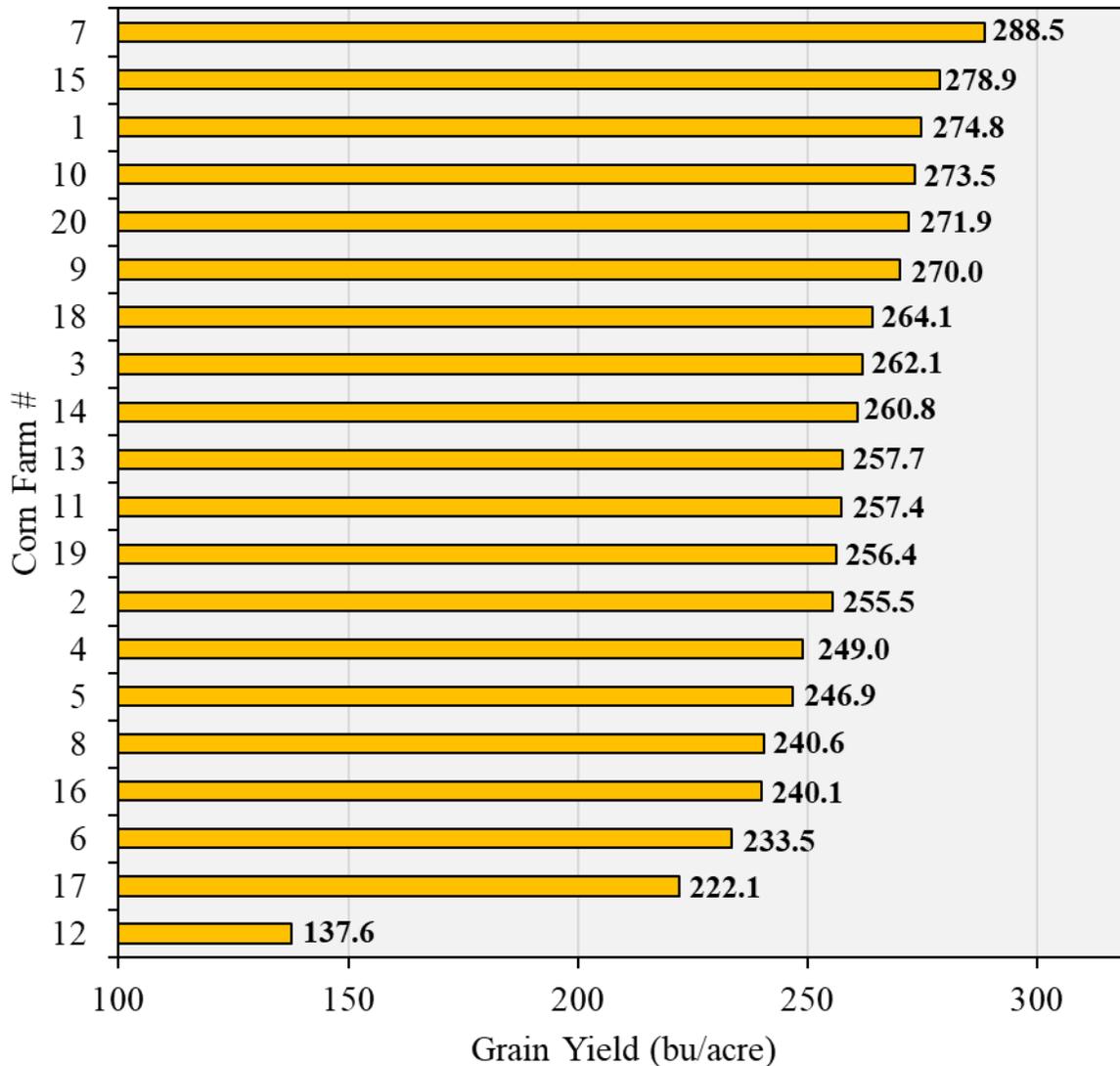


Figure 17. Grain yield (bu/acre) adjusted to 15.5% moisture content for the individual corn farms.

**Highest Input Use Efficiency**

Input use efficiency was quantified using the Water × Nitrogen Intensification Performance Index (WNIPI), which evaluates each farm relative to the control farm (Farm 12) that received no irrigation or nitrogen fertilizer. The WNIPI promotes effective irrigation and nitrogen management without sacrificing production and profitability. The WNIPI essentially evaluates the increase in yield above the control farm relative to the increase in inputs above the control farms water use (evapotranspiration, ET) and above ground nitrogen uptake. A higher WNIPI value indicates higher efficiency and a lower value indicates lower efficiency. The WNIPI equally weights the influence of irrigation and nitrogen fertilizer on efficiency, so therefore, both inputs have to be managed well to receive a high value.

The WNIPI values (and their ranking) for the individual corn farms are presented in Table 1, along with seasonal irrigation, nitrogen fertilizer, and grain yield. The WNIPI values ranged from 0.178 (Farm 8) to 0.267 (Farm 15) with an average and median of 0.215 and 0.211, respectively. The WNIPI values are graphically displayed relative to grain yield, irrigation, and nitrogen fertilizer in Figure 18. As can be seen,

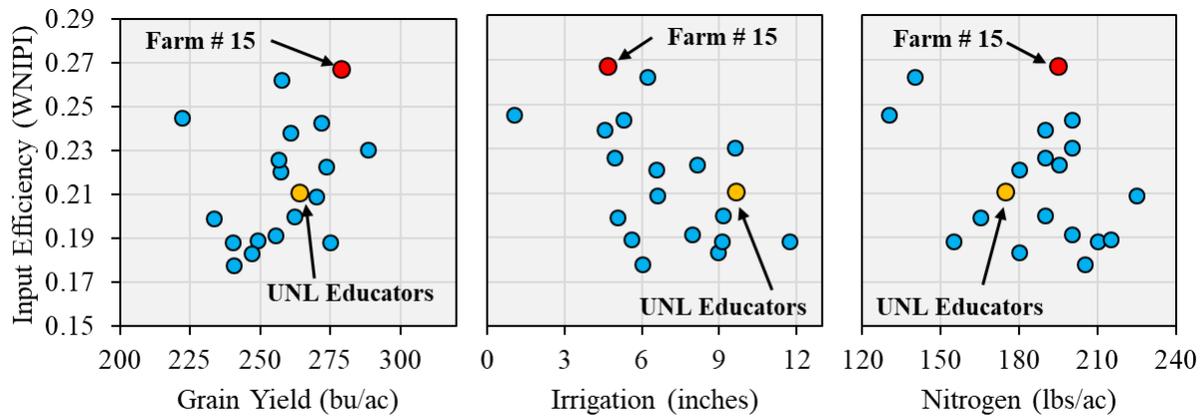
there is scatter in the WNIPI data relative to yield and inputs, which is somewhat expected as the index accounts for the interacting effects of inputs on yield. A few general observations, WNIPI tended to increase with increasing yield response and penalized higher applications of inputs due to the reduction of yield increase relative to input. As a reference, the UNL educator team, Farm 18, is shown in Figure 18. The UNL educator team followed the UNL nitrogen algorithm and triggered their irrigation using the AquaSpy soil moisture probe. Consequently, they ranked 10<sup>th</sup> in efficiency with a WNIPI value of 0.211.

**Table 1. Seasonal irrigation (inches), nitrogen fertilizer (lbs/acre), grain yield (bu/acre) adjusted to 15.5% moisture content, Water × Nitrogen Intensification Performance Index (WNIPI), and final efficiency ranking for the individual corn farms.**

<b>Farm #</b>	<b>Irrigation (inches)</b>	<b>Nitrogen (lbs/ac)</b>	<b>Grain Yield (bu/ac)</b>	<b>WNIPI (unitless)</b>	<b>Efficiency Ranking</b>
----- Corn Competition -----					
1	11.70	210	274.8	0.188	16
2	7.95	200	255.5	0.191	14
3	9.15	190	262.1	0.200	12
4	5.60	215	249.0	0.189	15
5	8.95	180	246.9	0.183	18
6	5.05	165	233.5	0.199	13
7	9.60	200	288.5	0.230	6
8	6.00	205	240.6	0.178	19
9	6.60	225	270.0	0.209	11
10	8.15	195	273.5	0.223	8
11	6.55	180	257.4	0.221	9
12	0.00	0	137.6	-	-
13	6.20	140	257.7	0.263	2
14	4.55	190	260.8	0.238	5
15	4.70	195	278.9	0.267	1
16	9.10	155	240.1	0.188	17
17	1.05	130	222.1	0.245	3
18	9.65	175	264.1	0.211	10
19	4.95	190	256.4	0.226	7
20	5.30	200	271.9	0.243	4

The highest WNIPI value and winner of the input use efficiency award was Tim Schmeackle, Farm 15. Tim planted DynaGro 52VC91 at a seeding rate of 34,000 per acre. His irrigation amount of 4.70 inches fell below the irrigation requirement range for maximum production; whereas, his nitrogen amount of 195 lbs/acre was between the UNL nitrogen algorithm and Ward Laboratory recommendations. Although, irrigation was below the estimated irrigation range, it had minor effect on yield response as his farm yielded the second highest with 278.9 bushels per acre. With the exception of fertigation, Tim did not initiate

irrigation until July 9<sup>th</sup> and concentrated most of his water in mid-July and early to mid-August. His nitrogen management consisted of applying a base rate of 75 lbs/acre as pre-plant and then fertigating 30 lbs/acre at V9, V12, VT, and R2. Congratulations to Tim Schmeackle, as he has won highest input use efficiency two years in a row.



**Figure 18. Input use efficiency (Water × Nitrogen Intensification Performance Index) of the corn farms compared against grain yield (bu/acre), irrigation (inches), and nitrogen fertilizer (lbs/acre). The most efficient farm (Farm 15) is highlighted in red and the UNL Educator team (Farm 18) is highlighted in yellow.**

### ***Most Profitable Farm***

Farm profitability ranged from a positive \$279.61 to a \$134.42 per acre (Figure 19). All nineteen competing teams showed a net profit. The magnitude of this number was little affected by the federal governments marketing compensation program. This compensation was set at \$0.01 per bushel which amounted to approximately \$2.58 per acre for Farm 13, the winning team with a profit of \$279.61 per acre. The next most profitable competitor, Farm 7, had only about \$1.86 per acre less in profit. While Farm 7 had superior yields with 288.4 bushels per acre versus Farm 13's 257.6 bushels per acre, and lower costs, amounting to about \$0.05 per bushel, it was the \$0.18 per bushel average market value that pushed Farm 13, NDEQ, to win. Congratulations team NDEQ!

The most profitable farm was not the highest yielding team, nor the lowest cost, but it did have respectable yields, costs in the lower ranges, and the highest average market value, compared to its competitors. Farm 15, did have the lowest per bushel costs, and better yields then the winner, but it marketed its whole crop at the base price and was therefore was unable to capture the win. The base price was \$3.27 per bushel, which resulted in this team only rising to third place. If Farm 15 had been able to increase average market price by \$0.064 (six point four cents) it would have been the most profitable. For this farm that would have meant achieving an average market price of just over \$3.33, which seems quite doable given the results. Much like last year's outcome it is balance in cost control, productivity, and marketing that bring about the best results.

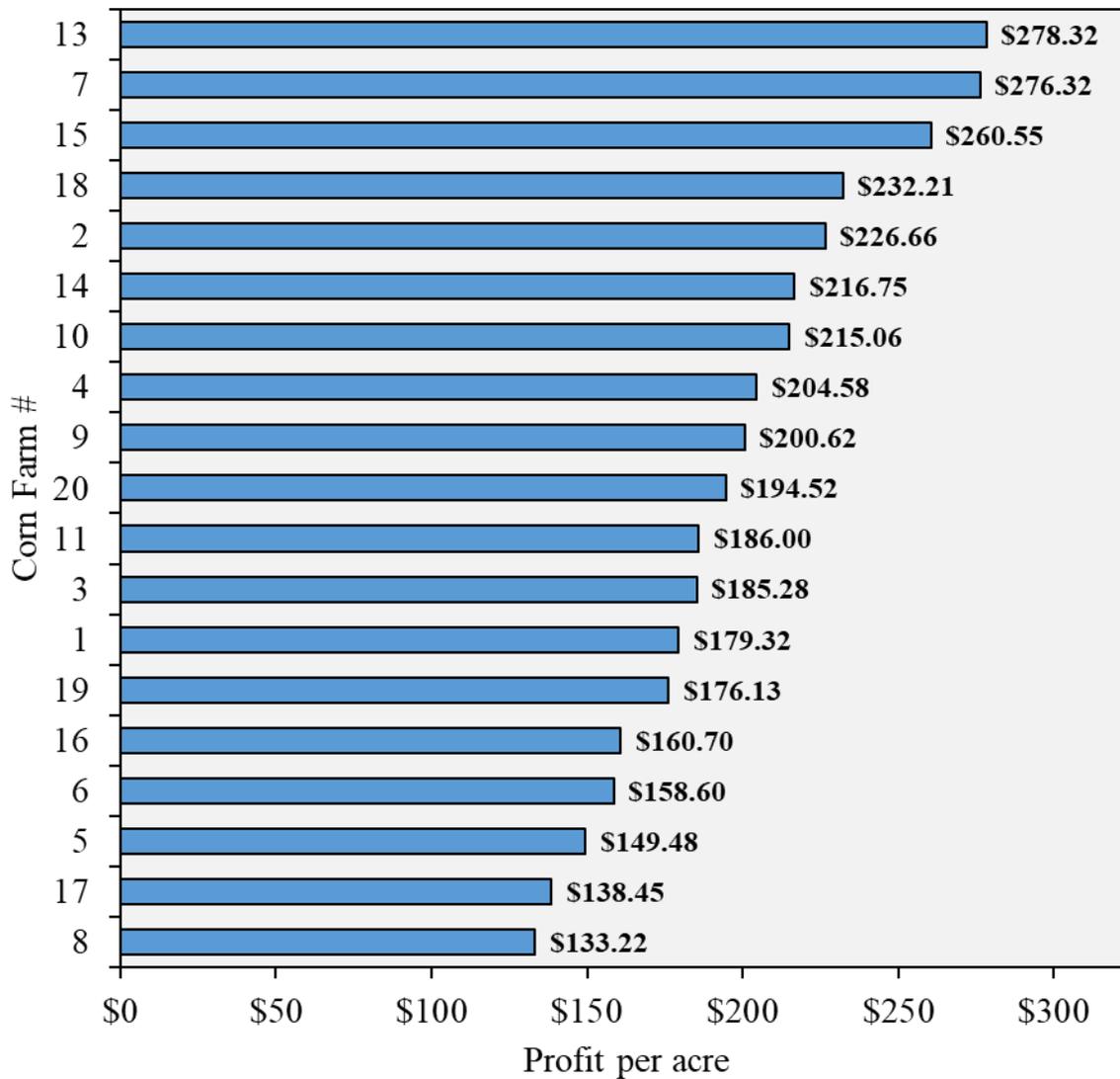


Figure 19. Profitability (\$ per acre) for individual corn farms ranked from highest to lowest.

**Sorghum Competition:**

***Greatest Grain Yield***

Yields from the sorghum farms ranged from 117.2 (control Farm 1) to 182.4 bu/acre (Farm 6) with an average of 171 bu/acre, not including the control farm (Figure 20). The two highest yielding teams were Farms 4 and 6, both of which planted Pioneer 84G62. Slater Chandler, Farm 6, had the greatest yield with

3.5 inches of irrigation, 180 lbs/acre of nitrogen, and a seeding rate of 125,000. Congratulations Slater Chandler!

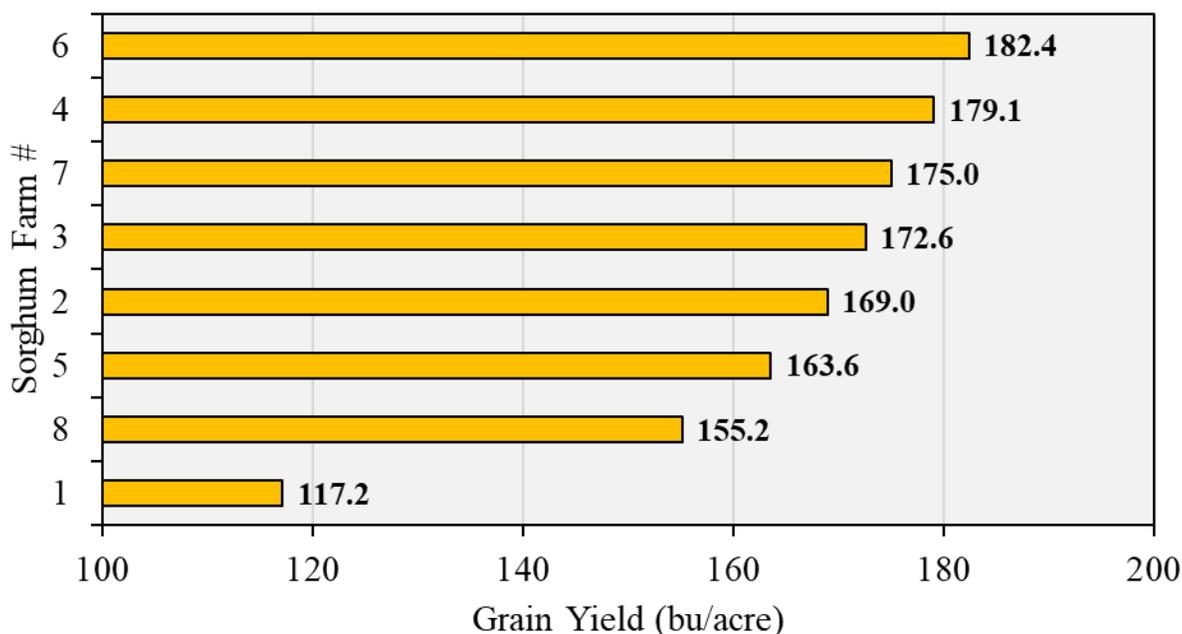


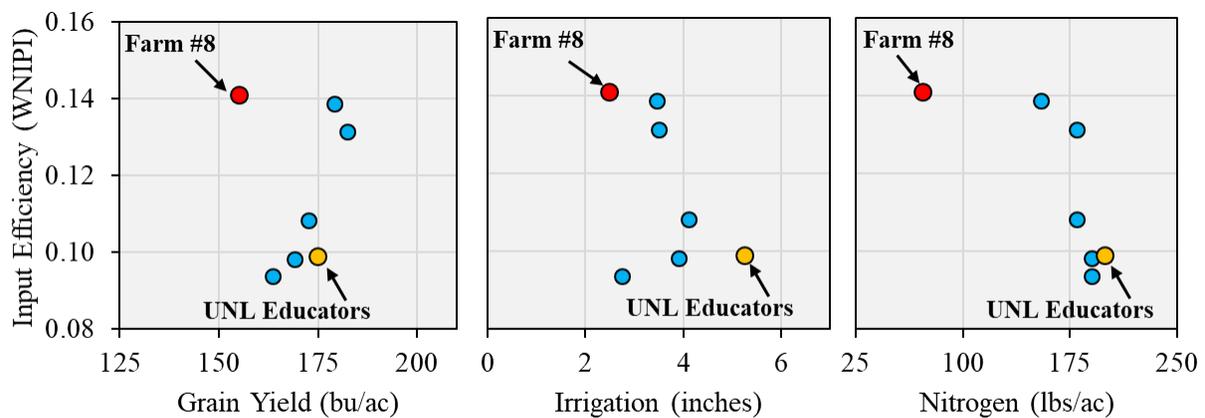
Figure 20. Grain yield (bu/acre) adjusted to 14% moisture content for the individual sorghum farms.

### ***Highest Input Use Efficiency***

The WNIPI values (and their ranking) for the individual sorghum farms are presented in Table 2, along with seasonal irrigation, nitrogen fertilizer, and grain yield. The WNIPI values are graphically displayed relative to grain yield, irrigation, and nitrogen fertilizer in Figure 21. The most efficient team, Farm 8, and the UNL Educator team, Farm 7, are highlighted in Figure 21. The sorghum WNIPI values ranged from 0.094 (Farm 5) to 0.141 (Farm 8) with an average value of 0.101. The most efficiency sorghum farm award goes to Tracy Zink, Farm 8. Tracy went with a low input production approach by applying a seasonal total of 2.5 inches of irrigation, 72 lbs/acre of nitrogen fertilizer, and planting of Fontanelle G6192 at a seeding rate of 76,500. Although, Tracy had a lower yield her efficiency was highest among the competing teams due to the increase in yield above the control farm relative to the inputs applied. Another noteworthy team was Farm 4, who had the second highest efficiency with a WNIPI value of 0.139. Farm 4 had higher inputs with 3.45 inches of irrigation, 155 lbs/acre of nitrogen, and 81,000 seeds per acre; however, they had a similar percent increase in grain yield above the control farm relative to the increase in inputs. One contributor to this increase was that the Pioneer 84G62 hybrid had a higher yield response to irrigation than the Fontanelle G6192 hybrid. Congratulations Tracy Zink!

**Table 2. Seasonal irrigation (inches), nitrogen fertilizer (lbs/acre), grain yield (bu/acre) adjusted to 14% moisture content, Water × Nitrogen Intensification Performance Index (WNIPI), and final efficiency ranking for the individual sorghum farms.**

Farm #	Irrigation (inches)	Nitrogen (lbs/ac)	Grain Yield (bu/ac)	WNIPI (unitless)	Efficiency Ranking
1	0.00	0	117.2	-	-
2	3.90	190	169.0	0.098	6
3	4.10	180	172.6	0.108	4
4	3.45	155	179.1	0.139	2
5	2.75	190	163.6	0.094	7
6	3.50	180	182.4	0.131	3
7	5.25	200	175.0	0.099	5
8	2.50	72	155.2	0.141	1



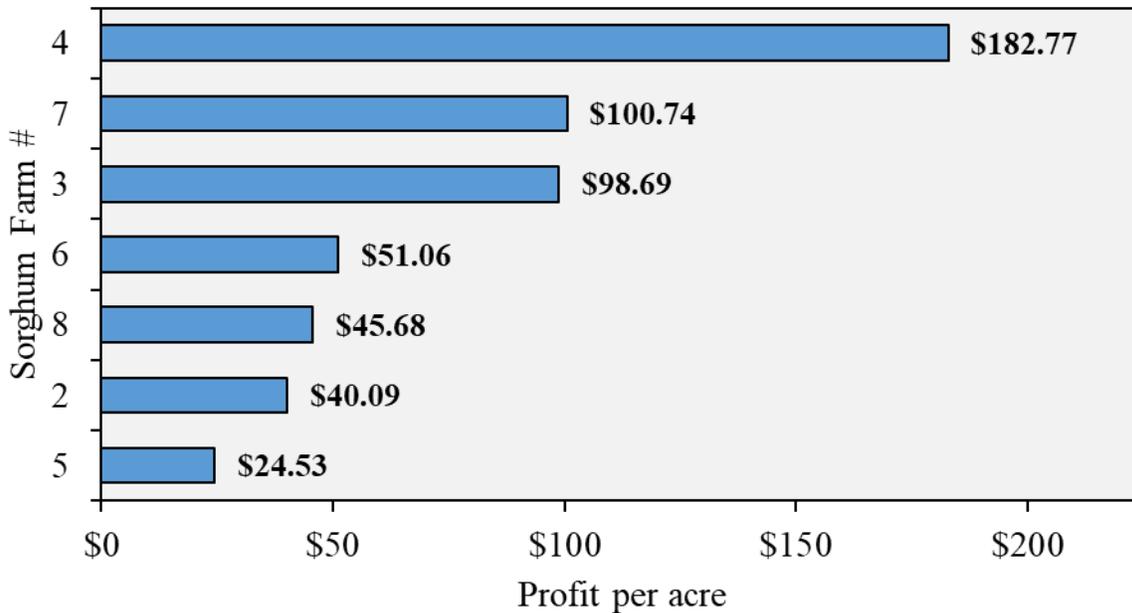
**Figure 21. Input use efficiency (Water × Nitrogen Intensification Performance Index) of the sorghum farms compared against grain yield (bu/acre), irrigation (inches), and nitrogen fertilizer (lbs/acre). The most efficient farm (Farm 8) is highlighted in red and the UNL Educator team (Farm 7) is highlighted in yellow.**

### ***Most Profitable Farm***

Farm profitability ranged from a positive \$182.77 to a \$117.20 per acre (Figure 22). All Eight farms showed a net profit. The magnitude of this number is partly the result of the federal governments marketing compensation to farmers for the loss in the market due to the current tariff situation. This compensation was set at \$0.46 per bushel which amounted to \$76.99 per acre for Farm 4. The farm with the greatest compensation was Farm 6 with \$78.41 per acre of compensation. The lowest producing farm, Farm 1 received close to \$50.38 per acre. Farm 4, Brian Ballou, was the most profitable with \$182.77 per acre. The next most profitable competitor, Farm 3, was nearly half as profitable at \$98.69 per acre. This was due to three factors: 1) Lower yields, 2) Lower average market value, and 3) Higher costs. To achieve the same proportional costs of production per bushel Farm 3 would have had to lower cost by more than \$0.27 per bushel, from \$3.04 to \$2.77. To breakeven with the winning team, Farm 3, would have to simultaneously

increase average market price to \$3.83 per acre, this assume their current yield. Congratulations Brian Ballou!

The most profitable farm was not the highest yielding team, but it did have high yield compared to its competitors. Notably Farm 4, did have the lowest per bushel costs of all the farms indicating it was the most costs efficient and effective. However what really drove profits for the winning team was their superior average marketing price which exceeded the next best by nearly \$0.28 per bushel. Translated into per acre value, Farm 4 had a \$73.40 per acre advantage in revenue and \$10.68 per acre advantage in reduced costs compare to the next best team, Farm 3.



**Figure 22. Profitability (\$ per acre) for individual sorghum farms ranked from highest to lowest.**

## Summary

The 2018 TAPS Irrigated Corn and Sorghum Farm Management Competitions provided great insight into various management strategies that can lead to profitable and efficient grain production. In addition, the competitions highlights the challenges associated with accounting for and managing of various inputs. This banquet report serves as a summary of the management decisions made and the resulting outcomes relative to grain yield, input use efficiency of water and nitrogen fertilizer, and farm profitability. Following this report, a more comprehensive report and discussion will be provided on the decisions made along with supporting data generated from technology provided by industry.

# Thank you 2018 TAPS Partners

## Seed Companies



## Non-Profit Entities



## Commodity Boards & Regulatory Agencies



## Financial Institutions



## Agricultural Industries





UNIVERSITY OF  
**Nebraska**  
Lincoln

**[www.TAPS.unl.edu](http://www.TAPS.unl.edu)**  
**West Central Research and Extension Center**  
**University of Nebraska-Lincoln**  
**402 West State Farm Road**  
**North Platte, NE 69101**

