UNL TAPS
TESTING AG PERFORMANCE SOLUTIONS

2024

Farm Management Competitions Report






USDA United States Department of Agriculture
Natural Resources Conservation Service

N EXTENSION

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ACKNOWLEDGEMENT

The TAPS program is successful in large part due to the contributions of many affiliates. We greatly appreciate each of these people for their assistance with the program. Contributing members from across the University of Nebraska's system bring a wealth of knowledge and support, as well as cohorts from the TAPS programs in Colorado, Kansas and Oklahoma. We would also like to thank our summer field assistants.

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 farms, farm businesses, and farm families to maintain profitability, sustainability, and productivity.

EXECUTIVE SUMMARY

The University of Nebraska – Lincoln's Testing Ag Performance Solutions (UNL-TAPS) program has celebrated another impactful year, advancing agricultural innovation and expanding its offerings to meet the evolving needs of the industry.

Now in its eighth year, the UNL-TAPS program hosted numerous competitions across four locations in Nebraska. West Central Research, Extension and Education Center (WCREEC) in North Platte, NE, facilitated two contests: sprinkler irrigated corn, and continuous corn. The grain sorghum competition was facilitated near Grant, NE. This year, UNL-TAPS expanded its Nebraska lineup with a new soybean competition at the Eastern Nebraska Research, Extension, and Education Center (ENREEC) near Mead, NE.

Across all Nebraska competitions, over 130 participants joined from six states (Nebraska, Wyoming, Oklahoma, Washington, Minnesota, and Michigan) and from overseas in Kenya and Luxembourg (Figure 1). Participants included producers, government agency professionals, students, and more, with both first-time and returning competitors engaging in the program.

The TAPS program continues to expand its innovative approach to agricultural management through competition, moving beyond Nebraska to neighboring states. After successfully establishing competitions in Oklahoma and Colorado, the program made its debut in Kansas in 2024. This growth reflects the TAPS program's commitment to fostering collaborative learning and advancing farm management practices across the region, offering teams unique opportunities to benchmark their skills, test strategies, observe other teams' results, and build skills in diverse agricultural environments. Looking ahead, TAPS is already exploring additional sites for 2025, further broadening its reach and impact in empowering the industry with hands-on, data-driven decision-making experiences.

We extend our gratitude to all who contribute to the UNL-TAPS program's success, including producers, commodity boards, ag service providers, regulatory agencies, financial institutions, and additional supporting organizations. This award-winning program continues to bring together industry expertise and Extension research with real-world grower experiences, fostering connections and shared knowledge in crop production.

Special thanks go to our sponsors, including the Nebraska Corn Board, Nebraska Soybean Board, Sorghum Checkoff, Nebraska Sorghum Board, and the USDA-NRCS. We are equally grateful to the organizations and individuals who generously provide resources, expertise, and innovative approaches to advance the TAPS mission (Figure 2).

We look forward to your continued participation as we explore and face new opportunities and challenges to learn, connect, and grow.

Sincerely,

The UNL-TAPS Team

PROGRAM OVERVIEW

The UNL-TAPS competitions facilitated at the UNL facilities in North Platte, Mead and Grant are the focus of this report. The competitions include the 8th annual Sprinkler Irrigated Corn competition, the 7th annual Sorghum competition, the 1st annual Continuous Corn competition and the 1st annual Soybean competition. The sprinkler irrigated corn and continuous corn competitions were facilitated at the West Central Research, Extension and Education Center (WCREEC) in North Platte, NE. The sorghum competition was located at the Henry J. Stumpf International Wheat Center near Grant, NE. The first year of the soybean competition was facilitated at the Eastern Nebraska Research, Extension and Education Center (ENREEC) near Mead, NE. The sprinkler irrigated corn competition included 38 teams, while the continuous corn competition had 13 teams, the sorghum competition had 12 teams, and the soybean competition had 18 teams (Figure 1). Each team was randomly assigned an experiment-sized plot replicated multiple times within the respective competition areas, totaling less than one-half of an acre per team, and referred to as a "farm". University personnel managed the competition plots under the supervision of the TAPS team.

Decisions that teams were required to make varied in each competition and will be discussed in each competition section to follow. Awards also varied for the competitions based on the management decisions teams were tasked with making and will be discussed in the sections to follow.

TECHNOLOGY

One of the primary goals of the TAPS program is to provide teams with an opportunity to use innovative technology and services in a financially risk-free environment. These innovations include equipment, ideas, strategies, new methods, etc. The core concept is for all involved to identify methods, technologies, and/or strategies that might bring financial and/or conservational value to their own operation(s) and to others who learn from them. Teams were provided access to a variety of technology, data, and methods that are designed to help inform production and marketing decisions (Figure 2). The technology provided included in-field and edge-of-field instrumentation, imagery products, sophisticated crop management models, and more. Soil moisture monitoring technology was provided by AquaSpy, CropX, GroGuru, Phytech, RealmFive, Sentek, and Soiltech. In addition, teams had access to several agricultural services and recommendations provided by commercial soil labs, DSMs, and others.

PARTICIPANTS

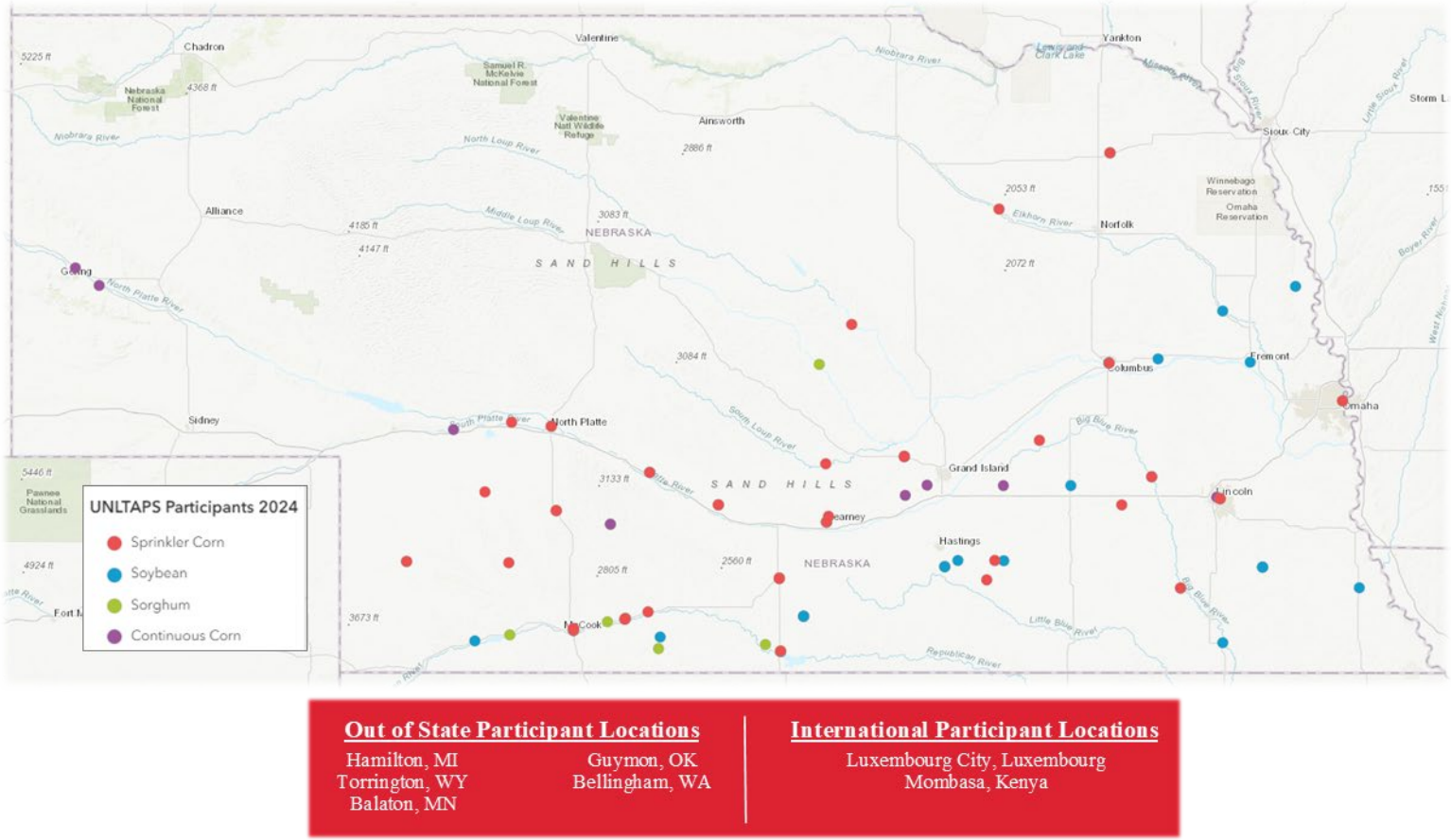


Figure 1. Locations of participants in the 2024 UNL-TAPS Farm Management Competitions, administered in Grant, Mead, and North Platte, Nebraska.

PARTNERS & SPONSORS

Figure 2. The success of the UNL-TAPS program is made possible by the support of its dedicated partners and sponsors. From donating technology and time to install equipment, to supplying seed, and providing financial contributions, each contribution is greatly appreciated.

NORTH PLATTE - PROGRAM OVERVIEW

The two UNL-TAPS competitions facilitated at WCREEC in North Platte, NE, included the Sprinkler Irrigated Corn competition, and the Continuous Corn competition. The competitions were facilitated under a Zimmatic variable rate center pivot irrigation system. The sprinkler irrigated corn competition included 38 teams, while the continuous corn competition had 13 teams. In each competition, the control, Farm 9, did not receive any irrigation or Nitrogen (N) and was used to determine the N and water use efficiency of the competing teams.

A modified University of Nebraska 2024 crop budget was used to estimate costs on a per acre basis. A copy of the crop budget can be found in the appendix at the end of this report. Yields and costs from each "farm" were scaled to represent 3,000 acres for the corn competitions. This "farm" scale provided opportunity and motivation for competitors to develop strategies for marketing grain and to consider the impact their decisions would have on a full-scale operation. These farm sizes are consistent with modern-sized farming operations, providing cognition of the effects even small decisions have on productivity and profitability.

The sprinkler corn competition had eight decisions for the first time in the history of the competition. Cover crop termination and insecticide decisions were added to the original six decisions (Figure 3). In the inaugural year of the continuous corn competition, teams made five decisions (Figure 3). These decisions have a direct effect on productivity, efficiency, and profitability. Each team's decisions were applied to plots in a randomized complete block design and replicated three times.

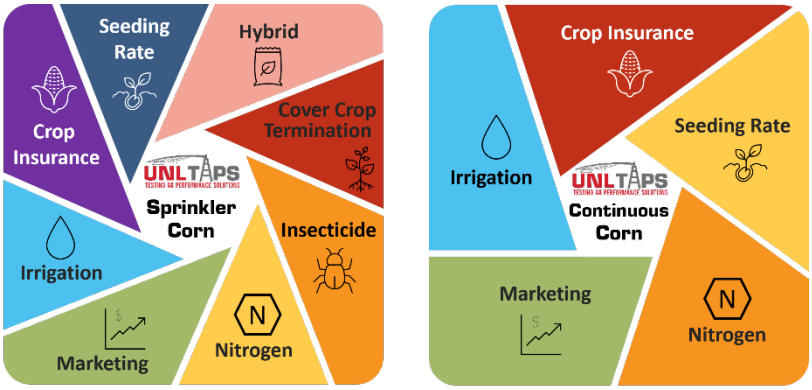


Figure 3. Each competition had a unique set of decisions to make in managing their crop in 2024 as shown for the sprinkler and continuous corn competitions.

Cover Crop Termination Timing (decision #1) – In the sprinkler corn competition, teams were responsible for selecting one of two possible cover crop termination timings. The first was approximately 2 weeks prior to corn planting and the second was at the time of corn planting (±2 days). Cover crops were terminated using 32 fl. oz. per acre glyphosate applied at 15 gallons per acre. The application cost for termination prior to planting was $6/acre and there was no additional charge if termination was done at planting.

Hybrid Selection (decision #2) and Seeding Rate (decision #3*)* – In the sprinkler corn competition, teams selected their own corn hybrid. District Sales Managers (DSMs) of multiple seed companies (Beck's, Channel, Dekalb, DynaGro, Golden Harvest, Hoegemeyer, and Pioneer) provided hybrid and seeding rate

recommendations, which included 32 corn hybrids. These recommendations were based on location, production history, and characteristics of the field used in the competition. While each sprinkler corn team had the option of selecting a DSM recommended hybrid, they were also free to provide their own corn hybrid. Teams who selected a recommended hybrid were provided seed by the respective DSM, otherwise teams provided the seed. In the continuous corn competition, all plots were planted with Pioneer P0622Q. Every team in both of the sprinkler corn and continuous corn competitions selected their seeding rate. The corn competitions were harvested when the majority of hybrids reached a 17% moisture content, consistent with the maximum moisture content elevators allow at harvest. Corn farms were charged a drying fee of $0.04 per bushel for each percentage point above 15.5% moisture content. All yields were adjusted to 15.5% moisture to ensure that yields were measured equally for each team.

Crop Insurance (decision #4*)* – Teams in all competitions were required to select a multi-peril crop insurance (MPCI) package from the following three options: Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), or Yield Protection (YP), using either Optional Units (OU) or Enterprise Units (EU). The available levels of coverage were 65, 70, 75, 80, or 85%. The premium rates were quoted by Farm Credit Services in North Platte. Due to the risk involved in borrowing funds to cover operating costs, a minimum level of 65% MPCI was required.

Nitrogen Management (decision #5) – Teams were able to select the amount of at-plant and/or in-season (via side-dress and/or fertigation) Nitrogen (N) fertilizer in the form of UAN 32%. All plots and competitions received 5 gallons/acre of in-furrow starter fertilizer (10-34-0) at time of planting. At-plant N was available in both competitions and was applied using the Precision Plant Conceal applicator (Precision Planting, Tremont, IL) three inches to the side of the planted row. Side-dress N fertilizer was also available in all competitions and was applied at the ground surface neighboring each crop row using 360° Y-Drop (360° Yield Center, Morton, IL). In the corn competitions, fertigation was applied through the center pivot using a variable rate injection pump (Agri-Inject, Yuma, CO) that maintained proper concentrations, as the irrigation system flow rate changed. The maximum application of N was limited to a total of 180 pounds/acre for at-plant, 180 pounds/acre for side-dress, and 30 pounds/acre for each fertigation event. At-plant, side-dress (V4-V6), and five fertigation events (V9, V12, VT/R1, R2, and R3) were available to both corn competitions. An application cost of $8.50/acre, which did not include the cost of the fertilizer, was charged for the side-dress operation, and $1.25/acre for each fertigation application. No additional application charge was incurred for at-plant nitrogen, as that was included in the cost of planting.

Irrigation Management (decision #6) – The pivot irrigation system was operated every Monday and Thursday mid-June to mid-September for the corn competitions. Teams had until 10 AM on the day of irrigation to submit their decision via their password protected online portal otherwise irrigation was not applied. Irrigation amount per application could be as much as 1.0-inch, in intervals of 0.05 inches.

Grain Marketing (decision #7) – The option to market grain was available to teams in all competitions from April 1 through December 2. Teams in the corn competitions had five different methods to sell their grain. These five options were: 1) spot or cash sales, 2) forward contracts, 3) basis contracts, 4) simple hedge to arrive, and 5) hedging with futures contracts.

Insecticide (decision #8) – In the sprinkler corn competition, teams were able to make decisions on insect pest management at two points during the competition: 1) during hybrid selection, based on the Bt trait package for that hybrid, and 2) whether or not to apply a foliar spray of insecticide at VT,

with a choice between three insecticide products and rates including: 1) Vantacor at 1.2 fl oz/ac, 2) Elevest at 4.8 fl oz/ac and 3) Brigade at 5.0 fl oz/ac. Insect management could have included a variety of pests, but based on local pest pressure history, western bean cutworm was the most likely economically threatening insect. For the foliar insecticide choice, insect monitoring (collection of moths from a black light trap located at WCREEC) and scouting data (inspection of corn plants for the presence of western bean cutworm eggs and larvae) was provided by the entomology research team. Products were to be applied with a spray boom at approximately 95% tasseling. The entomology research team gathered data approximately 28 days after insecticide applications to measure survival of western bean cutworm caterpillars and ear feeding injury to the corn ear.

Other Management Practices – All other management practices, (e.g., tillage practices, herbicides, etc.), were determined using UNL best practices, executed by the TAPS team and were uniformly applied to the competition area. While the TAPS team did the physical management of all farms (e.g., operation of machinery, irrigation systems, application of chemicals, and harvesting) teams were encouraged to actively observe their plots, install additional data collecting technology, and non-destructively collect any additional data from their plots throughout the growing season at their own expense. No additional inputs (e.g., fertilizers, additives, amendments, operations, sprays, etc.) were permitted.

GROWING CONDITIONS

North Platte has a semi-arid climate with the majority of annual precipitation occurring between late-April and mid-October. The predominant soil type at the North Platte site is Cozad silt loam with approximately 1.5 inches/feet of lab-estimated plant available water (i.e., difference between field capacity and permanent wilting point). The 2024 growing season received 13.05 inches from May 1st to September 30th. As compared to the previous seven years of TAPS competitions, this rainfall amount was less than the average of 14.72 inches over the same time period. The North Platte, NE location was not affected by hail or wind damage during the 2024 season.

AWARDS

Each corn competition had three cash awards, 1) Most Profitable Farm, 2) Highest Input Use Efficiency, and 3) Greatest Grain Yield, adjusted based on profitability. Along with the monetary award, all winners also received a plaque, an oversized keepsake check, and a TAPS apparel item. Each award is described in detail below:

1. Most Profitable Award – Profit is the difference between total revenue minus total cost. Since each competitor is managing under identical conditions, it is the individual decisions of the teams that determine profit. Total revenue is obtained by bushels sold multiplied by the prices received as determined by cash sales, forward contracts, hedge-to-arrive or basis contracts, plus all insurance indemnities, and any gain/loss incurred from using futures contracts. The average per acre revenue is the total revenue divided by acres. Costs included fixed costs (in this case the uniform management practices), and variable expenses were those incurred during the season through the execution of the team's individual management decisions. Together these represent total cost. Since all farms in the competition manage the same number of acres, the farm with the most per acre profit is the most profitable.

2. Highest Input Use Efficiency Award – Efficiency is assessed using the Water-Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019) for the sprinkler and continuous corn competitions. The WNIPI metrics were calculated as follows:

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

   where, "Control" is a farm managed by UNL that receives no irrigation or N fertilizer (except for 5 gallons per acre of 10-34-0 at planting applied to the entire field) and "Farm" referenced in the equation for yield, irrigation and N is the farm managed by the teams. "Y" is yield in bushels/acre, "ET" is seasonal evapotranspiration in inch acre/acre, "I" is seasonal irrigation in inch acre/acre, "N" is total seasonal applied nitrogen in pounds/acre, and "ANU" is aboveground (grain and stover) nitrogen uptake in pounds/acre. The farm with the highest value is used to determine the winner.

3. Greatest Grain Yield Award – The cash prize for Greatest Grain Yield is adjusted by the highest yielding team's percentage of total possible profit. Total possible profit was the range of difference between the most and least profitable farms.

Sprinkler Corn Competition

This year 38 teams participated in the sprinkler corn competition, including nearly 100 participants from throughout Nebraska, Wyoming, Minnesota, Oklahoma, Washington and Michigan, as well as an international team from the country of Luxembourg (Figure 1). Within the 38 teams, there were six that were non-competitive teams used for benchmarking UNL recommendations and research. Farm 9 was the control used for determining the water and N efficiency. Farms 32 through 35 and 38 have been excluded from this report as their management decisions are not directly comparable to the competing teams. Farm 36 is included in the report but is a non-competing team managed by UNL.

Field Design

As in past years, each team was assigned three randomized plots (Figure 4) located at the intersection of Highway 83 and State Farm Road in North Platte, NE.

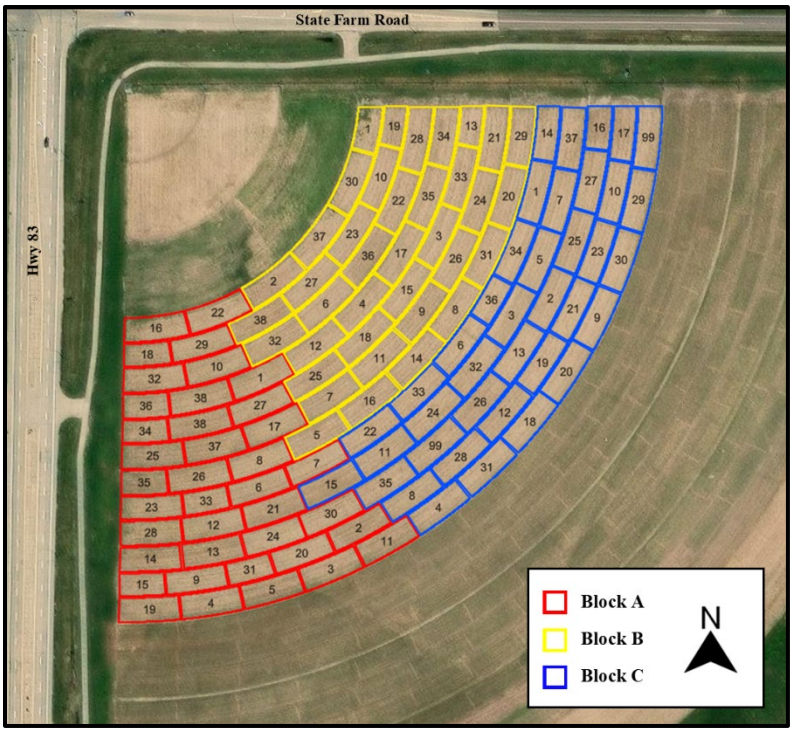


Figure 4. Layout for the sprinkler corn competition held at the WCREEC in North Platte, NE. Each team was assigned a randomized plot in blocks A, B, and C.

Competition Data

In mid-March, aggregate soil samples were collected from each block across the TAPS competition field. Ward Laboratories in Kearney, NE analyzed the samples, and the results (Table 1) were provided to teams before the start of the growing season.

Table 1. Soil sample results for the sprinkler corn competition field.

Sample ID / Lab No.	Soil pH 1:1	Soluble Salts 1:1 mmho/cm	Excess Lime Rating	Organic Matter LOI-%	KCl Nitrate ppm N	Depth / Nitrate Lbs N/A	Method / Phosphorus ppm P	-Ammonium Acetate- K ppm	Ca ppm	Mg ppm	Na ppm	M-3 Sulfate ppm S	----------DTPA---------- Zn ppm	Fe ppm	Mn ppm	Cu ppm	Sum of Cations me/100g	% Base -----Saturation----- H	K	Ca	Mg	Na
1 A SC						0 - 8 in	M-3															
46663	7.5	0.08	NONE	2.7	8.0	19	54	413	1904	276	16	9.5	1.41	5.5	1.7	0.34	13.0	0	8	73	18	1
2 A SC						8 - 36 in																
46664					8.5	71																
3 B SC						0 - 8 in	M-3															
46665	6.8	0.10	NONE	2.4	10.7	26	36	468	1667	306	19	11.2	1.56	9.6	3.3	0.49	12.2	0	10	68	21	1
4 B SC						8 - 36 in																
46666					9.6	81																
5 C SC						0 - 8 in	M-3															
46667	7.6	0.13	LOW	2.4	8.5	20	28	412	2027	300	16	10.0	1.17	4.3	1.5	0.35	13.8	0	8	73	18	1
6 C SC						8 - 36 in																
46668					11.4	96																

On July 12th, leaf tissue samples were collected from 12 plants in each plot outside of the yield determining rows to measure leaf tissue nitrogen. Plant maturity for the plots averaged VT. Samples were processed and analyzed at Ward Laboratories. The results (Figure 5) were made available to teams via their TAPS online portal prior to the last three fertigation opportunities.

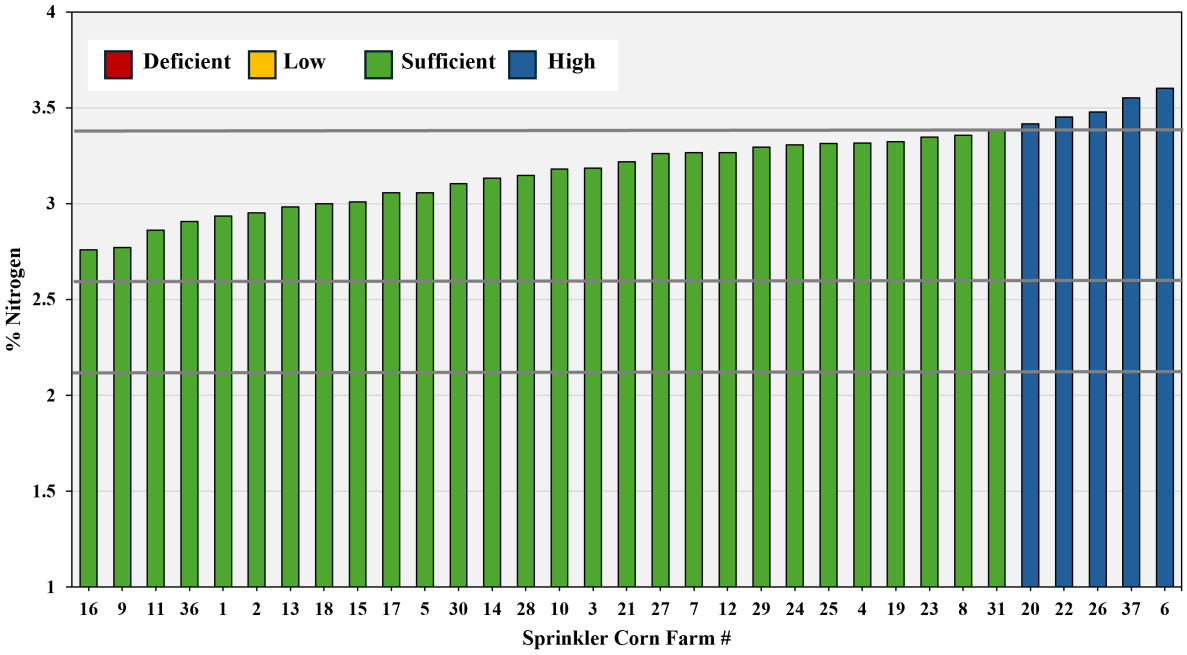


Figure 5. Average leaf tissue nitrogen for the sprinkler irrigated corn competition at VT growth stage.

Decisions

All decisions were submitted by teams via the TAPS online password protected portal that time-stamped all decisions. The decisions and resulting outcomes are summarized below.

Agronomic Decisions

Agronomic decisions made by each team are shown in Table 2. For the second year in the sprinkler corn competition, SoilBuilder Cool Season Fall Cover Crop Mix was drilled on September 27 following soybean harvest. This year, teams were tasked with deciding when to terminate the cover crops using glyphosate. The large majority (25) of the teams chose to terminate the cover crops two weeks prior to planting, on April 17. The remaining eight teams decided to terminate near planting on May 8.

Sixteen different corn hybrids were selected from six seed companies and planted on May 7 (Table 2). Seven hybrids were selected by more than one team: Pioneer P1366AML, Pioneer P1185AM, Pioneer P1170AM, Dekalb DKC59-82RIB, Channel 212-02VT2PRIB, Golden Harvest G11V76-AA, and Dekalb DKC62-89RIB. Pioneer P1366AML, P1185AM, P1170AML, and Dekalb DKC59-82RIB were each selected by four teams, making those hybrids the most used options. Two teams provided their own hybrids, Preceon Smart Corn and Pioneer P12904Q. Golden Harvest G11V76-AA, chosen by Farms 8 and 12, had the lowest cost at $250/bag, while Pioneer P12904Q, chosen by Farm 23, had the highest cost at $330/bag. Farm 24 had the lowest seeding rate at 30,000 seeds/acre and planted hybrid Channel 212-02VT2PRIB. The highest seeding rate of 36,000 seeds/acre was planted by Farms 13, 21 and 37 using Dekalb DKC59-82RIB, Channel 212-02VT2PRIB, and Preceon PR111-20SSCVT2PRIB, respectively.

Total N fertilizer applied ranged from 0 to 320 pounds/acre (Table 2). On average, 22% of N was applied at planting, 32% at side-dress, and the remaining 46% was applied over the five fertigation options with 7%, 9%, 12%, 11% and 7% applied on June 26, July 3, 25 and 31, and August 7, respectively.

The irrigation season opened on June 17, although the first irrigation request was June 20, and the season concluded on September 19. Teams were allowed to irrigate up to 1 inch twice a week. Three irrigations were cancelled due to rainfall events (two in July, and one in August). Excluding the control, seasonal irrigation ranged from 0.00 inches, Farm 13, to 14.68 inches, Farm 24, while the average applied across all teams was 7.91 inches (Table 2). Irrigation totals include the water applied during fertigation operations (0.1 inch of water per 10 pounds N). More information about the irrigation applications can be found in the appendix at the end of this report.

Of the 33 sprinkler corn teams, 23 chose not to apply any foliar insecticide. Nine teams, Farms 3, 5, 6, 10, 15, 17, 20, 29 and 31 opted for Brigade and one team, Farm 24, chose Vantacor. Subsequent evaluations revealed minimal reduction in feeding injury from WBC across all plots that had been sprayed, suggesting that, under low infestation conditions, there was no economic benefit of insecticide applications. Additionally, corn hybrids expressing the Vip3A Bt protein provided effective control against WBC without the need for additional insecticide treatments. To learn more about these findings, please visit the November, 21, 2024 CropWatch article at go.unl.edu/zsdpv.

Table 2: Summary of select agronomic inputs from the 2024 TAPS sprinkler corn competition.

Farm #	Hybrid Name	Seeding Rate (1,000/ac)	Cover Crop Termination	Insecticide	Nitrogen Fertilizer May 7	Jun 14	Jun 26	Jul 3	Jul 25	Jul 31	Aug 7	Total	**Irrigation (in)
					---------- (lbs/ac) ----------								
1	Pioneer P1170AM	33	Prior To	None	50	120	30	0	30	30	0	260	1.26
2	Pioneer P1366AML	32.5	At Plant	None	30	50	30	0	30	30	10	180	9.32
3	Channel 212-02VT2PRIB	34	Prior To	Brigade	80	80	0	10	10	15	0	195	8.18
4	Golden Harvest G14B65-DV	34	Prior To	None	80	50	10	10	5	30	30	215	12.46
5	Pioneer P1170AM	33	At Plant	Brigade	0	150	0	20	30	0	20	220	10.24
6	Dekalb DKC59-82RIB	34	At Plant	Brigade	102	0	30	0	30	30	0	192	8.96
7	Pioneer P1366AML	31	At Plant	None	55	40	30	30	0	0	0	155	5.64
8	Golden Harvest G11V76-AA	33	Prior To	None	45	0	30	0	30	0	30	135	4.61
*9	Pioneer P1366AML	34	Prior To	None	0	0	0	0	0	0	0	0	0
10	Pioneer P0859AM	34.5	Prior To	Brigade	50	150	20	0	10	0	15	245	11.23
11	Pioneer P1185AM	34	Prior To	None	40	70	20	30	30	30	30	250	7.74
12	Golden Harvest G11V76-AA	33.5	Prior To	None	0	60	30	30	30	10	10	170	13.18
13	Dekalb DKC59-82RIB	36	Prior To	None	0	0	0	0	0	0	0	0	0
14	Pioneer P1185AM	31	Prior To	None	0	85	0	30	30	25	0	170	8.75
15	Beck's 5871AM	33	Prior To	Brigade	30	70	10	10	30	15	10	175	7.81
16	Pioneer P1185AM	34	Prior To	None	0	20	0	30	30	30	0	110	7.76
17	Pioneer P1170AM	32	Prior To	Brigade	60	60	0	30	0	0	0	150	4.62
18	Dekalb DKC62-89RIB	34	Prior To	None	0	0	0	30	30	30	0	90	7.71
19	Dekalb DKC62-89RIB	31	Prior To	None	80	0	0	0	30	30	0	140	6.59
20	Channel 211-70TRERIB	32	Prior To	Brigade	0	60	30	30	30	30	30	210	11.20
21	Channel 212-02VT2PRIB	36	Prior To	None	0	120	0	0	0	30	0	150	4.07
22	Golden Harvest G11V76-AA	33.5	At Plant	None	120	50	0	10	25	30	30	265	13.96
23	Pioneer P12904Q	34	Prior To	None	50	50	30	30	30	30	30	250	11.10

Farm #	Hybrid Name	Seeding Rate (1,000/ac)	Cover Crop Termination	Insecticide	Nitrogen Fertilizer May 7 (lbs/ac)	Jun 14	Jun 26	Jul 3	Jul 25	Jul 31	Aug 7	Total	**Irrigation (in)
24	Channel 212-02VT2PRIB	30	Prior To	Vantacor	100	100	30	30	20	30	10	320	14.68
25	Channel 213-81DGVT2PRIB	32	At Plant	None	50	0	0	30	30	30	0	140	7.96
26	Dekalb DKC59-82RIB	31	At Plant	None	0	45	30	30	30	30	30	195	4.60
27	Dekalb DKC61-41RIB	34	Prior To	None	100	75	30	0	30	0	30	265	6.96
28	Pioneer P1170AM	34	Prior To	None	65	0	30	30	30	30	20	205	8.89
29	Dekalb DKC110-41RIB	33	Prior To	Brigade	0	120	0	0	30	0	0	150	6.72
30	Pioneer P1185AM	34.5	Prior To	None	40	40	0	20	0	30	30	160	6.95
31	Dekalb DKC59-82RIB	34	At Plant	Brigade	53	62	20	0	30	30	0	195	8.85
36	Pioneer P1366AML	34	Prior To	None	25	30	0	30	30	30	30	175	7.13
37	Preceon PR111-20SSCVT2PRIB	36	Prior To	None	0	100	0	25	30	0	0	155	3.94

*Control ** "Irrigation" includes both irrigation and water applied with fertigation applications.

Note: Farms 32, 33, 34, 35, 38 were non-competing teams and were omitted from this report.

Economic Decisions

Teams were required to select a multi-peril crop insurance (MPCI) policy, either revenue protection (RP), yield protection (YP), or revenue protection with harvest price exclusion (RP-HPE). These policies were all offered at the 65, 70, 75, 80 and 85% levels of coverage. No additional insurance options were available. Twenty-one teams chose RP policies, seven went with RP-HPE policies and four selected a YP policy (Figure 6). Of all the competitors five used Optional Units (OU), while the others all opted for Enterprise Units (EU). Eight teams used RP-EU at 75% coverage, the most widely used policy. The average cost across all competitors was $13.74/acre. The least expensive policy was RPHPE-EU at 65% coverage ($2.88/acre), selected by Farms 8, 16, and 28. The most expensive was RP-OU at 85% coverage ($58.47/acre), by Farm 1.

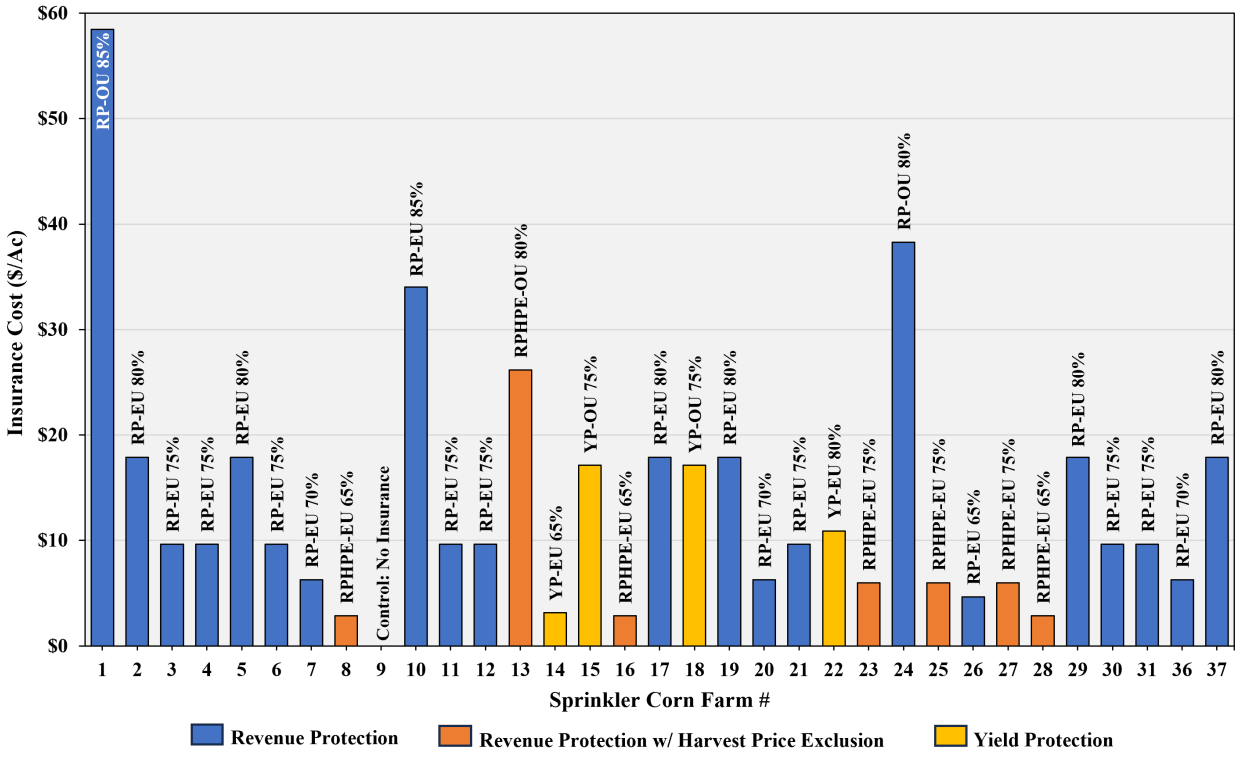


Figure 6. Insurance cost ($/acre) for the individual sprinkler irrigated corn competition teams. Policies offered included Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), and Yield Protection (YP) with either Optional Units or Enterprise Units.

Closely tied to insurance is the risk related to forward pricing and sales of grain. Teams are encouraged to take advantage of seasonal price trends and events that often make early season marketing decisions such as forward contracting, hedging, basis contracts and hedge-to-arrive tools economically advantageous. They are however limited to market only expected production, represented by trend adjusted Average Production History (APH). These four tools and spot cash sales had to be completed during the time period of April 1 through December 2.

The 2024 TAPS marketing year saw December corn futures drop from close to $5.00/bushel in January to below $4.00/bushel in August and September. During this same period the previous year, futures prices ranged from more than $6.25/bushel to as low as $4.68/bushel. These past two years have shown a downward trend toward lower prices. The supply of corn versus the demand for corn has continued to expand. As is typically expected this year's harvest price ($4.16/bushel) was lower than the announced spring price ($4.66/bushel). The seasonal price variation provided many opportunities to market corn at higher cash prices than at harvest. These opportunities were generally during the early part of the competition season.

The marketing decisions led to average prices received by teams ranging from $3.88 to $4.42/bushel (Figure 7 and Table 3). Farm 1, whose grain was sold for an average of $4.27/bushel also received an indemnity payment of $0.16/bushel due to the crop insurance the team selected, which ultimately earned them the highest average price per bushel of the season. Six teams chose not to sell any of their production during the season, therefore it was sold at the end of the competition on December 2 at $4.09/bushel. Any unsold grain after the close of the competition incurred a $0.05/bushel handling fee. Two teams, Farms 1 and 13, received indemnity payments based on their low yields and their crop insurance selection. This additional revenue ultimately increased their average market value.

Farm 4 that earned the highest average revenue per bushel without an indemnity payment, initiated eight forward contracts throughout the season, half of which were in April and May. Those four contracts totaled 400,000 bushels at an average of $4.54/bushel which was much higher than the competition average of $4.14/bushel. The remaining four forward contracts were much smaller in quantity, only totaling 215,000 bushels at an average of $4.21/bushel, still higher than that of the competition average. The remaining bushels were sold at the end of the season at $4.09/bushel.

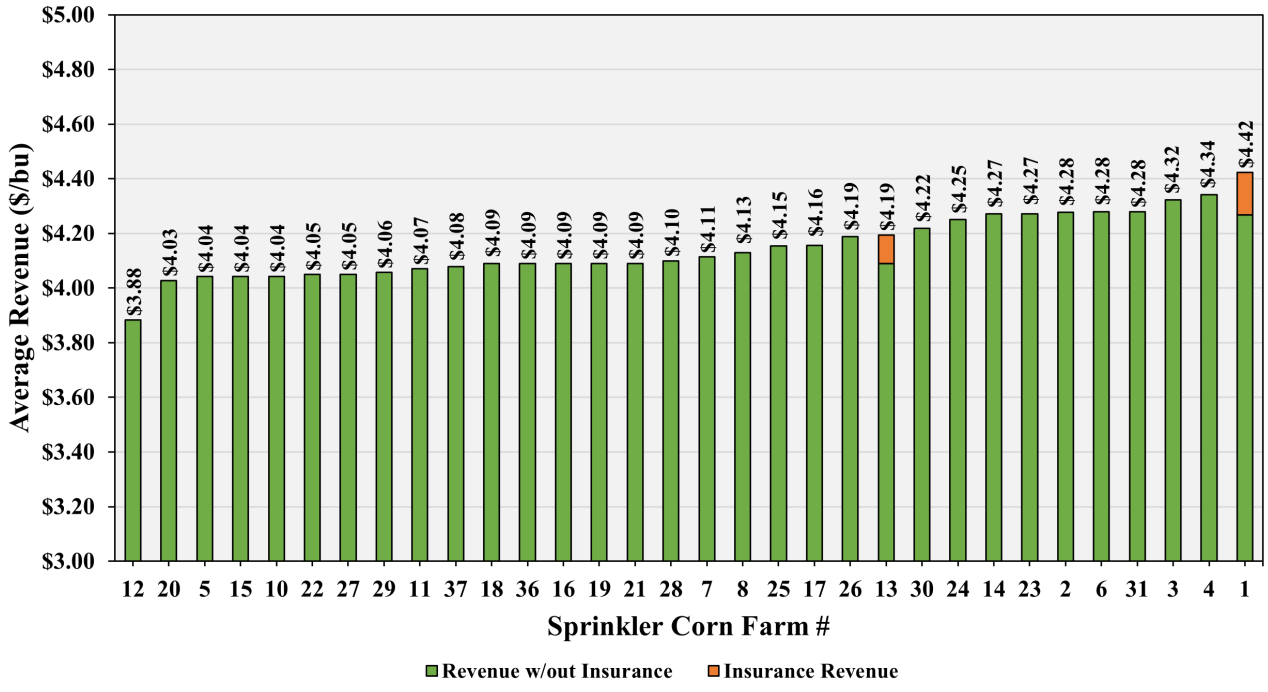


Figure 7. Average revenue received ($/bushel) for the individual sprinkler irrigated corn competition teams.

Results and Rankings

Grain Yield

The grain yields for the competition averaged 262.0 bushels/acre, which was 32 bushels/acre more than the APH of 230 bushels/acre (Table 3). Only four teams had an average yield that fell below the APH. Excluding the control, the teams ranged from 206.1 bushels/acre, Farm 13, to 294.4 bushels/acre, Farm 36 which was UNL's benchmarking team. Figure 8A shows the relationship between grain yield and total N fertilizer applied, with N only accounting for 21% of the variability in grain yield. On the other hand, grain yield was more strongly correlated to irrigation where it explained 52% of yield variability (Figure 8B). Farm 6, that achieved the highest yield of 294.1 bushels/acre applied 8.96 inches of applied water, which was 1.2 inches more than the most efficient team (Farm 16). Farm 6 applied 192 pounds of nitrogen which was 82 pounds more than Farm 16 with a similar yield of 285.3 bushels/acre.

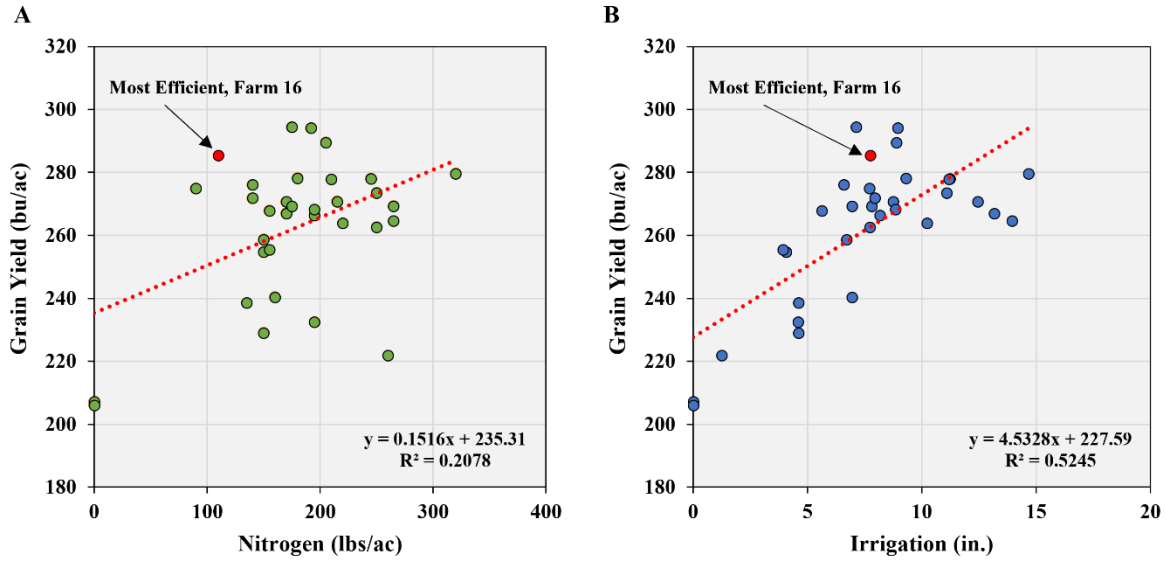


Figure 8. Sprinkler corn grain yield response to seasonal total nitrogen fertilizer (A) and irrigation (B) at the WCREEC in North Platte, NE. The most efficient team as measured by the Water Nitrogen Intensification Performance Index (WNIPI) is denoted in red.

Input Use Efficiency

The Water Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019), was used to quantify input use efficiency (Figure 9 and Table 3). It compares the effect of nitrogen (N) and irrigation input on grain yield with respect to the control. The control is used to calculate the effect on yield from any added water or N fertilizer. The control with no added N or irrigation and yielded 207.1 bushels/acre. Farm 16 had the highest WNIPI score of 0.172 (Table 3). Farm 16 applied 110 pounds of N/acre and 7.76 inches per acre of water, resulting in a yield of 285.3 bushels/acre, which was the third highest yield in the competition. Agronomic Efficiency (AE) measures the bushels gained for each pound of N fertilizer added above the control (Table 3). Farm 16 yielded 78.2 bushels/acre more than the control. When the yield difference is divided by the amount of additional applied N fertilizer (110 pounds/acre), the AE is calculated to be 0.71 bushel per pound of N. This is over double the competition average of 0.34 bushels per pound of N for all other teams. Irrigation Water Use Efficiency (IWUE) is calculated as yield minus control divided by irrigation water applied (Table 3). Farm 16's IWUE was calculated to be 10.1 bushels/acre-inch. The average was 7.75 bushels/acre-inch, for those teams that chose to irrigate. The most efficient farm's yield was 8.5 bushels less than the highest yield but applied 82 pounds less nitrogen and 2.25 inches less irrigation water.

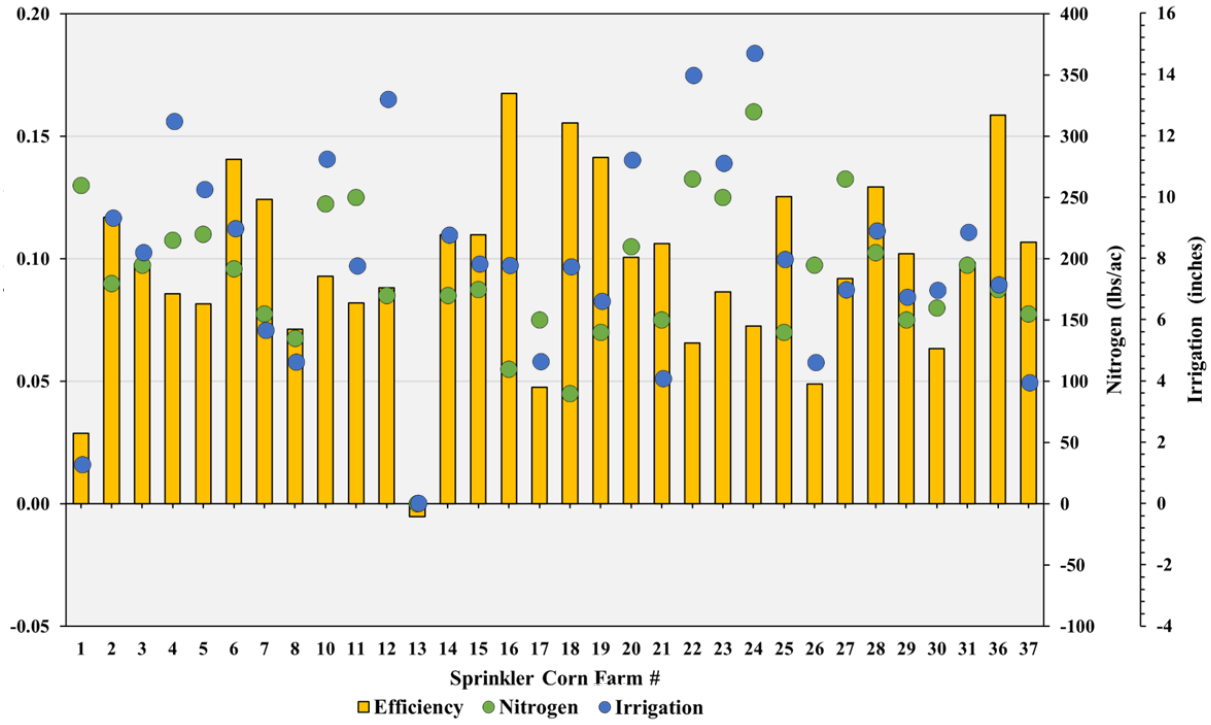


Figure 9. Input use efficiency (WNIPI) compared against irrigation (inches) and N fertilizer (lbs/acre) in the sprinkler corn competition.

Profitability

Profitability is derived as total revenue minus total cost. Revenue was found by adding the total value of each market transaction with any insurance indemnities, and/or losses. Costs were based on the budget each competition was assigned. Most of these costs were fixed on a per acre basis and are common among all teams. However, some costs e.g., grain hauling, fertilizer and water use, insecticide application, were based on a fixed per unit cost and varied by individual management decisions. Since all teams are identical in cost structure, physical attributes, and revenue opportunity it is the choices made and the resulting outcome of those choices that drive the difference in profitability.

Revenue per bushel ranged from a low of $3.88/bushel, Farm 12, to a high of $4.42/bu, Farm 1 (Table 3). Aside from the control, the lowest cost per acre was achieved by Farm 13 at $924/acre (Table 3). The highest cost per acre was Farm 24 at $1,236/acre.

Half of the competing teams were profitable while the other half didn't reach breakeven (Figure 10). With revenue and cost considered, Farm 6 was the most profitable with $178/acre profit, $44/acre more than the second ranked team, Farm 16. The team's high revenue per acre, the highest in the competition, combined with the top yield in the competition, resulted in winning the top award.

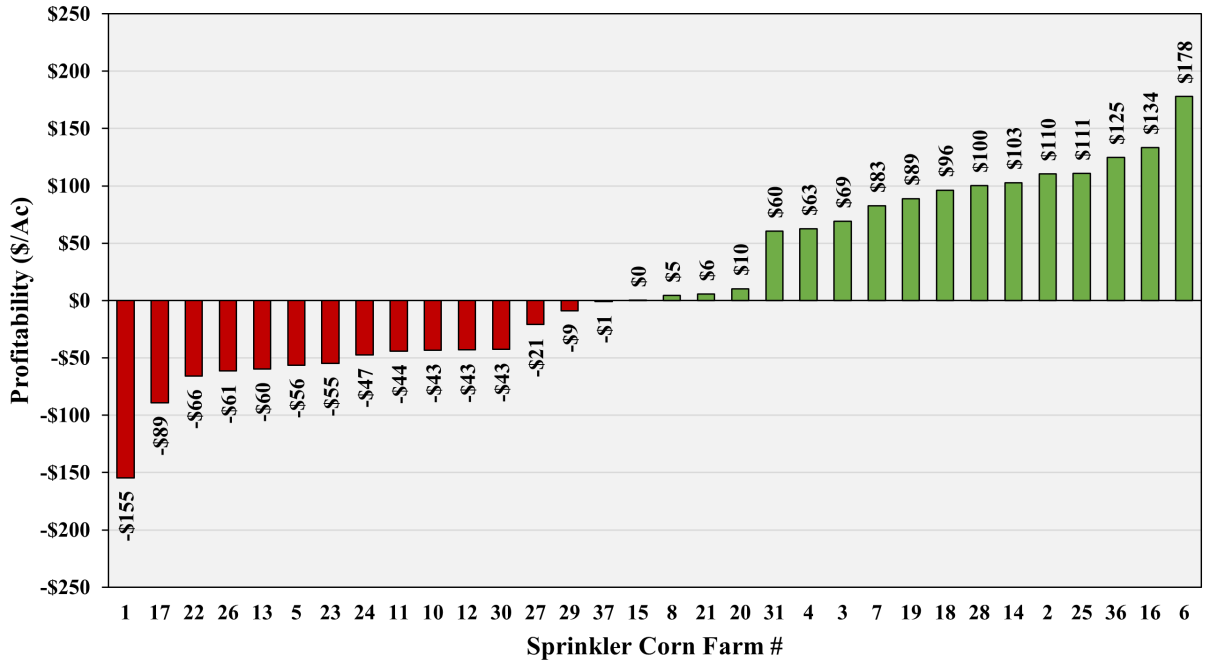


Figure 10. Profit per acre received for the individual sprinkler irrigated corn competition teams.

Table 3: Summary of results from the 2024 TAPS sprinkler corn competition.

Farm #	Grain Yield ** (bu/ac)	Revenue ($/bu)	Cost ($/ac)	Profit ($/ac)	AE (bu/lbs)	IWUE (bu/ac-in)	WNIPI (Unitless)
1	221.8	$4.42	$1136	-$155	0.06	11.63	0.029
2	278.2	$4.28	$1080	$110	0.39	7.63	0.117
3	266.3	$4.32	$1082	$69	0.30	7.23	0.098
4	270.7	$4.34	$1113	$63	0.30	5.10	0.086
5	263.8	$4.04	$1123	-$56	0.26	5.54	0.082
6	294.1	$4.28	$1081	$178	0.45	9.70	0.141
7	267.9	$4.11	$1019	$83	0.39	10.76	0.124
8	238.5	$4.13	$980	$5	0.23	6.81	0.071
*9	207.1	-	-	-	-	-	-
10	278.0	$4.04	$1167	-$43	0.29	6.31	0.093
11	262.6	$4.07	$1113	-$44	0.22	7.16	0.082
12	267.0	$3.88	$1080	-$43	0.35	4.54	0.088
13	206.1	$4.19	$924	-$60	-	-	-
14	270.7	$4.27	$1053	$103	0.37	7.26	0.110
15	269.2	$4.04	$1088	$0	0.35	7.95	0.110
16	285.3	$4.09	$1033	$134	0.71	10.08	0.168
17	229.0	$4.16	$1041	-$89	0.15	4.73	0.048
18	274.9	$4.09	$1028	$96	0.75	8.79	0.156
19	276.1	$4.09	$1040	$89	0.49	10.46	0.141
20	277.8	$4.03	$1108	$10	0.34	6.31	0.101
21	254.7	$4.09	$1036	$6	0.32	11.69	0.106
22	264.6	$4.05	$1137	-$66	0.22	4.11	0.066
23	273.6	$4.27	$1224	-$55	0.27	5.98	0.087
24	279.6	$4.25	$1236	-$47	0.23	4.94	0.073
25	271.8	$4.15	$1018	$111	0.46	8.13	0.125
26	232.5	$4.19	$1035	-$61	0.13	5.50	0.049
27	269.3	$4.05	$1112	-$21	0.23	8.93	0.092
28	289.5	$4.10	$1087	$100	0.40	9.26	0.129
29	258.7	$4.06	$1058	-$9	0.34	7.67	0.102
30	240.4	$4.22	$1056	-$43	0.21	4.78	0.063
31	268.2	$4.28	$1087	$60	0.31	6.90	0.098
36	294.4	$4.09	$1079	$125	0.50	12.23	0.159
37	255.4	$4.08	$1042	-$1	0.31	12.24	0.107

*Control **Reported as 15.5% grain moisture content.

AE - Agronomic Efficiency (yield increase over the control plot, bushels of grain/pounds of N applied)

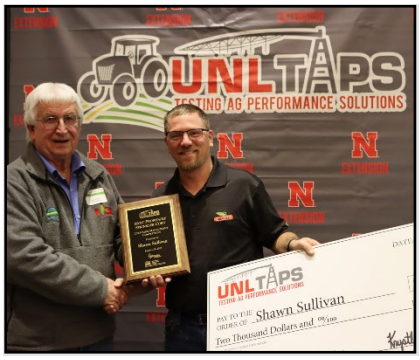
IWUE - Irrigation Water Use Efficiency (yield increase over the control plot, bushels of grain/inches of water applied)

WNIPI - Water-Nitrogen Intensification Performance Index

Note: Farms 32, 33, 34, 35, 38 were non-competing teams and were omitted from this report.

AWARD RECIPIENTS

Photo 1. The ***Greatest Grain Yield Award*** was awarded to Shawn Sullivan of Wallace, NE, Farm 6, with a yield of 294.1 bushels/acre. Sullivan planted Dekalb DKC59-82RIB at a population density of 34,000 seeds/acre. Sullivan also won the ***Most Profitable Award.*** Shawn applied 192 pounds of N and 8.96 inches of irrigation, which led to a yield of 294.1 bushels/acre. The combination of his high yield, along with high revenue per acre, resulted in winning the top award.



Pictured Above: Tom Nathan (L) of the Nebraska Corn Board presented the award to Sullivan (R).

Photo 2. The ***Highest Input Use Efficiency Award*** was won by the Tri Basin Water Watchers, Farm 16. The team included (from L to R) Chris Ecklun, Curtis Scheele, Reed Phillips, Rick Reinsch, Pat Nott, Darrin Swanson (not pictured) and Michael Dibbern (not pictured). The team planted Pioneer P1185AM at 34,000 seeds/acre. They applied 110 pounds of N and 7.76 inches of irrigation, which led to a yield of 285.3 bushels/acre.

Pictured Above: Tom Nathan (Far Left) of the Nebraska Corn Board presented the award to Scheele, Nott and Ecklun (L to R).

Continuous Corn Competition

In the inaugural year of the continuous corn competition 13 teams participated, including more than 20 participants from across Nebraska (Figure 1). Within the 13 teams, there were five that were non-competitive teams used for benchmarking UNL recommendations and research. Farm 9 was the control used for determining the water and N use efficiency. Farms 8, 10 and 11 have been excluded from this report as their management decisions are not directly comparable to the competing teams. Farms 12 and 13 are included in the report but are non-competing teams managed by UNL.

Field Design

Each team was assigned three randomized plots (Figure 11) located at the intersection of Highway 83 and State Farm Road in North Platte, NE.

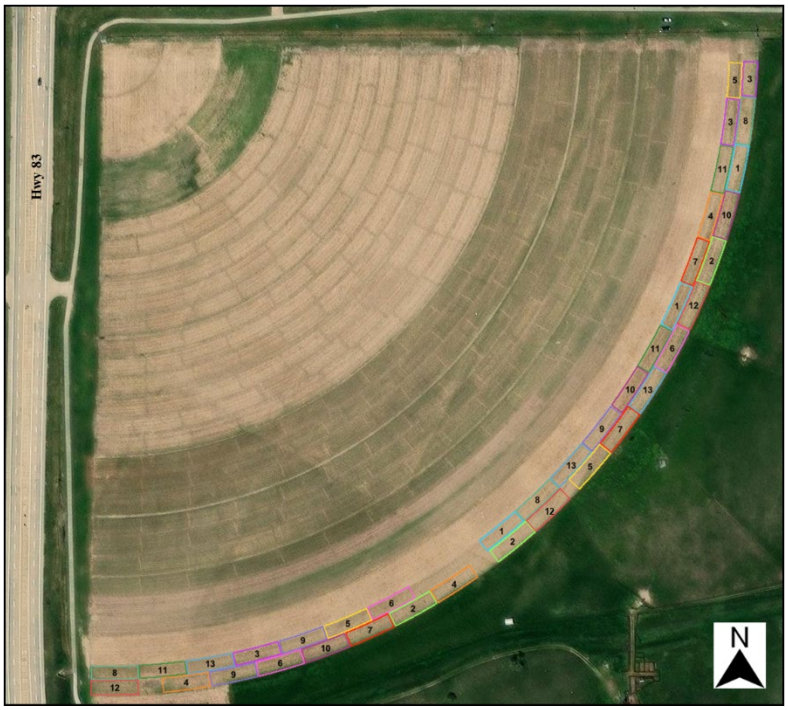


Figure 11. Plot layout for the 2024 continuous corn competition held at the West Central Research, Extension & Education Center in North Platte, NE. Each team had three randomized plots.

Competition Data

In mid-March, three aggregate soil samples were collected from across the TAPS competition field. ReGen Ag Lab in Pleasanton, NE analyzed the samples, and the results (Table 4) were provided to teams ahead of the growing season.

Table 4. Soil sample results for the continuous corn competition field.

Aggregate Sample #1

Lab #	Nitrogen									Phosphorus					
	H3A Extract			H2O Extract						H3A Extract					
	Nitrate ppm NO3-N	Ammonium ppm NH4-N	Inorg. N ppm N	Total N ppm N	Org. N ppm N	Org. N: Inorg. N	Org. N Rel. ppm N	Org. N Res. ppm N	Avail. N lbs/A	Total P ppm P	Inorg. P ppm PO4-P	Org. P ppm P	Org. P Rel ppm P	Org. P Res. ppm P	Avail. P lbs/A
8688	3.2	1.0	4.2	14.0	9.5	2.16	9.5	0.0	33.0	141.7	126.0	15.7	15.7	0.0	325.9
Rank															

Lab #	Other Soil Measures					Fertility									
						H3A Extract									
	Soil pH 1:1	Buffer pH Mod. WDRF	Soluble Salt mmho/cm	Excess Lime	Soil OM % LOI	Potassium ppm K	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Manganese ppm Mn	Iron ppm Fe	Copper ppm Cu	Aluminum ppm Al	Sulfur ppm S
8688	8.0	-	0.09	NONE	2.2	180	913	135	20	1.34	3.0	16	0.09	86	4.31
Rank															

Lab #	Soil Health						Nitrogen Comparison				Reviewer Comments
		H2O Extract					Traditional N lbs/A	Haney N lbs/A	Differ. N lbs/A	Savings N $/A	
	Soil Resp. ppm CO2-C	Org. C ppm C	MAC %	C:N	SHC	Cover Crop Suggestion					
8688	66.7	130	51.2	13.65	10.23	40% Legume 60% Grass	7.7	33.0	25.3	26.35	
Rank											

Aggregate Sample #2

Lab #	Nitrogen									Phosphorus					
	H3A Extract			H2O Extract						H3A Extract					
	Nitrate ppm NO3-N	Ammonium ppm NH4-N	Inorg. N ppm N	Total N ppm N	Org. N ppm N	Org. N: Inorg. N	Org. N Rel. ppm N	Org. N Res. ppm N	Avail. N lbs/A	Total P ppm P	Inorg. P ppm PO4-P	Org. P ppm P	Org. P Rel ppm P	Org. P Res. ppm P	Avail. P lbs/A
8689	3.5	0.5	4.1	14.8	10.3	2.29	10.3	0.0	34.4	150.2	133.0	17.2	17.2	0.0	345.4
Rank															

Lab #	Other Soil Measures					Fertility									
						H3A Extract									
	Soil pH 1:1	Buffer pH Mod. WDRF	Soluble Salt mmho/cm	Excess Lime	Soil OM % LOI	Potassium ppm K	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Manganese ppm Mn	Iron ppm Fe	Copper ppm Cu	Aluminum ppm Al	Sulfur ppm S
8689	8.0	-	0.13	NONE	2.0	192	897	133	17	1.39	4.1	15	0.09	102	4.51
Rank															

Lab #	Soil Health						Nitrogen Comparison				Reviewer Comments
		H2O Extract					Traditional N lbs/A	Haney N lbs/A	Differ. N lbs/A	Savings N $/A	
	Soil Resp. ppm CO2-C	Org. C ppm C	MAC %	C:N	SHC	Cover Crop Suggestion					
8689	55.3	127	43.5	12.36	9.11	50% Legume 50% Grass	8.5	34.4	26.0	27.01	
Rank											

Aggregate Sample #3

Lab #	Nitrogen									Phosphorus					
	H3A Extract			H2O Extract						H3A Extract					
	Nitrate ppm NO3-N	Ammonium ppm NH4-N	Inorg. N ppm N	Total N ppm N	Org. N ppm N	Org. N: Inorg. N	Org. N Rel. ppm N	Org. N Res. ppm N	Avail. N lbs/A	Total P ppm P	Inorg. P ppm PO4-P	Org. P ppm P	Org. P Rel ppm P	Org. P Res. ppm P	Avail. P lbs/A
8690	3.5	0.7	4.2	12.4	7.8	1.68	7.8	0.0	28.8	134.1	116.0	18.1	18.1	0.0	308.3
Rank															

Lab #	Other Soil Measures					Fertility									
						H3A Extract									
	Soil pH 1:1	Buffer pH Mod. WDRF	Soluble Salt mmho/cm	Excess Lime	Soil OM % LOI	Potassium ppm K	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Manganese ppm Mn	Iron ppm Fe	Copper ppm Cu	Aluminum ppm Al	Sulfur ppm S
8690	8.0	-	0.11	NONE	2.2	180	824	133	16	1.30	3.9	16	0.11	95	4.53
Rank															

Lab #	Soil Health						Nitrogen Comparison				Reviewer Comments
		H2O Extract					Traditional N lbs/A	Haney N lbs/A	Differ. N lbs/A	Savings N $/A	
	Soil Resp. ppm CO2-C	Org. C ppm C	MAC %	C:N	SHC	Cover Crop Suggestion					
8690	62.9	108	58.4	13.82	9.22	50% Legume 50% Grass	8.4	28.8	20.4	21.24	
Rank											

On July 12th, leaf tissue samples were collected from 12 plants in each plot outside of the yield determining rows to measure leaf tissue nitrogen. Plant maturity for the plots averaged VT. Samples were processed and analyzed at Ward Laboratories in Kearney. The results (Figure 12) were made available to teams via their TAPS online portal prior to the remaining three fertigation opportunities.

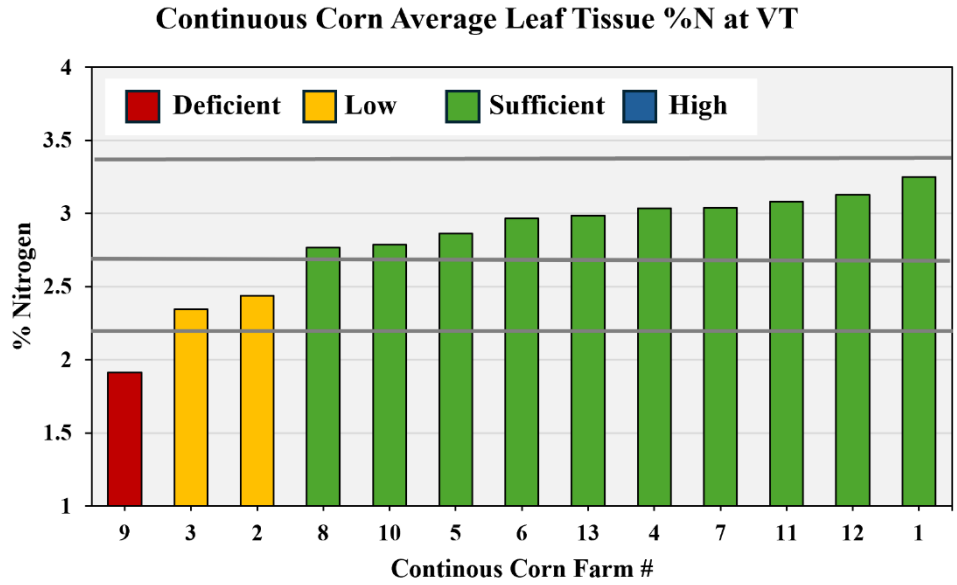


Figure 12. Continuous Corn competition average leaf tissue results for nitrogen at VT growth stage.

Decisions

Teams were responsible for making economic and production management decisions, including insurance coverage, seeding rate, nitrogen and irrigation quantity and timing, and marketing. All decisions were submitted by teams via the TAPS online password protected portal that time-stamped all decisions. The decisions and resulting outcomes are summarized below.

Agronomic Decisions

Agronomic decisions made by each team are shown in Table 5. Unlike other competitions, the teams in the continuous corn competition did not make the hybrid decision in order to understand and evaluate agronomic input variation effects without the influence of hybrid. Therefore, all plots were planted with Pioneer P0622Q. Teams did select their seeding rate. Farm 2 had the lowest seeding rate at 33,000 seeds/acre (Table 5). The highest seeding rate was 36,000 seeds/acre planted by Farms 9, 12 and 13.

The total N fertilizer applied, not including the control, ranged from 110 to 250 pounds/acre (Table 5). On average, 32% of N was applied at planting, 20% as side-dress, and the remaining 48% was applied over the

five fertigation opportunities with 7%, 12%, 12%, 12% and 5% applied on June 26, July 3, 25 and 31, and August 7, respectively.

The teams were given the opportunity to irrigate, starting June 17. However, the first irrigation decision was not submitted until June 27. Irrigation concluded September 19. Excluding the control, irrigation ranged from 5.95 inches, Farm 12, to 11.71 inches, Farm 7, with an average of 8.37 inches (Table 5). Irrigation totals include the water applied during fertigation operations (0.1 inch of water per 10 pounds N). More information about the irrigation applications can be found in the appendix at the end of this report.

Table 5. Summary of select agronomic inputs from the 2024 TAPS Continuous Corn competition.

		Nitrogen Fertilizer								
Farm #	**Seeding Rate (1,000/ac)**	**Apr 30**	**Jun 14**	**Jun 26**	**Jul 03**	**Jul 25**	**Jul 31**	**Aug 07**	**Total**	****Irrigation (in)**
		----------	----------	----------	**(lbs/ac)**	----------	----------	----------	----------	
1	34	120	60	0	20	20	10	0	230	10.23
2	33	0	0	0	30	30	30	30	120	8.78
3	34	20	0	0	0	30	30	30	110	5.96
4	35.3	50	0	30	30	0	30	0	140	6.91
5	35	50	50	30	30	30	30	30	250	10.60
6	35	90	0	30	30	30	30	0	210	8.08
7	34	50	75	0	30	30	30	0	215	11.71
*9	36	0	0	0	0	0	0	0	0	0
12	36	110	110	0	0	0	0	0	220	5.95
13	36	55	55	30	30	30	20	0	220	7.12

* Control ** "Irrigation" includes both irrigation and water applied with fertigation applications.
Note: Farms 8, 10 and 11 were non-competing teams and were omitted from this report.

Economic Decisions

Teams were required to select a multi-peril crop insurance (MPCI) policy, either revenue protection (RP), yield protection (YP), or revenue protection with harvest price exclusion (RP-HPE). These policies were all offered at the 65, 70, 75, 80 and 85% levels of coverage. No additional insurance options were available. Five teams chose RP policies, three teams selected an RP-HPE policy, with one team choosing a YP policy (Figure 13). All but one of the competing teams selected to be insured with Enterprise Units (EU), while the other chose Optional Units (OU). Two teams had RP-EU at the 70% level, the most common selection. The average cost across competitors was $9.06/acre. The least expensive policy was RPHPE-EU at 65% coverage ($2.88/acre), selected by Farm 6. The most expensive was RP-EU at 80% coverage ($17.87/acre), chosen by Farm 1.

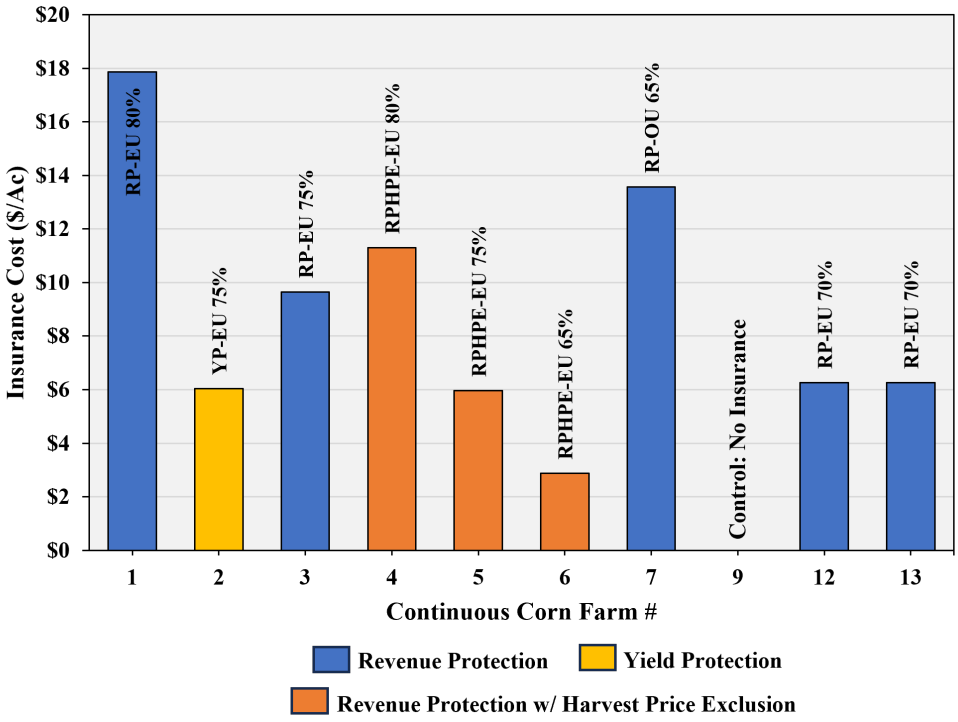


Figure 13. Insurance cost ($/acre) for the individual Continuous Corn competition teams. Policies offered included Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), and Yield Protection (YP) with either Optional Units (OU) or Enterprise Units (EU).

Closely tied to insurance is the risk related to forward pricing and sales of grain. Teams are encouraged to take advantage of seasonal price trends and events that often make early season marketing decisions such as forward contracting, hedging, basis contracts and hedge-to -arrive tools economically advantageous. They are however limited to market only expected production, represented by trend adjusted Average Production History (APH). These four tools and spot cash sales must be done during the time period of April 1 through December 2.

The 2024 TAPS marketing year saw December corn futures drop from close to $5.00/bushel in January to below $4.00/bushel in August and September. In the previous year, prices ranged from more than $6.25/bushel to as low as $4.68/bushel. These past two years have shown a downward trend toward lower prices. The supply of corn versus the demand for corn has continued to expand. As is typically expected this year's harvest price ($4.16/bushel) was lower than the spring price ($4.66/bushel). The seasonal price

variation provided the opportunity to market corn at higher cash prices during the early part of the competition season.

Five teams chose not to sell any of their production during the season, therefore it was sold at the end of the competition at the December 2 price of $4.09/bushel incurring a charge of $0.05/bushel. If a team sold more grain than was produced, those bushels were bought back at the $4.09/bushel price, along with a processing fee of $0.10/bushel. Two teams chose to sell their production using forward or cash sales throughout the season. One team chose to use futures contracts throughout the season and then sell their grain at the end of the season. Farm 7 was the most active throughout the season, using a combination of futures contracts, hedge-to-arrive contracts, forward contracts and a cash sale with most of these contracts initiated in May and June when prices were higher. Two teams, Farms 3 and 4, received an insurance indemnity payment (Figure 14). This was a result of low yields and their selection of higher levels of crop insurance coverage, which ultimately increased their revenue per bushel. The average price received ranged from a low of $4.09 per bushel (Farms 1, 2, 6, 12 and 13) to a high of $4.86 per bushel (Farm 3). The overall average price per bushel across the competition was $4.23/bushel.

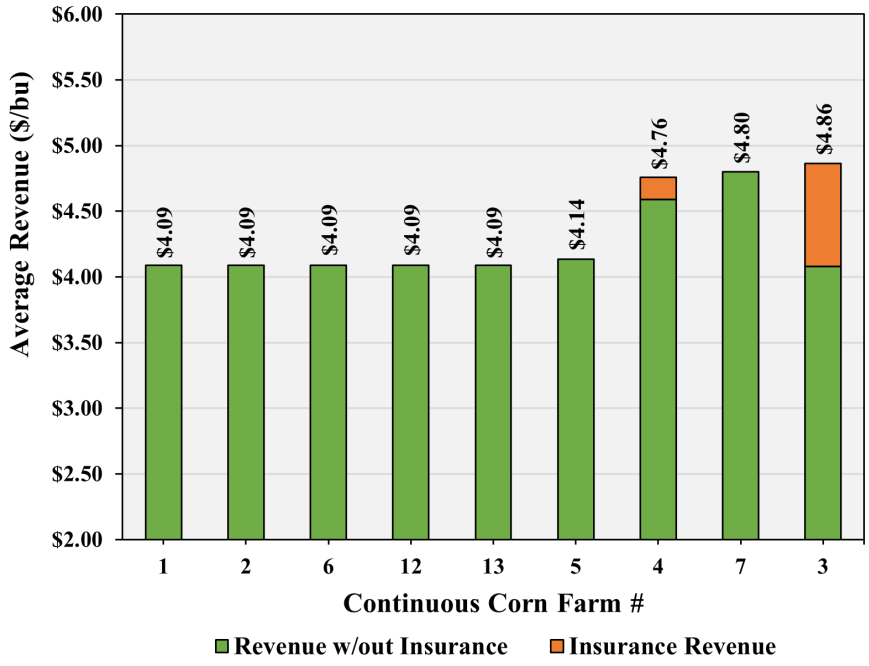


Figure 14. Average revenue received ($/bushel) for the individual Continuous Corn competition teams.

Results and Rankings

Grain Yield

For the continuous corn competition only three teams reached the APH of 230 bushels/acre (Table 6). The average for the ten teams was 200.8 bushels/acre. Excluding the control, the yields ranged from 165.0 bushels/acre, (Farm 3), to 253.1 bushels/acre, (Farm 13). Figure 15A shows that 80% of the grain yield response can be explained by increased N amounts. Grain yields were moderately correlated to irrigation amounts, with irrigation explaining 63% of grain yield variability (Figure 15B).

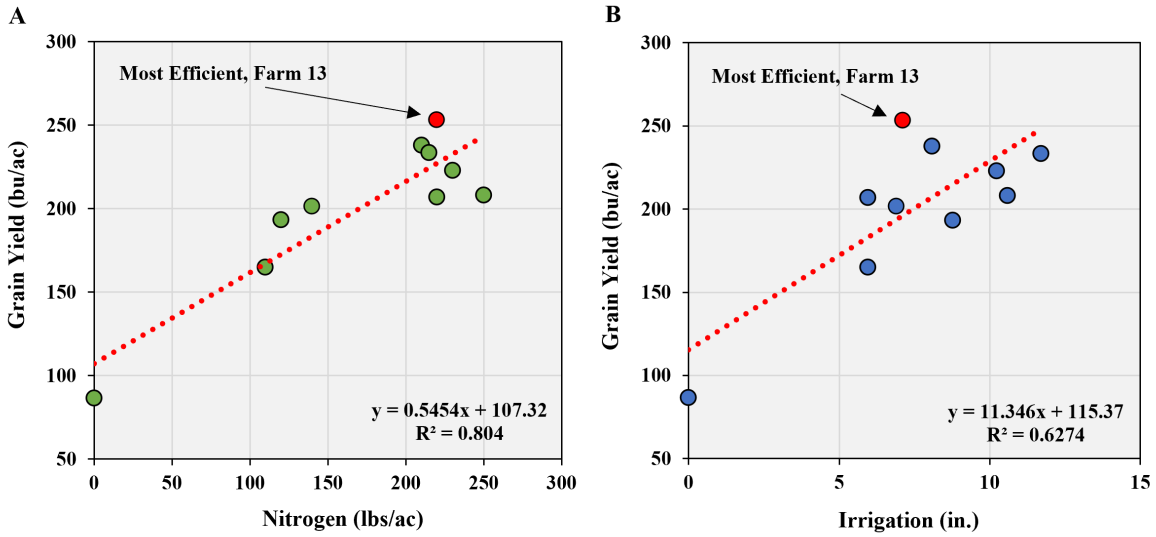


Figure 15. Continuous Corn grain yield response to seasonal total nitrogen fertilizer (A) and irrigation (B) at the WCREEC in North Platte, NE. The most efficient team as measured by the Water Nitrogen Intensification Performance Index (WNIPI) is denoted in red.

Profitability

Profitability is derived as total revenue minus total cost. Revenue was found by adding the total value of each market transaction with any insurance indemnities, and/or losses. Costs were based on the stated expenses each competition was assigned. Most of these costs were fixed on a per acre basis and are common among all teams. However, some costs e.g., grain hauling, fertilizer and water use, were based on a fixed per unit cost and varied by individual team choices. Since all teams are identical in cost structure, physical attributes, and revenue opportunity it is the choices made and the resulting outcome of those choices that drive differences in profitability.

Revenue ranged from a low of $4.09/bushel to a high of $4.86/bushel, Farm 3 (Table 6). Among competing teams, the lowest cost per acre was achieved by Farm 3 at $876/acre (Table 6). The highest cost per acre was Farm 1 at $1,029/acre. Only four of the teams competing ended up earning a profit in the competition.

With revenue and cost considered, Farm 7 was the most profitable per acre, with $116/acre profit. This was nearly $50/acre more than that of the second place team, Farm 13 (Figure 16). Although this team's cost per acre was one of the higher in the competition when combined with the highest revenue per acre and the third place yield it led them to win the Most Profitable Award.

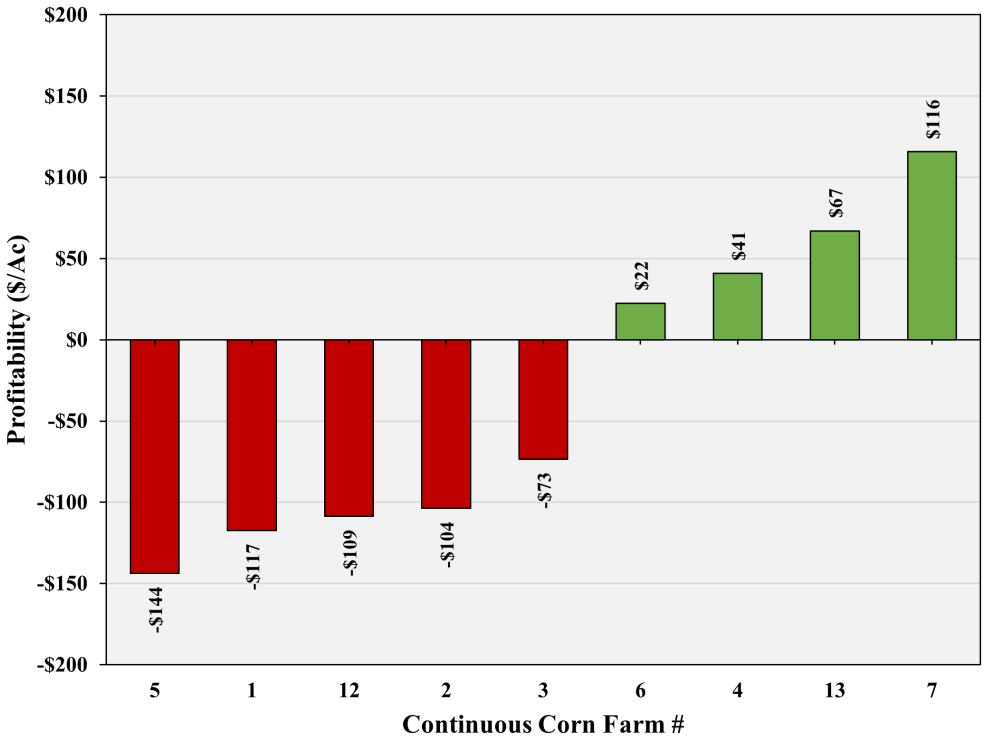


Figure 16. Profit per acre received for the individual Continuous Corn competition teams.

Input Use Efficiency

The Water Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019), was used to quantify input use efficiency (Table 6 and Figure 17). It compares the effect of N and irrigation input on grain yield with respect to a control treatment (0 N and 0 Irrigation). The control, (Farm 9) is a baseline and is used to measure the effect of any added water or N fertilizer, produced 86.5 bushels/acre. Farm 9 has been under continuous corn since 2021 and has had no added N or irrigation during that time. Farm 13 (UNL's Best Management Practices (BMP)) had the highest efficiency with a WNIPI of 0.343. Farm 13 applied 220 pounds of N/acre and 7.12 inches of irrigation resulting in a yield of 253.1 bushels/acre. The Agronomic Efficiency (AE) measures the effect each added pound of N has on yield relative to the unfertilized control (Farm 9). Farm 13 had an AE of 0.76 bushels for every pound of N fertilizer applied (Table 6). This is more than the average of 0.68 bushels/pound of N for all the teams excluding the control. Irrigation Water Use Efficiency (IWUE) measured the effect from each inch of irrigation water on yield relative to the unirrigated control (Table 6). Farm 13's IWUE was calculated to be 23.4 bushels/inch. The overall average was 14.8 bushels/inch.

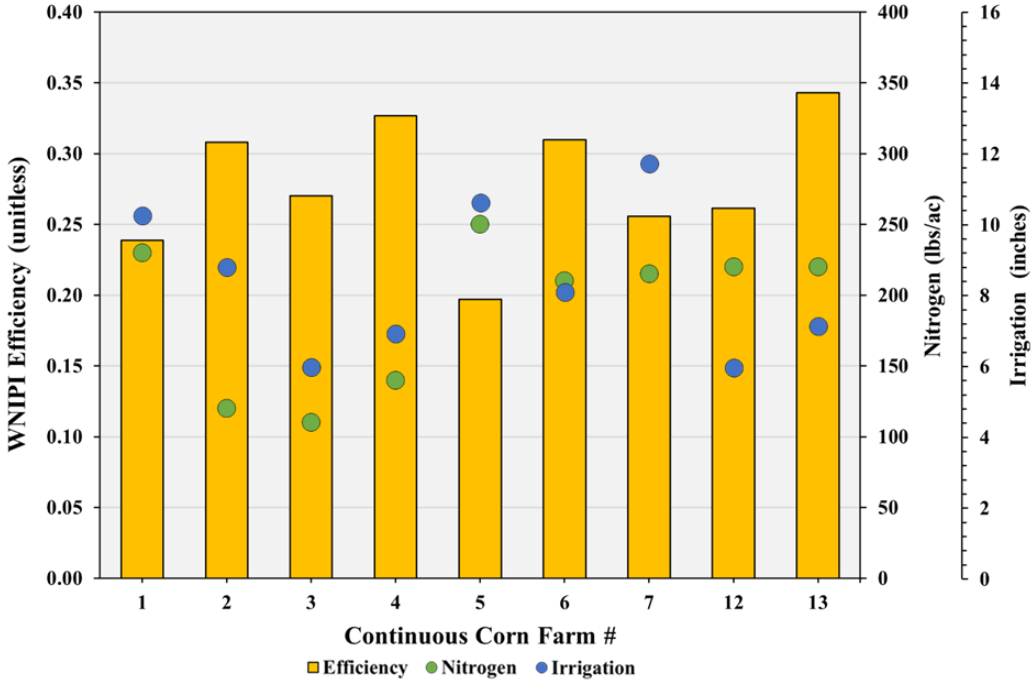


Figure 17. Input use efficiency (WNIPI) compared against irrigation (inches) and N fertilizer (lbs/acre) in the Continuous Corn competition.

Table 6: Summary of results from the 2024 TAPS Continuous Corn competition.

Farm #	Grain Yield** (bu/ac)	Revenue ($/bu)	Cost ($/ac)	Profit ($/ac)	AE (bu/lbs)	IWUE (bu/ac-in)	WNIPI (unitless)
1	222.9	$4.09	$1029	-$117	0.59	13.3	0.239
2	193.2	$4.09	$894	-$104	0.89	12.1	0.308
3	165.0	$4.86	$876	-$74	0.71	13.2	0.270
4	201.4	$4.76	$917	$41	0.82	16.6	0.327
5	208.1	$4.14	$1005	-$144	0.49	11.5	0.197
6	238.0	$4.09	$951	$22	0.72	18.7	0.310
7	233.4	$4.80	$1004	$116	0.68	12.5	0.256
9	86.5	-	-	-	-	-	-
12	206.8	$4.09	$954	-$109	0.55	20.2	0.261
13	253.1	$4.09	$968	$67	0.76	23.4	0.343

*Control **Reported as 15.5% grain moisture content

AE - Agronomic Efficiency (yield increase over the control plot, bushels of grain/pounds of N applied)

IWUE - Irrigation Water Use Efficiency (yield increase over the control plot, bushels of grain/inches of water applied)

WNIPI - Water-Nitrogen Intensification Performance Index

Note: Farms 8, 10 and 11 were non-competing teams and were omitted from this report.

AWARD RECIPIENTS

Photo 3. The ***Greatest Grain Yield Award*** was won by Tri Basin Water Watchers, Farm 6, of Holdrege, NE with a yield of 238.0 bushels/acre. The team included (from L to R) Chris Ecklun, Curtis Scheele, Reed Phillips, Rick Reinsch, Pat Nott, Darrin Swanson (not pictured) and Michael Dibbern (not pictured). The Tri-Basin Water Watchers planted 34,000 seeds/acre and used 210 pounds/acre of N and 8.08 inches/acre of irrigation water.

Pictured Above: Rob Lawson (Far Left) of NRCS presented the award to Scheele, Nott and Ecklun (L to R).

Photo 4. The ***Most Profitable Award*** was won by Jamey Balthazor (L) and Dan Fitts (R), Farm 7, from Scottsbluff, NE. The team planted at a rate of 34,000 seeds/acre. They applied 215 pounds of N and 11.7 inches of irrigation water, which led to a yield of 233.4 bushels/acre. The team's average revenue of $4.80/bushel combined with their yield was the driving factor in winning the profitability award in the 2024 Continuous Corn competition. Rob Lawson (L) of NRCS presented the award to Fitts (R).

Pictured Above: Rob Lawson (L) of NRCS presented the award to Fitts (R).

Photo 5. The ***Highest Input Use Efficiency Award*** was won by the Rattlesnake Boys, Farm 4, of Wood River, NE. The team included (from L to R) Jay Johnson, Kevin Harsch, Amy Harsch, and Jeremy Gewecke. They planted a seeding rate of 35,300 seeds/acre and applied 140 pounds/acre of N and 6.91 inches/acre of irrigation water with a final yield of 201.4 bushels/acre.

Pictured Above: Rob Lawson (Far Left) of NRCS presented the award to Amy Harsch, Kevin Harsch and Johnson (L to R).

GRANT - PROGRAM OVERVIEW

The 7th annual UNL-TAPS Sorghum Competition was held at the Henry J. Stumpf International Wheat Center near Grant, NE. The competition was facilitated under a Valley variable rate center pivot irrigation system. The sorghum competition included 12 teams (Figure 1). In each competition, there is a control, Farm 9, which did not receive any irrigation or Nitrogen (N) and was used to determine the efficiency of the competing teams.

A modified University of Nebraska 2024 crop budget was used to estimate costs on a per acre basis. A copy of the crop budget can be found in the appendix at the end of this report. Yields and costs from each "farm" were scaled to represent 1,000 acres for the sorghum competition. This "farm" scale provided opportunity and motivation for competitors to develop strategies for marketing grain and to consider the impact their decisions would have on a full-scale operation. These farm sizes are consistent with modern-sized farming operations, providing cognition of the effects even small decisions have on productivity and profitability.

The sorghum competition had six management decisions (Figure 18), which included crop insurance, hybrid selection, seeding rate, irrigation, nitrogen, and marketing. These decisions have a direct effect on productivity, efficiency, and profitability. Each team's decisions were applied to plots in a randomized complete block design and replicated three times.

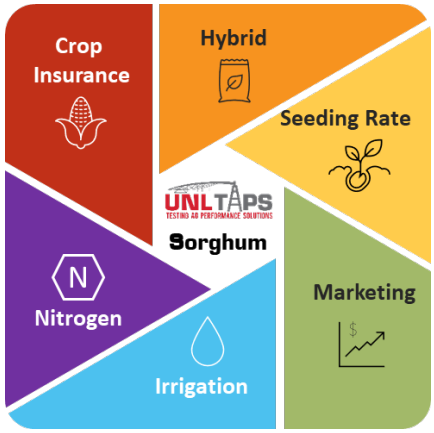


Figure 18. The unique set of decisions participants had to make in managing their sorghum crop in the 2024 competition.

Hybrid Selection (decision #1) and Seeding Rate (decision #2*)* – District Sales Managers (DSMs) of multiple seed companies (Arrow Seed, Beck's, Channel, Dekalb, DynaGro, Hoegemeyer, and Pioneer) provided hybrid and seeding rate recommendations, which included 13 sorghum hybrids. These recommendations were based on location, production history, and characteristics of the field used in the competition. While each team had the option of selecting a DSM recommended hybrid, they were also free to select and use their own seed hybrid. Teams who selected a recommended hybrid were provided seed by the respective DSM, otherwise teams provided their own seed. Each team selected their seeding rate. The sorghum competitions were harvested when the majority of hybrids reached a 16% moisture content, consistent with the maximum moisture content elevators allow at harvest. Sorghum teams were charged a drying fee of $0.04 per bushel for each percentage point above 14% moisture content. This ensured that all yields were measured equally for each team.

Crop Insurance (decision #3*)* – Teams were required to select a multi-peril crop insurance (MPCI) package from the following three options: Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), or Yield Protection (YP), using either Optional Units (OU) or Enterprise Units (EU). The available levels of coverage were 65, 70, 75, 80, or 85%. The premium rates were quoted by Farm Credit Services for the sorghum competition area in Grant. Due to the risk involved in borrowing funds to cover operating costs, a minimum level of 65% MPCI was required.

Nitrogen Management (decision #4) – Teams were able to select the amount of pre-plant and/or side-dress Nitrogen (N) fertilizer in the form of UAN 32%. All plots received 5 gallons/acre of in-furrow starter fertilizer (10-34-0) at time of planting. Pre-plant N was applied at the ground surface neighboring each crop row using 360° Y-Drop (360° Yield Center, Morton, IL). Side-dress N fertilizer was applied at the ground surface neighboring each crop row using 360° Y-Drop. Maximum application of N was limited to a total of 180 pounds/acre for pre-plant, and 180 pounds/acre for side-dress. An application cost of $8.50/acre, which did not include the cost of the fertilizer, was charged for the preplant and side-dress operations.

Irrigation Management (decision #5) – The pivot irrigation system was operated every Monday and Thursday throughout the growing season. Teams had until 10 AM on the day of irrigation to submit their decision via their password protected online portal. If teams failed to indicate their intent to irrigate by 10 AM, irrigation was not applied. Irrigation amount per application could be as much as 1.0-inch, in intervals of 0.05 inches.

Grain Marketing (decision #6) – The option to market grain was available to participants in all competitions from April 1 through December 2. Teams in the sorghum competitions had five different methods to sell their grain. These five options were: 1) spot or cash sales, 2) forward contracts, 3) basis contracts, 4) simple hedge to arrive, and 5) hedging with futures contracts. As a farm management competition using the market to speculate was not allowed.

Other Management Practices – All other management practices, (e.g., tillage practices, residue management, herbicides, etc.), were determined using best practices and executed by the TAPS team and were uniformly applied to the study area. Each team freely made choices in the competition's decision areas, as they sought to be the most profitable, efficient, and highest yielding farm. As noted, the TAPS team did the physical management of all plots (e.g., operation of machinery, irrigation systems, application of chemicals, and harvesting). Teams, however, were encouraged to actively observe their plots, install additional data collecting technology, and non-destructively collect any additional data from their plots throughout the growing season, but at their own expense. No other inputs (e.g., fertilizers, additives, amendments, operations, sprays, etc.) were permitted.

GROWING CONDITIONS

Grant has a semi-arid climate with the majority of annual precipitation occurring between late-April and mid-October. The predominant soil type at the Grant site is Kuma silt loam. The 2024 growing season received 9.0 inches from May 1st to September 30th. For the first time in the history of the sorghum competition, the plots were measurably affected by severe weather on August 8th including hail and wind.

DESCRIPTION OF AWARDS

The sorghum competition had three cash awards, 1) Most Profitable Farm, 2) Highest Input Use Efficiency, and 3) Greatest Grain Yield, adjusted based on profitability. Along with the monetary award, all winners also received a plaque, an oversized keepsake check, and a TAPS apparel item. Each award is described in detail below:

1. Most Profitable Award – Profit is the difference between total revenue minus total cost. Since each competitor is operating under identical conditions and events, it is the individual actions of the competitor that determines profit. Total revenue is obtained by bushels sold times the prices received, plus all government payment, insurance indemnities, and any gain/loss incurred from using futures contracts. The average per acre revenue is the total revenue divided by acres. Costs included fixed costs (in this case those incurred by the University), and variable expenses were those incurred during the season through the execution of the competitor's individual management decisions. Together these represent total cost. Since all teams in any one competition have the same number of acres, the team with the most per acre profit is the most profitable.

2. Highest Input Use Efficiency Award – Efficiency was assessed using the Water-Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019) for the sorghum competition. The WNIPI metrics were calculated as follows:

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

   where, "Control" is a farm managed by UNL that receives no irrigation or N fertilizer (except for 10-34-0 at planting) and "Farm" referenced in the equation for yield, irrigation and N is the farm managed by the teams. "Y" is yield in bushels/acre, "ET" is seasonal evapotranspiration in inch acre/acre, "I" is seasonal irrigation in inch acre/acre, "N" is total seasonal applied nitrogen in pounds/acre, and "ANU" is aboveground nitrogen uptake in pounds/acre. The farm with the highest value was determined as the winner.

3. Greatest Grain Yield Award – The cash prize for Greatest Grain Yield was adjusted by the winner's percentage of total possible profit. Total possible profit was the range of difference between the most and least profitable farms.

Irrigated Sorghum Competition

This year 12 teams competed in the sorghum competition from across Nebraska, as well as one international team from Kenya (Figure 1). Farm 9 was the control used for determining the water and N efficiency.

Field Design

Each team was assigned three randomized plots in the irrigated field (Figure 19). The irrigated field is located north of Highway 61 and the Henry J. Stumpf International Wheat Center.

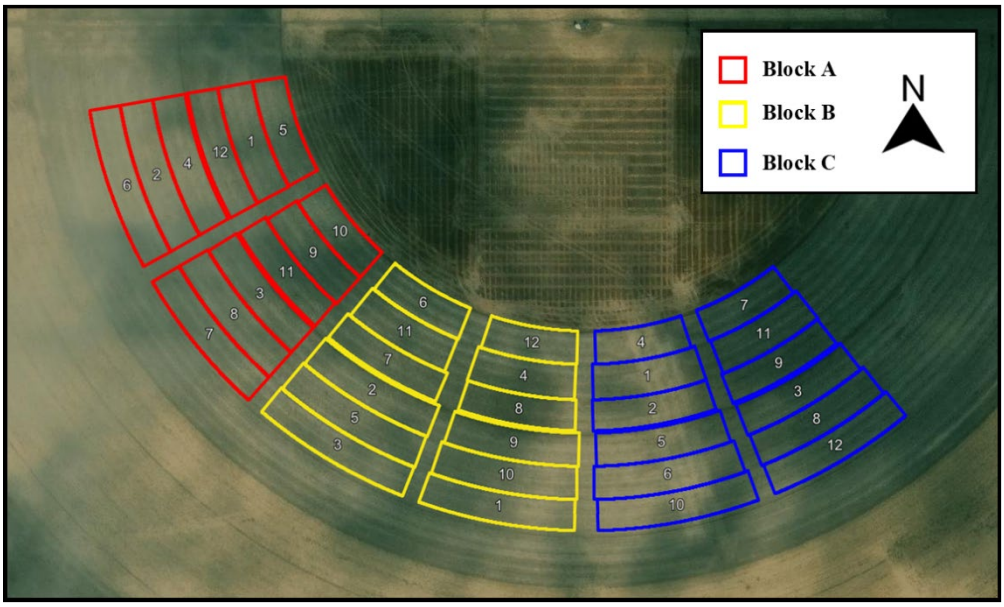


Figure 19. Farm layout for the 2024 irrigated sorghum competition held at the Henry J. Stumpf International Wheat Center near Grant, NE. Each team was assigned a randomized plot in blocks A, B, and C.

Competition Data

In mid-March, aggregate soil samples were collected throughout the TAPS competition field. American Agricultural Laboratory in McCook, NE analyzed the samples, and the results were provided to teams ahead of the first decision deadlines.

Table 7. Soil sample results for the irrigated sorghum competition field.

SOIL TEST RESULTS																		
LAB NUMBER	FIELD IDENTIFICATION	SAMPLE IDENTIFICATION	Depth Inches	pH		EL	SOLUBLE SALTS mod. SP mmhos/cm	OM LOI %	NITRATE-N (FIA)		PHOSPHORUS				
				1 : 1 Soil	Buffer Woodruff				ppm	lbs/A	P1 ppm	Bicarb ppm	P2 ppm	M2 ppm	M3 ppm
	PIVOT 5 TAPS		0-8	7.3		H	1.02	2.4	23.9	57		29			
	PIVOT 5 TAPS		8-36						18.7	157					

LAB NUMBER	SULFATE-S Ca-P ppm	NH4OAc (Exchangeable)				DTPA				BORON Sorbitol ppm	EST. CATION EXCHANGE CAPACITY (CEC) me/100g	% SATURATION					
		K ppm	Ca ppm	Mg ppm	Na ppm	Zn ppm	Fe ppm	Mn ppm	Cu ppm			BASE	H	Ca	Mg	K	Na
		424															

Decisions

All decisions were submitted by teams via the TAPS online password protected portal that time-stamped all decisions. The decisions and resulting outcomes are summarized below.

Agronomic Decisions

Six sorghum hybrids were selected from four seed companies (Table 8). One hybrid, Pioneer 85P58, was provided by Farm 7. Channel 6B95 was the most selected, planted by five of the teams. Dekalb DKS28-05, selected by Farms 2, 3 and 11, was the least expensive at $0.128 per 1,000 seeds and Pioneer 85P58, chosen by Farm 7, was the costliest at $0.293 per 1,000 seeds. The lowest seeding rate, 75,000 seeds per acre, was selected by Farm 6 with Channel 6B95. The highest seeding rate, 110,000 seeds per acre, was chosen by Farms 7 and 10 with Pioneer 85P58 and Channel 6B95, respectively (Table 8).

The nitrogen management options were limited to a maximum of 180 pounds/acre of N at pre-plant and an additional 180 pounds/acre of N applied via side-dress with no fertigation applications offered. The sorghum competition followed a rotation of soybeans that did not yield well due to an irrigation well issue that limited water application; therefore, the field had a higher-than-normal amount of residual N (Table 7). The pounds of N fertilizer applied per team, not including the control, ranged from 0 to 150 pounds per acre (Table 8), and averaged 93 pounds/acre. Forty-eight percent of the fertilizer applied to the plots was done as a pre-plant application, with the other 52% applied via side-dress.

The teams were given the opportunity to irrigate, starting June 24. However, the first irrigation was not requested until July 8. Irrigation concluded September 19. Seasonal irrigation ranged from 0.00 inches, Farm 4, to 12.00 inches, Farm 10, with an average of 4.18 inches (Table 8). More information about the irrigation applications can be found in the appendix at the end of this report.

Table 8. Summary of select agronomic input decisions from the 2024 TAPS sorghum competition.

Farm	Hybrid	Seeding Rate	Nitrogen Fertilizer			Irrigation
			Jun 18	Jul 24	Total	
#	Name	(1,000/ac)	---------- (lbs/ac) ---------			Inches
1	Channel 6B55	85	45	95	140	5.20
2	Dekalb DKS28-05	105	0	0	0	5.75
3	Dekalb DKS28-05	100	30	40	70	4.00
4	Pioneer 86P20	80	60	30	90	0.00
5	Beck's M5990	85	40	40	80	5.90
6	Channel 6B95	75	80	55	135	2.35
7	Pioneer 85P58	110	50	100	150	6.50
8	Channel 6B95	90	20	20	40	0.75
*9	Channel 6B95	85	0	0	0	0.00
10	Channel 6B95	110	80	0	80	12.00
11	Dekalb DKS28-05	90	33	77	110	3.00
12	Channel 6B95	95	50	80	130	4.65

*Control

Economic Decisions

Teams were required to select a multi-peril crop insurance (MPCI) policy, either revenue protection (RP), yield protection (YP), or revenue protection with harvest price exclusion (RP-HPE). These policies were all offered at the 65, 70, 75, 80 and 85% levels of coverage. No additional insurance options were available. Nine teams chose RP policies, one team went with RP-HPE and one chose a YP policy (Figure 20). All but one team purchased Enterprise Units (EU) with the one selecting Optional Units (OU). Three teams each chose RP-EU at 70% and 75% coverage levels, the two most common selections. The average cost across all competitors was $12.43/acre. The least expensive policy was RP-EU at 65% coverage ($6.29/acre), selected by Farm 11. The most expensive policy was RP-OU at 80% coverage ($38.27/acre), chosen by Farm 10.

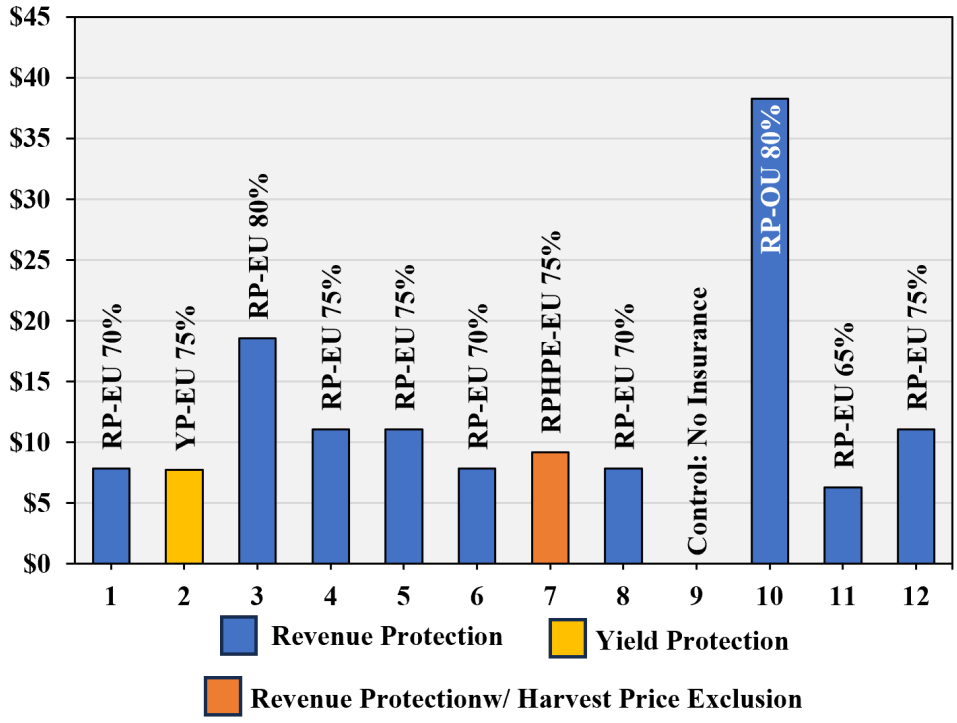


Figure 20. Insurance cost ($/acre) for the individual sorghum competition teams. Policies offered included Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), and Yield Protection (YP) with either Optional Units (OU) or Enterprise Units (EU).

Closely tied to insurance is the risk related to forward pricing and sales of grain. Teams are encouraged to take advantage of seasonal price trends and events that often make early season marketing such as forward contracting, hedging, basis contracts and hedge-to -arrive tools economically advantageous. They are, however, limited to market only expected production, represented by trend adjusted Average Production History (APH). These four tools and spot cash sales had to be done during the time period of April 1 through December 13.

Grain sorghum prices historically follow the corn market. This crop does not have a futures market and cross hedges using corn futures. Therefore, the USDA announced spring and harvest prices for MPCI are fixed at 99.6% off the corn spring and harvest prices. This price correctly shows that sorghum is usually

sold at a discount relative to corn. These past two years have shown a downward trend toward lower prices. The supply versus the demand has continued to expand. As is typically expected, this year's corn harvest price ($4.16/bushel) was lower than the spring price of $4.66/bushel. The seasonal price variation provided many opportunities to capture market value at higher prices during the early part of the competition season.

Five teams relied on the TAPS team to market their entire crop, sold after the last day of the competition, December 13, at $3.72 per bushel. Any unsold grain after this date incurred a sales fee of $0.05 per bushel. Two teams sold all their production toward the end of the competition without incurring a sales fee. One team used forward contracts throughout the season. The other three teams chose to use a combination of basis and/or futures contracts throughout the season along with forward and/or cash sales. All teams received indemnity payments ranging from $0.04/bushel to $2.20 per bushel, based on their low yields and their crop insurance selection. This additional revenue ultimately increased their average per bushel value. The marketing decisions and insurance payments led to revenue ranging from $3.78 per bushel, Farm 6, to $5.92 per bushel, Farm 3 (Table 9 and Figure 21). Farm 3, whose production was marketed on the last day of the competition by the TAPS team had the largest insurance indemnity payment, which resulted in the highest average per bushel price of the season. The overall average price per bushel received for all teams was $4.53 per bushel, including an average indemnity payment of $0.74 per bushel.

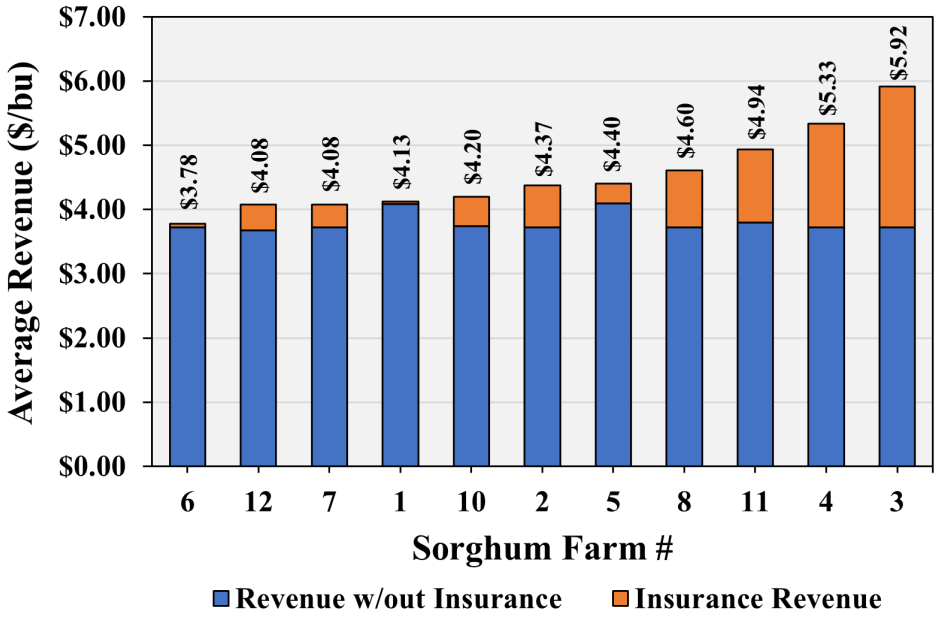


Figure 21. Revenue received ($/bushel) for the individual sorghum competition teams.

Results and Rankings

Grain Yield

The yields for the sorghum competition were lower than the field APH of 145 bushels per acre due to a hail event on August 8 (Table 9). The average for the thirteen teams was 103.93 bushels/acre. Except for the control, the yields ranged from 82.8 bushels/acre, Farm 11, to 136.0 bushels/acre, Farm 7. Figure 22A shows a weak grain yield relationship to total N fertilizer (R^2 = 28%). Whereas irrigation had a greater impact on grain yields with 52% of yield variability being explained by irrigation amount (Figure 22B).

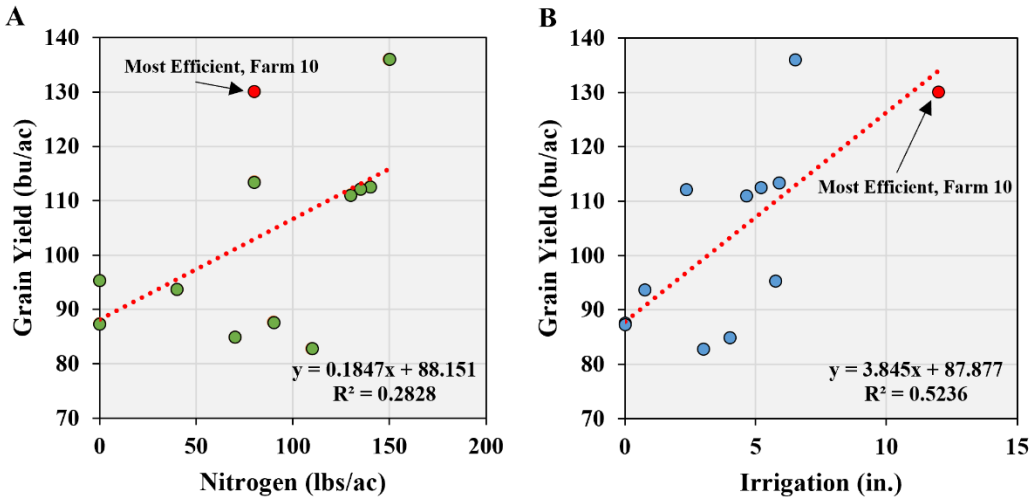


Figure 22. Sorghum grain yield response to seasonal total nitrogen fertilizer (A) and irrigation (B) at the Stumpf International Wheat Center in Grant, NE. The most efficient team as measured by the Water Nitrogen Intensification Performance Index (WNIPI) is denoted in red.

Input Use Efficiency

The Water Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019), was used to quantify input use efficiency (Table 9 and Figure 23). It compares the effect of N and irrigation input on grain yield with respect to the control treatment. The control is used to measure the effect of any added water or N fertilizer. The control (Farm 9) produced 87.4 bushels/acre. Farm 10 had the highest efficiency with a WNIPI of 0.356. This team applied 80 pounds of N/acre and 12.0 inches of irrigation resulting in a yield of 130.1 bushels per acre. The Agronomic Efficiency (AE) measures the effect each added pound of N has on yield in terms of bushels. Farm 10 yielded 42.7 bushels/acre more than the control resulting in an AE of 0.53 bushels for every pound of N fertilizer applied (Table 9). This is more than the average of 0.18 bushels/pound of N of all other teams that chose to apply N. Irrigation Water Use Efficiency (IWUE) with the increase in yield for inches per acre of applied water above the control (Table 9). Farm 10's IWUE was calculated to be 3.56 bushels/inch. The overall average was 4.37 bushels/inch.

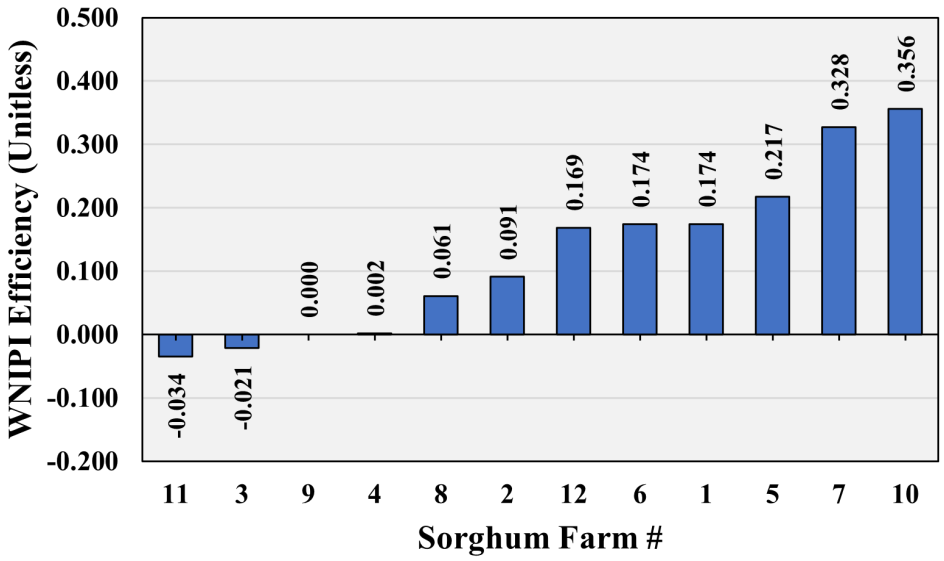


Figure 23. Input use efficiency (WNIPI) compared against irrigation (inches) and N fertilizer (lbs/acre) in the Sorghum competition.

Profitability

Profitability is derived as total revenue minus total cost. Revenue was found by adding the total value of each market transaction with any insurance indemnities, and/or losses. Costs were based on the stated expenses each competition was assigned. Most of these costs were fixed on a per acre basis and are common among all farms. However, some costs e.g., grain hauling, fertilizer use, insecticide application, were based on a fixed per unit cost and varied by individual choices. Since all teams are identical in cost structure, physical attributes, and revenue opportunity it is the choices made and the resulting outcomes of those choices that drive the difference in profitability.

Revenue per bushel ranged from a low of $3.78/bushel, Farm 6, to a high of $5.92/bushel, Farm 3 (Table 9). The lowest cost per acre, excluding the control, was achieved by Farm 2 at $608/acre (Table 9), and the highest cost per acre was Farm 10 at $764/acre.

With revenue and cost considered on a per acre basis, Farm 3 earned the award for profitability with the least loss of $161/acre (Table 9 and Figure 24). The cost per acre for the team with the highest profit was $663/acre (Table 9), which was lower than the competition's average of $680/acre. The revenue per bushel sold for the winning team was $5.92/bushel, the highest in this competition. This higher value is the result of an insurance indemnity payment of $2.20/bushel due to the high level of insurance and the low production. With one of the lowest yields in the competition and nearly average costs per acre, Farm 3 managed to have the least loss.

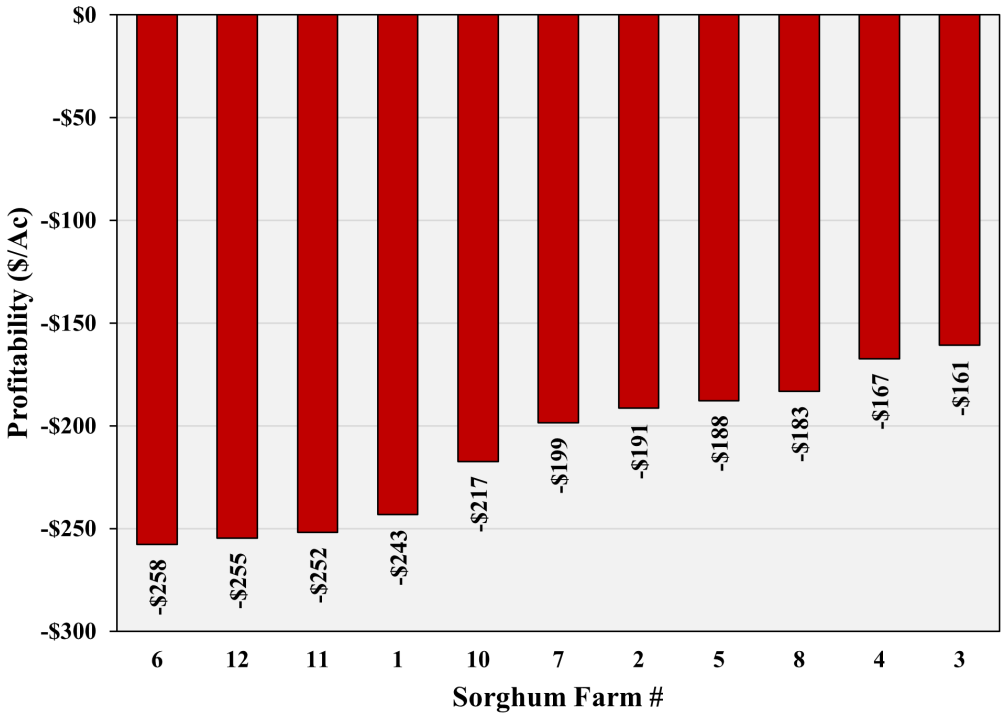


Figure 24. Profit per acre received for the individual sorghum competition teams.

Table 9: Summary of results from the 2024 TAPS sorghum competition.

Farm #	Grain Yield** (bu/ac)	Revenue ($/bu)	Cost ($/ac)	Profit ($/ac)	AE (bu/lbs)	IWUE (bu/ac-in)	WNIPI (unitless)
1	112.6	$4.13	$708	-$243	0.18	4.85	0.174
2	95.3	$4.37	$608	-$191	-	1.38	0.091
3	84.9	$5.92	$663	-$161	-0.04	-0.62	-0.021
4	87.7	$5.33	$635	-$167	0.00	-	0.002
5	113.5	$4.40	$687	-$188	0.33	4.45	0.217
6	112.2	$3.78	$681	-$258	0.18	10.54	0.174
7	136.0	$4.08	$754	-$199	0.32	7.48	0.328
8	93.7	$4.60	$615	-$183	0.16	8.45	0.061
*9	87.4	-	-	-	-	-	-
10	130.1	$4.20	$764	-$217	0.53	3.56	0.356
11	82.8	$4.94	$661	-$252	-0.04	-1.51	-0.034
12	111.1	$4.08	$707	-$255	0.18	5.09	0.169

*Control **Reported as 14% grain moisture content

AE - Agronomic Efficiency (yield increase over the control plot, bushels of grain/pounds of N applied)

IWUE - Irrigation Water Use Efficiency (yield increase over the control plot, bushels of grain/inches of water applied)

WNIPI - Water-Nitrogen Intensification Performance Index

AWARD RECIPIENTS

Photo 6. The ***Greatest Grain Yield Award*** was won by Luke Olson, Farm 7, of McCook, NE with a yield of 136.0 bushels/acre. Olson planted Pioneer 85P58 at 110,000 seeds/acre and used 150 pounds/acre of N and 6.50 inches/acre of irrigation water.

Pictured Above: Kristine Dvoracek-Jameson (L) of the Nebraska Sorghum Board presented the award to Olson (R).

Photo 7. The ***Highest Input Use Efficiency Award*** was won by Tyler Bose, Farm 10, of Arcadia, NE. Bose planted Channel 6B95 at a seeding rate of 110,000 seeds/acre and applied 80 pounds/acre of N and 12.0 inches/acre of irrigation water with a final yield of 130.1 bushels/acre.

Pictured Above: Kristine Dvoracek-Jameson (L) of the Nebraska Sorghum Board presented the award to Bose (R).

Photo 8. The ***Most Profitable Award*** was won by Brandon Rimpley (L) and Ron Robison (R), Farm 3, from Orleans and Alma, NE respectively. The group planted Dekalb DKS28-05 at 100,000 seeds/acre. They applied 70 pounds of N and 4.0 inches of irrigation water, which led to a yield of 84.9 bushels/acre. The team's average revenue of $5.92/bushel, including $2.20/bushel from an indemnity payment combined with a lower cost per acre was the driving factor in winning the top award in the 2024 sorghum competition.

Pictured Above: Kristine Dvoracek-Jameson (Far L) of the Nebraska Sorghum Board presented the award to Brent and Adrian Stroebel (L to R) accepting the award on behalf of Robison & Rimpley.

MEAD - PROGRAM OVERVIEW

The first annual UNL-TAPS Soybean Competition was facilitated at the Eastern Nebraska Research, Extension and Education Center (ENREEC) near Mead, NE. The competition was facilitated under a Valley center pivot irrigation system on a field that was in corn the previous year. The inaugural soybean competition included 18 teams (Figure 1). In each competition, there is a control, Farm 9, which received minimal inputs and was used as a baseline. Each team was randomly assigned an experiment-sized plot replicated four times within the competition area, totaling less than one-half of an acre per team, referred to as a TAPS "farm". University personnel managed the competition plots under the supervision of the TAPS team.

A modified University of Nebraska 2024 crop budget was used to estimate costs on a per acre basis. A copy of the crop budget can be found in the appendix at the end of this report. Yields and costs from each "farm" were scaled to represent 1,500 acres for the soybean competition. This "farm" scale provided opportunity and motivation for competitors to develop strategies for marketing grain and to consider the impact their decisions would have on a full-scale operation. These farm sizes are consistent with modern-sized farming operations, providing cognition of the effects even small decisions have on productivity and profitability.

The soybean competition had seven general management decisions (Figure 25), which included crop insurance, variety and seed treatment selection, seeding rate, nutrient management, herbicide, pest management, and marketing. These decisions have a direct effect on productivity and profitability.

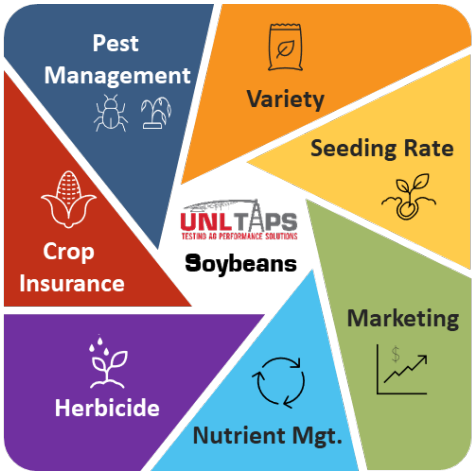


Figure 25. The unique set of decisions participants had to make in managing their soybean crop in the 2024 competition.

Variety and Seed Treatment Selection (decision #1) and Seeding Rate (decision #2*)* – Teams were required to select their seed variety, seed treatment, and seeding rate. District Sales Managers (DSMs) of multiple seed companies (Beck's, DynaGro, Golden Harvest, Hoegemeyer, and Stine) provided variety and seeding rate recommendations, which included 16 soybean varieties. These recommendations were based on location, production history, and characteristics of the field used in the competition. While each team had the option of selecting a DSM supplied variety, they were also free to provide their own seed variety. The soybean competitions were harvested when the majority of varieties reached a 13% moisture content, consistent with the maximum moisture content elevators allow at harvest without dock or a discount in the

price received. Final yields were adjusted to 13% moisture to ensure that all yields were measured equally for each team.

Crop Insurance (decision #3*)* – Teams in all competitions were required to select a multi-peril crop insurance (MPCI) package from the following three options: Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), or Yield Protection (YP), using either Optional Units (OU) or Enterprise Units (EU). The available levels of coverage were 65, 70, 75, 80, or 85%. The premium rates were quoted by Eden Agency, Inc. for the soybean competition area. Due to the risk involved in borrowing funds to cover operating costs, a minimum level of 65% MPCI was required.

Nutrient Management (decision #4) – Teams were able to apply sulfur using ammonium sulfate 21-0-0-24 (AMS) at V1-V3. Options for application were 0 pounds per acre, 50 pounds per acre, or 100 pounds per acre of AMS. The cost for this option was $0.25 per pound, along with a $6 per acre application fee.

Postemergence Herbicide Management (decision type #5) – Teams had the opportunity to apply different postemergence herbicide programs targeting the V4 growth stage. These programs were designed to provide low, medium, and high-cost options with non-residual and residual options. Specifications on products, rates and costs were provided to teams prior to the decision deadline.

Pest Management (decision #6) – Teams could choose to apply different fungicide/insecticide/micronutrient programs at R3. These programs gave the choice of one, two, or three different components with different price points. Specifications on products, rates and costs, along with leaf tissue nutrient and scouting reports were provided to teams prior to the decision deadline.

Grain Marketing (decision type #7) – The option to market grain was available to teams in all competitions from April 1 through October 30. Teams in the soybean competitions had five different methods to sell their grain. These five options were: 1) spot or cash sales, 2) forward contracts, 3) basis contracts, 4) simple hedge to arrive, and 5) hedging with futures contracts. As a farm management competition using the market to speculate was not allowed.

Other Management Practices – All other management practices, (e.g., tillage practices, residue management, etc.), were determined and executed by the TAPS team and were uniformly applied to the competition area. Each team freely made choices in their competition's decision areas, as they sought to be the most productive, profitable, and highest yielding farm. As noted, the TAPS team did the physical management of all farms (e.g., operation of machinery, irrigation systems, application of chemicals, and harvesting). Teams, however, were encouraged to actively observe their plots, install additional data collecting technology, and non-destructively collect any additional data from their plots throughout the growing season, but at their own expense. No other inputs (e.g., fertilizers, additives, amendments, operations, sprays, etc.) were permitted.

GROWING CONDITIONS

Mead has a hot, humid summer climate with the majority of annual precipitation occurring between April and October. The predominant soil types at the Mead site are Yutan silt clay loam, Filbert silt loam, and Fillmore silt loam. The 2024 growing season received 23.45 inches from planting on April 24th to harvest on October 3rd, according to the Realm Five weather station located at the field edge. The historical average rainfall amount for this area from May to September is 18.56 inches. This year was quite variable, with wet conditions for the 2 weeks following planting, large rain events in May and July, and then very dry conditions through harvest (Figure 26).

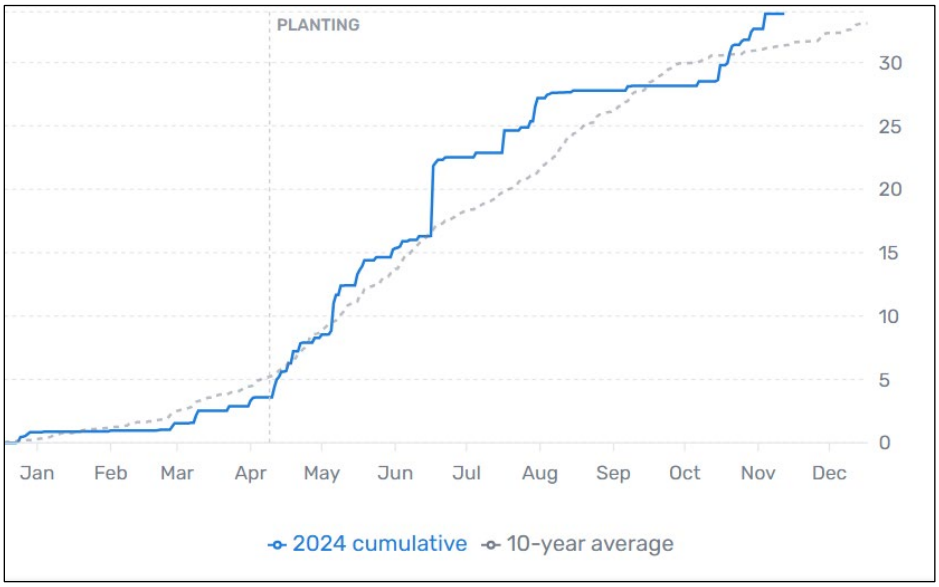


Figure 26. Yearly rainfall for 2024 versus 10-year average at ENREEC.

DESCRIPTION OF AWARDS

The soybean competition had three cash awards, 1) Most Profitable Farm, 2) Lowest Cost of Production, and 3) Greatest Grain Yield, adjusted based on profitability. Along with the monetary award, all winners also received a plaque, an oversized keepsake check, and a TAPS apparel item. Each award is described in detail below:

1. Most Profitable Award – Profit is the difference between total revenue minus total cost. Since each competitor is operating under identical conditions and events, it is the individual actions of the competitor that determines profit. Total revenue is obtained by bushels sold times the prices received, plus all government payment, insurance indemnities, and any gain/loss incurred from using futures contracts. The average per acre revenue is the total revenue divided by acres. Costs included fixed costs (in this case those incurred by the University), and variable expenses were those incurred during the season through the execution of the team's individual management decisions. Together these represent total cost. Since all teams in any one competition have the same number of acres, the team with the most per acre profit is the most profitable.

2. Lowest Cost of Production per Bushel – The lowest cost of production per bushel is a key measure of efficiency in soybean production, reflecting the relationship between total costs and yield. Each competitor's management decisions directly influence their variable costs, which are combined with fixed costs (incurred by the University) to determine total cost. By dividing the total cost by the total bushels produced, competitors can calculate their cost per bushel. This metric rewards efficient use of resources, as higher yields achieved with minimal input costs result in a lower cost per bushel. The team with the lowest cost of production per bushel demonstrates the most cost-effective management approach.

3. Greatest Grain Yield Award – The cash prize for Greatest Grain Yield was adjusted by the winner's percentage of total possible profit. Total possible profit was the range of difference between the most and least profitable teams.

Soybean Competition

In the soybean competition, 18 teams participated, including 38 participants from across Nebraska (Figure 1). Within the 18 teams, there were three that were non-competitive teams used for benchmarking UNL recommendations and research. Farm 9 was the control used for determining productivity with minimal inputs. Farm 17 has been excluded from this report as their management decisions are not directly comparable to the competing teams. Farms 15 and 18 are included in the report but are non-competing teams managed by UNL.

Field Design

Each team was assigned four randomized plots in the field (Figure 27). The field is located south of County Road J and east of County Road 10, near Mead, NE.

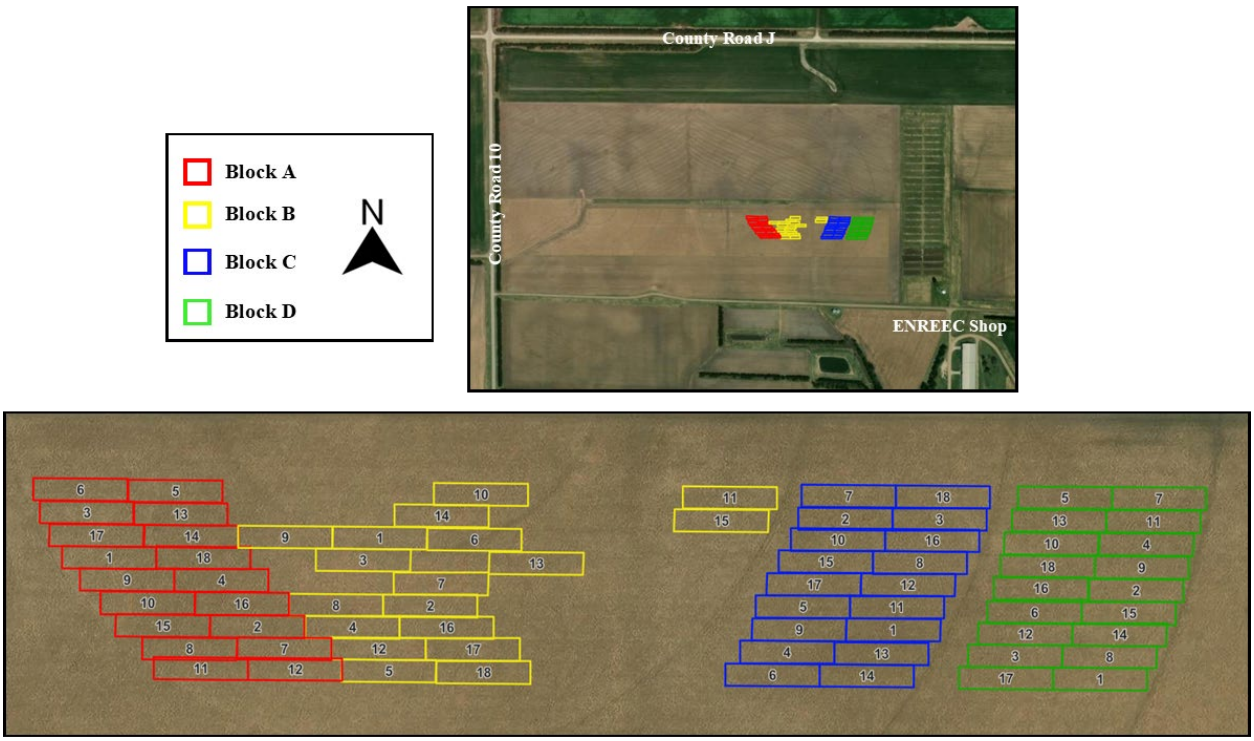


Figure 27. Farm layout for the 2024 soybean competition held at the Eastern Nebraska Research, Extension and Education Center near Mead, NE. Each team was assigned four randomized plots across the replicated blocks denoted by the different color outlines.

Competition Data

In mid-March, aggregate soil samples were collected from each block across the TAPS competition field. Ward Laboratories, Inc. in Kearney, NE analyzed the samples, and the results were provided to teams ahead of the first decision deadlines.

Table 10. Soil sample results for the soybean competition field. Rep 1-4 corresponds to Blocks A-D.

TAPS Soybean 2024								
Sample ID	Depth (inches)	Soil pH 1:01	Soluble Salts 1:1 mmho/cm	Excessive Lime Rating	Organic Matter LOI (%)	KCL Nitrate (ppm N)	Nitrate (lbs/acre)	Phosphorus by M-3 (ppm P)
Surface Rep 1	0 to 8	6.6	0.24	NONE	3.6	24.2	58	66
Surface Rep 2	0 to 8	6.3	0.13	NONE	3.3	13	31	23
Surface Rep 3	0 to 8	6.4	0.11	NONE	3.9	12.5	30	17
Surface Rep 4	0 to 8	6.5	0.1	NONE	4.1	12.5	30	13
Subsurface Rep 1	8 to 36	6.9	0.15	LOW	1.9	7.4	62	47
Subsurface Rep 2	8 to 36	6.7	0.11	NONE	2.4	8.4	71	19
Subsurface Rep 3	8 to 36	6.6	0.09	NONE	2.7	8.8	74	9
Subsurface Rep 4	8 to 36	6.5	0.09	NONE	3	7.8	66	6

Sample	Depth	K	Mg	Na	Sulfate by M-3	Zn	Fe	Mn	Cu	Sum of Cations	% Base Saturation					% Soil Composition		
ID	(inches)	(ppm)	(ppm)	(ppm)	(ppm S)	(ppm)	(ppm)	(ppm)	(ppm)	(m3/100g)	H	K	Ca	Mg	Na	Sand	Silt	Clay
Surface Rep 1	0 to 8	270	312	270	10.1	3.48	84.9	3.9	1.21	15.3	0	5	77	17	1	8	54	38
Surface Rep 2	0 to 8	199	297	199	8	2.55	59.5	6	1.06	15.1	11	3	69	16	1	4	56	40
Surface Rep 3	0 to 8	280	402	280	8.9	2.16	29.5	7.5	1.05	17.9	7	4	69	19	1	4	52	44
Surface Rep 4	0 to 8	277	324	277	7.6	2.82	26.1	8.2	0.94	14.6	6	5	70	18	1	6	52	42
Subsurface Rep 1	8 to 36	300	711	300	7.9	0.62	71.8	1.7	1.52	22.8	0	3	69	26	2	2	44	54
Subsurface Rep 2	8 to 36	176	571	176	8.4	0.37	41.7	2.4	1.23	19.8	0	2	72	24	1	2	48	50
Subsurface Rep 3	8 to 36	116	459	116	7.9	0.37	18.8	3.2	0.8	14.7	0	2	71	26	1	8	44	48
Subsurface Rep 4	8 to 36	159	505	159	7.6	0.58	20.1	4.8	0.96	17.9	6	2	67	24	1	8	44	48

Decisions

All decisions were submitted by teams via the TAPS online password protected portal that time-stamped all decisions. The decisions and resulting outcomes are summarized below.

Agronomic Decisions

Twelve soybean varieties were selected from six seed companies (Table 13). Eight varieties were provided by individual teams. Stine 32EF23 was the most selected variety, planted by three of the teams, and was the least expensive at $45 per bag. Pioneer P30A75E, chosen by Farm 16, was the costliest at $80 per bag. The lowest seeding rate, 110,000 seeds/acre, was planted by Farm 16 with Pioneer P30A75E. The highest seeding rate, 180,000 seeds/acre, was planted by Farm 11 with Pioneer 33Z17E (Table 13). Teams also had the option to add seed treatments; however, Beck's varieties already came with a standard seed treatment. Four teams chose to add additional seed treatments to their selections. One team, Farm 2, chose to use Cruiser Maxx, while the other three teams, Farms 3, 15 and 18, chose to use Apron Maxx RTA. The seed treatment cost is added to the seed price. The eight varieties provided by competitors also had seed treatments, which are listed in Table 13. Seed prices included the cost of seed treatments for these teams. Farm 9 was the only team that chose to use no seed treatment.

Nine teams chose to apply sulfur as AMS, while the other 8 teams didn't apply any AMS (Table 13). Three teams, Farms 7, 11 and 12, chose to apply 100 pounds per acre. Farms 1, 5, 13, 14, 16, and 18 chose to apply 50 pounds per acre.

Teams had three options for their post emergence herbicide application decision. The three options are as noted in Table 11 below.

Table 11. Herbicide decision options for the 2024 UNL-TAPS Soybean Competition.

Option 1		Option 2		Option 3	
Product	**Rate**	**Product**	**Rate**	**Product**	**Rate**
Enlist One	32 oz/ac	Enlist One	32 oz/ac	Liberty	32 oz/ac
Glyphosate	24 oz/ac	Glyphosate	24 oz/ac	Enlist One	32 oz/ac
Clethodim	6 oz/ac	Clethodim	6 oz/ac	Zidua	3 oz/ac
Crop Oil	32 oz/ac	Metolachlor	32 oz/ac	Clethodim	10 oz/ac
AMS	40 oz/ac	AMS	40 oz/ac	Metolachlor	32 oz/ac
-	-	-	-	AMS	40 oz/ac
Mix Price	$20.69/ac	**Mix Price**	$25.19/ac	**Mix Price**	$37.08/ac

Twelve teams chose Option #2 at a cost of $25.19 per acre, while the other five teams chose Option #3 at a cost of $37.08 per acre (Table 13).

Six options were given to the teams for the R3 application which could include insecticide, fungicide and/or micronutrients. The options are noted in Table 12 below.

Table 12. Insecticide, fungicide, and micronutrient tank-mix options applied at R3 from the 2024 UNL-TAPS Soybean Competition.

	Option 0		Option 1		Option 2		Option 3		Option 4		Option 5	
	Product	Rate	Product	Rate	Product	Rate	Product	Rate	Product	Rate	Product	Rate
Insecticide	-	-	-	-	Leverage 360	2.8 oz/ac	Hero	10 oz/ac	Hero	10 oz/ac	-	-
Fungicide	-	-	-	-	Headline	6 oz/ac	Delaro Complete	8 oz/ac	Delaro Complete	8 oz/ac	Headline	6 oz/ac
Micro Nutrients	-	-	Legend Elite	32oz/ac	-	-	-	-	Legend Elite	32oz/ac	Legend Elite	32oz/ac
	Mix Price	$0	Mix Price	$12/ac	Mix Price	$15/ac	Mix Price	$55/ac	Mix Price	$67/ac	Mix Price	$20/ac

Three teams, Farms 3, 9 and 10, chose Option #0, forgoing all applications at the R3 stage (Table 13). Four teams, Farms 4, 8, 12, 14, chose Option #2. Option #3 was selected by Farms 1 and 13. Farms 6, 7, and 18 selected Option #4. The final five teams, Farms 2, 5, 11, 15, and 16, chose Option #5.

Table 13. Summary of select agronomic input decisions from the 2024 TAPS soybean competition.

Farm #	Hybrid Name	Seed Treatment	Seeding Rate (1,000/ac)	Sulfur (lbs/ac)	Herbicide	R3 Application
1	Pioneer P27Z71E	Lumigen, LumiTreo, Lumiderm, ILEVO	160	50	Opt. #2	Opt. #3
2	Pioneer 28A39R	Cruiser Maxx	160	0	Opt. #2	Opt. #5
3	Stine 28EC32	Apron Maxx RTA	120	0	Opt. #2	Opt. #0
4	Alloy 33E34	Acceleron	160	0	Opt. #3	Opt. #2
5	Beck's 2950E3	Escalate	130	50	Opt. #3	Opt. #5
6	Alloy 33E34	Acceleron	130	0	Opt. #3	Opt. #4
7	Pioneer 33Z17E	Lumigen, LumiTreo, Lumiderm, ILEVO	130	100	Opt. #2	Opt. #4
8	Hoegemeyer 3185E	Lumigen, LumiTreo, Lumiderm, ILEVO	120	0	Opt. #2	Opt. #2
*9	Stine 32EF23	None	140	0	Opt. #2	Opt. #0
10	Beck's 3140E3	Escalate	120	0	Opt. #2	Opt. #0
11	Pioneer 33Z17E	Lumigen, LumiTreo, Lumiderm, ILEVO	180	100	Opt. #3	Opt. #5
12	Golden Harvest GH3043E3	CruiserMaxx APX	130	100	Opt. #2	Opt. #2
13	Golden Harvest GH3043E3	CruiserMaxx APX	170	50	Opt. #2	Opt. #3

14	Hoegemeyer 2855E	Lumigen, LumiTreo	130	50	Opt. #2	Opt. #2
15	Stine 32EF23	Apron Maxx RTA	140	0	Opt. #2	Opt. #5
16	Pioneer P30A75E	Lumigen, LumiTreo, Lumiderm, ILEVO	110	50	Opt. #2	Opt. #5
18	Stine 32EF23	Apron Maxx RTA	140	50	Opt. #3	Opt. #4

*Control

Note: Farm 17 was a non-competing team and therefore omitted from this report.

Economic Decisions

Teams were required to select a multi-peril crop insurance (MPCI) policy, either revenue protection (RP), yield protection (YP), or revenue protection with harvest price exclusion (RP-HPE). These policies were all offered at the 65, 70, 75, 80 and 85% levels of coverage. No additional insurance options were available. Eight teams chose to purchase RP policies, three teams went with RP-HPE and five chose YP policies (Figure 28). All but one of the teams purchased Enterprise Units (EU) with the other one selecting Optional Units (OU). Three teams each chose RP-EU at 70% making it the most common selection. The average cost per acre across all competitors was $5.59/acre. The least expensive policy was YP-EU at 65% coverage ($0.96/acre), selected by Farms 2 and 3. The most expensive policy was RP-EU at 85% coverage ($17.89/acre), chosen by Farm 7.

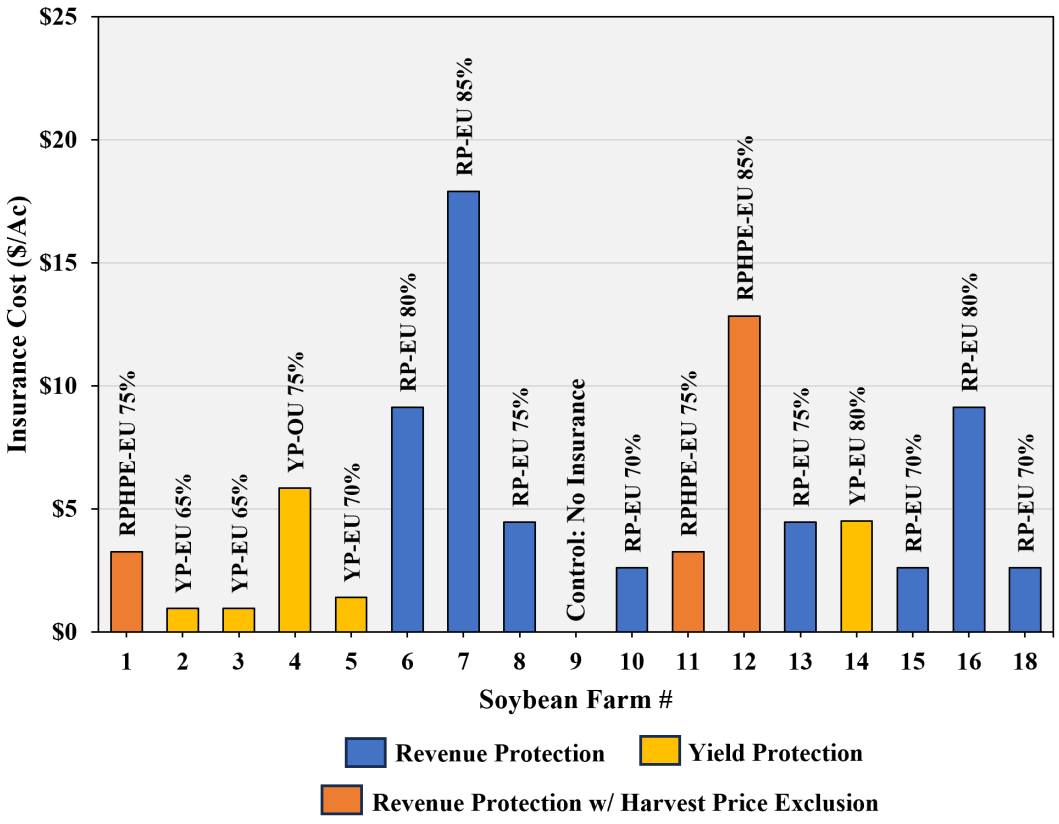


Figure 28. Insurance cost ($/acre) for the individual soybean competition teams. Policies offered included Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RP-HPE), and Yield Protection (YP) with either Optional Units (OU) or Enterprise Units (EU).

Closely tied to insurance is the risk related to forward pricing and sales of grain. Teams are encouraged to take advantage of seasonal price trends and events that often make early season marketing decisions such as forward contracting, hedging, basis contracts and hedge-to -arrive tools economically advantageous. They are however limited to market only expected production, represented by trend adjusted Average Production History (APH). These four tools and spot cash sales had to be done during the time period of April 1 through October 30.

The 2024 TAPS marketing year saw soybean prices behaving in the normal seasonal manner. Soybean November futures peaked in February of 2022 at a high in the upper $17 per bushel range. Since that time prices have had a downward trend with harvest prices being lower than spring prices. This year's spring price was $11.55 per bushel with the harvest price at $10.03 per bushel. This is a $1.52 per bushel decline. Compare this with the 2023 $13.76/bushel spring and $12.84/bushel harvest price, a $0.92/bushel difference. As a normal seasonal pattern those that sold earlier in the year were able to generally capture higher returns.

Six teams relied on the TAPS team to market their entire crop after the last day of the competition, October 30, at $9.22/bushel, which incurred an unsold grain sales fee of $0.05/bushel. Two teams sold all their production on the last day of the competition without incurring a sales fee. Five teams chose to sell part, or all their production using forward and/or cash sales throughout the season. These teams received some of the highest prices per bushel by doing so early in the season when the price was higher. The other three teams used a combination of futures contracts, basis contracts, forward marketing and cash sales. When a team sold more grain than was produced, those bushels were bought back at the $9.22/bushel price, with an added penalty of $0.10/bushel for transaction costs. Five teams received indemnity payments based on their low yields and their crop insurance selection. This additional revenue ultimately increased their average market value. The marketing decisions and insurance payments led to average prices ranging from $9.18/bushel, Farm 2, to $11.79/bushel, Farm 1 (Table 14 and Figure 29). Farm 1 used four futures contracts, along with a basis contract to market their grain, which earned them $11.46/bushel and then a $0.32/bushel indemnity payment increased their revenue to $11.79/bushel. The average price per bushel received for all teams was $9.78/bushel, just over $2/bushel less than Farm 1's revenue per bushel.

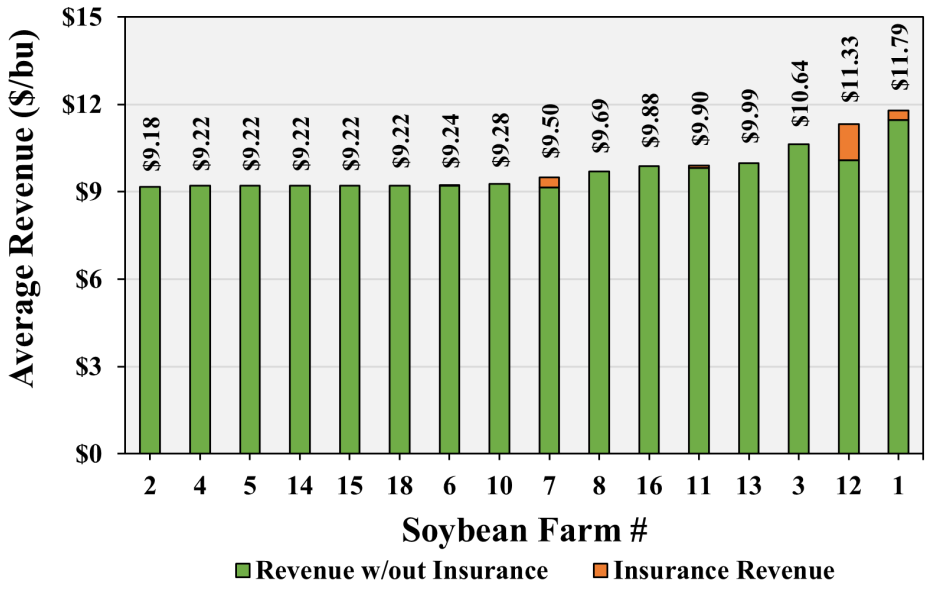


Figure 29. Revenue received ($/bushel) for the individual soybean competition teams.

Results and Rankings

Grain Yield

The yields for the soybean competition were lower than the historic average with only four teams reaching the APH of 66 2/3 bushels/acre for the field (Table 14 and Figure 30). The average for the seventeen teams was 61.6 bushels/acre. Except for the control, the yields ranged from 49.7 bushels/acre, Farm 3, to 73.6 bushels/acre, Farm 18. Seeding rate showed a very weak negative grain yield response to higher seeding rates (Figure 31). Consistent with previous research, seeding rates above 100,000 seeds/acre do not consistently result in higher yields.

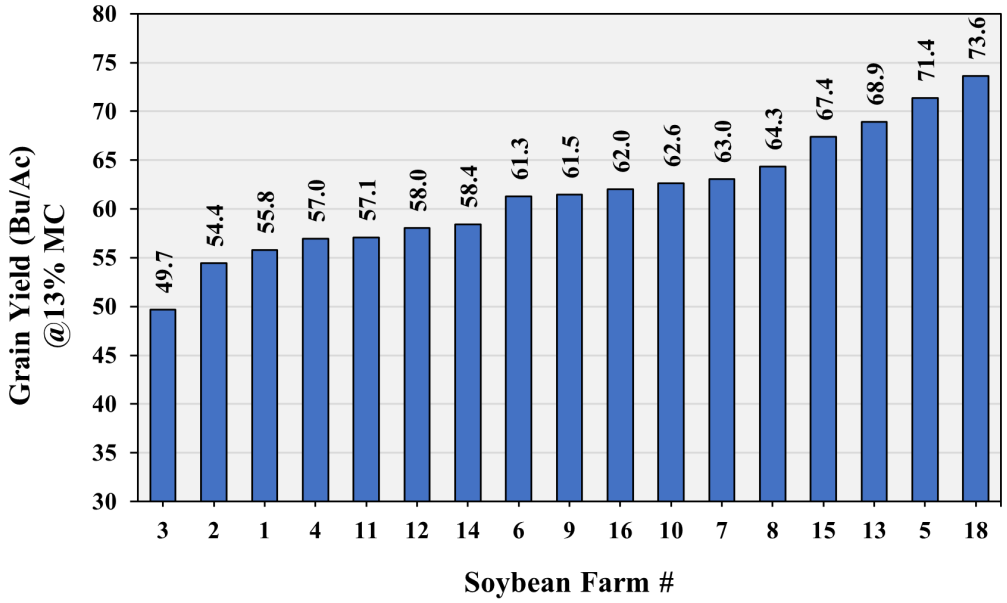


Figure 30. Soybean grain yields in the 2024 Soybean Competition at ENREEC near Mead, NE.

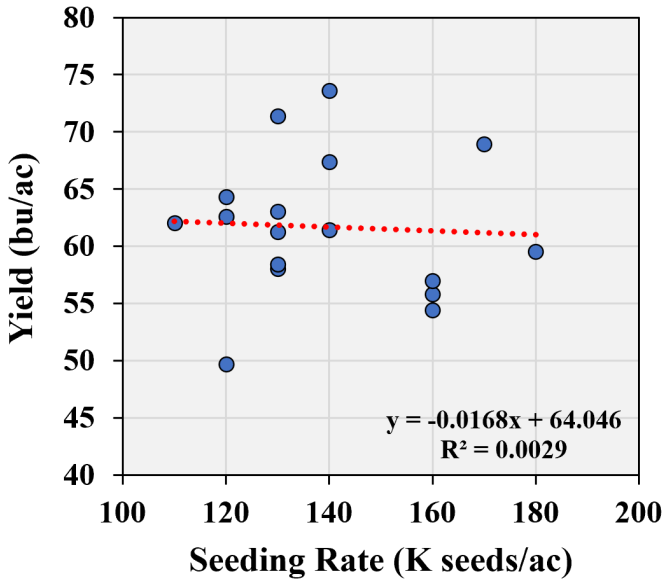


Figure 31. Soybean grain yield response to seeding rate at ENREEC near Mead, NE.

Cost of Production per Bushel

The cost of production is calculated as the total cost divided by the total yield, expressed in dollars per bushel. Achieving the lowest cost of production requires minimizing expenses while maintaining sufficient yield. While many costs, such as land, machinery, and fixed inputs, are consistent across all competition teams, variable costs depend on each team's management decisions. The choices made to optimize inputs and practices are what drive the variation in cost of production. Teams who effectively balance input efficiency with yield outcomes achieve the lowest cost per unit of production.

After reviewing the Crop Budget, we noticed that the opportunity cost is driven by a fairly high interest rate, and recently escalated land values, possibly making it unrealistic and excessively high. To avoid this dilemma, we replaced ownership cost with a land rental rate of $355/acre, which also eliminated taxes on land of $162.50/acre. This change also moved the rent value to being a cash expense and increased the interest paid by $12.42/acre. Effectually this lowered total cost by approximately $185/acre. The per bushel effect varied depending on the farm number, a $2.51/bushel decrease in cost reduction for Farm 18, to a greater decrease in cost of $3.73/bushel for Farm 3. Even with this adjustment profits are negative. A copy of the crop budget can be found in the appendix at the end of this report.

Cost of production per acre ranged from a high of $774/acre to a low of $613/acre (Table 14). When divided by the final yield, the cost of production per bushel ranged from $13.35/bushel by Farm 1 to $9.84/bushel by Farm 15 (Table 14 and Figure 32). Farm 15 was a UNL managed plot, therefore the award was given to Farm 8, which had the second lowest cost of production at $10.06/bushel. Farm 8's lower cost per acre combined with its higher yield effectively lowered the cost of production per bushel.

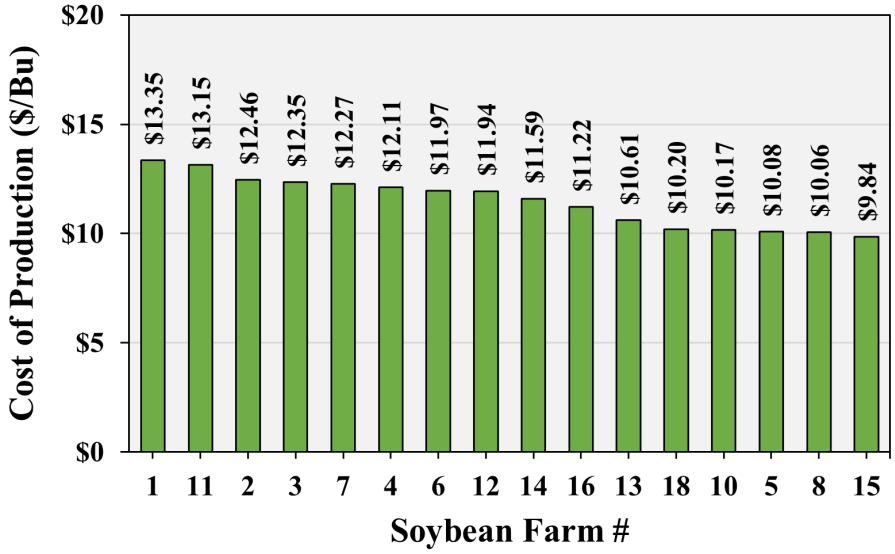


Figure 32. Cost of Production per Bushel received for the individual soybean competition teams.

Profitability

Profitability is derived as total revenue minus total cost. Revenue was found by adding the total value of each market transaction with any insurance indemnities, and/or losses. Costs were based on the stated expenses each competition was assigned. Most of these costs were fixed on a per acre basis and are common among all farms. However, some costs were based on a fixed per unit cost and varied by individual choices. Since all farms are identical in cost structure, physical attributes, and revenue opportunity it is the choices made and the resulting outcomes of those choices that drive the difference in profitability.

Revenue per bushel ranged from a low of $9.18/bushel, Farm 2, to a high of $11.79/bushel, Farm 1 (Table 14). The lowest cost per acre, excluding the control, was achieved by Farm 3 at $613/acre (Table 14), and the highest cost per acre was Farm 7 at $774/acre.

Although all of the soybean teams had a negative profit, due to the low yields and prices, when revenue and cost were considered on a per acre basis, Farm 8 earned the award for profitability with -$24 per acre loss (Table 14, and Figure 33). The cost per acre for the winning team was $647/acre (Table 14), which was lower than the competition average of $700/acre. The revenue per bushel sold for the winning team was $9.69/bushel, which was just lower than the average of $9.78/bushel for the competition. With one of the lowest costs and higher yields in the competition Farm 8 won the Most Profitable Award.

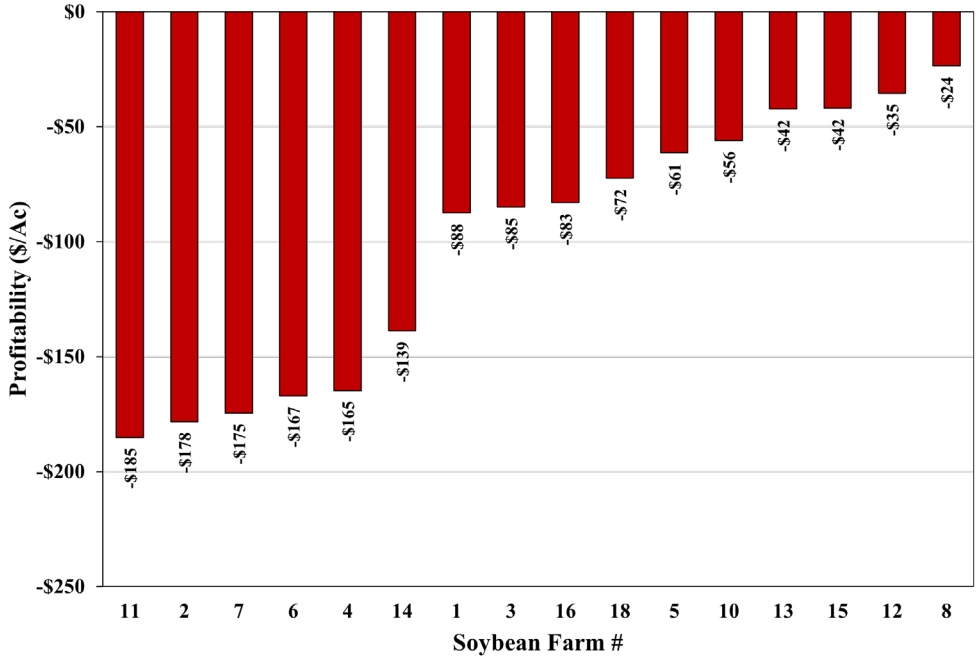


Figure 33. Profit per acre received for the individual soybean competition teams.

Table 14: Summary of results from the 2024 TAPS soybean competition.

Farm #	Grain Yield** (bu/ac)	Revenue ($/bu)	Cost ($/ac)	Cost ($/bu)	Profit ($/ac)
1	55.8	$11.79	$745	$13.35	-$88
2	54.4	$9.18	$678	$12.46	-$178
3	49.7	$10.64	$613	$12.35	-$85
4	57.0	$9.22	$690	$12.11	-$165
5	71.4	$9.22	$719	$10.08	-$61
6	61.3	$9.24	$734	$11.97	-$167
7	63.0	$9.50	$774	$12.27	-$175
8	64.3	$9.69	$647	$10.06	-$24
*9	61.5	-	-	-	-
10	62.6	$9.28	$637	$10.17	-$56
11	57.1	$9.90	$751	$13.15	-$185
12	58.0	$11.33	$693	$11.94	-$35
13	68.9	$9.99	$731	$10.61	-$42
14	58.4	$9.22	$678	$11.59	-$139
15	67.4	$9.22	$663	$9.84	-$42
16	62.0	$9.88	$696	$11.22	-$83
18	73.6	$9.22	$751	$10.20	-$72

*Control **Reported as 13% grain moisture content.

Note: Farm 17 was a non-competing team and therefore omitted from this report.

AWARD RECIPIENTS

Photo 9. The ***Greatest Grain Yield Award*** was won by Brian Stehno, Farm 5, of Stratton, NE with a yield of 71.4 bushels/acre. Stehno planted Beck's 2950E3 at 130,000 seeds/acre. He chose to apply 50 pounds of sulfur, the highest cost herbicide package and an R3 package that included micronutrients and fungicides.

Pictured Above: Rob Lawson (L) of NRCS presented the award to Stehno (R).

Photo 10. The ***Lowest Cost of Production Award*** and ***Most Profitable Award*** was won by Philip Swantek, Rodger Farr, Shawn McDonald and Chad Lammers, Farm 8. The group planted Hoegemeyer 3185E at 120,000 seeds/acre. They chose not to apply sulfur and then went with the second and lower cost options for post herbicide and R3 application. The team's average revenue of $9.69/bushel combined with their lower cost per acre choices and higher yields were the driving factor in winning the top awards in the inaugural year of the soybean competition.

Pictured Above: Rob Lawson (Far Left) of NRCS presented the award to Farr and McDonald (L to R).

OUTSTANDING TAPS ADVOCATE AWARD

The Nebraska Corn Board was recognized as this year's recipient of the "Outstanding TAPS Advocate". This annual honor celebrates individuals, groups, or organizations that have gone above and beyond in supporting and advocating for the TAPS program. Since the program's inception, the Nebraska Corn Board has played a pivotal role in fostering the TAPS program's growth and success through significant contributions and steadfast support. Their commitment to advancing agricultural innovation and education has been invaluable, helping TAPS provide producers with opportunities to enhance their management skills and decision-making. Congratulations, and thank you to the Nebraska Corn Board for your exceptional dedication!

CONCLUSION

As the 2024 season concludes, UNL-TAPS continues to evolve and provide unique opportunities for competitors, industry professionals, researchers, students, and supporters. Each competition offers a platform to generate actionable insights, explore innovative technologies, and refine management practices. The dynamic, real-world experience of UNL-TAPS delivers invaluable lessons through hands-on application, preparing participants to face the real challenges of modern production agriculture. This year, we introduced new opportunities for engagement, from navigating market fluctuations to responding to complex weather events, fostering critical reflection and learning.

Looking ahead, UNL-TAPS is focused on broadening its impact by deepening the understanding and application of data collected through competitions. With plans to expand our reach, we are actively exploring new competition formats, innovative educational initiatives, and exciting collaborations. Efforts like the virtual TAPS (VTAPS) program and integration into high school agriculture courses are in progress, paving the way for the next generation of agricultural leaders.

We are grateful to everyone who has and continues to contribute to the growth and success of the TAPS program. Your involvement and support drive the program's mission forward. We extend congratulations to this year's teams and winners for their dedication and achievements. Together, we look forward to a future filled with innovation, collaboration, and success in advancing agricultural excellence.

SUPPORT

The TAPS program continues to be successful due to the commitment and support provided by our participants, partners, and sponsors (Figures 4 and 5). The 2024 competitions were supported through the following grants: USDA-NRCS Technical Agreement, Nebraska Corn Board, the Nebraska Soybean Board, National Sorghum Checkoff, and the Nebraska Sorghum Board.

REFERENCES

Lo, T., Rudnick, D.R., Burr, C.A., Stockton, M.C., & Werle, R. (2019). Approaches to evaluating grower irrigation and fertilizer nitrogen amount and timing. *Agricultural Water Management*. 213: 693-706.

APPENDIX
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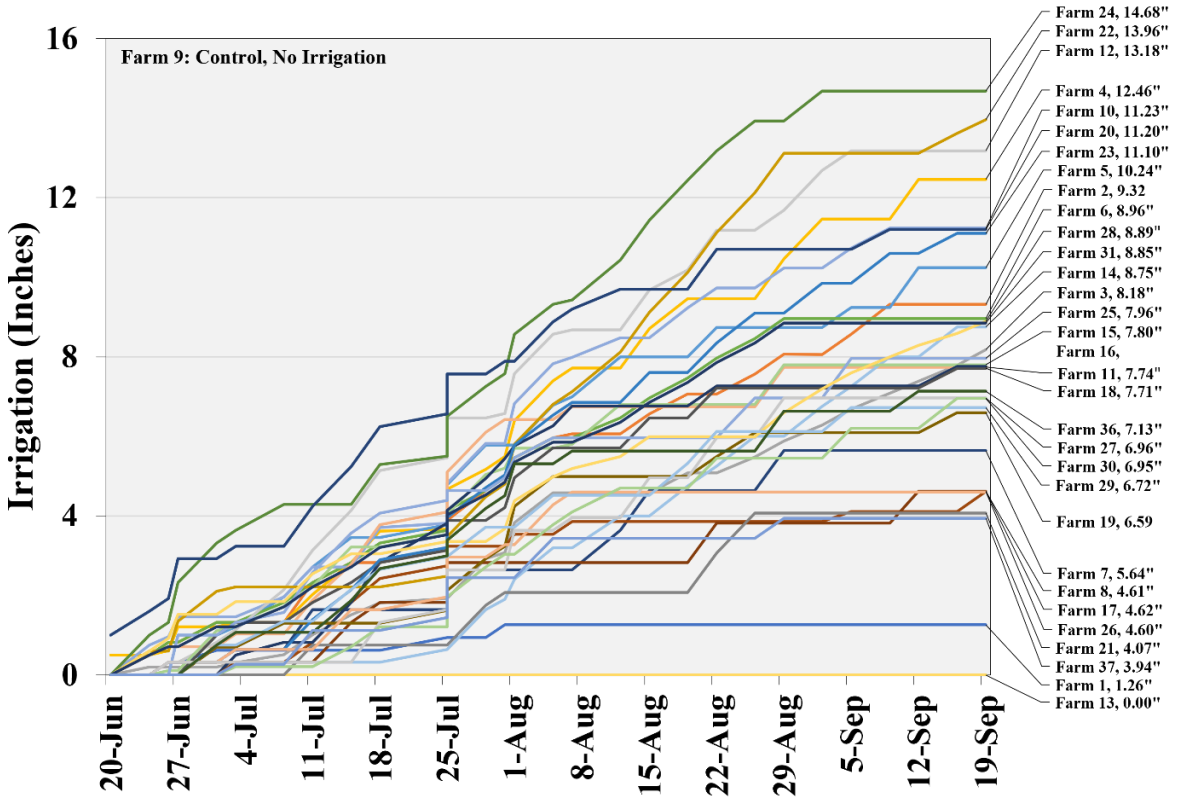
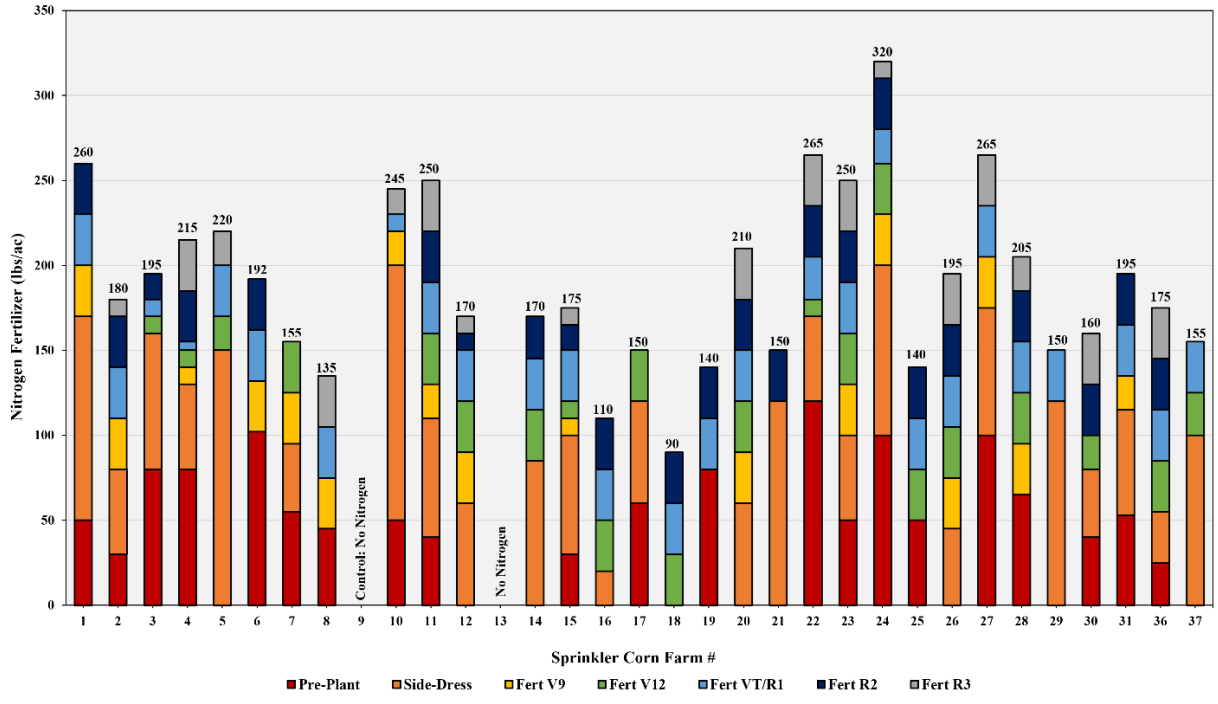
NORTH PLATTE

Sprinkler Corn





2024 Budget 33: Based on Pivot Irrigated Corn, No-Till, Bt & ECB, following Soybeans, Yield Goal of 275 bu/ac

User Input	
Yield Goal	230
Actual Yield @ 15.5% MC (bu/ac)	294.37
Loaded Miles	0
Moisture Content Above 15.5%	0

EXAMPLE

Farm #36	Field Operations	Times or Qty	Unit	Labor @ $25.00 /Hr	Fuel @ $3.83 & Lube	Repairs Power	Repairs Imp.	Ownership Power	Ownership Imp.	Total Costs ($/ac)
					Dollars per Acre					
1	Spray Spring Burndown Herbicide	0.5	% of ac	0.47	0.16	0.01	0.55	0.79	1.01	$2.99
2	Spray Post Application #1	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
3	Spray Post Application #2	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
4	Planting (no-till)	1.0	% of ac	3.00	1.34	0.06	6.56	5.24	9.12	$25.32
5	Pivot 125 ft Lift with fertigation	7.1	inches	6.10	$/ac-in	0.00	0.00			$43.49
6	Pivot Ownership Costs	NA		0.00	0.00	0.00	0.00	5.00	14.24	$19.24
7	Combine	1.0	% of ac	5.32	8.06	8.53	1.93	39.16	13.37	$76.37
8	Grain Cart	294.37	bu/ac	0.021	$/bu					$6.03
9	Grain Cart Ownership	NA		0.00	0.00	0.00	0.00	4.37	2.99	$7.36
	Total for Field Operations			16.81	10.20	8.64	11.26	57.74	44.77	$192.83

Materials & Services	Item	Percent Acres Applied	Application Rate	Unit	Applied Price	Total
Glyphosate w/Surf	Herbicide	100%	32	ounce	0.13280	$4.25
2,4-D Ester 4#	Herbicide	100%	1	pint	4.50	$4.50
21-0-0-24S	Additive	100%	1.7	pound	0.40000	$0.68
Acuron	Herbicide	100%	2.5	quart	21.25	$53.13
Crop Oil Concentrate	Additive	100%	1.6	pint	1.63	$2.61
21-0-0-24S	Additive	100%	2.5	pound	0.40	$1.00
Corn Bt & ECB	Seed Cost/ac	100%	1.0	acre	125.38	$125.38
10-34-0	Fertilizer	100%	5.0	gallon	3.30	$16.50
32-0-0 (Pre and Sidedress)	Fertilizer	100%	55.0	pound N	0.60	$33.00
32-0-0 (applied by fertigation)	Fertilizer	100%	120.0	pound N	0.60	$72.00
Armezon Pro	Herbicide	100%	14	ounce	1.48	$20.72
Atrazine 90 DF	Herbicide	100%	1	pound	6.50	$3.25
Crop Oil Concentrate	Additive	100%	0.5	pint	21.25	$10.63
UAN	Additive	100%	3	pint	0.25	$0.75
Spray	Custom	30%	1	acre	9.00	$2.70
Western Bean Cutworm Control	Insecticide	100%	0	ounce	0.00	$0.00
WBC Application	Insecticide	100%	0	applications	9.00	$0.00
Brigade 2EC	Insecticide	50%	5.12	ounce	1.48	$3.79
Mustang Max EC	Insecticide	50%	3	ounce	1.88	$2.82
Sidedress Application	Fertilizer	100%	1	applications	8.50	$8.50
Fertigate Applications	Fertilizer	100%	4	applications	1.25	$5.00
Spray	Custom	30%	1	acre	9.00	$2.70
Delaro Complete	Fungicide	60%	12	ounce	4.14	$29.81
Cover Crop Seed Mix	Seed	100%	1	acre	31.20	$31.20
Drill Cover Crop	Custom	100%	1	acre	20.00	$20.00
Cover Crop Termination Spray	Custom	100%	1	acre	6.00	$6.00
Haul Grain Bushels	Custom	100%	294.37	bushel	0.0000	$0.00
Dry 1 Point Removed	Custom	100%	294.37	bushel	0.04	$0.00
Scouting Irrigated Corn	Scouting	100%	1	acre	13.00	$13.00
Technology	Imagery/sensor	100%	1	acre	10.00	$10.00
Crop Insurance	Crop Insurance	100%	1	acre	6.26	$6.26

Total Materials & Services:	$490.16
*Insecticide for 1st brood European Corn Borer (10% of refuge), Western Bean Cutworm, and Spider Mites, respectively.	

Total listed costs for Field Operations and Materials and Services:					$682.99
Interest on Operations Capital	$ 580.48	cash expense @	7.00%	for 6 months	$20.32

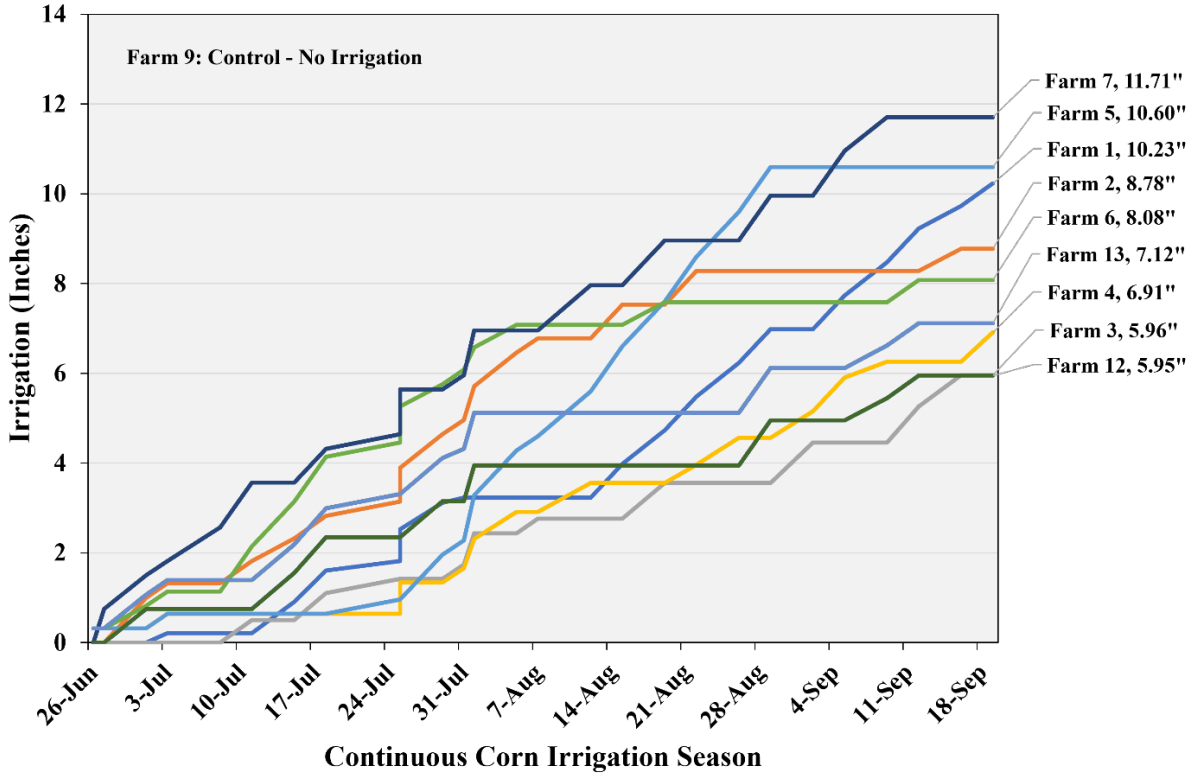
Total Operating and Use Related Ownership Costs	$703.31

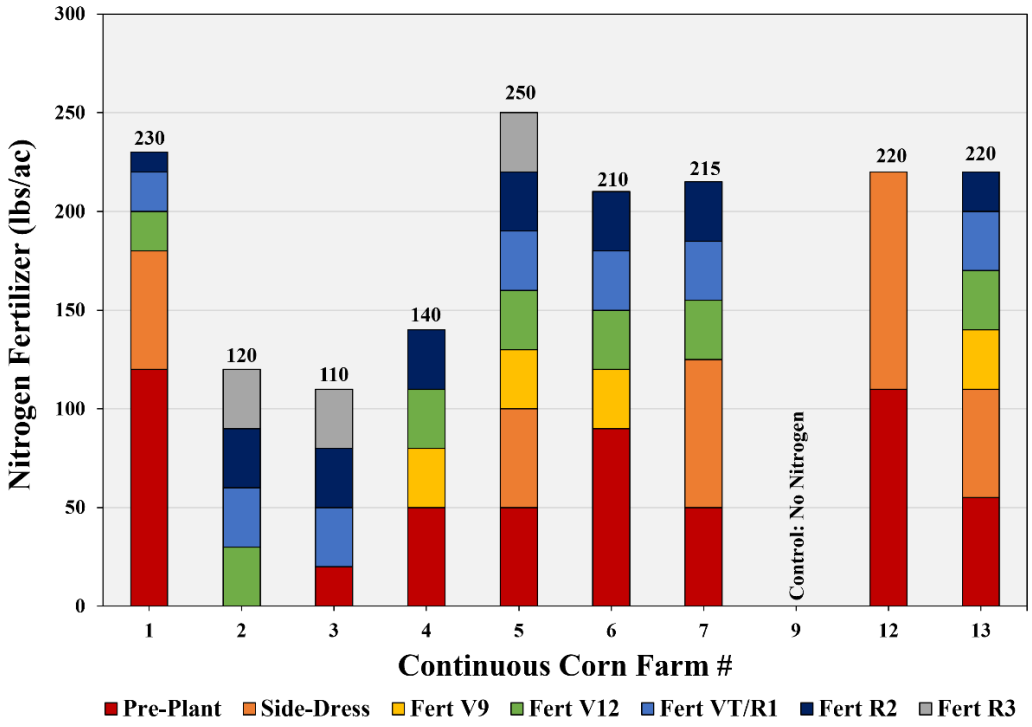
Overhead (accounting, liability insurance, vehicle cost, office expense)					$25.00
Real Estate Opportunity	Pivot (SW & Central)	$ 7,000	per acre @	3.00%	$210.00
Real Estate Taxes		$ 7,000	per acre @	1.25%	$87.50
Total Cost per Acre Including Overhead					$1,025.81

*** Cost per Bushel**	$3.48
Cash Cost per Bushel	$2.34

* Does not inlcude marketing costs.

Continuous Corn





User Input	
Yield Goal	230
Actual Yield @ 15.5% MC (bu/ac)	253.09
Loaded Miles	0
Moisture Content Above 15.5%	0

EXAMPLE

Farm #13	Field Operations	Times or Qty	Unit	Labor @ $25.00 /Hr	Fuel @ $3.83 & Lube	Repairs Power	Repairs Imp.	Ownership Power	Ownership Imp.	Total Costs ($/ac)
				---------- Dollars per Acre ----------						
1	Spray Spring Burndown Herbicide	0.5	% of ac	0.47	0.16	0.01	0.55	0.79	1.01	$2.99
2	Spray Post Application #1	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
3	Spray Post Application #2	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
4	Planting (no-till)	1.0	% of ac	3.00	1.34	0.06	6.56	5.24	9.12	$25.32
5	Pivot 125 ft Lift with fertigation	7.1	inches	6.10	$/ac-in	0.00	0.00			$43.43
6	Pivot Ownership Costs	NA		0.00	0.00	0.00	0.00	5.00	14.24	$19.24
7	Combine	1.0	% of ac	4.88	7.39	7.82	1.77	35.90	12.26	$70.02
8	Grain Cart	253.09	bu/ac	0.021	$/bu					$5.19
9	Grain Cart Ownership	NA		0.00	0.00	0.00	0.00	3.97	2.71	$6.68
	Total for Field Operations			16.37	9.53	7.93	11.10	54.08	43.38	$184.89

Materials & Services	Item	Percent Acres Applied	Application Rate	Unit	Applied Price	Total
Glyphosate w/Surf	Herbicide	50%	32	ounce	0.13280	$2.12
2,4-D Ester 4#	Herbicide	50%	1	pint	4.50	$2.25
21-0-0-24S	Additive	50%	1.7	pound	0.40000	$0.34
Acuron	Herbicide	100%	2.5	quart	21.25	$53.13
Crop Oil Concentrate	Additive	100%	1.6	pint	1.63	$2.61
21-0-0-24S	Additive	80%	1.7	pound	0.40	$0.54
Corn Bt & ECB	Seed Cost/ac	100%	1.0	acre	144.00	$144.00
10-34-0	Fertilizer	100%	5.0	gallon	3.30	$16.50
32-0-0 (Pre and Sidedress)	Fertilizer	100%	110.0	pound N	0.60	$66.00
32-0-0 (applied by fertigation)	Fertilizer	100%	110.0	pound N	0.60	$66.00
Armezon Pro	Herbicide	80%	14	ounce	1.48	$16.58
Crop Oil Concentrate	Additive	80%	0.5	pint	21.25	$8.50
Spray	Custom	30%	1	acre	9.00	$2.70
Brigade 2EC	Insecticide	50%	5.12	ounce	1.48	$3.79
Mustang Max EC	Insecticide	50%	3	ounce	1.88	$2.82
Sidedress Application	Fertilizer	100%	1	applications	8.50	$8.50
Fertigate Applications	Fertilizer	100%	4	applications	1.25	$5.00
Spray	Custom	30%	1	acre	9.00	$2.70
Revytek	Fungicide	30%	8	ounce	3.67	$8.81
Haul Grain Bushels	Custom	100%	253.09	bushel	0.0000	$0.00
Dry 1 Point Removed	Custom	100%	253.09	bushel	0.04	$0.00
Scouting Irrigated Corn	Scouting	100%	1	acre	13.00	$13.00
Technology	Imagery/sensor	100%	1	acre	10.00	$10.00
Crop Insurance	Crop Insurance	100%	1	acre	6.26	$6.26

Total Materials & Services:	$442.14
*Insecticide for 1st brood European Corn Borer (10% of refuge), Western Bean Cutworm, and Spider Mites, respectively.	

Total listed costs for Field Operations and Materials and Services:					$627.03
Interest on Operations Capital	$ 529.57	cash expense @	7.00%	for 6 months	$18.54

Total Operating and Use Related Ownership Costs	$645.57

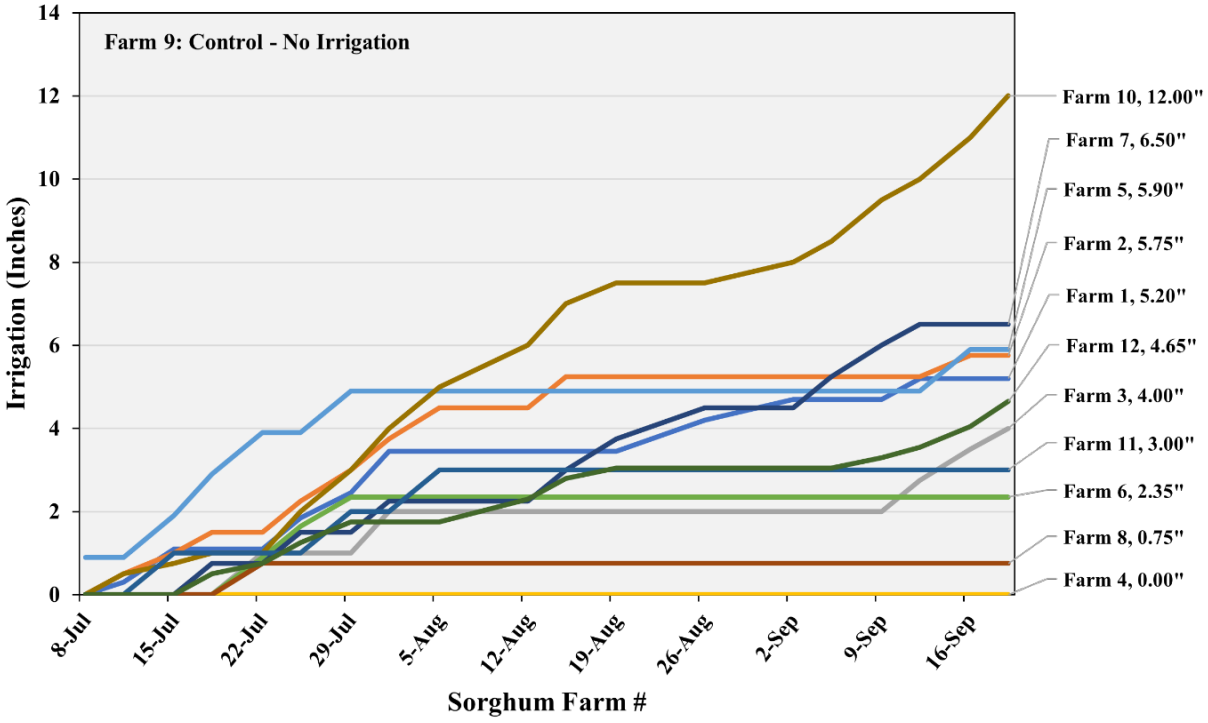
Overhead (accounting, liability insurance, vehicle cost, office expense)					$25.00
Real Estate Opportunity	Pivot (SW & Central)	$ 7,000	per acre @	3.00%	$210.00
Real Estate Taxes		$ 7,000	per acre @	1.25%	$87.50
Total Cost per Acre Including Overhead					$968.07

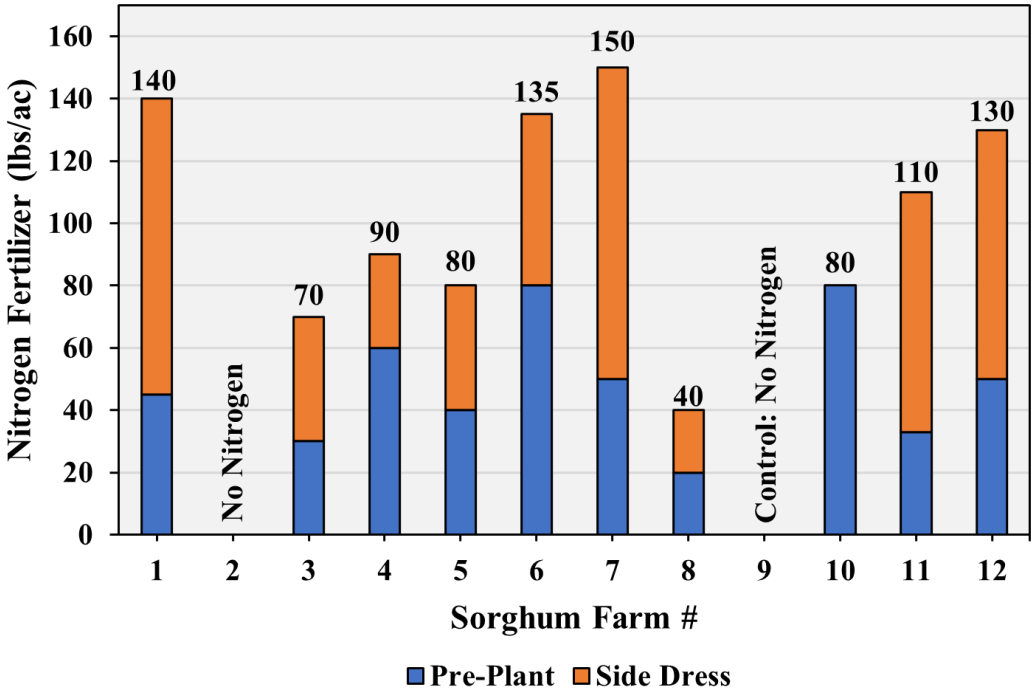
*** Cost per Bushel**	$3.83
Cash Cost per Bushel	$2.51

* Does not include marketing costs.

GRANT

Sorghum





2024 Budget 49: Based on Pivot Irrigated Grain Sorghum, No-Till

User Input	
Yield Goal	145
Actual Yield @14% MC (bu/ac)	136.02
Loaded Miles	0
Moisture Content Above 14%	0

EXAMPLE

Farm #7	Field Operations	Times or Qty	Unit	Labor @ $25.00 /Hr	Fuel @ $3.83 & Lube	Repairs Power	Repairs Imp.	Ownership Power	Ownership Imp.	Total Costs ($/ac)
					Dollars per Acre					
1	Spray Spring Burndown Herbicide	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
2	Spray Post Application #1	1.0	% of ac	0.95	0.32	0.02	1.11	1.59	2.02	$6.01
3	Spray Post Application #2	0.8	% of ac	0.76	0.25	0.02	0.89	1.27	1.61	$4.80
4	Planting (no-till)	1.0	% of ac	3.00	1.34	0.06	6.56	5.24	9.12	$25.32
5	Pivot 125 ft Lift w/fert - $8.31/ac-in	6.5	inches	8.31	$/ac-in					$54.02
6	Pivot Ownership Costs	NA		0.00	0.00	0.00	0.00	4.47	8.73	$13.20
7	Combine	1.0	% of ac	3.90	5.90	6.24	0.86	28.66	4.47	$50.03
8	Grain Cart	136.02	bu/ac	0.0205	$/bu					$2.79
9	Grain Cart Ownership	NA		0.00	0.00	0.00	0.00	2.70	1.85	$4.55
	Total for Field Operations							45.52	29.82	$166.72

Materials & Services	Item	Percent Acres Applied	Application Rate	Application Unit	Applied Price	Total
Glyphosate w/Surf	Herbicide	100%	32	ounce	0.13	$4.16
2,4-D Ester 4#	Herbicide	100%	1	pint	4.50	$4.50
21-0-0-24S	Additive	100%	1.7	pound	0.40	$0.68
Lumax EZ	Herbicide	100%	2.7	quart	18.75	$50.63
21-0-0-24S	Additive	50%	1.7	pound	0.40	$0.34
Sorghum Seed	Seed Cost/Ac	100%	1.0	$/ac	32.24	$32.24
10-34-0	Fertilizer	100%	5.0	gallon	3.30	$16.50
32-0-0 (Pre and Sidedress)	Fertilizer	100%	150.0	pound N	0.60	$90.00
Huskie	Herbicide	50%	120	ounce	1.05	$63.00
Preplant & Sidedress Application	Fertilizer	100%	2	applications	8.50	$17.00
Aereal Spray	Custom	15%	1	acre	11.00	$1.65
Mustang Maxx	Insecticide	15%	3	oz.	1.88	$0.85
Haul Grain Bushels	Custom	100%	0	bushel	0.1000	$0.00
Technology Cost	Imagery/sensor	100%	1	acre	10.00	$10.00
Dry 1 Point Removed	Custom	100%	136.02	bushel	0.04	$0.00
Crop Insurance	Crop Insurance	100%	1	acre	9.16	$9.16

Total Materials & Services:	$300.70
*Insecticide for 1st brood European Corn Borer (10% of refuge), Western Bean Cutworm, and Spider Mites, respectively.	

Total listed costs for Field Operations and Materials and Services:					$467.42
Interest on Operations Capital	$ 392.08	cash expense @	7.00%	for 6 months	$13.72

Total Operating and Use Related Ownership Costs	$481.15

Overhead (accounting, liability insurance, vehicle cost, office expense)					$25.00
Real Estate Opportunity	Pivot (SW)	$ 5,340	per acre @	3.00%	$160.20
Real Estate Taxes		$ 5,340	per acre @	1.25%	$66.75
Total Cost per Acre Including Overhead					$733.10

*** Cost per Bushel**	$5.39
Cash Cost per Bushel	$3.47

* Does not include marketing costs.

MEAD

Soybeans

2024 Budget 61-Soybeans, Enlist, No Till, after Corn, 70 bushel Yield
Pivot Irrigated Electric, 800 GPM 35 PSI, 6 acre/inches

User Input	
Yield Goal	66
Actual Yield @ 13.0% MC (bu/ac)	73.62
Loaded Miles	0
Moisture Content Above 13.0%	0

EXAMPLE

Field Operations	Times or Qty	Unit	Labor @ $25.00 /Hr	Fuel @ $3.45 and Lube	Repairs Power	Repairs Imp.	Ownership^ Power	Ownership^ Imp.	Total	
Spray Burndown Herbicide	1		0.95	0.32	0.02	1.11	1.59	2.02	$	6.01
Plant No-Till	1		3.00	1.02	0.06	10.25	5.24	6.08	$	25.65
Sulfur Application	1		0.95	0.32	0.02	1.11	1.59	2.02	$	6.01
Spray Herbicide	1		0.95	0.32	0.02	1.11	1.59	2.02	$	6.01
Spray Herbicide	1		0.95	0.32	0.02	1.11	1.59	2.02	$	6.01
Pivot E 55' Lift - $6.50/ac-in	2.75	ai	at $6.50/ac-in						$	17.88
Pivot Ownership Costs	NA						4.47	8.73	$	13.20
Combine Irr SB (flex head)	1		3.17	4.81	5.08	0.63	23.35	7.35	$	44.39
Grain Cart	73.62	bu/ac	0.02	$/bu					$	1.51
Grain Cart Ownership Cost							2.70	1.85	$	4.55
	Total for Field Operations						**42.12**	**32.09**	**$**	**131.21**

Materials & Services		Operation Index	Percent Acres Applied	Application Rate	Application Unit	Applied Price	Total	
Glyphosate 5# w/Surfactant	Herbicide	1	1	32	ounce	0.132813	$	4.25
2,4-D Ester LV4	Herbicide	1	1	1	pint	4.5	$	4.50
21-0-0-24S	Additive	1	1	1.7	pound	0.25	$	0.43
Sulfur		1	1	1	acre	18.5	$	18.50
Residual Herbicide Decision	Herbicide	1	1	1	acre	0	$	-
Enlist Soybeans	Seed	2	1	1	acre	58	$	58.00
Soybean Seed Treatment	Fungicide	2	1	1		6	$	6.00
Post Herbicide Application	Herbicide	3	1	1	acre	37.08	$	37.08
Fungicide/Insectide/Micronutrient	Cost	4	1	1	acre	67	$	67.00
Fungicide/Insectide/Micronutrient	Application	1	1	1	acre	6	$	6.00
Haul Grain Bushels	Custom	8	1	0	bushel	0.1	$	-
Scouting Irrigated Soybeans	Scouting		1	1	acre	0	$	-
Crop Insurance							$	2.60
	Total Materials & Services						**$**	**204.36**

* Harvest factor adjustment used on costs

**Insecticide for Aphids and Caterpillars

Total listed costs for Field Operations and Materials and Services				$	335.57
Interest on Operations Capital	$ 616.36	cash expense @	7%	for 6.0 mo.	$ 21.57
Total Operating and Use Related Ownership Costs				**$**	**357.14**
Overhead (accounting, liability insurance, vehicle cost, office expense, soil tests)				$	33.00
Cash Rent		per acre @		$	355.00
Real Estate Taxes	$ -	per acre @	1.25%	$	-
Total Cost per Acre Including Overhead				**$**	**745.14**
* Cost Per Bushel	^Ownership and RE Opportunity not included in cash costs.			**$**	**10.12**
Cash Cost Per Bushel				**$**	**8.67**

*Does not include markting costs.

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EXTENSION