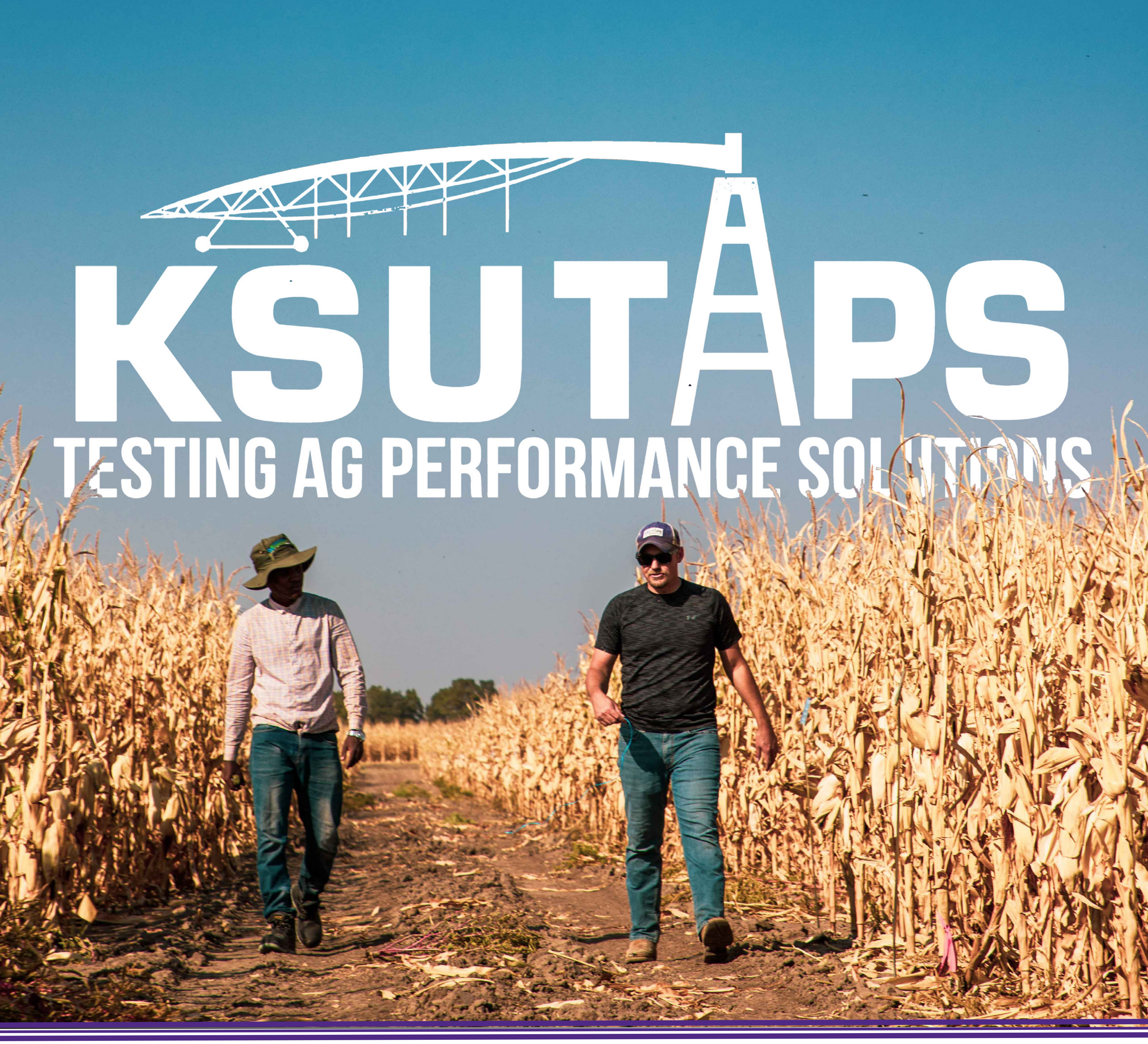


2024 FARM MANAGEMENT COMPETITION REPORT

Kansas State University
Kansas Water Institute

USDA United States Department of Agriculture
Natural Resources Conservation Service

K-State Research and Extension

TABLE OF CONTENTS

Acknowledgement

The success of the KSU-TAPS program is made possible through the invaluable contributions of many affiliates and partners. We are deeply grateful to the dedicated individuals across the Kansas State University system, who bring a wealth of knowledge and steadfast support to our efforts. We also extend our gratitude to our collaborators from the TAPS programs in Nebraska, Colorado, Oklahoma, Alabama, Maryland, and Florida for their shared vision and partnership.

A special thank you goes to our talented interns, Tumwesige (Maxwell) Kabateraine, Rayhaan Kabenge, and Simon Salcido for their hard work and dedication to this program. Their contributions have been essential to our success, and we are proud to have them as part of the TAPS team.

Mission Statement

To fully engage agriculturalists, scientists, educators, students, and industry in an innovative endeavor, to TAP into the Kansas State University Research and Extension system'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.

K-STATE
Research and Extension

Publications from Kansas State University are available at
ksre.ksu.edu

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

TAPS Team

We are shaping the future of sustainable agriculture through innovation, efficiency, and collaborative research.

Daran Rudnick
Director of Sustainable Irrigation

Renee Tuttle
Extension Associate, Irrigation and TAPS

Kelsey Stremel
Communications and Marketing Specialist

Raenette Martin
Research Assistant

Ray Duffey
Agricultural Tech II

Jonathan Aguilar
Professor and Extension Specialist, Water Resources

Lucas Haag
Professor, Extension Agronomy Specialist

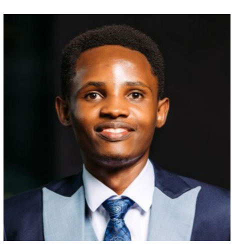
Jeanne Falk Jones
Multi-County Agronomy Specialist

Daniel O'Brien
Professor, Agricultural Economist

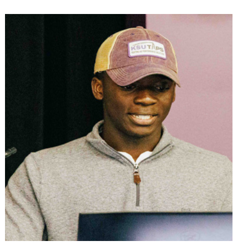
Brian Olson
WKREC Department Head

Susan Metzger
Director, Strategic Interdisciplinary Program Development
Director, Kansas Water Institute and the Kansas Center for Agricultural Resources and the Environment
Director, Institute for Digital Agriculture and Advanced Analytics - Engagement

Dwane Roth
Front Porch Farms Where Agriculture Connects



Tumwesige (Maxwell) Kabateraine
Visiting Scholar



Rayhaan Kabenge
TAPS Intern

Dear Participants, Partners, and Supporters,

As we reflect on the past year, we are deeply grateful for the progress made through the KSU-TAPS program. Since our October 2023 launch, TAPS has worked to address pressing water challenges and support sustainable agricultural practices in meaningful ways.

Through events such as the TAPS Kickoff, Technology Field Day, Agronomy Field Day, and Awards Banquet, we've fostered opportunities for farmers, researchers, and industry partners to connect, share insights, and collaborate. These gatherings have highlighted the value of working together to address the challenges and opportunities in modern agriculture.

This progress would not have been possible without the steadfast support of our partners, sponsors, and most importantly, our farmers. Your participation and contributions are the foundation of TAPS, enriching the learning experience for everyone involved. We also want to thank our collaborators at K-State and the many organizations, businesses, and agencies that share our vision.

To this year's competition participants and winners—congratulations on your hard work and achievements. Your innovative approaches and thoughtful decision-making have been inspiring to witness.

Looking ahead, TAPS remains committed to expanding our reach, strengthening partnerships, and promoting practices that support efficiency and sustainability in agriculture. Together, we are building momentum to address the challenges facing our region and industry.

Thank you for being part of this journey. We look forward to continuing this work with all of you in the year ahead.

Sincerely,
The TAPS Team

TAPS Overview

The 2024 TAPS Sprinkler-Irrigated Corn Competition took place at the Kansas State University Northwest Research-Extension Center (NWREC) in Colby, Kansas.

The competition has four awards: 1) Most Economically Profitable; 2) Most Economically Profitable at or Below Q-Stable; 3) Highest Input Use Efficiency; and 4) Greatest Grain Yield. The competition consisted of 98 participants representing thirty-four teams, referred to as farms, where each farm was allocated four randomized plots (figure 1) under a Valley variable rate linear-move irrigation system.

Each Farm team was tasked with making key agricultural production and farm business decisions, including technology utilized, planting date, hybrid selection, seeding rate, irrigation amount and timing, nitrogen fertilizer amount and timing, insurance coverage, and grain marketing.

Details of each decision are shared below. Agronomic decisions utilizing data from the contestants' plots were submitted via the password protected TAPS data portal (TAPSNetwork.org). These decisions were compiled by the TAPS team and implemented in the field at NWREC utilizing precision agricultural equipment and machinery. The farm business decisions, insurance and marketing, were simulated. Grain yields and costs of each farm were scaled (i.e., multiplied) to represent 2,000 acres of production allowing each team to insure and market an amount of grain that is representative of a farm size in Northwest Kansas.

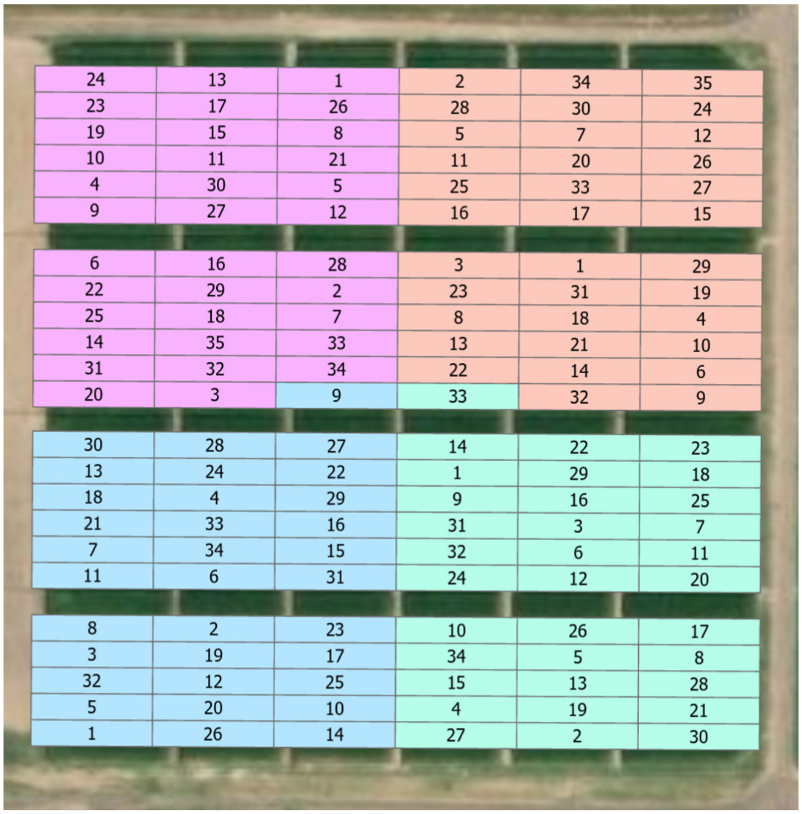


Figure 1. *Plot map of the TAPS competition field at the Northwest Research-Extension Center.*

TAPS Competitors

Map of TAPS Participants from Kansas

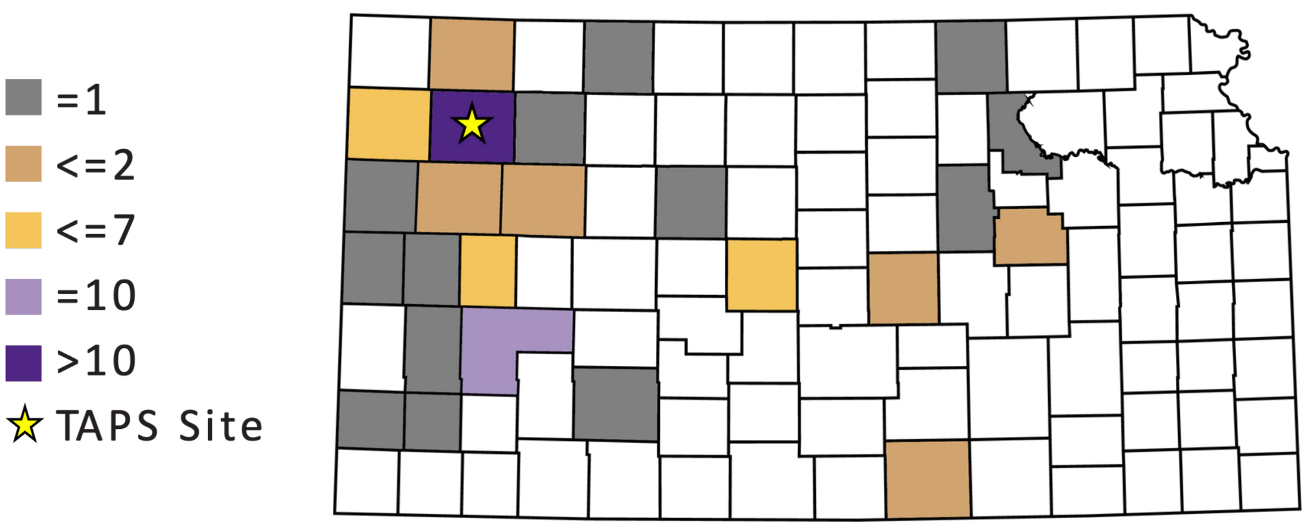


Figure 2. *Location of the 2024 Kansas TAPS Farm Management Competition participants for the TAPS competition administered in Colby, Kansas.*

NOTE: *TAPS participants are also competitors in the Farm Management Competition and so these two terms will be used interchangeably throughout the report.*

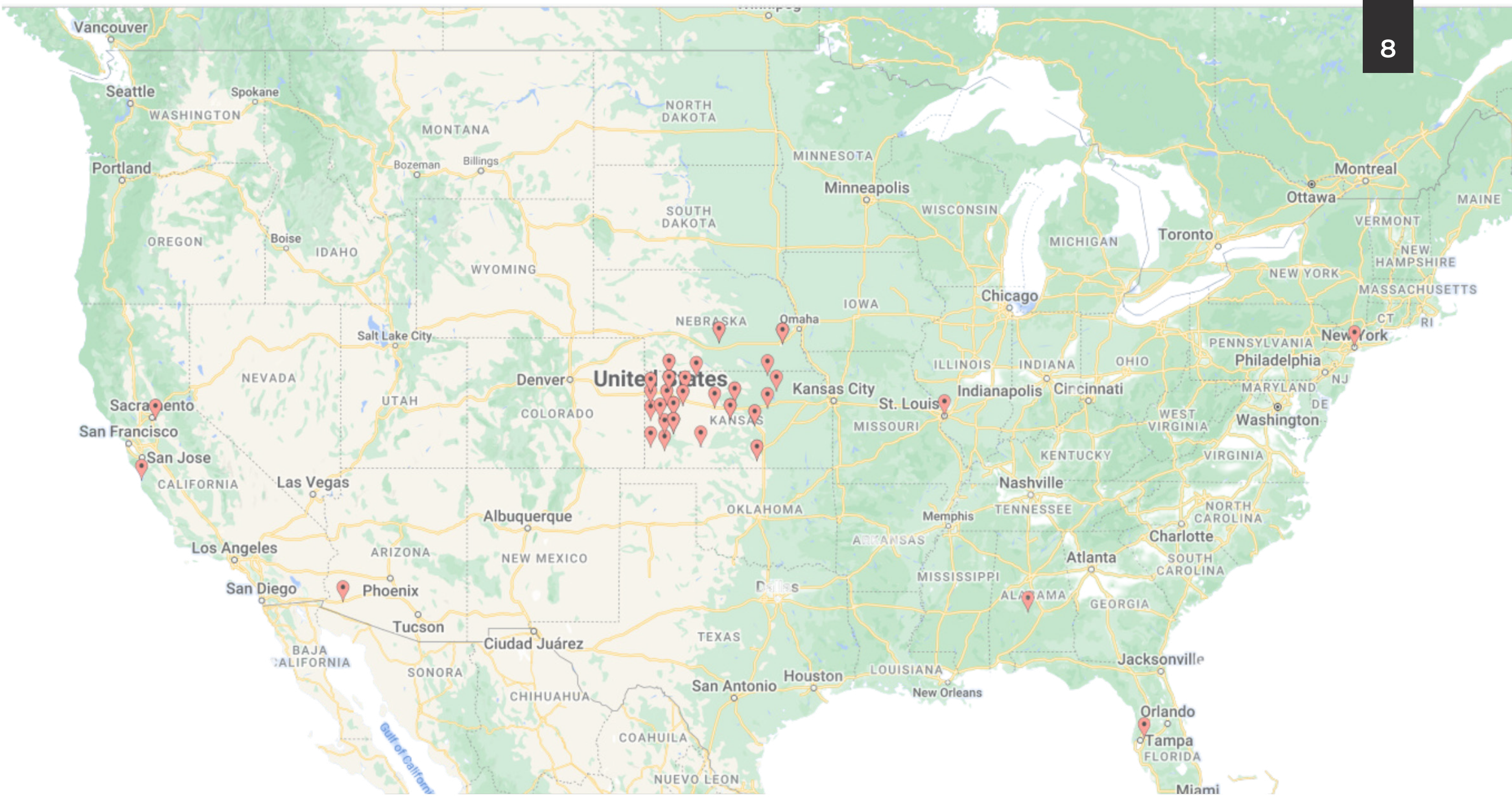


Figure 3. *Location of the 2024 TAPS Farm Management Competition participants for the TAPS competition administered in Colby, Kansas.*

TAPS Participants

Phillip Lange
Aaron Lange
Paul Lange
Mason Scheetz
Martin Lager
Dwane Roth
Robyn Grimm
Zion Roth
Dan Northrup
Shane Mann
Jeremy Myers
Ryan Inman
Mark Myers
Abby Kroupa
Clint Kroupa
Steve Friesen
Ray Smith
Preston Smith
Johan Marquardt
Greg Bellamy
Shannon Hopson
Lynn Goossen

Marc Ramsey
Witton Peter
Mason Kersenbrock
Wyatt Grabbe
Jack Polifka
Grant Hervey
Nick Osman
Janet Smith
Brant Peterson
Ray Flickner
Mark Nelson
Ryan Flickner
Christopher Hain
Alexander Ruane
Shane Ohlde
Will Carrara
Forrest Melton
Chad Godsey
Stewart Beckman
Edmund Hilger
Jas Dale
Eloy Baquera

Nick Waltz
Elisa Mai
Ethan Mai
Jared Stegman
Luke Minnix
Michael Burch
Jared Riedl
Britt Carter
Matt Long
John West
Garret Smith
Kel Grafel
Nick Higgason
Mike Barton
Kent Higerd
Aaron Higerd
Randy Clydesdale
Russ Martin
Matthew Murrow
Ward Taylor
Jay Ostmeyer
Brian Linin

Brent Linin
Jim Kopriva
Andrew Marshall
Tim Franklin
Janet Bear
Lucas Haag*
Dan O'Brien*
Renee Tuttle*
Daran Rudnick*
Dylan Addington*
Khris Staton*
Jackson Stansell*
James Herrick*
Shane Forney*
Troy Dumler*
Jonathan Aguilar*
John Holman*
Kelsey Stremel*

** Denotes university and private sector teams inelligible for competative awards.*

TAPS Crowdsource Team 16

Farm 16 of the TAPS program took an innovative approach to engage the public and expand the reach of agricultural education. Using social media, the team publicly posted their farm management decisions and invited the public to vote, offering a unique, interactive way for non-participants to experience the farming process while learning about the science and strategy behind it. This allowed followers to “try TAPS” in a collaborative, low-stakes environment, gaining a deeper appreciation for the challenges of farming in Kansas.

Utilizing extension research, Team #16 guided participants through real-world challenges such as irrigation management, input decisions, and market strategies. Each voting opportunity was paired with research-backed explanations and actionable resources to ensure the process was educational and impactful.

The Role of Social Media in Extension Education

Social media platforms are powerful tools for extension outreach, enhancing accessibility and engagement with diverse audiences. Research highlights the role of social media in fostering real-time communication and enabling participatory learning experiences (Newbury et al., 2014). By integrating public voting into the decision-making process, Team 16 expanded the reach and impact of TAPS, achieving:

- **Interactive learning:** Participants gained experience navigating farm decisions, seeing the consequences of their choices in real time.
- **Inclusive engagement:** Voting opportunities encouraged individuals from all backgrounds to connect with agriculture, breaking down barriers to understanding.
- **Timely, relevant outreach:** Social media ensured that the educational content was delivered when it was most applicable and impactful.

Building Agricultural Networks

Farm 16's initiative demonstrated how interactive social media campaigns can strengthen agricultural networks. By inviting the public to engage directly in farm management decisions, the team fostered trust, collaboration, and mutual learning among producers, extension professionals, and non-farming audiences. These networks are essential for:

- **Exchanging ideas:** Farmers and stakeholders can share insights and strategies.
- **Building community:** Inclusive engagement fosters a sense of shared responsibility for addressing agricultural challenges.
- **Amplifying impact:** Broader networks mean greater dissemination of innovative practices and extension resources.

Through their efforts, TAPS Crowdsourced Farm 16 not only advanced agricultural literacy but also strengthened the agricultural community, creating a model for how extension education can connect science, strategy, and people.

TAPS Timeline

Closing Corn Cash Market Price Trend
April 5 - November 30

Kickoff
March 27

Technology and Crop Insurance Decisions Due Grain Marketing Opened
April 5

Planting
May 7, 15 & 31

Technology Field Day
June 20

March	April	May	June	Ju

Irrigation Opened
April 15

Irrigation
Up to 1” per week

Nitrogen Application

Pre-Plant
April 24

Sidedress
June 21

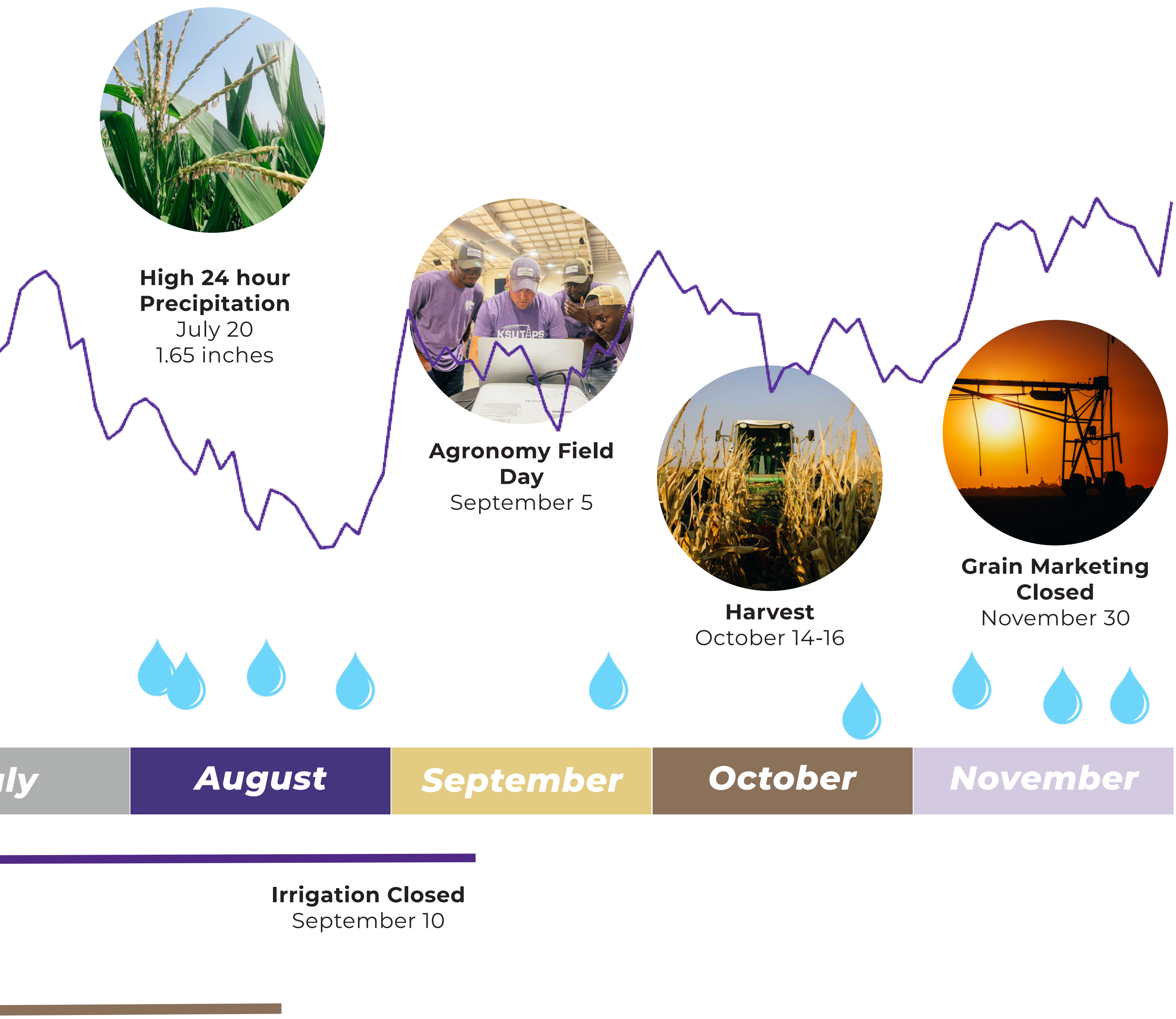


Figure 4. *A brief look at the 2024 competition timeline, including marketing conditions and rainfall activity among the decision making and events.*

Awards

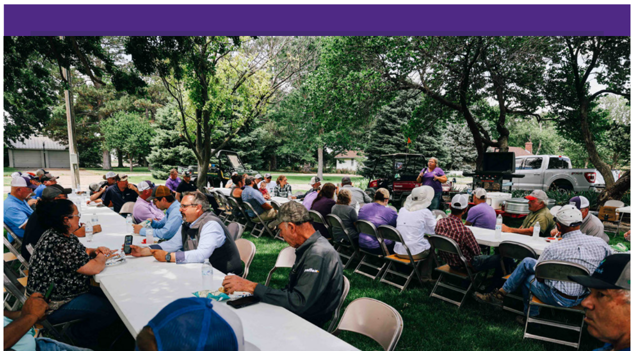
Participants were competing across four award categories: Most Economically Profitable, Most Economically Profitable at or Below Q-Stable, Highest Input Use Efficiency, and Greatest Grain Yield. Thanks to our partners and sponsors, winners of each category received a cash prize, and a trophy buckle presented at the awards ceremony.

Most Economically Profitable: $2,000

This award recognizes the farm with the highest net return rounded to $0.01. Net return was the difference in revenue and costs of the simulated TAPS farms, designed to represent a farm in Northwest Kansas. Revenue was calculated by multiplying the average yield of each farm by 2,000 acres and then by the weighted average market price of the grain sold. Expenses accounted for fixed costs that did not vary across farms (e.g., capital recovery) and variable costs associated with the decisions in the competition.

Most Economically Profitable at or Below Q-Stable: $1,500

This award was determined using the same method as the Most Economically Profitable award. However, eligibility was limited to farms that applied water at or below a Q-Stable value of 7.65 inches. The Q-Stable concept, developed by Butler et al. (2016), estimates the level of pumping needed to stabilize groundwater levels.
Brownie Wilson of the Kansas Geological Survey analyzed water usage data and groundwater levels from 2013 to 2022 at the TAPS site. The analysis revealed that a 27% reduction in pumping is required to stabilize groundwater levels in the area. Considering irrigated versus non-irrigated acreage and net aquifer inflows, the Q-Stable value was calculated as 7.65 inches.



Highest Input Use Efficiency: $2,000

Input use efficiency was calculated using the Water-Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019), which is non-dimensional accounting for the impact of both irrigation and nitrogen fertilizer on grain yield with respect to a control. The farm with the highest WNIPI value rounded to the thousandth decimal place was determined the winner. WNIPI is calculated as follows:

$$WNIPI = \frac{\left(\frac{Y_{Farm}}{Y_{Control}} - 1\right)}{\left(1 + \frac{I_{Farm}}{ET_{Control}}\right) \times \left(1 + \frac{N_{Farm}}{ANU_{Control}}\right)}$$

where, “Farm” is analogous to treatment in the TAPS competition layout, “control” is a farm receiving no additional irrigation or nitrogen fertilizer, “ET” is seasonal evapotranspiration, “I” is seasonal irrigation, “N” is total seasonal applied nitrogen, and “ANU” is aboveground nitrogen uptake.
The control Farm did receive 0.25 inches of irrigation on April 25 for herbicide activation, 12 lbs/acre of N fertilizer as part of a dry phosphorous fertilizer blend on April 24, and 7 lbs/acre as a starter fertilizer at time of planting.

Greatest Grain Yield: $500 maximum

While this is not a yield-focused competition, production remains a critical measure of crop success, particularly when achieved with efficiency and profitability in mind. This award honors the farm with the highest yield, calculated to the nearest 0.01 bu/acre. However, the cash prize is adjusted proportionally based on the performance of the most economically profitable farm.

> TAPS ISN'T JUST ABOUT MAKING (MANAGEMENT) DECISIONS; IT'S ABOUT SEEING THE RIPPLE EFFECTS OF THOSE DECISIONS ON FARM PROFITABILITY AND SUSTAINABILITY.
>
> DARAN RUDNICK

TAPS Partners and Sponsors

We are profoundly grateful for our partners and sponsors' unwavering support and collaboration. Their commitment to our program has been instrumental in our early success and continues to drive our mission forward. Together, we are not just addressing the challenges of today, but actively shaping the future of agriculture. Investment in TAPS is an investment in the resilience and prosperity of our farming communities. We are grateful for our partners' trust, innovation, and dedication to cultivating a more sustainable agricultural landscape.

cropx

LI-COR

AGRI-INJECT
Because irrigation can deliver more than just water.

AquaSpy

BREVANT seeds

groguru

PIONEER

DEKALB

PACLEADER TECHNOLOGY

USDA United States Department of Agriculture
Natural Resources Conservation Service

KCARE
Kansas Center for Agricultural Resources and the Environment

Kansas State University | Kansas Mesonet

BOOT HILL DISTILLERY
DODGE CITY KANSAS

NELSON

ceres IMAGING

OSUTAPS
TESTING AG PERFORMANCE SOLUTIONS

TAMUTAPS
TESTING AG PERFORMANCE SOLUTIONS

UNLTAPS
TESTING AG PERFORMANCE SOLUTIONS

K-STATE Research and Extension | Western Kansas Research-Extension Centers

Phytech

LINDSAY™

DYNAGRO SEED

BECK'S

Channel

syngenta

Golden Harvest®

FARM CREDIT OF WESTERN KANSAS
Financing ag for generations.

Sentek

AD ASTRA PER ASPERA
Kansas Water Office

SENTINEL FERTIGATION

Veris technologies

ARABLE

Precision Planting®

CSU TAPS
TESTING AG PERFORMANCE SOLUTIONS

AU TAPS
TESTING AG PERFORMANCE SOLUTIONS

Growing Conditions and Field History

The 2024 TAPS Sprinkler-Irrigated Corn Competition took place at the Northwest Research-Extension Center in Colby, Kansas. The competition area spanned approximately 12 acres and operated under a Valley variable-rate linear-move irrigation system. The field is under a corn/soybean rotation, thus the competition was planted into soybean residue. However, the field was tilled in fall of 2023 resulting in bare soil conditions for the 2024 growing season. The predominant soil type was Keith Silt Loam with a slope of 0 to 1%. Table 1 summarizes the soil's textural and hydraulic properties, averaged over nine replications, within the six-foot profile. The estimated available water holding capacity (AWHC), water accessible to plants, ranged from 2.03 to 2.21 inches per foot.

Table 1. *Physical and hydrologic soil properties were measured within the competition area. Organic matter content (OMC) and textural composition were analyzed by a commercial laboratory (ServiTech, Inc., Garden City, KS). Field capacity (FC) and permanent wilting point (PWP) were estimated using the algorithm described by Saxton and Rawls (2006).*

Depth (inches)	OMC (%)	Sand, % (%)	Silt, % (%)	Clay, % (%)	FC ($in^3\ in^{-3}$)	PWP ($in^3\ in^{-3}$)	AWHC ($in\ ft^{-1}$)
0 - 12	2.0	21.5	54.4	24.2	0.326	0.155	2.05
12 - 24	1.0	20.4	55.6	24.0	0.329	0.160	2.03
24 - 36	1.0	20.7	59.2	20.1	0.312	0.136	2.10
36 - 48	0.9	21.7	61.2	17.1	0.290	0.110	2.15
48 - 60	0.8	21.8	63.4	14.9	0.281	0.098	2.19
60 - 72	0.8	21.6	64.6	13.8	0.278	0.093	2.21

Weather conditions for 2024 and long-term averages (2010–2024) are summarized in Table 2. From May 1 to October 31, precipitation totaled 8.35 inches, approximately 63% of the long-term average of 13.13 inches. There were 42 rainfall events exceeding 0.04 inches (1 mm), with the highest single event recording 1.65 inches. Daily alfalfa reference evapotranspiration (ETr) ranged from 0.06 to 0.61 inches with an average of 0.33 ± 0.11 inches (figure 1). Overall, 2024 experienced comparable levels of incoming solar radiation (Rs), daily maximum and minimum temperatures (Tmax and Tmin), and relative humidity (RH) to the long-term averages. Wind speed at 2 m height (u2) was highest early in the growing season, a common occurrence in the region.

Table 2. *Monthly average weather conditions for the 2024 growing season and long-term (2010 – 2024) measured near the experimental field at the Northwest Research and Extension Center in Colby, KS. Weather parameters include rainfall, minimum and maximum Temperature (Tmin and Tmax), average relative humidity (RHavg), wind speed at 2 m height (u2), and incoming solar radiation (Rs).*

Year	Month	Rainfall Inches	T_{max} °F	T_{min} °F	RH_{avg} %	u_2 mph	R_s W m^{-2}
2024	April	1.6	68	38	51	10.5	233
	May	2.8	74	46	58	9.3	273
	June	0.7	89	62	57	9.6	290
	July	2.7	90	61	59	6.3	284
	August	1.2	88	62	65	7.0	226
	September	0.6	86	54	53	8.3	221
	October	0.2	75	42	48	8.0	166
2010 to 2024	April	1.5	65	35	56	10.5	235
	May	3.7	73	46	64	9.1	252
	June	2.2	88	59	58	9.0	290
	July	3.0	90	63	61	7.5	280
	August	2.3	88	61	63	6.9	250
	September	1.1	83	53	59	7.6	208
	October	0.9	68	38	57	8.0	160

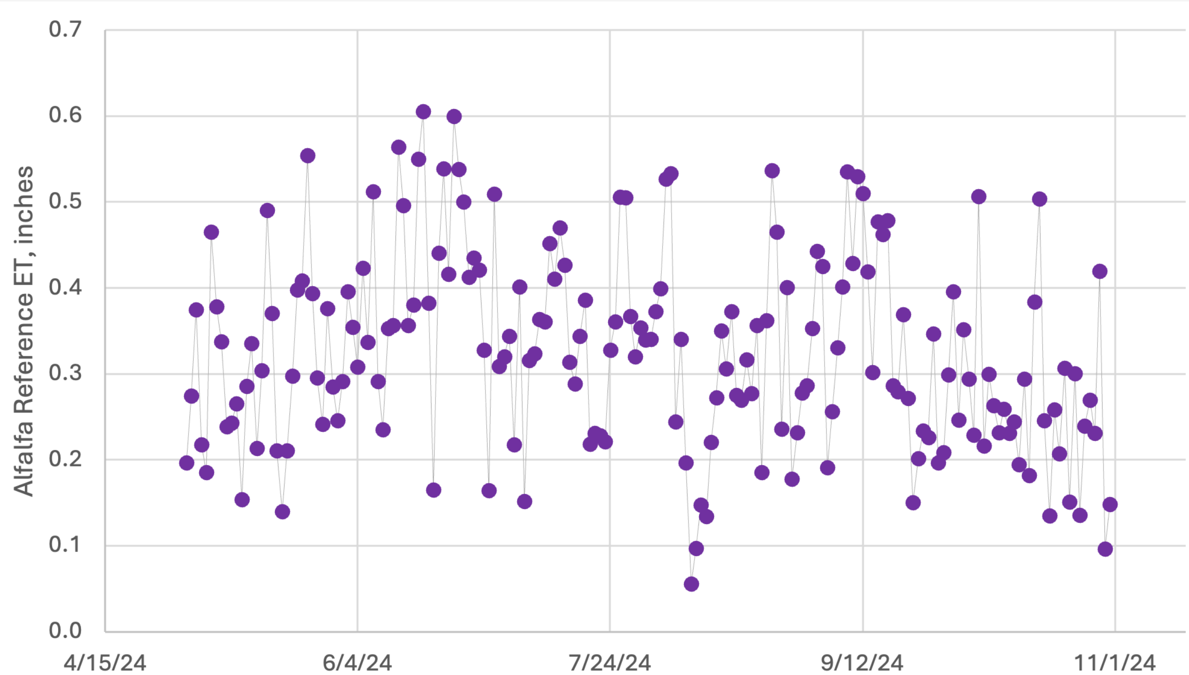


Figure 5. *Daily alfalfa reference evapotranspiration (ETr, inches) at Colby, KS, calculated using the American Society of Civil Engineers (ASCE) Standardized Reference Evapotranspiration equation (ASCE, 2005). Weather data was obtained from the Kansas Mesonet (https://mesonet.k-state.edu/).*

Management Decisions

Teams were tasked with making key production management decisions, including hybrid selection, population density (seeds per acre), planting date, nitrogen application (pre-plant, at-planting, and in-season), as well as irrigation quantities and timing. These decisions are summarized in Table 3.

Table 3. *Summary of each Farm's agronomic decisions, including planting date, hybrid and seeding rate, nitrogen fertilizer, and seasonal irrigation. Nitrogen was applied in the form of urea ammonium nitrate (UAN) 32%.*

Farm	Planting	Company	Seeding	---------------------------- Nitrogen Fertilizer (lbs/acre) ----------------------------								Irrigation
ID	Date	Hybrid	(x1,000/ac)	Apr 24	Planting	Jun 21	Jul 9	Jul 16	Jul 22	Aug 6	Sum	(inches)
1	5/31/24	Channel 214-78DGVT2PRIB	33,000	237	7	0	0	0	0	20	264	9.75
2	5/8/24	AgVenture AV8614AM	24,000	112	87	60	0	0	0	15	274	13.25
3	5/8/24	Axis 63F60 SSPRIB	23,500	12	65	60	0	0	0	0	137	7.50
4	5/8/24	Pioneer P1122AML	28,000	12	7	0	0	0	0	0	19	0.25
5	5/8/24	Pioneer P1122AML	26,500	12	67	101	0	0	30	30	240	10.25
6	5/15/24	Pioneer P1122AML	25,000	12	147	0	0	0	0	0	159	6.25
7	5/8/24	Pioneer P0859AM	31,000	12	187	0	0	20	0	20	239	7.25
8	5/8/24	Pioneer P1122AML	24,000	12	107	0	0	25	0	0	144	6.90
9	5/8/24	Dekalb DKC61-41	22,000	12	167	0	0	0	0	0	179	7.25
10	5/8/24	DynaGro D54VC14RIB	28,000	12	37	0	30	30	30	30	169	10.35
11	5/8/24	Pioneer P1122AML	24,000	12	82	0	30	30	30	0	184	6.85
12	5/15/24	Golden Harvest G10L16 DV	26,000	12	127	0	0	30	0	30	199	7.65
13	5/15/24	Channel 204-54TRERIB	23,000	12	97	0	30	30	30	30	229	6.90
14	5/8/24	AgriGold A643-52VT2RIB	28,000	87	7	0	0	30	30	30	184	7.65
15	5/8/24	Dekalb DKC108-64RIB	25,000	12	187	0	0	0	0	0	199	11.25
16	5/8/24	Channel 200-48VT2PRIB	23,000	12	187	0	30	25	0	0	254	8.05
17	5/8/24	Channel 213-19VT2	28,000	12	77	100	0	30	30	0	249	9.60
18	5/31/24	Dekalb DKC105-33RIB	28,000	12	57	0	30	30	30	30	189	8.85
19	5/15/24	Golden Harvest G10L16 DV	22,000	12	187	0	0	0	30	0	229	7.65
20	5/15/24	Pioneer P1366AML	30,000	12	117	0	0	0	0	30	159	7.25
21	5/8/24	Beck's 6414V2P	24,000	12	87	0	10	15	0	15	139	2.00
22	5/31/24	Beck's 5864AM	24,000	82	57	0	30	30	0	0	199	10.25
23	5/8/24	Pioneer P1122AML	36,000	12	97	0	30	0	30	30	199	7.75
24	5/8/24	Channel 212-02VT2PRIB	25,000	12	87	0	30	30	30	30	219	11.55
25	5/8/24	Golden Harvest G16Q82 DV	28,000	12	127	0	0	25	25	25	214	9.25
26	5/8/24	Pioneer P1122AML	25,500	72	32	30	30	0	0	30	194	9.25
27	5/15/24	Pioneer P1366AML	34,000	12	147	0	30	30	30	30	279	11.35
28	5/15/24	DynaGro D56TC44RIB	28,000	12	187	40	0	0	0	0	239	7.15
29	5/15/24	Pioneer P1366AML	28,000	12	87	80	0	30	0	30	239	5.45
30	5/8/24	Pioneer P1122AML	26,000	12	77	40	0	0	0	0	129	11.25
31	5/8/24	Channel 212-02VT2PRIB	28,000	12	187	0	0	0	0	0	199	15.25
32	5/8/24	Brevant B04Z92AM	28,000	12	37	0	0	30	30	0	109	6.65
33	5/8/24	Brevant B04Z92AM	28,000	12	37	0	0	30	30	0	109	7.65
34	5/8/24	Brevant B04Z92AM	28,000	12	97	0	0	30	30	0	169	7.65

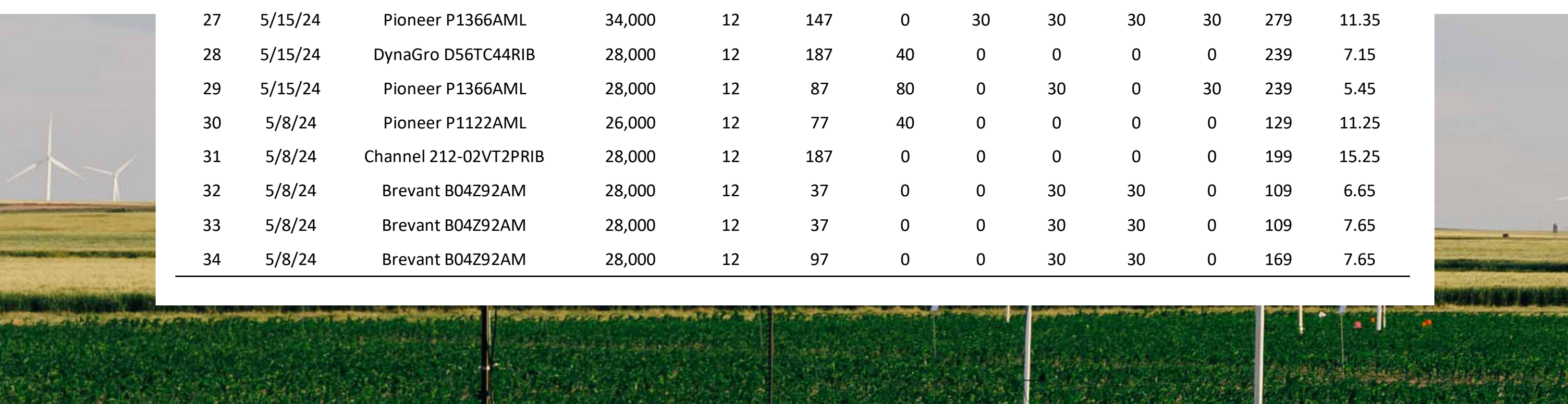


Table 4. *Summary of each Farm's business decisions, including insurance type, coverage, and cost as well as grain marketing sales methods used and weighted average price per bushel received.*

Farm ID	Insurance Type & Coverage*	Insurance Cost $/acre	Grain Marketing Method(s)	Market Price $/bu
1	RP-EU 65%	$7.00	Forward: 4 / Spot Cash: 1	$4.26
2	RPHPE-EU 80%	$16.00	Basis: 1 / Unsold Cash: 1	$4.29
3	RP-EU 75%	$13.00	Forward: 2 / Spot Cash: 2	$4.32
4	RP-EU 75%	$13.00	Unsold Cash: 1	$4.28
5	RP-EU 65%	$7.00	Unsold Cash: 1	$4.28
6	RP-EU 80%	$22.00	Spot Cash: 1 / Futures: 30 / Basis: 2	$4.75
7	RP-EU 65%	$7.00	Forward: 4 / Spot Cash: 2 / Futures: 1	$4.32
8	RP-EU 75%	$13.00	Spot Cash: 1	$4.34
9	RP-EU 85%	$39.00	Forward: 1 / Spot Cash: 1 / Basis: 1	$4.27
10	RP-EU 75%	$13.00	Forward: 10 / SHTA: 1	$4.50
11	RP-EU 80%	$22.00	Forward: 1	$4.28
12	YP-EU 65%	$5.00	Unsold Cash: 1	$4.28
13	RP-EU 75%	$13.00	Spot Cash: 1	$4.32
14	RP-EU 80%	$22.00	Unsold Cash: 1	$4.28
15	RP-EU 70%	$9.00	Unsold Cash: 1	$4.28
16	RP-OU 80%	$45.00	Unsold Cash: 1	$4.28
17	RP-EU 75%	$13.00	Forward: 1 / Spot Cash: 3 / Basis: 1	$4.65
18	RPHPE-EU 65%	$5.00	Spot Cash: 1	$4.56
19	YP-EU 70%	$6.00	Forward: 1 / Unsold Cash: 1	$4.26
20	RP-EU 70%	$9.00	Unsold Cash: 1	$4.28
21	YP-EU 75%	$8.00	Unsold Cash: 1	$4.28
22	RP-EU 75%	$13.00	Unsold Cash: 1	$4.28
23	RP-EU 75%	$13.00	Forward: 1 / Spot Cash: 1	$4.45
24	RP-EU 75%	$13.00	Unsold Cash: 1	$4.28
25	RP-EU 75%	$13.00	Forward: 1	$4.24
26	RP-OU 75%	$32.00	Unsold Cash: 1	$4.28
27	RP-EU 80%	$22.00	Spot Cash: 1 / Futures: 2 / Basis: 3	$4.92
28	YP-EU 75%	$8.00	Unsold Cash: 1	$4.28
29	RPHPE-EU 85%	$29.00	Forward: 1	$5.01
30	RPHPE-EU 85%	$29.00	Spot Cash: 1	$4.30
31	RP-EU 75%	$13.00	Forward: 2 / Spot Cash: 1	$4.44
32	RP-EU 75%	$13.00	Forward: 1 / Unsold Cash: 1	$4.41
33	RP-EU 75%	$13.00	Forward: 1 / Unsold Cash: 1	$4.40
34	RP-EU 75%	$13.00	Forward: 1 / Unsold Cash: 1	$4.39

*YP: Yield Protection; RP: Revenue Protection; EU: Enterprise Units; OU: Optional Units; HPE: Harvest Price Exclusion

TAPS Data and Technology

Data is fundamental in making informed decisions for profitable and efficient crop production. Competitors of the TAPS competition were provided access to commercial technologies, decision support tools, and soil laboratory results. Each Farm was allowed to select an in-field sensor to be installed in one of their replicated plots to help guide input management. A summary of the selected technologies is shown below. All technologies were placed in Farm 16, crowdsourcing team.

In addition, competitors were provided field level data, including aerial imagery provided by Ceres Imaging (figure 7 and 8), soil moisture from a cosmic ray neutron sensor (CRNS) provided by Dr. Trenton Franz from the University of Nebraska-Lincoln and displayed by Lab C, actual crop evapotranspiration (ET) from a LI-COR 710 ET Sensor, soil apparent electrical conductivity from a Veris Technologies MSP3 Soil Scanner, and weather provided by the Kansas Mesonet located at NWREC.
To help in analyzing the results from the competition, the TAPS team collected soil water content from all plots monthly to a depth of 8 ft using field calibrated 503Elite Hydroprobe neutron moisture meters (InstroTek,CA,USA), above ground biomass weight and nitrogen content from all plots, and before and after season deep soil samples for soil residual nitrogen in selected plots.

These data will be further analyzed and shared in subsequent TAPS reports.

Arable 12

Farms 2, 4, 5, 13, 15, 16, 21, 22, 26, 27 & 28

Sentek 11

Farms 3, 9, 10, 16, 17, 23, 29, 30, 32, 33 & 34

AquaSpy 6

Farms 12, 14, 16, 25, 28 & 31

Phytech 5

Farms 1, 6, 13, 16 & 19

GroGuru 4

Farms 4, 7, 16 & 20

CropX 4

Farms 4, 11, 16 & 24

Figure 6. Summary of technology selections for the 2024 KSU-TAPS Competition.

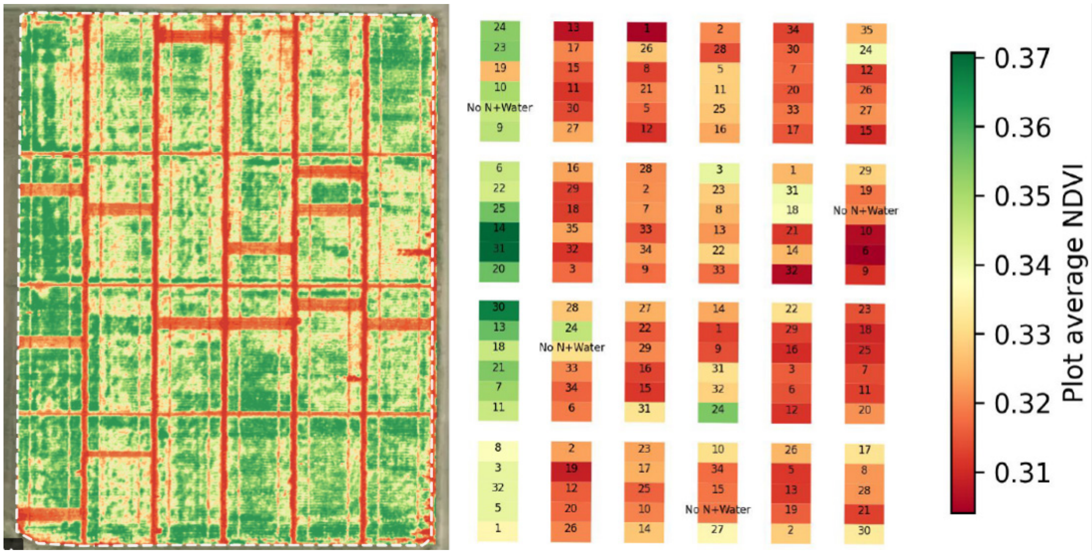


Figure 7. *Aerial imaging provided by Ceres Imaging showing NDVI index imagery.*

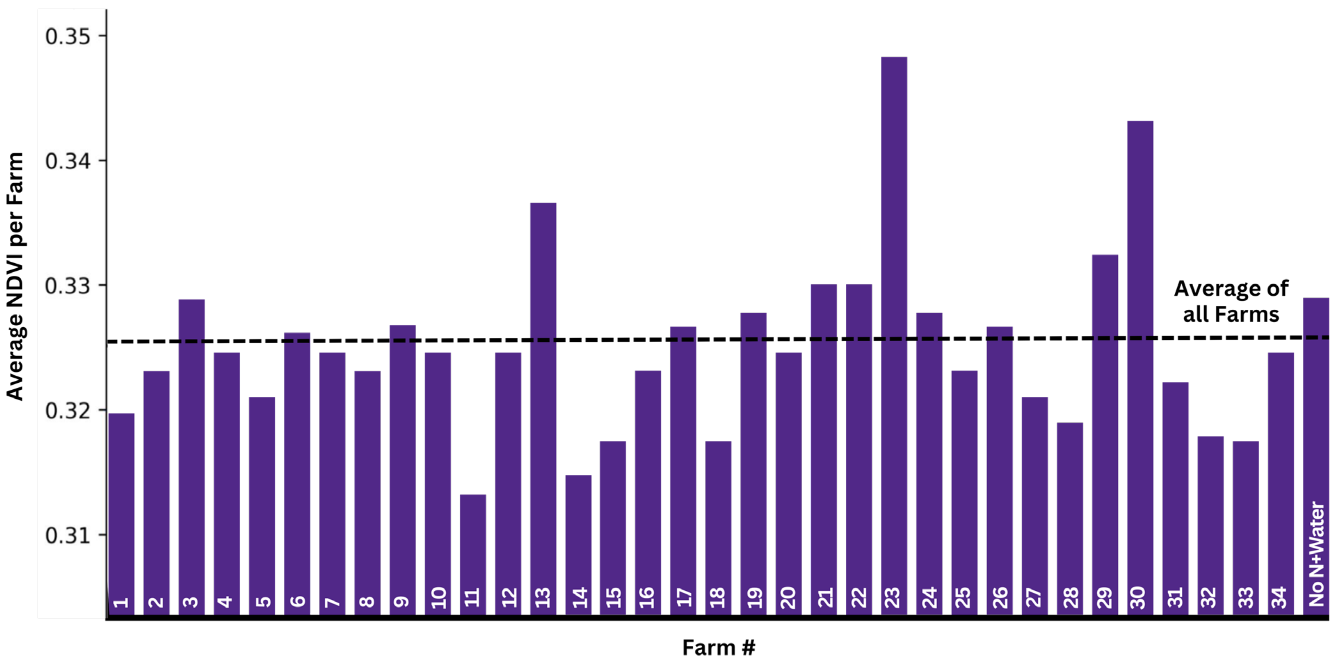


Figure 8. *Average NDVI per farm associated with the imagery shown in figure 6*

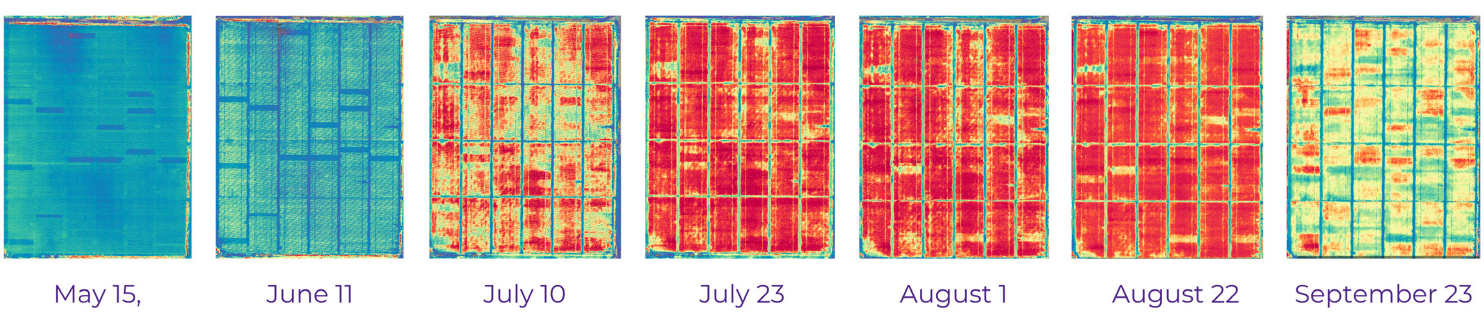


Figure 9: *Drone images taken throughout the 2024 KSU-TAPS Competition by pilot Ray Duffey, Agricultural Tech II at the Northwest Research-Extension Center, Colby, KS.*

Crop Insurance

Excluding the control group, each farm was required to select a multi-peril crop insurance (MCPI) policy (Table 4 and Figure 10). Three policy types were offered at coverage levels of 65%, 70%, 75%, 80%, or 85%: Revenue Protection (RP), Revenue Protection with Harvest Price Exclusion (RPHPE), and Yield Protection (YP). Policies were available at both the optional unit (OU) and enterprise unit (EU) levels, based on an Average Production History (APH) of 200 bushels/acre and a February price guarantee of $4.66/bushel (USDA RMA). Insurance premiums were provided by Dr. Daniel O'Brien, an Agricultural Economist at Kansas State University.

There was a clear preference for RP-EU, selected by 23 farms, followed by RPHPE-EU and YP-EU, each chosen by four farms, and RP-OU, selected by two farms. The most common coverage level was 75%, chosen by 16 farms, followed by 80% (6 farms), 65% (5 farms), and 70% and 85% (3 farms each). This resulted in an average cost of $15.70 per acre, ranging from a high of $45.00/acre (Farm 16) to a low of $5.00/acre (Farms 12 and 18).

Insurance played a critical role in the competition, as seven farms experienced insufficient yields and received indemnity payments. These included:

- Farm 21: $293.35/acre
- Farm 29: $210.78/acre
- Farm 14: $98.27/acre
- Farm 16: $51.27/acre
- Farm 6: $35.05/acre
- Farm 11: $18.98/acre
- Farm 9: $8.35/acre

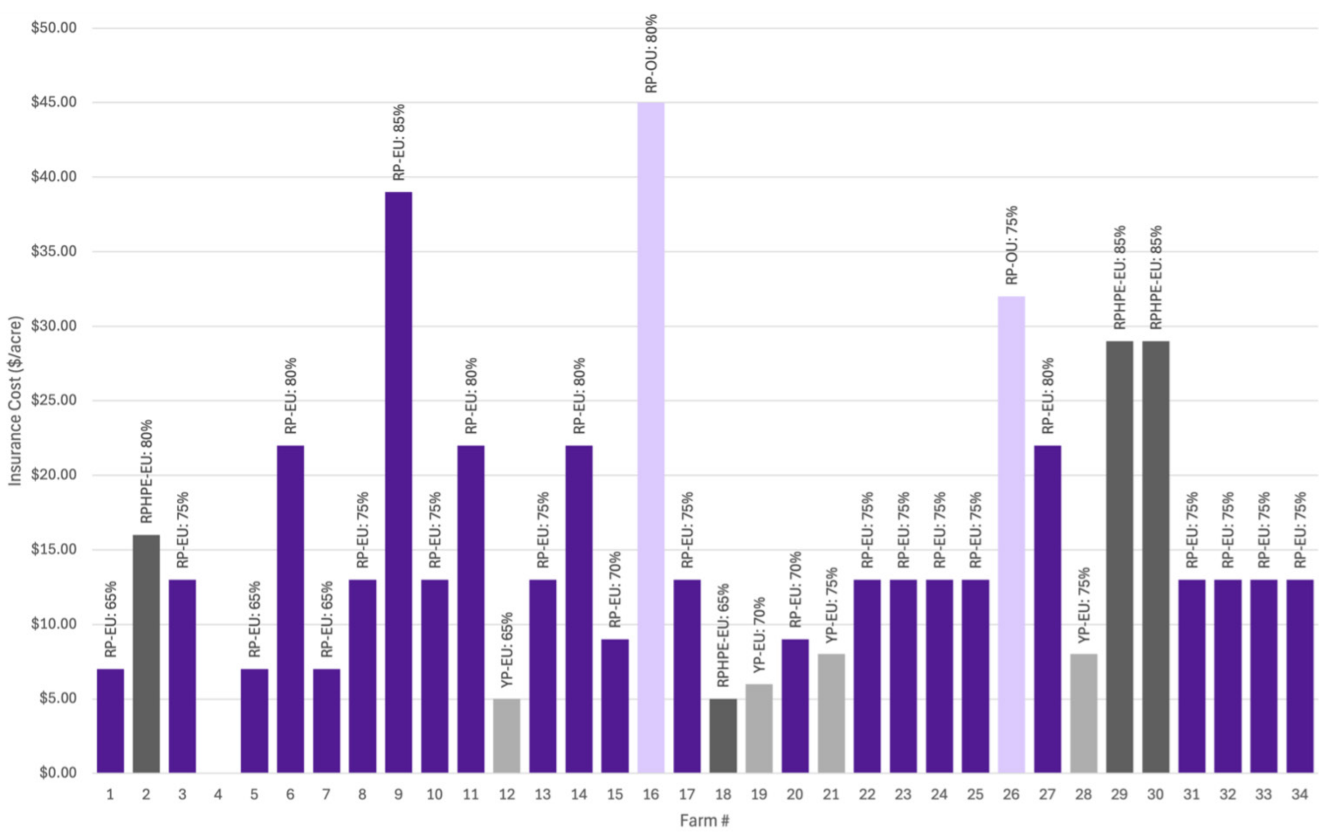


Figure 10. *Crop insurance type, coverage, and costs ($/acre) for the TAPS Farms. RP is revenue protecton, YP is yield protection, RPHPE is revenue protection harvest price exclusion, EU is enterprise unit, and OU is optional unit.*

Planting Date

Farms had the option to select one of three planting dates: early (targeting May 1), mid (targeting May 15), or late (targeting May 31). Due to light rain showers from May 1 to May 3, the early planting date was delayed to May 7–8. The early planting date was the most popular, chosen by 23 farms. The mid planting date on May 15 was selected by eight (Farms 6, 12, 13, 19, 27, 28, and 29), while the late planting date on May 31 was the least chosen, with only three (Farms 1, 18, and 22). All farms' plots were planted using a four-row Precision Planter equipped with vSet Select meters. Targeted planting depth was 2.25 inches and seed firmers were installed.

Rainfall differences across the planting periods were not substantial: 0.15 inches between May 8 and May 15, and 1.11 inches between May 8 and May 31. However, during the same intervals, the alfalfa reference evapotranspiration (ETr) differed by 1.86 and 7.05 inches, respectively. ETr is a calculated value representing the water demand of a well-maintained hypothetical alfalfa crop under the observed weather conditions; it does not reflect actual water loss to the atmosphere. Nevertheless, it illustrates the difference in atmospheric water demand across planting dates.

Soil volumetric water content (VWC) to a depth of 4 inches was measured across the TAPS field at time of planting using a handheld water content reflectometer (Campbell Scientific CS659). Similar soil moisture conditions existed between the first two planting dates, with average VWC of 21.3% and 21.7%, respectively. The late planting date had slightly higher soil moisture in the surface with an average of 24.8%. Albeit the exposed soil surface, all three planting dates had adequate soil moisture for seed germination as evidenced by even stand emergence.

Most teams opted for an early planting date of May 1, while only a few chose the late planting date of May 31, which is the cutoff for corn planting insurance in NW Kansas.

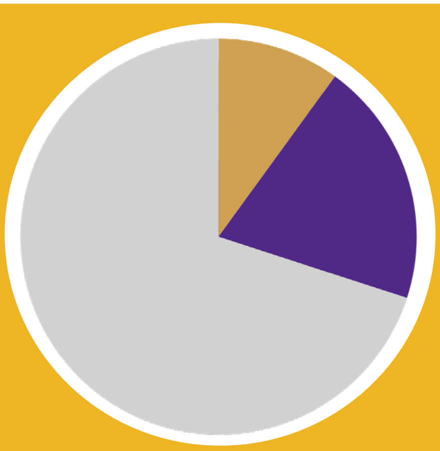


Figure 11. *Pie chart showing the proportion of Farms that chose the early planting date (grey), mid planting date (purple), and late planting date (tan).*

Hybrid and Seeding Rate

Seed dealers and district sales managers provided recommended hybrids along with suggested seeding rates tailored to the location and field conditions. Participants could either select one of the recommended hybrids or provide their own seed. Across the 34 teams, 21 different hybrids were used, sourced from ten brands: Channel®, AgVenture®, Axis®, Pioneer®, Dekalb®, DynaGro®, Golden Harvest®, AgriGold®, Beck's®, and Brevant®. The relative maturity (RM) of the selected hybrids ranged from 104 (Brevant® B04Z92AM) to 113 (Channel® 213-19VT2) days. Seed prices varied between $226 and $330 per bag. The most chosen hybrid was Pioneer® P1122AML, which has an RM of 111 days and cost of $297 per bag.

Each participant's chosen hybrid was planted in their four replicated plots at a seeding rate of their choice. Seeding rates ranged from 22,000 seeds per acre (Farm 9) to 36,000 seeds per acre (Farm 23), with a median rate of 27,250 seeds per acre. The most selected seeding rate was 28,000 seeds per acre. Total seed expenses, accounting for both bag cost and planting rate, ranged from $64.98 per acre for Farm 16 (who planted Channel® 200-48VT2PRIB at 23,000 seeds per acre) to $133.65 per acre for Farm 23 (who planted Pioneer® P1122AML at 36,000 seeds per acre).

To evaluate the impact of hybrid and seeding rate compared to irrigation and water management on production, all competition plots were split in half. On one side, the grower-selected hybrid and seeding rate were planted, while the other side featured a reference hybrid, Brevant® B04Z92AM, planted at a standard seeding rate of 28,000 seeds per acre. Only yield from the grower selected hybrid and seeding rate was used to determine the winners of the competition.

22 Hybrids from Ten Brands
Top Planted: P1122AML

Population
AVG: 26,838
MIN: 22,000 MAX: 36,000
Top Selected: 28,000

Nitrogen Fertiliz

Participants were offered multiple options for applying nitrogen (N) fertilizer in the form of Urea Ammonium Nitrate (UAN 32%): pre-plant, at planting, sidedress, and through four fertigation events. Composite soil samples were collected from depths of 0–8 and 8–24 inches across the TAPS site on March 26, 2024, and analyzed by ServiTech. Residual N averaged 26.5 lbs per acre in the 0–8 inch layer and 22 lbs per acre in the 8–24 inch layer.

A dry phosphorus (P) blend, applied uniformly to the field by Nutrien Ag Solutions on April 24, 2024, contributed an additional 12 lbs of N per acre. Additionally, all teams received 2 gallons per acre of Riser and 2 gallons per acre of 10-34-0 at planting, equating to approximately 7 lbs of N per acre.

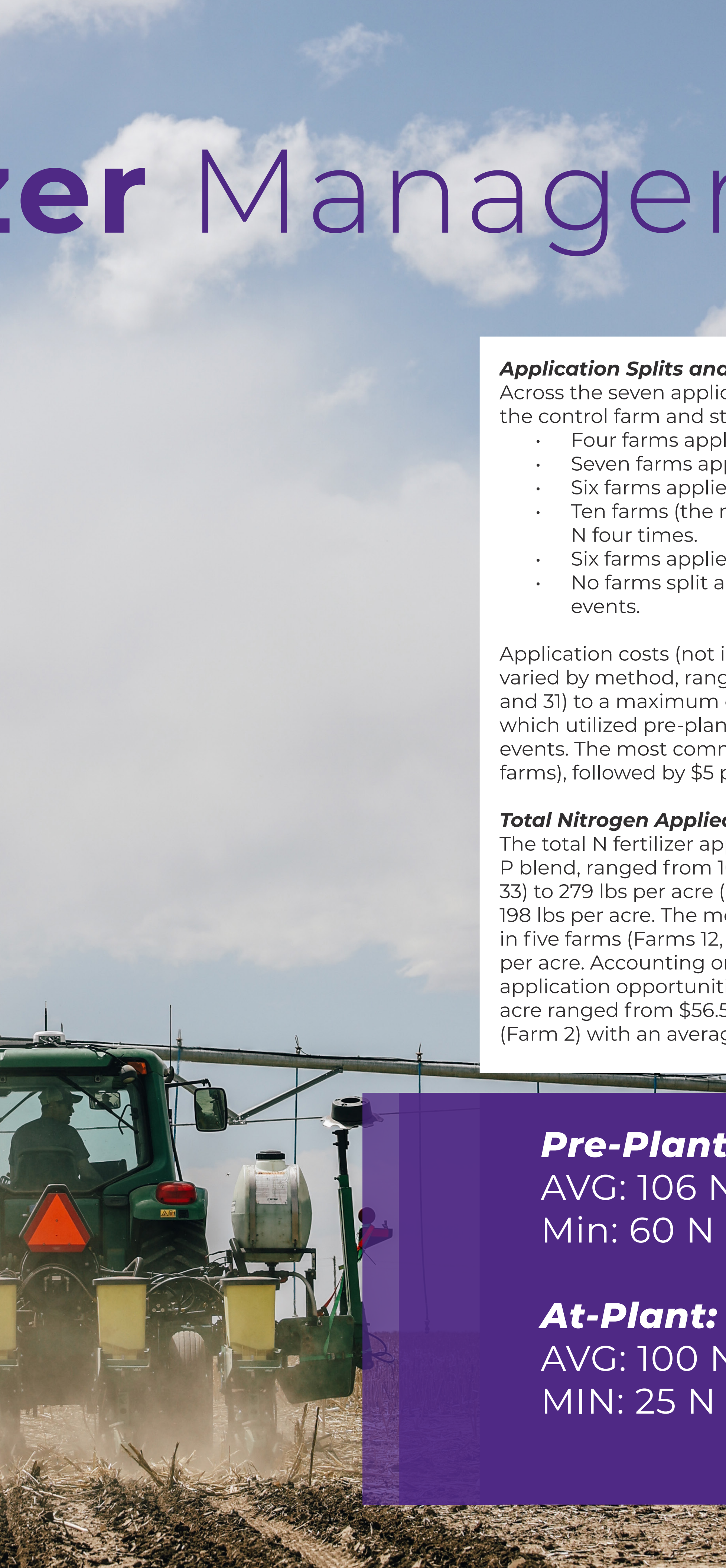
1. **Pre-Plant Application**
   Pre-plant nitrogen was applied using a double coulter liquid applicator that placed fertilizer 7.5 inches on either side of the intended crop row at a depth of 3–4 inches. Five farms opted for this method, which costs $8.50 per acre. The maximum pre-plant N application was 225 lbs per acre (Farm 1).

2. **At-Planting Nitrogen Application**
   At planting, N fertilizer was applied using Precision Planting Conceal, which banded fertilizer 3 inches on both sides of the planted row at a depth of 1 inch. This method was the most popular, chosen by 31 farms, with no associated application cost. Only Farms 1, 4 (control), and 14 did not use this method. Six farms opted to apply the maximum amount of 180 lbs per acre.

3. **Sidedress Nitrogen Application**
   Eight farms (Farms 2, 3, 5, 17, 26, 28, 29, and 30) chose to apply sidedress N fertilizer using 360 Y-Drops, which deposited fertilizer on the soil surface on both sides of the planted row. This method was applied during the V8 growth stage for May 8 planting and V7 growth stage for May 15 planting. Sidedress application incurred a cost of $8.50 per acre.

4. **Fertigation**
   Fertigation was performed using an Agri-Inject Reflex Injection Pump, connected to the irrigation system's flow meter. The cost per fertigation event was $1.25 per acre. N application was proportional to the amount of water applied, with a maximum of 30 lbs of N per acre applied alongside 0.30 inches of water. Fertigation events were conducted on July 9, July 16, July 22, and August 6, 2024, with 11, 19, 15, and 17 farms participating on each respective date.

zer Management



Application Splits and Costs

Across the seven application opportunities (excluding the control farm and starter/dry P applications):

- Four farms applied N in a single application.
- Seven farms applied N twice.
- Six farms applied N three times.
- Ten farms (the most common group) applied N four times.
- Six farms applied N five times.
- No farms split applications across six or seven events.

Application costs (not including cost of fertilizer) varied by method, ranging from $0 (Farms 6, 9, 15, and 31) to a maximum of $19.50 per acre for Farm 26, which utilized pre-plant, sidedress, and two fertigation events. The most common cost was $2.50 per acre (six farms), followed by $5 per acre (five farms).

Total Nitrogen Applied

The total N fertilizer applied, including starter and dry P blend, ranged from 109 lbs per acre (Farms 32 and 33) to 279 lbs per acre (Farm 27), with an average of 198 lbs per acre. The most common total, observed in five farms (Farms 12, 15, 22, 23, and 31), was 199 lbs per acre. Accounting only for the seven N fertilizer application opportunities, total N fertilizer costs per acre ranged from $56.50 (Farms 33 and 34) to $171.25 (Farm 2) with an average of $112.77.

Pre-Plant: 5 Teams

AVG: 106 N

Min: 60 N Max: 225 N

At-Plant: 31 Teams

AVG: 100 N

MIN: 25 N Max: 180 N

Irrigation Management

Irrigation was applied using a Valley variable-rate linear-move irrigation system equipped with Nelson D3030 Sprayhead LEPA sprinklers with 6 psi regulators mounted 36 inches above the ground. The system had a capacity of 2.7 gallons per minute (gpm) per acre, allowing each farm to apply up to 1 inch of water per week during the growing season, including weeks with fertigation. The application cost, covering energy and maintenance, was $8.50 per acre-inch.

The first irrigation, totaling 0.25 inches, was applied uniformly across the entire field, including the control farm, on April 25 to activate herbicides. The first opportunity for participants to schedule irrigation was May 23, when a single farm (Farm 31) applied water. The next scheduled irrigation (the following week) was canceled due to rainfall totaling 1.65 inches. No farms scheduled irrigation for the week of June 4.

Starting in mid-June, irrigation was applied weekly until the final application on September 10. In total, participants had 16 opportunities to schedule irrigation, excluding the herbicide activation. Farm 31 scheduled the most irrigation events, with a total of 15 applications, while Farm 21 applied the least, with just three applications. Most farms applied either eight or ten irrigation events.

Seasonal irrigation totals ranged from 2.00 inches (Farm 21) to 15.25 inches (Farm 31), with an average of 8.57 inches and a median of 7.65 inches. Excluding the control Farm, this resulted in a range of irrigation costs of $17.00 (Farm 21) to $129.63 (Farm 31) with an average of $72.87 per acre. A cumulative distribution of applied irrigation is shown in Figure 12. Including the control farm, a total of 18 farms applied irrigation amounts at or below the median value of 7.65 inches (Q-Stable). Those Farms include: 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 19, 20, 21, 28, 29, 32, 33, and 34.

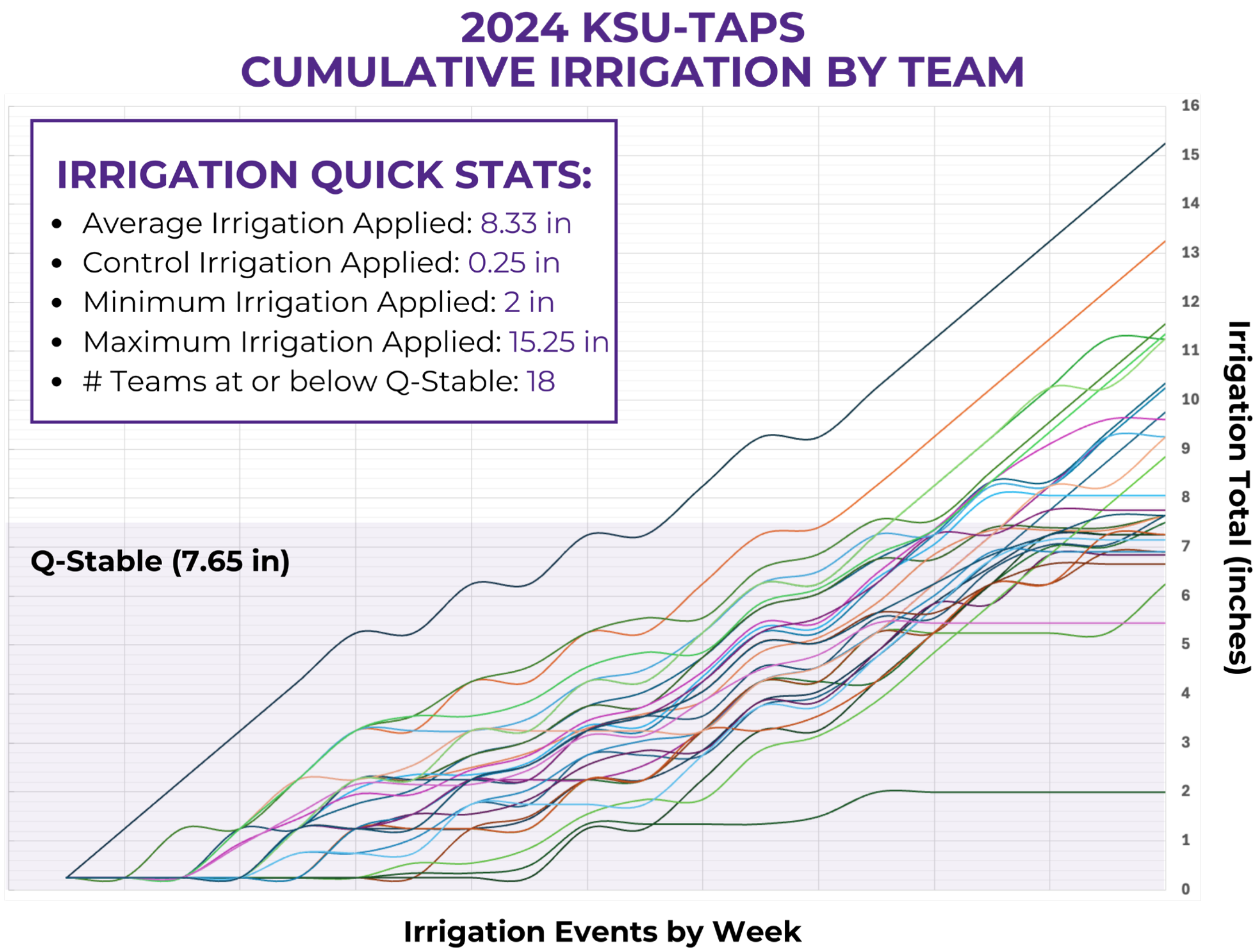


Figure 12. *Q-Stable and cumulative irrigation (inches) of the 2024 TAPS Farms competing at the Kansas State University Northwest Research-Extension Center in Colby, KS.*

Grain Marketing

Participants were encouraged to utilize five marketing methods: Spot (Cash) Sales, Forward Contracts, Basis Contracts with Delivery at Harvest, Simple Hedge-to-Arrive, and Futures Contracts. All marketing decisions were made between April 5 and November 30, 2024.

Final farm production was calculated based on the average yield from each farm's plots, managed according to the team's specifications. For example, if a farm's average yield was 210 bu/acre, adjusted for weight and quality, the simulated 2,000-acre farm produced 420,000 bushels. For marketing purposes, however, the Average Production History (APH) of 200 bu/acre resulted in an expected yield of 400,000 bushels per farm.

Grain marketing decisions were validated, and trucking fees were assessed. All contracts were required to be closed by November 30. Penalties included $0.10/bu for any open contracts closed by the TAPS team, $0.05/bu for unsold grain, and $0.10/bu plus the current market price for oversold grain bought back on November 30.

The 2024 USDA harvest price for corn was $4.16/bu, 11% lower than the projected price of $4.66/bu. While the market remained stagnant for much of the season, December 2024 corn futures rallied by nearly $0.50 in late August before falling by $0.35 in October. A brief rally occurred in late November, marking the end of the TAPS marketing year.

Grain marketing decisions varied significantly among participants (Table 4). A total of 23 farms made marketing decisions, resulting in 86 completed contracts: 24 Forward Contracts, 17 Spot (Cash) Contracts, 5 Simple Hedge-to-Arrive Contracts, 33 Futures Contracts, and 7 Basis Contracts with Delivery at Harvest.

The average price achieved was $4.38/bu, with a maximum of $5.01/bu by Farm 29 and a minimum of $4.24/bu by Farm 25. The 11 farms that did not make marketing decisions had their grain sold at the end of the marketing period for $4.33/bu, minus a $0.05/bu handling fee. The weighted average grain market price ($/bu) and grain yields for each farm are summarized in figure 13.

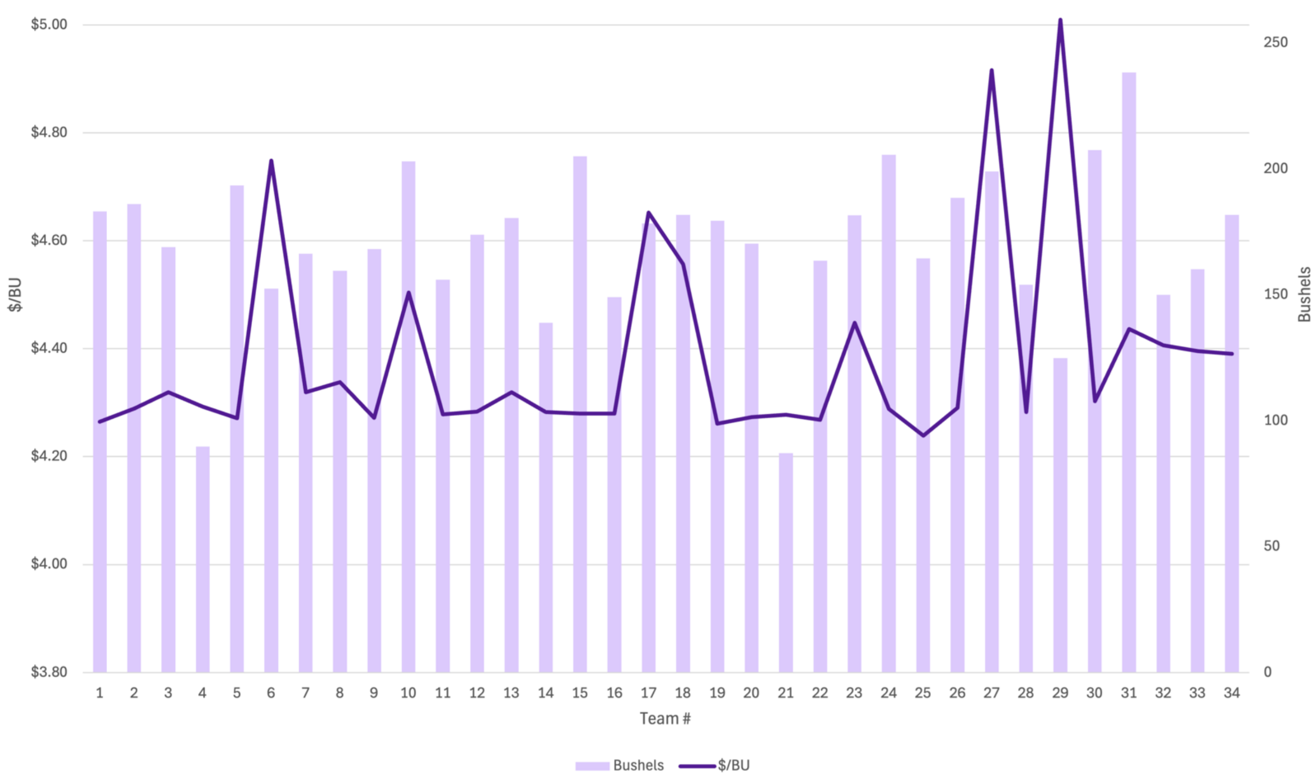


Figure 13. *Weighted average grain market price ($/bushels) and average grain yields (bu/acre) obtained for the TAPS Farms.*


WELCOME
KSUTAPS
TESTING AG PERFORMANCE SOLUTIONS
PLOT MAPS ARE LOCATED IN BOX BELOW.
IN CASE OF EMERGENCY, CONTACT RAENETTE MARTIN 785-443-2364.
SHARE YOUR VISIT- @KSUTAPS
k-state.edu/taps/
2024

WARD WINNERS

MOST ECONOMICALLY **PROFITABLE**

The Most Economically Profitable award is net-income calculated based on the average yield of the contestants' plots, grain marketing, cost of production (fixed and variable), and any necessary insurance indemnity payments. Profitability was not calculated for the control (Farm 4). While most costs were fixed on a per acre basis, there were several variable costs based on individual farm decisions, including seed, crop insurance, irrigation, nitrogen fertilizer, and grain trucking.

Expenses per bushel ranged from a low of $3.46/bu (Farm 31) to a high of $7.44/bu (Farm 21) with an average of $4.57/bu. Accounting for yield, total expenses per acre ranged from a low of $647.50 (Farm 21) to a high of $880.20 (Farm 27) with an average of $769.80.

Whereas revenue per bushel ranged from a low of $4.24 (Farm 25) to high of $5.01 (Farm 29) with an average of $4.39. With consideration to production (i.e., yield), total revenue per acre ranged from a low of $659.12 (Farm 28) to a high of $1,056.90 (Farm 31) with an average of $779.02.

Profitability across competing farms is illustrated in figure 14. Profitability showed a positive linear relationship with grain yield, with an R^2 value of 0.58 (Figure 15). Profitability per acre ranged from a negative $113.80 (Farm 28) to a positive $232.10 (Farm 31) with an average profitability of $9.22. Overall, 19 farms were profitable, and 14 farms were not profitable.

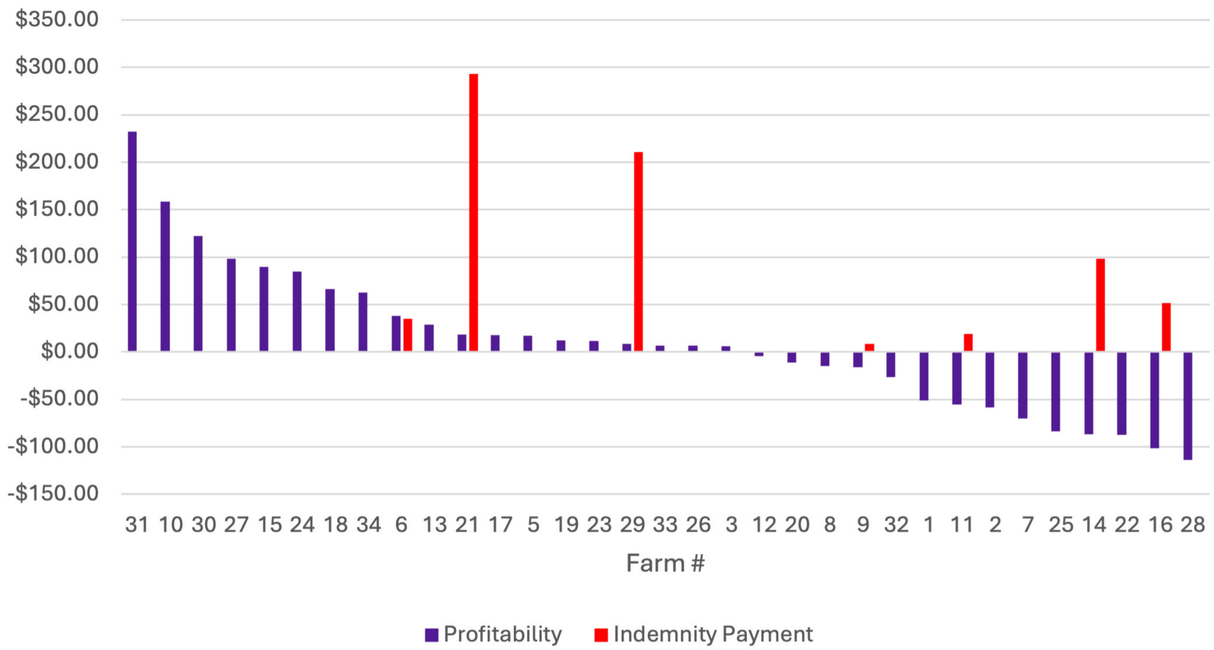


Figure 14. *Total profitability calculated on net-income basis with any farms that received crop insurance indemnity payments noted.*

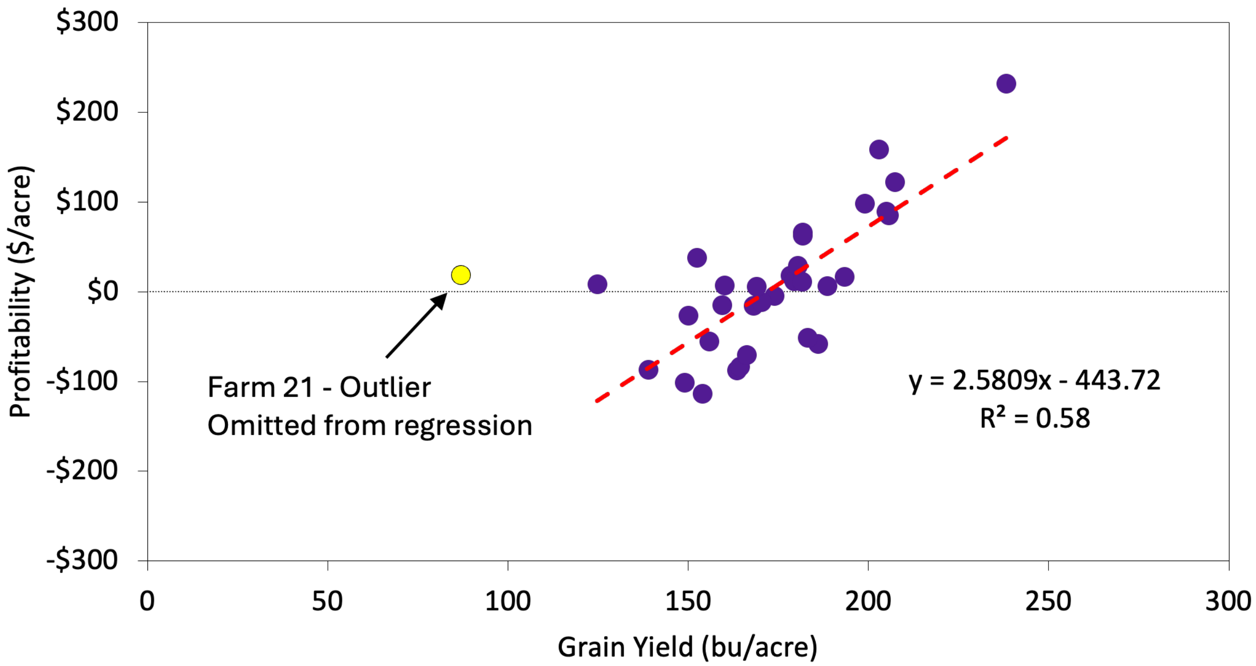


Figure 15. *Relationship between profitability ($/acre) and grain yield (bu/acre) adjusted to 15.5% moisture content for the 2024 TAPS Sprinkler Irrigated Corn Competition in Colby, KS. Farm #21 was omitted from the regression equation, as the indemnity payment was the primary source of income.*

FARM PROFITABILITY IS THE ULTIMATE MEASURE OF SUCCESS—YIELD MAY FILL THE BIN, BUT EFFICIENCY AND SMART RESOURCE MANAGEMENT FILL THE BALANCE SHEET.

AWARD WINNER

MOST ECONOMICALLY PROFITABLE

MOST ECONOMICALLY PROFITABLE

FIRST PLACE: FARM 31 — **$232/ ACRE**

Kent and Aaron Higerd with a profitability of $232.10/acre. Farm 31 utilized timely Forward and Spot Cash Contracts for average price sold of $4.44/bu.

SECOND PLACE: FARM 10 — **$158/ ACRE**

Martin Lager and **Mason Scheetz** with a profitability of $158.49/acre. Farm 10 utilized Forward Contracts and a Simple Hedge-to-Arrive Contract for an average price sold of $4.50/bu.

THIRD PLACE: FARM 30 — **$122/ ACRE**

Garret Smith, **Kel Grafel**, **Nick Higgason**, and **Mike Barton** with a profitability of $122.03/acre. Farm 30 utilized one Spot Cash Contract for a price sold of $4.31/bu.


CORTEVA

Most Economically Profitable at **Q-Stable**

This award was self-selected, considering only teams that applied irrigation at or below the Q-Stable threshold of 7.65 inches for the Northwest Research-Extension Center in Colby, KS. Profitability was calculated using the same budget and price assumptions as those used for the most economically profitable award. Farm 4 (the control) was excluded from the analysis, and Farms 13, 32, 33, and 34 were disqualified due to university partnership.

Excluding the control, 17 farms applied irrigation at or below 7.65 inches. Farm 21 applied the least irrigation with 2 inches, while five farms (12, 14, 19, 33, and 34) applied exactly 7.65 inches, resulting in an average application of 6.8 inches. The highest yield achieved was 181.7 bu/acre (Farm 34, ineligible for the award).

Profitability per acre ranged from a loss of $113.80 (Farm 28) to a gain of $62.76 (Farm 34, ineligible), with an average loss of $12.81. Of the 17 eligible farms, 8 were profitable while maintaining irrigation at or below Q-Stable. As shown in Figure 16, no correlation was observed between irrigation application and profitability, despite a moderate correlation (R^2 = 0.76, data not shown) between irrigation and yield. This disconnect was likely influenced by differences in indemnity payments, production costs, and market prices received.

Table 5 provides a comparative analysis of farms above and below the Q-Stable threshold. As expected, irrigation totals differed significantly between groups, with an average difference of 3.65 inches. Interestingly, the average nitrogen fertilizer rate was 179 lbs/acre for the below Q-Stable group, compared to 217 lbs/acre for farms exceeding Q-Stable. Additionally, seeding rates were approximately 6% lower among the below-Q-Stable farms. This suggests that lower-irrigating farms adjusted their input costs in recognition of the reduced yield potential associated with limited water availability.

Regarding award categories, there was a difference of 32 bu/acre in yield, 0.028 in WNIPI, and $45 in profitability between the groups.

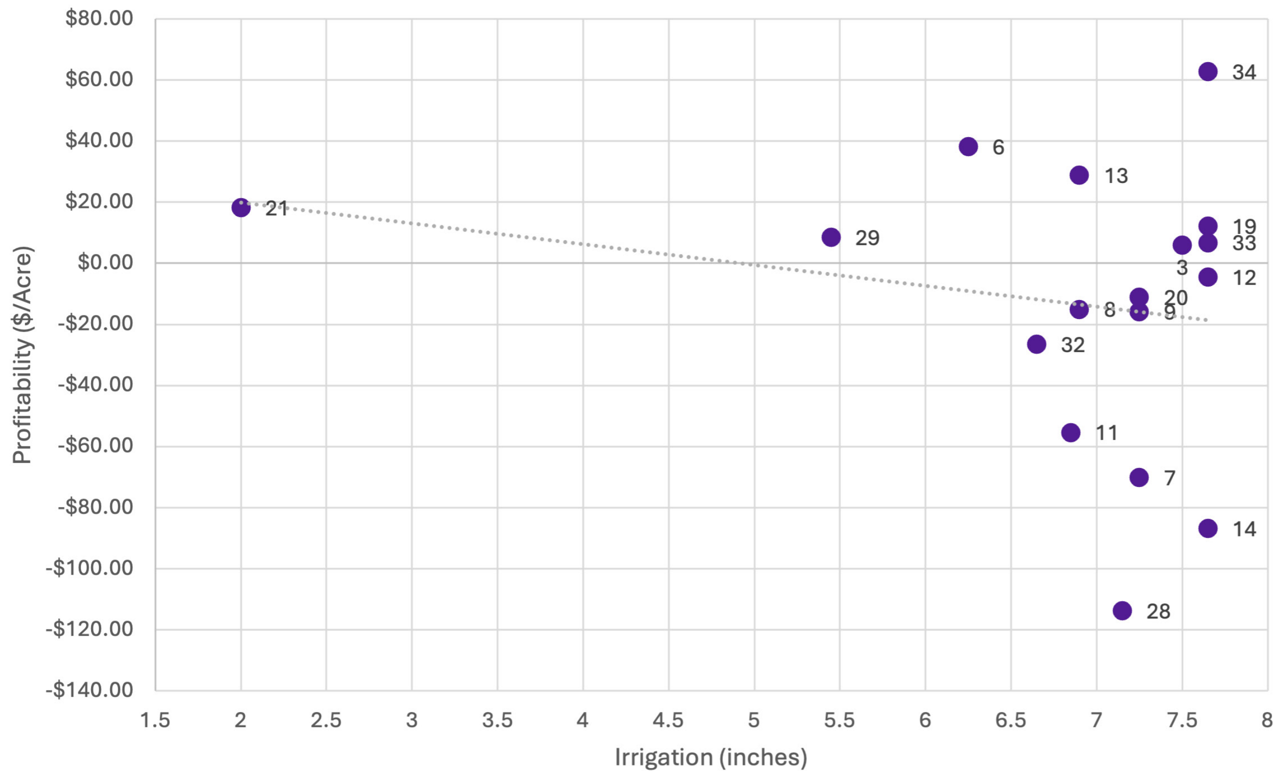


Figure 16. *Relationship between profitability ($/acre) and irrigation (inches/acre) for farms that irrigated at or below Q-Stable for the 2024 TAPS Sprinkler Irrigated Corn Competition in Colby, KS.*

STRIVING FOR ECONOMIC PROFITABILITY AT OR BELOW Q-STABLE REFLECTS THE BALANCE BETWEEN RESPONSIBLE WATER USE AND SUSTAINABLE FARMING PRACTICES. IT'S A CHALLENGE WORTH PURSUING TO ENSURE BOTH THE HEALTH OF THE OGALLALA AOUIFER AND THE FUTURE OF AGRICULTURE.

Table 5. *Comparing decision making and performance metrics between the seventeen Farms at or below Q-Stable versus the sixteen Farms above Q-Stable.*

Category	Units	Below Q-Stable	Above Q-Stable
Irrigation	(inches)	6.80	10.45
Nitrogen	(lbs/ac)	179	217
Seeding Rate	(seeds/acre)	26,029	27,625
Total Cost	($/ac)	$ 738.95	$ 802.57
Toral Revenue	($/ac)	$ 726.14	$ 835.21
Profit	($/ac)	$ (12.81)	$ 32.64
WNIPI	(unitless)	0.200	0.228
Yield	(bu/ac)	157.2	189.2

AWARD WINNER

MOST ECONOMICALLY PROFITABLE AT OR BELOW Q-STABLE

MOST ECONOMICALLY PROFITABLE AT OR BELOW Q-STABLE

FIRST PLACE: FARM 6 — **$38/ ACRE**

Russ Martin, **Matthew Murrow**, **Ward Taylor** and **Jay Ostmeyer** with a profitability of $38.15/acre. Farm 6 utilized the most marketing contracts of any other farm in the competition: 30 Futures Contracts, 2 Basis Contract and 2 Spot Cash Contracts for an average price sold of $4.76/bu.

SECOND PLACE: FARM 21 — **$18/ ACRE**

Witton Peter, **Mason Kersenbrock**, **Wyatt Grabbe**, **Grant Hervey** and **Jack Polifka** with a profitability of $18.20/acre. Farm 21 did not utilize grain marketing; therefore, their corn was sold at $4.28/bu.

THIRD PLACE: FARM 19 — **$12/ ACRE**

Greg Bellamy with a profitability of $12.15/acre. Farm 19 utilized a Forward Contract for one-third of their harvested crop and the rest was sold at cash price for an average price sold of $4.27/bu.

Highest Input Use Efficiency

Good irrigation or nitrogen management is often assessed using traditional efficiency metrics such as crop water use efficiency, nitrogen use efficiency, among others. Unfortunately, these metrics only focus on a single input without consideration of the other. To address this, the Water-Nitrogen Intensification Performance Index (WNIPI, Lo et al., 2019) was used to assess each Farm's input use efficiency. The index evaluates the increase in grain yield over a control with respect to the amount of applied N fertilizer and irrigation above the control's aboveground N uptake and ET amounts, respectively. The control farm, which received zero N and irrigation excluding the uniform starter, N at time of dry fertilizer, and herbicide activation, had an average yield of 89.7 bushels per acre, aboveground N uptake of 123 lbs per acre, and seasonal ET of 13.3 inches.

The WNIPI values with respect to seasonal irrigation and N fertilizer are shown in Figure 17. WNIPI ranged from negative 0.012 (Farm 21) to 0.346 (Farm 30), with an average of 0.214. Farm 30 had a yield of 207 bushels per acre applying 11.25 inches of irrigation and 129 lbs of N per acre. As visually illustrated in figure 17, higher WNIPI values reflect balance in applied irrigation and nitrogen fertilizer. As described in the equation, WNIPI will decrease if inputs are too low suppressing yield or if inputs are too high resulting in minimal to no gain in yield.

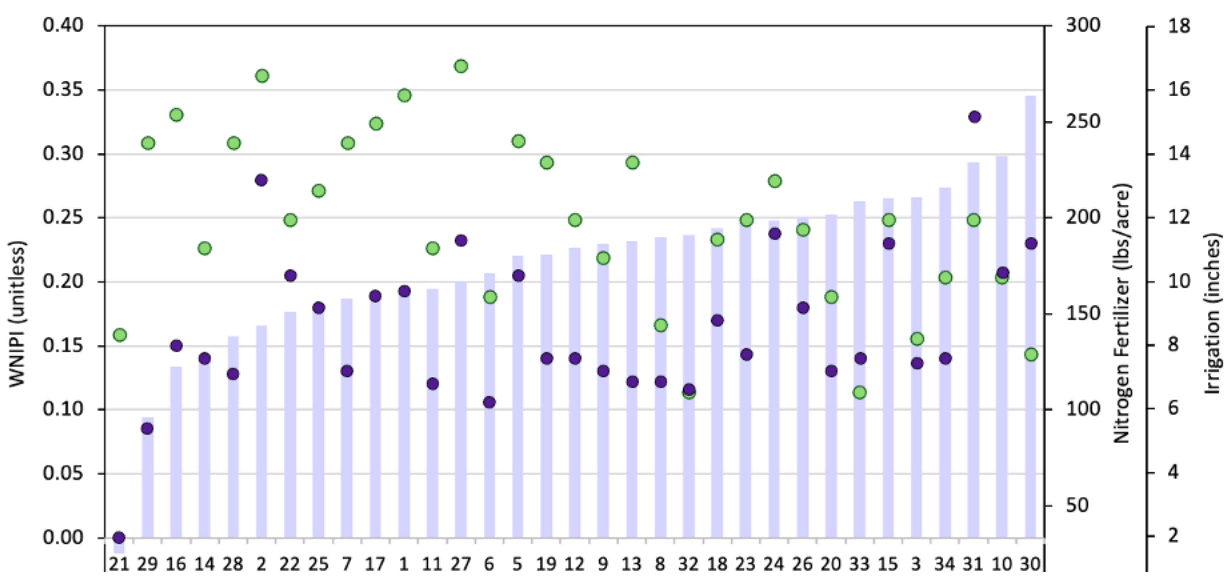


Figure 17. *Input use efficiency measured by the Water-Nitrogen Intensification Performance Index (WNIPI) compared against cumulative irrigation (inches) and applied nitrogen fertilizer (lbs per acre) for the 2024 TAPS Sprinkler Irrigated Corn competition in Colby, KS.*

Preliminary analysis indicates that nearly all farms applied irrigation amounts below yield-limiting thresholds. Using Kansas State University irrigation scheduling tool, KanSched (https://kansched3.engg.ksu.edu/), the estimated full irrigation requirements for corn at the TAPS site, accounting for an irrigation system capacity limitation of 1 inch per week, were 17, 16, and 14 inches for early, middle, and late planting, respectively. However, research shows that the diminishing response of yield to irrigation often results in minimal to no economic loss when irrigation is applied at 75 to 80% of full irrigation requirements (Klocke et al. 2011; Lamm et al. 2014; Rudnick et al. 2016). Based on KanSched's estimated full irrigation amounts, 75% of full irrigation corresponds to 12.75, 12, and 10.5 inches for the early, middle, and late planting, respectively. Additionally, the optimal N fertilizer rate depends on water availability (Hargreaves and Samani, 1984). Under the deficit irrigated conditions, many farms likely applied excess N fertilizer, which further reduced WNIPI.

AWARD WINNER

HIGHEST INPUT USE EFFICIENCY

FIRST PLACE: FARM 30 — 0.346

Garret Smith, **Kel Grafel**, **Nick Higgason**, and **Mike Barton** had a WNIPI of 0.346. They planted Pioneer® P1122AML at a seeding rate of 26,000 per acre on May 8. They irrigated 11.25 inches and applied 129 lbs/acre of N fertilizer, resulting in a yield of 207 bu/acre.

SECOND PLACE: FARM 10 — 0.298

Mason Scheetz and **Marty Lager** had a WNIPI of 0.298. They planted DynaGro® D54VC14RIB at a seeding rate of 28,000 per acre on May 8. They irrigated 10.35 inches and applied 169 lbs/acre of N fertilizer, resulting in a yield of 203 bu/acre.

THIRD PLACE: FARM 31 — 0.294

Kent and Aaron Higerd had a WNIPI of 0.294. They planted Channel® 212-02VT2PRIB at a seeding rate of 28,000 per acre on May 8. They irrigated 15.25 inches and applied 199 lbs/acre of N fertilizer, resulting in a yield of 238 bu/acre.

Greatest Grain Yield

While TAPS focuses on profitability and efficiency, grain yield is a key measurement of crop success. Grain harvest for all farms was conducted on October 16 using a Wintersteiger Delta Combine equipped with a Harvest Master Grain Gauge. The center two rows of both the grower-selected hybrid and reference hybrid were harvested, although only the grower-selected hybrid yields were considered in determining competition winners.

Grain yields, adjusted to 15.5% moisture content for the grower-selected hybrids across farms, are illustrated in Figure 18. The competition's average yield was 170 bushels per acre (bu/acre), with yields ranging from 87 bu/acre (Farm 21) to 238 bu/acre (Farm 31). Notably, five farms (27, 10, 15, 24, 30, and 31) surpassed the field's average production history (APH) of 200 bu/acre. All of these farms shared a planting date of May 8 and applied seasonal irrigation at or above 10.35 inches, representing five of the seven highest irrigation levels in the competition. In contrast, nitrogen (N) fertilizer applications across these farms varied widely, ranging from 129 to 219 lbs/acre, spanning rankings from 31st to 12th in N application amounts.

As shown in Figure 19, grain yield had a positive, diminishing response to irrigation with an R^2 of 0.82, compared to a weaker correlation with N fertilizer application (R^2 = 0.26). This stronger response to irrigation was expected due to drier-than-average rainfall conditions. Similar trends were observed with the reference hybrid Brevant® B04Z92AM planted at a rate of 28,000 seeds per acre, eliminating uncertainties related to hybrid versus input management. However, variations in hybrid performance emerged at different water levels. For instance, Farm 31, which achieved the highest yield of 238 bu/acre with Channel® hybrid 212-02VT2PRIB at a seeding rate of 28,000 per acre, recorded a lower yield of 208 bu/acre for the reference hybrid. Conversely, Farm 29, which planted Pioneer® P1366AML on May 15 at the same seeding rate, produced 125 bu/acre compared to 137 bu/acre for the reference hybrid.

In conclusion, grain yield is influenced by numerous factors and their interactions, including not just the quantity but also the timing of inputs, along with genetic and environmental factors. Further analysis will explore the drivers behind the observed yield differences across farms.

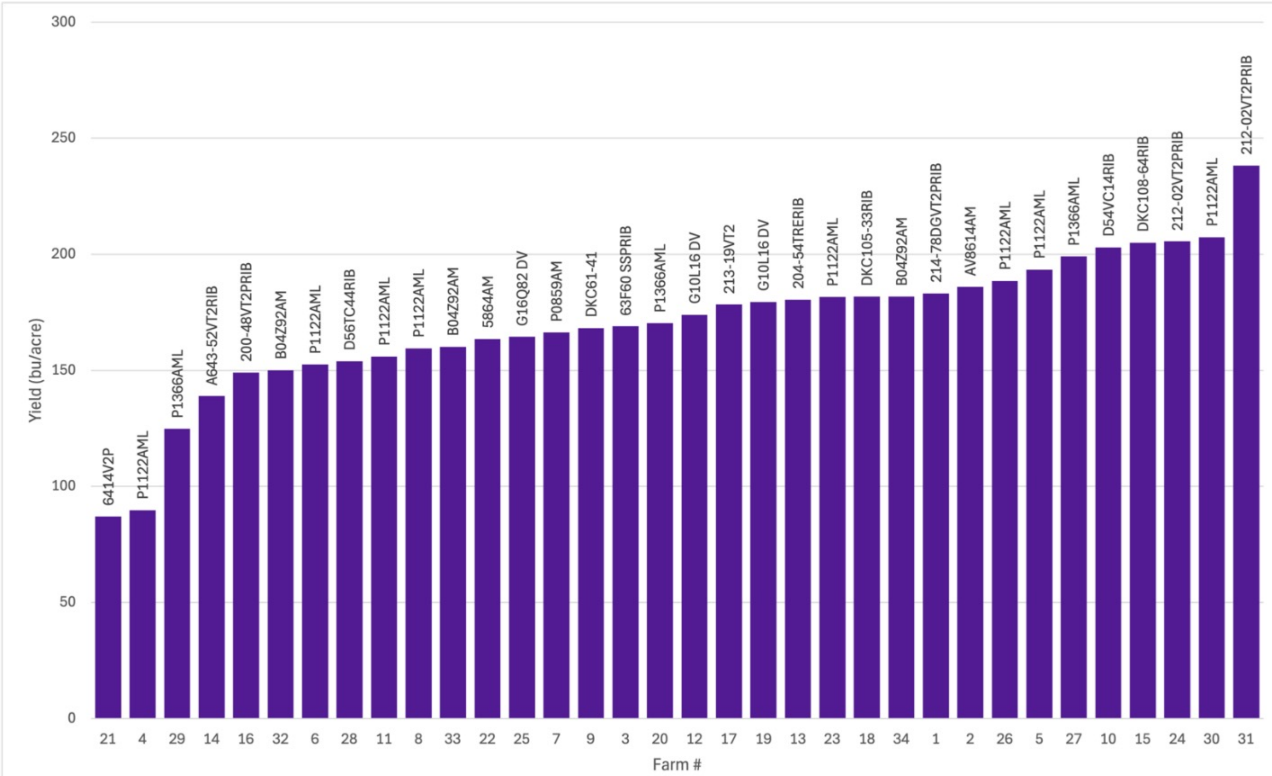


Figure 18. *Planted hybrid and resulting grain yield (bu/acre) adjusted to 15.5% moisture content for the TAPS Farms.*

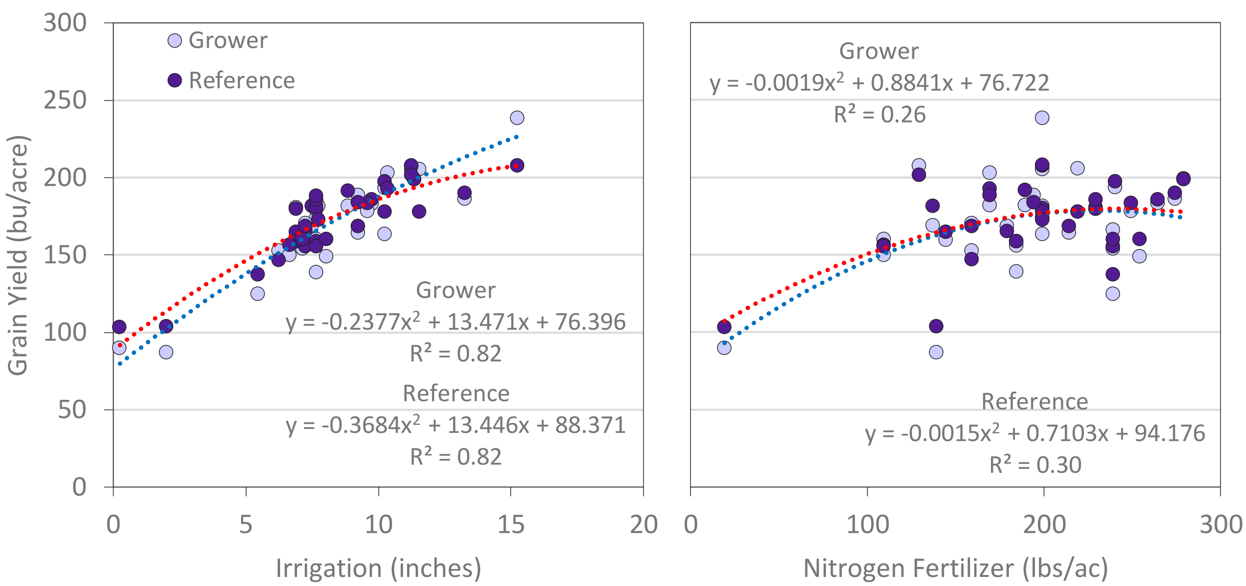


Figure 19. *Grain yield at 15.5% moisture content response to seasonal irrigation (inches) and nitrogen fertilizer (lbs/acre) for the grower selected hybrids and reference hybrid. Reference hybrid was Brevant® B04Z92AM planted at a seeding rate of 28,000 per acre.*

AWARD WINNER

GREATEST GRAIN YIELD

GREATEST GRAIN YIELD AWARD WINNERS

FIRST PLACE: FARM 31 — **238 BU/ACRE**

Kent and Aaron Higerd achieved a yield of 238 bu/acre using Channel® hybrid 212-02VT2PRIB, planted on May 8 at a seeding rate of 28,000 per acre, with irrigation of 15.25 inches and 199 lbs/acre of N fertilizer.

SECOND PLACE: FARM 30 — **207 BU/ACRE**

Garret Smith, **Kel Grafel**, **Nick Higgason**, and **Mike Barton** achieved a yield of 207 bu/acre using Pioneer® hybrid P1122AML, planted on May 8 at a seeding rate of 26,000 per acre, with irrigation of 11.25 inches and 129 lbs/acre of N fertilizer.

THIRD PLACE: FARM 24 — **206 BU/ACRE**

Christopher Hain, **Alexander Ruane**, **Shane Ohlde**, **Will Carrara**, **Forrest Melton**, and **Chad Godsey** achieved a yield of 206 bu/acre using Channel® hybrid 212-02VT2PRIB, planted on May 8 at a seeding rate of 25,000 per acre, with irrigation of 11.55 inches and 219 lbs/acre of N fertilizer.

Result Summary

The 2024 TAPS Sprinkler Irrigated Corn Competition results are summarized in Table 6. The competition environment was challenged by dry, below average rainfall, along with bare soil conditions. Nevertheless, competitors were able to leverage their experience, farming knowledge, and various technologies and decision support tools to pull the most out of their competition plots. Congratulations to all of the competitors and the winners!

Table 6. *Result summary of the 2024 TAPS Sprinkler Irrigated Corn Competition at the Kansas State University Northwest Research-Extension Center in Colby, KS.*

Farm ID	Total Cost ($/ac)	Revenue ($/ac)	Profit ($/ac)	Yield (bu/ac)	WNIPI (unitless)
1	$832.13	$781.02	-$51.11	183.1	0.190
2	$856.23	$797.86	-$58.37	186.0	0.166
3	$723.63	$729.61	$5.98	168.9	0.266
4	N/A	N/A	N/A	89.7	0.000
5	$809.20	$826.04	$16.84	193.4	0.221
6	$720.94	$759.09	$38.15	152.5	0.207
7	$788.20	$718.10	-$70.10	166.2	0.187
8	$706.69	$691.65	-$15.04	159.4	0.235
9	$742.82	$726.93	-$15.89	168.2	0.230
10	$755.42	$913.91	$158.49	202.9	0.298
11	$741.42	$686.06	-$55.36	155.9	0.195
12	$749.16	$744.72	-$4.44	173.9	0.227
13	$750.63	$779.40	$28.77	180.4	0.232
14	$780.02	$693.19	-$86.82	138.9	0.139
15	$787.81	$877.40	$89.59	205.0	0.265
16	$790.55	$688.99	-$101.56	149.0	0.134
17	$811.78	$829.73	$17.95	178.3	0.189
18	$762.05	$828.10	$66.05	181.7	0.242
19	$752.47	$764.62	$12.15	179.4	0.221
20	$738.78	$727.60	-$11.18	170.3	0.253
21	$647.50	$665.71	$18.20	87.0	-0.012
22	$784.92	$697.64	-$87.28	163.4	0.177
23	$796.18	$807.60	$11.42	181.6	0.247
24	$796.73	$881.68	$84.95	205.6	0.248
25	$780.57	$697.00	-$83.57	164.4	0.179
26	$802.40	$808.92	$6.52	188.5	0.251
27	$880.20	$978.40	$98.20	199.0	0.201
28	$772.92	$659.12	-$113.80	153.9	0.158
29	$827.26	$835.78	$8.52	124.8	0.094
30	$770.14	$892.17	$122.03	207.4	0.346
31	$824.80	$1,056.90	$232.10	238.2	0.294
32	$687.53	$661.00	-$26.53	150.0	0.237
33	$697.04	$703.80	$6.76	160.1	0.263
34	$735.20	$797.96	$62.76	181.7	0.274

2024 **TAPS EVENTS**

TAPS HOSTS FOUR EVENTS EACH COMPETITION.

Kickoff Meeting
March 27, 2024

Competition Overview
Rules and Guidelines
Team Portal Credentials

Field Tour and Technology Day
June 20, 2024

Competition Update
Touring of Plots
Technology Demonstrations

Agronomy Field Day
September 5, 2024

Competition Update
Agronomic Update
Northwest Research-Extension
Center Update

Awards Banquet
January 18, 2025
Dodge City, KS

Dinner
Competition Summary
Awards and Acknowledgements


KANSAS STATE
UNIVERSITY
Carl and Melinda Helwig Department of
Biological and Agricultural Engineering

TAPS KICKOFF

March 28, 2024 | Colby, KS

The TAPS Kickoff Event marked the start of a new season, bringing together farmers, industry partners, and researchers to explore the opportunities and challenges ahead. The event featured program updates, interactive sessions, and discussions on emerging technologies and management strategies. It set the tone for collaboration, innovation, and informed decision-making that define the TAPS competitions.

63 ATTENDANCE
30 TEAMS
14 PARTNERS

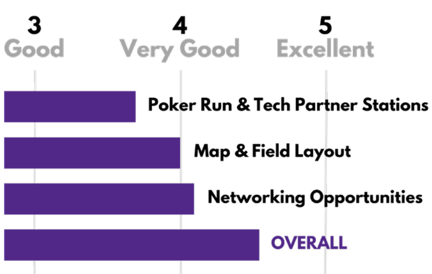
TAPS TECHNOLOGY FIELD DAY

June 20, 2024 | Colby, KS

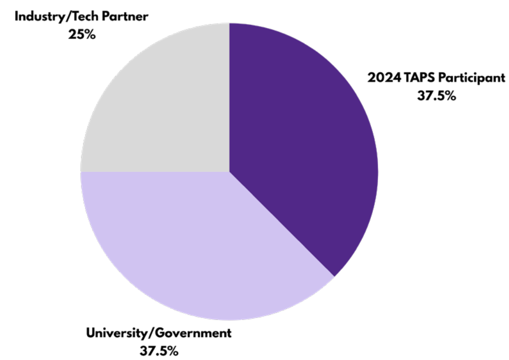
The TAPS Technology Field Day showcased innovative agricultural technologies and management strategies designed to enhance efficiency and sustainability in farming. Participants engaged with hands-on demonstrations, collaborative discussions, and data-driven insights aimed at advancing water use and production practices. The event emphasized TAPS' commitment to fostering innovation and peer-to-peer learning among producers, industry leaders, and researchers.

"The opportunity to learn was evident in the fact that so many famers stuck around."

In-Field Tech Showcase



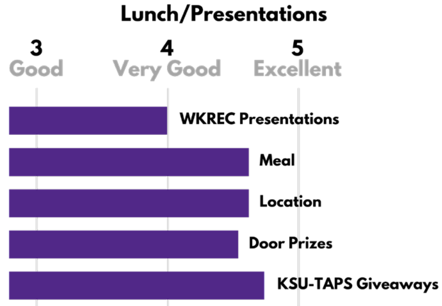
Attendees by Type



"Good atmosphere and company/ networking!"

"This was such an interesting and well-thought out event!"

Lunch/Presentations

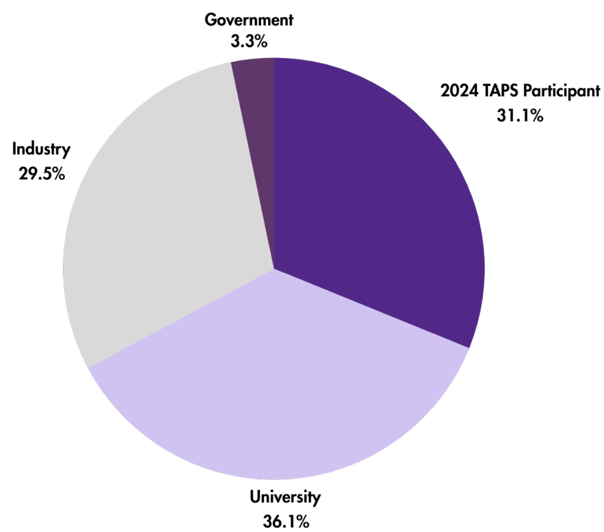


TAPS AGRONOMY FIELD DAY

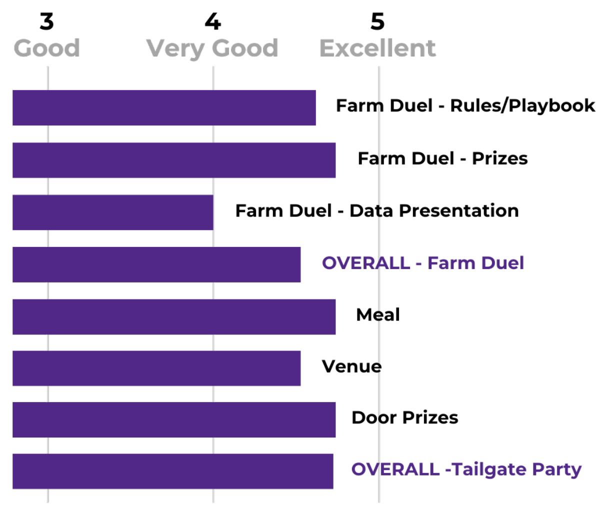
The TAPS Technology Field Day showcased innovative agricultural technologies and management strategies designed to enhance efficiency and sustainability in farming. Participants engaged with hands-on demonstrations, collaborative discussions, and data-driven insights aimed at advancing water use and production practices. The event emphasized TAPS' commitment to fostering innovation and peer-to-peer learning among producers, industry leaders, and researchers.

61 attendees

Attendees by Type



Farm Duel/Tailgate Party



Seed Sponsors

Channel

BECK'S

Golden Harvest

PIONEER

DEKALB

BREVANT seeds

DYNAGRO SEED

> FUN AND EDUCATIONAL WITH LOTS OF NETWORKING! GREAT EVENT!

KSU-TAPS
FARM DUEL

Farm Duel is the brainchild of several faculty and team members of the Western Kansas Research-Extension Centers and the Carl & Melinda Helwig Department of Biological and Agricultural Engineering that were looking for a way to combine the best of farming and football. With this unique Field Day experience, we wanted to up the competition between current participants, while allowing others outside the competition to see what TAPS competitions are like in real-time.

Twenty Farm Duel Teams came together to make decisions on: hybrid, seeding rate, fertilizer application, and rapid-fire irrigation decisions. Data from these decisions were entered into the Decision Support System for Agrotechnology Transfer (DSSAT) model, a powerful tool used for modeling potential crop outcomes; primarily yield. The model integrates irrigation and nitrogen decisions by predicting baseline crop water and nutrient needs based on historical weather data and soil typography. For purposes of this simulation, weather data from the Kansas Mesonet located on the Northwest Extension-Research Center from 2016 was used.

This virtual-reality competition offered prizes in four categories matching the live 2024 Sprinkler Irrigated Corn Competition: Overall Most Profitable, Most Profitable at or Below Q-Stable (7.65 in for Colby, KS), Highest Input Use Efficiency, and Greatest Yield.

Farm Duel

Decision Data

Four hybrids were offered for selection:

1. Kan-sas Corn: Long-Season, 4 Teams Selected
2. Dean's Mean Green: Mid-Season, 8 Teams Selected
3. Daran-ator: Mid – Short Season, 8 Teams Selected
4. Rae(y)-Liable: Short Season, Not Selected

Seeding Rate/Acre:

8 seeding rates were offered for selection:

- 12,100
- 16,200
- 20,200, 2 Teams Selected
- 24,300, 4 Teams Selected
- 28,300, 10 Teams Selected
- 32,400, 4 Teams Selected
- 36,400

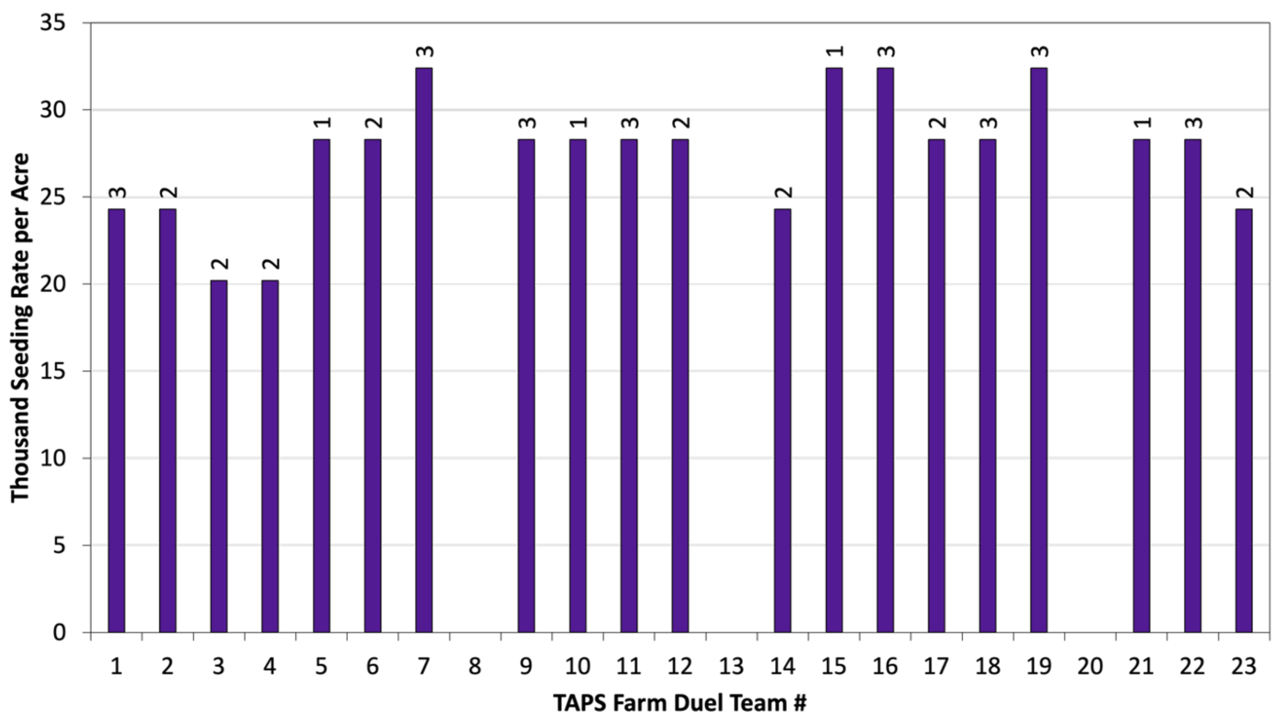
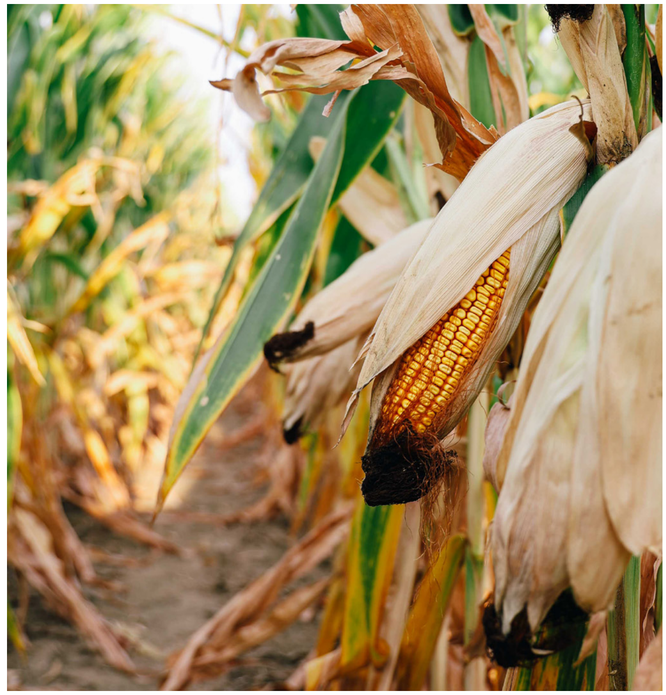


Figure 20. *Farm Duel Competition Farms' decision of thousand seeding rate per acre.*

Farm Duel



Nitrogen Decisions

Nitrogen applications were offered at-plant, sidedress and via fertigation. At-plant, teams could apply 0 – 180 lbs of N/acre and it was banded two inches below the surface. Sidedress offered the opportunity for teams to apply 0 – 180 lbs of N/acre banded on the surface. Three fertigation rounds were offered allowing for the application of: 0, 10, 20 or 30 lbs/acre for each round. Each round of fertigation also included 0.32 in of irrigation.

The average nitrogen applied was 207 lbs/acre, with the highest amount applied being 310 lbs/acre and the lowest being 130 lbs/acre. See summary table 7 for full nitrogen decision data.

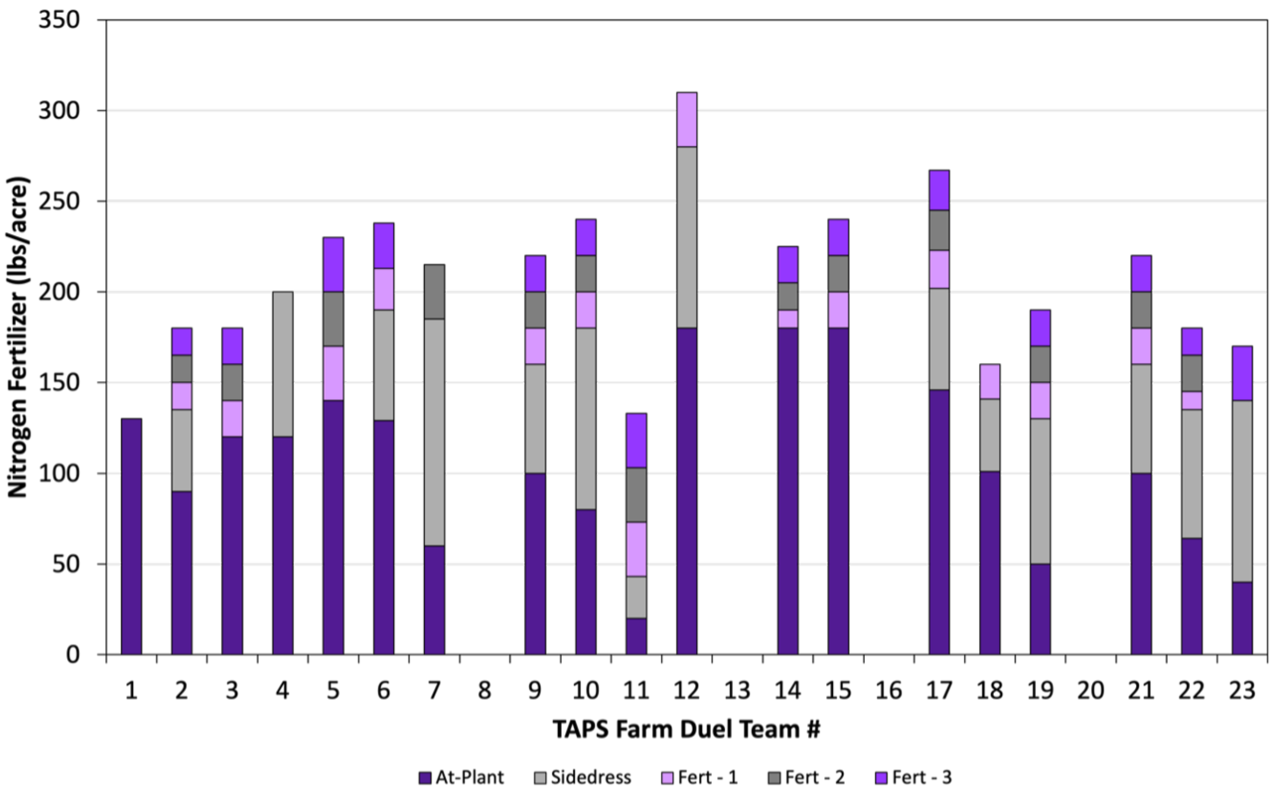


Figure 21. *Farm Duel Farms Total Nitrogen applied (lbs/acre) At-Plant, Sidedress, Fertigation 1, Fertigation 2, Fertigation 3.*

Irrigation Decisions

Teams were kept on their toes with 15 rounds of rapid-fire irrigation decisions. For each decision, teams were presented with the observed weather for the previous week (high/low temperatures and precipitation), alfalfa reference evapotranspiration (ETr), and forecasts for the upcoming week (predicted high/low temperatures and precipitation). As more rounds were completed, the time allotted for teams to make their decisions got shorter, bringing more spunk to the decision-making process.

The average irrigation applied was 8.8 inches, with the highest amount applied being 14.32 inches and the lowest being 2.62 inches. See summary table 7 for full irrigation decision data.

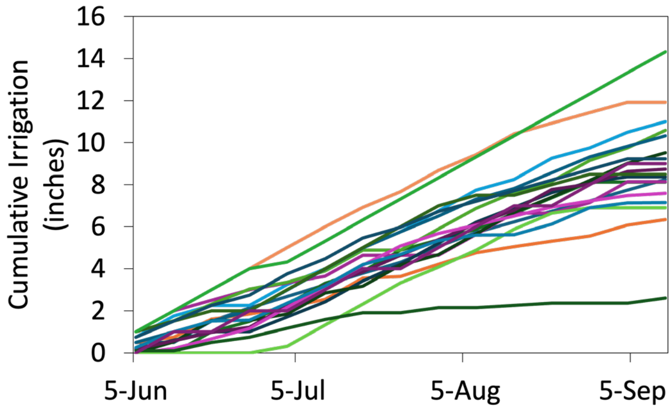


Figure 22. *Farm Duel competition farm seasonal irrigation applied in inches.*

Table 7. *Summary of each Farm's agronomic decisions, including hybrid and seeding rate, nitrogen fertilizer, and seasonal irrigation. Nitrogen was applied in the form of urea ammonium nitrate (UAN) 32%.*

Farm ID	Hybrid	Seeding (per ac)	---------------- Nitrogen Fertilizer (lbs/acre) ---------------						Irrigation (inches)
			At-Plant	Sidedress	Fert-1	Fert-2	Fert-3	Sum	
1	Daran-ator	24,300	130	0	0	0	0	130	8.25
2	Dean's Mean Green	24,300	90	45	15	15	15	180	6.33
3	Dean's Mean Green	20,200	120	0	20	20	20	180	8.13
4	Dean's Mean Green	20,200	120	80	0	0	0	200	11
5	Kan-Sas Korn	28,300	140	0	30	30	30	230	8.14
6	Dean's Mean Green	28,300	129	61	23	0	25	238	10.59
7	Daran-ator	32,400	60	125	0	30	0	215	8.37
9	Daran-ator	28,300	100	60	20	20	20	220	9.51
10	Kan-Sas Korn	28,300	80	100	20	20	20	240	10.32
11	Daran-ator	28,300	20	23	30	30	30	133	8.73
12	Dean's Mean Green	28,300	180	100	30	0	0	310	8.49
14	Dean's Mean Green	24,300	180	0	10	15	20	225	11.92
15	Kan-Sas Korn	32,400	180	0	20	20	20	240	14.32
16	Daran-ator	32,400	-	-	-	-	-	-	-
17	Dean's Mean Green	28,300	146	56	21	22	22	267	7.59
18	Daran-ator	28,300	101	40	19	0	0	160	6.9
19	Daran-ator	32,400	50	80	20	20	20	190	9.22
21	Kan-Sas Korn	28,300	100	60	20	20	20	220	2.61
22	Daran-ator	28,300	64	71	10	20	15	180	7.15
23	Dean's Mean Green	24,300	40	100	0	0	30	170	9

KSU-TAPS 2024 FARM DUEL

AWARD WINNERS

Based on the outcomes of the DSSAT model and like the 2024 KSU-TAPS Competition, four prizes were awarded:

OVERALL MOST PROFITABLE $500

Net income based on the average yield of the competitor's plots.

WINNER: DWANE ROTH MANHATTAN, KS — **$397/ ACRE**

MOST PROFITABLE AT OR BELOW Q-STABLE $500

Net income based on the average yield of the competitor's plots and must have irrigated at or below Q-Stable (7.65 inches for Colby, KS).

WINNER: RUSS MARTIN COLBY, KS — **$394/ ACRE**

HIGHEST INPUT USE EFFICIENCY $500

Calculated based on the Water-Nitrogen Performance Index.
See 2024 KSU-TAPS Competition for full description.

WINNER: RUSS MARTIN COLBY, KS — **0.346**

HIGHEST YIELD $250

Adjusted percentage of the overall most profitable farm.

WINNER: DAVID SLOANE ST. LOUIS, MO — **241 BU/ ACRE**

Table 8: *Result summary of the 2024 Farm Duel Competition hosted in Colby, KS.*

Farm ID	Yield (bu/ac)	WNIPI (unitless)	Profit ($/ac)
1	220	0.344	$397
2	215	0.292	$347
3	207	0.235	$324
4	206	0.194	$276
5	174	0.243	$117
6	233	0.262	$333
7	232	0.292	$352
9	242	0.283	$393
10	174	0.215	$81
11	213	0.319	$334
12	233	0.235	$310
14	223	0.216	$312
15	181	0.211	$68
17	233	0.273	$343
18	227	0.346	$394
19	233	0.309	$361
21	174	0.331	$165
22	227	0.319	$378
23	203	0.243	$282

One of the greatest strengths of TAPS is its ability to serve as a catalyst for collaboration and multidisciplinary research. We are deeply grateful to Dr. Vaishali Sharda and her students from the K-State Carl and Melinda Helwig Department of Biological and Agricultural Engineering for their invaluable contributions to the Farm Duel. Their expertise in precision agriculture and data-driven decision-making enriched the competition, enabling participants to better understand the impact of their strategies.

Dr. Vaishali's team provided advanced tools for real-time data collection and analysis, enhancing decision-making in irrigation, nitrogen management, and other inputs. By bridging engineering with agricultural practice, their work highlighted the critical role of technology in addressing modern farming challenges.

We are thankful for their partnership and the innovation they brought to the Farm Duel. Their contributions exemplify the power of interdisciplinary teamwork and continue to shape TAPS as a leading platform for applied agricultural research and education.

Kansas State University | Carl and Melinda Helwig Department of Biological and Agricultural Engineering

Kansas Water Institute

TAPS RFP

Goal: Promote interdisciplinary research and partnerships to help address water challenges facing Kansans.
Max Award: $25,000

Summary:

The Kansas Water Institute's TAPS (Testing Ag Performance Solutions) RFP represents an innovative approach to addressing water challenges in Kansas through interdisciplinary research and collaboration. TAPS, launched at Kansas State University in October 2023 under a 5-year agreement with the USDA Natural Resources Conservation Service, is a unique program that blends real-world farming with virtual competition and citizen science. It allows participants to make critical farming decisions implemented on university research farms, providing a risk-free environment to test various management strategies and technologies. This catalyzes interdisciplinary research with the potential to impact all aspects of agriculture and natural resources, sociology, and culture in western Kansas.

The Kansas Water Institute issued a TAPS RFP to enhance its impact further. The RFP funds several interdisciplinary projects to address pressing water sustainability challenges, ranging from innovative hackathons to bilingual initiatives and advanced soil moisture estimation techniques. These projects leverage the unique data and framework provided by the TAPS program.

Funded Projects:

- Wildcat Hackathon: Innovative Solutions for Sustainable Water Use in Kansas
- Creation of Novel Use Case Studies Based on Actual TAPS Data
- Bilingual Initiatives to Address Pressing Water Sustainability Challenges
- Refining Soil Moisture Estimation by Integrating Satellite Data with Local Irrigation Practices.

Kansas State University | Kansas Water Institute

Wildcat Hackathon

The Wildcat Hackathon, sponsored by TAPS, stands as a prime example of innovation and collaboration at the intersection of technology and agriculture. This week-long event, held in October 2024, invited teams of K-State students to develop interactive dashboards using real-world datasets to address critical issues in sustainable water use. Organized by the Department of Agronomy, the Department of Geography and Geospatial Sciences, and KSU-TAPS, the Hackathon provided a unique opportunity for 49 students, representing 16 teams across 11 departments to tackle pressing challenges faced by Kansas farmers, researchers, and water managers.

With access to TAPS datasets and additional sources such as the Kansas Mesonet and remote sensing imagery, participants created functional dashboards capable of transforming soil, crop, and weather data into actionable insights. From tools for smart irrigation scheduling to platforms identifying crop stress, the Hackathon fostered creativity and practical solutions. Each project culminated in a presentation showcasing how their work could directly aid stakeholders in optimizing resource use and enhancing sustainability.

TAPS is proud to sponsor this event and play a role in cultivating multidisciplinary collaboration. With 16 teams representing 11 departments and leveraging open-source programming frameworks, the Hackathon exemplifies the power of connecting data science, agronomy, and engineering to solve real-world problems. By empowering students to address challenges like water conservation and resource management, the Wildcat Hackathon not only advances the TAPS mission but also inspires the next generation of agricultural innovators.

Conclusion

As the 2024 TAPS season concludes, we reflect on another impactful year of challenges, innovation, and collaboration. These competitions provided participants, partners, and supporters with practical opportunities to test strategies, evaluate technologies, and benchmark decisions in a real-world setting. This year, competitors faced tough conditions, including below-average rainfall and economic pressures, offering valuable insights into resource management and decision-making.

TAPS thrives on its ability to offer hands-on, applied education. By stepping into the role of decision-makers, participants explored innovative approaches and pushed the boundaries of efficiency and profitability. The lessons learned here are not hypothetical—they are tools that can be directly applied to farms across the High Plains and beyond.

We are incredibly grateful to all who made this season possible: the participants who gave their best efforts, the collaborators from Nebraska, Colorado, Oklahoma, Maryland, Alabama, and Florida who shared their expertise, the industry supporters and sponsors who made the program possible, and our dedicated interns, Kabateraine (Maxwell) Tumwesige, Rayhaan Kabenge, Simon Salcido whose contributions were essential to the program's success.

The success of the TAPS program would not be possible without the steadfast support of our colleagues at Kansas State University. We extend our heartfelt gratitude to Dr. Vaishali and her students from the Carl and Melinda Helwig Department of Biological and Agricultural Engineering, Dr. Jane Schu, Dean Ernie Minton, Brian Olson, and all the team at the Western Kansas Research-Extension Centers.

We extend our sincere gratitude to the USDA - Natural Resources Conservation Service for the technical agreement that makes TAPS possible and for their shared vision of advancing collaborative water conservation efforts.

We are also deeply appreciative of Susan Metzger and the Kansas Water Institute for their leadership and vision. Together, their expertise, dedication, and collaboration have been instrumental in making the TAPS program a reality and a success.

Looking to 2025, we are energized by the opportunities ahead. With competitions set for Garden City and Colby, TAPS is expanding its reach and creating new opportunities for growth. Each season strengthens the foundation for smarter farming, sustainable practices, and stronger networks across the agricultural community.

Thank you for being part of this journey. We are excited about the future and look forward to welcoming new participants, supporters, and collaborators as we take on the next challenges. Together, we are building a more resilient and forward-thinking agriculture for the years ahead.

The KSU-TAPS Team

References

ASCE. 2005. The ASCE Standardized Reference Evapotranspiration Equation. Reston, VA: ASCE-EWRI. https://doi.org/10.1061/9780784408056

Butler, J.J., D.O. Whittemore, B.B. Wilson, and G.C. Bohling. 2016. A new approach for assessing the future of aquifers supporting irrigated agriculture. Geophysical Research Letters 43(5), 2004–2010. https://doi.org/10.1002/2016gl067879

Hargreaves, G.H. and Z.A. Samani. 1984. Economic considerations of deficit irrigation. Journal of Irrigation and Drainage Engineering 110(4): 343-358.

Klocke, N.L., R.S. Currie, D.J. Tomsicek, and J. Koehn. 2011. Corn yield response to deficit irrigation. Transactions of the ASABE 54(3): 931-940.

Lamm, F.R., D.H. Rogers, J. Aguilar, and I. Kisekka. 2014. Deficit irrigation of grain and oilseed crops. In: Proc. 2014 Irrigation Association Technical Conference, Phoenix, Arizona, November 19-20. Available from the Irrigation Association, Falls Church, Virginia.

Lo, T., D.R. Rudnick, C.A. Burr, M.C. Stockton, and R. Werle. 2019. Approaches to evaluating grower irrigation and fertilizer nitrogen amount and timing. Agricultural Water Management 213: 693-706. https://doi.org/10.1016/j.agwat.2018.11.010

Newbury, E., Humphreys, L., & Guess, L. (2014). Over the Hurdles: Barriers to Social Media Use in Extension Offices. The Journal of Extension, 52(5), Article 14. https://doi.org/10.34068/joe.52.05.14

Rudnick, D.R., S. Irmak, R.B. Ferguson, T. Shaver, K. Djaman, G. Slater, A. Bereuter, N. Ward, D. Francis, M. Schmer, B. Wienhold, and S. van Donk. 2016. Economic return versus crop water productivity of maize for various nitrogen rates under full irrigation, limited irrigation, and rainfed settings in south central Nebraska. Journal of Irrigation and Drainage Engineering 142(6): 04016017. https://doi.org/10.1061/(ASCE)IR.1943-4774.0001023

Saxton, K.E. and W.J. Rawls. 2006. Soil Water Characteristic Estimates by Texture and Organic Matter for Hydrologic Solutions. Soil Science Society of America Journal 70(5), 1569–1578. https://doi.org/10.2136/SSSAJ2005.0117

Driving Sustainable Agriculture Solutions

We build networks around innovative farming practices, using precision agriculture technology and connecting research with real-world applications to maximize efficiency and profitability.

KSUTAPS
TESTING AG PERFORMANCE SOLUTIONS

PARTNER WITH US

Join us in revolutionizing sustainable and economically viable agriculture. Partner with us to leverage cutting-edge technology, enhance your farming practices, and drive profitability. Together, we can make a lasting impact on the future of farming.

Phone
+(712)204-6772

Email
TAPS@KSU.EDU

Website
WWW.K-STATE.EDU/TAPS

Office Address
105 Experiment Farm Drive
Colby, KS 67701-786