KSU TAPS
TESTING AG PERFORMANCE SOLUTIONS

Advancing Groundwater Solutions

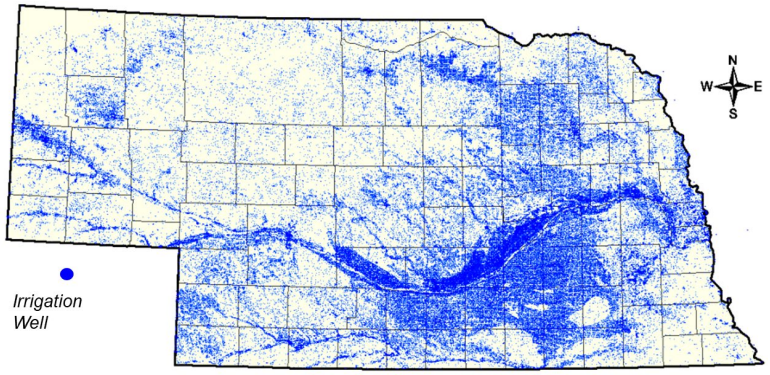
Daran R. Rudnick, Ph.D.

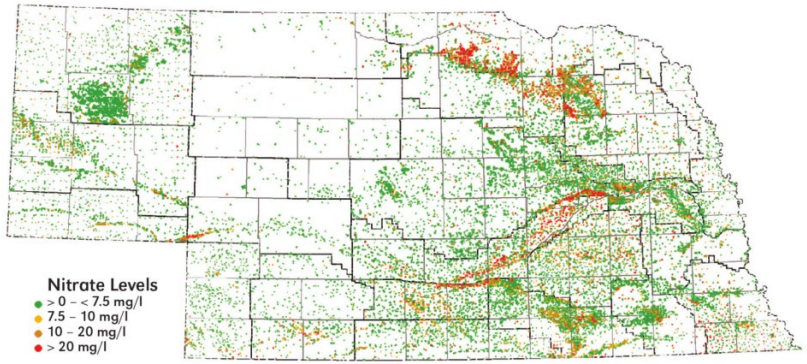
Professor and Director of Sustainable Irrigation
Kansas State University Research and Extension
Department of Biological and Agricultural Engineering
Phone: (712) 204-6772, Email: drudnick@ksu.edu

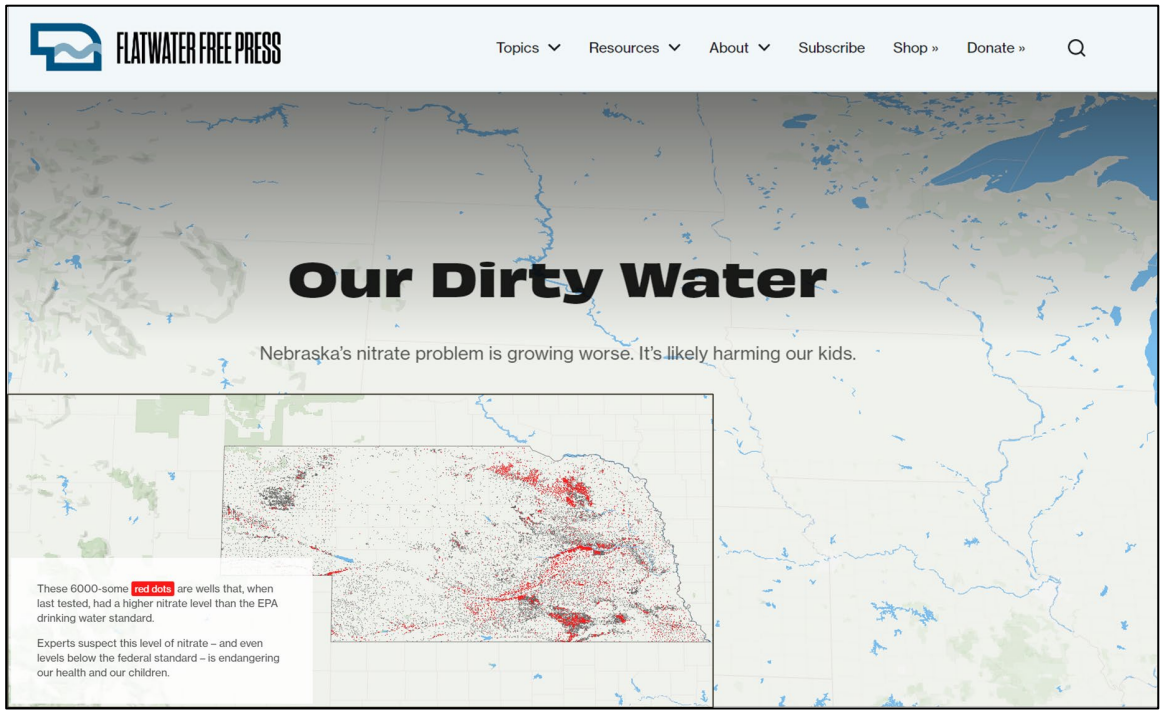
K-STATE
Research and Extension

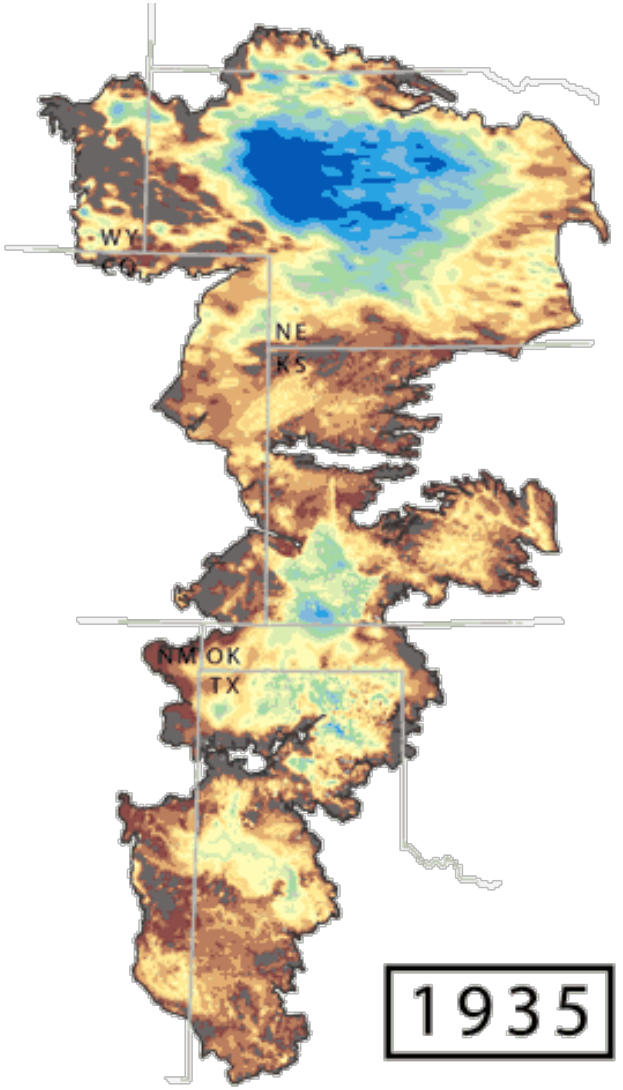
Haacker et al. 2015

Challenges Facing Irrigated Agriculture









Growing Concerns

KANSAS REFLECTOR

NEWS POLITICS CIVIL RIGHTS ENVIRONMENT PODCASTS OPINION

AGRICULTURE ENVIRONMENT POLITICS + GOVERNMENT

Western Kansas' economy threatened by reliance on irrigating crops with Ogallala Aquifer

Tuttle Creek Lake's water holding capacity sliced in half from sedimentation

BY: TIM CARPENTER - AUGUST 29, 2022 3:12 PM

Audit finds western Kansas keeps losing water, despite local efforts

Evaluation covers groundwater management districts, most of which are meant to conserve water in the Ogallala Aquifer.

BY: ALLISON KITE - FEBRUARY 16, 2023 1:27 PM

This is the first time the Kansas Water Authority has voted to save what's left of the Ogallala

By David Condos, Kansas News Service | Dec. 16, 2022, 5 a.m. · 5 min read

With the Ogallala Aquifer drying up, Kansas ponders limits to irrigation

KCUR | By David Condos

Published April 4, 2023 at 6:00 AM CDT

▶ LISTEN · 4:39

David Condos / Kansas News Service

AP U.S. WORLD POLITICS VIDEO SPOTLIGHT ENTERTAINMENT SPORTS BUSINESS SCIENCE FACT CHECK CLIMATE HEA

Warning about aquifer's decline sets up big fight in Kansas

1 of 17 | Lee Reeve poses for a photo at the cattle feedyard and ethanol plant operated by his family Thursday, Jan. 5, 2023, near Garden City, Kan. Reeve sees language by the Kansas Water Authority on controlling groundwater use in western Kansas as "toxic," as the Kansas Legislature looks to take up ways to address depletion of the Ogallala Aquifer in the region. Read More

BY JOHN HANNA

Published 11:28 AM CDT, January 6, 2023

Share

KANSAS REFLECTOR

NEWS POLITICS CIVIL RIGHTS ENVIRONMENT PODCASTS OPINION

AGRICULTURE ENVIRONMENT POLITICS + GOVERNMENT

Kansas legislation got 'watered down' but will help aquifer conservation efforts

'There's the eternal battle between limited resources ... and need,' says Rep. Jim Minnix, R-Scott City, who chairs the House Water Committee

BY: ALLISON KITE · MAY 12, 2023 8:30 AM

Innovation!

2021 Ogallala Aquifer Summit encourages a community-wide approach to tackle issues facing the aquifer

March 16, 2021 / By Ava English / Ogallala Aquifer, Ogallala Aquifer Program, Ogallala Aquifer Summit

NEWS

Kansas Farmer Launches New Innovation Farm Project

With the help of irrigation, drone and imagery companies, as well as Kansas State University researchers and water conservationists, one farmer is using his land and his knowledge to further innovation.

September 02, 2021 • Alice Mannette, The Hutchinson News

...a dream. A dream to heal the land and help others do the same.

Some Nebraska farmers are using technology to manage their pivot irrigation systems

by Risell Ventura | Tue, October 11th 2022, 7:09 PM CDT

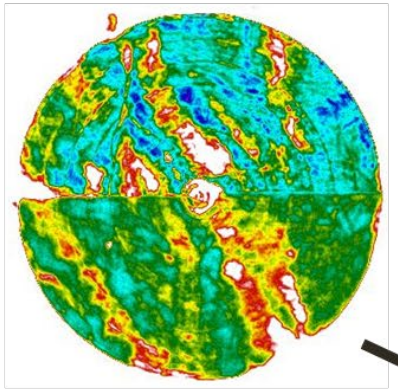
OCTOBER 11, 2022 - Co-owner of Prairie Fire Ag Solutions, Amy Harsch, said this is an amazing tool for growers (Photo Credit: NTV News)

GRAND ISLAND, Neb. — As the years pass by, more and more technology seems to be blending with the agricultural needs of growers. There's a particular type of technology helping farmers with their center-pivot irrigation systems.

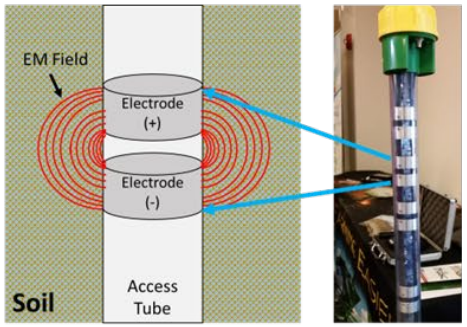
360 RAIN Autonomous Banding System Finds Success with Hog Barns, Dairies

By Julienne Isaacs posted on October 4, 2023 | Posted in Precision Agriculture, Water Management

Imagery

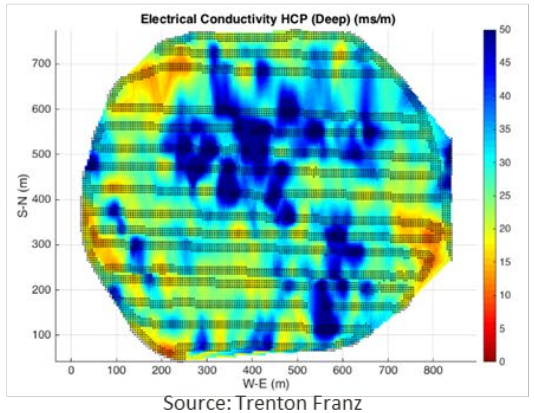


Soil Moisture



Weather

Soil Variability

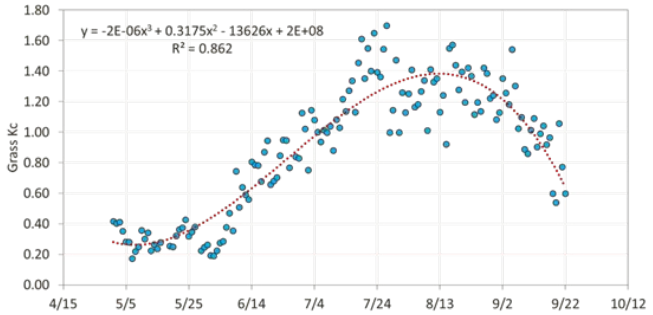


Source: Trenton Franz

Plant Sensors

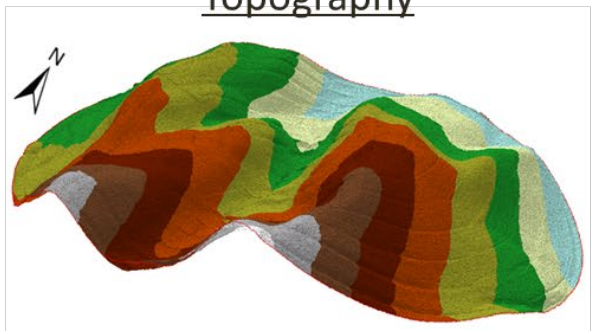
Mechanistic - Empirical - AI

Crop Growth and Development



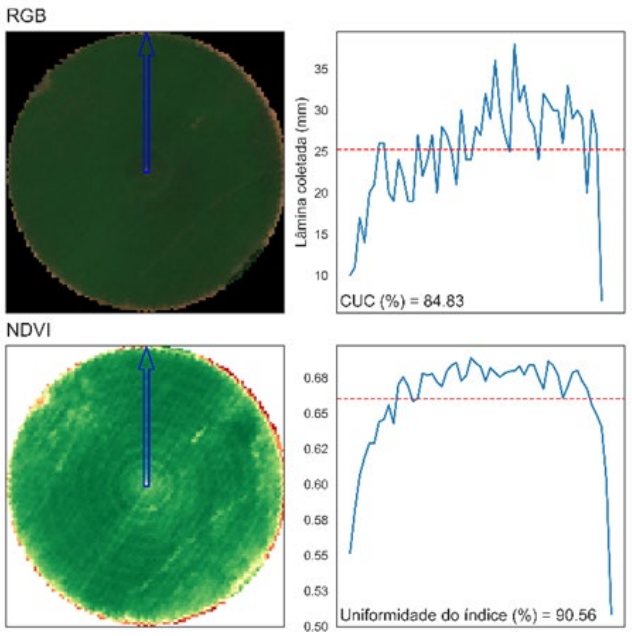
System Details and Performance

Topography

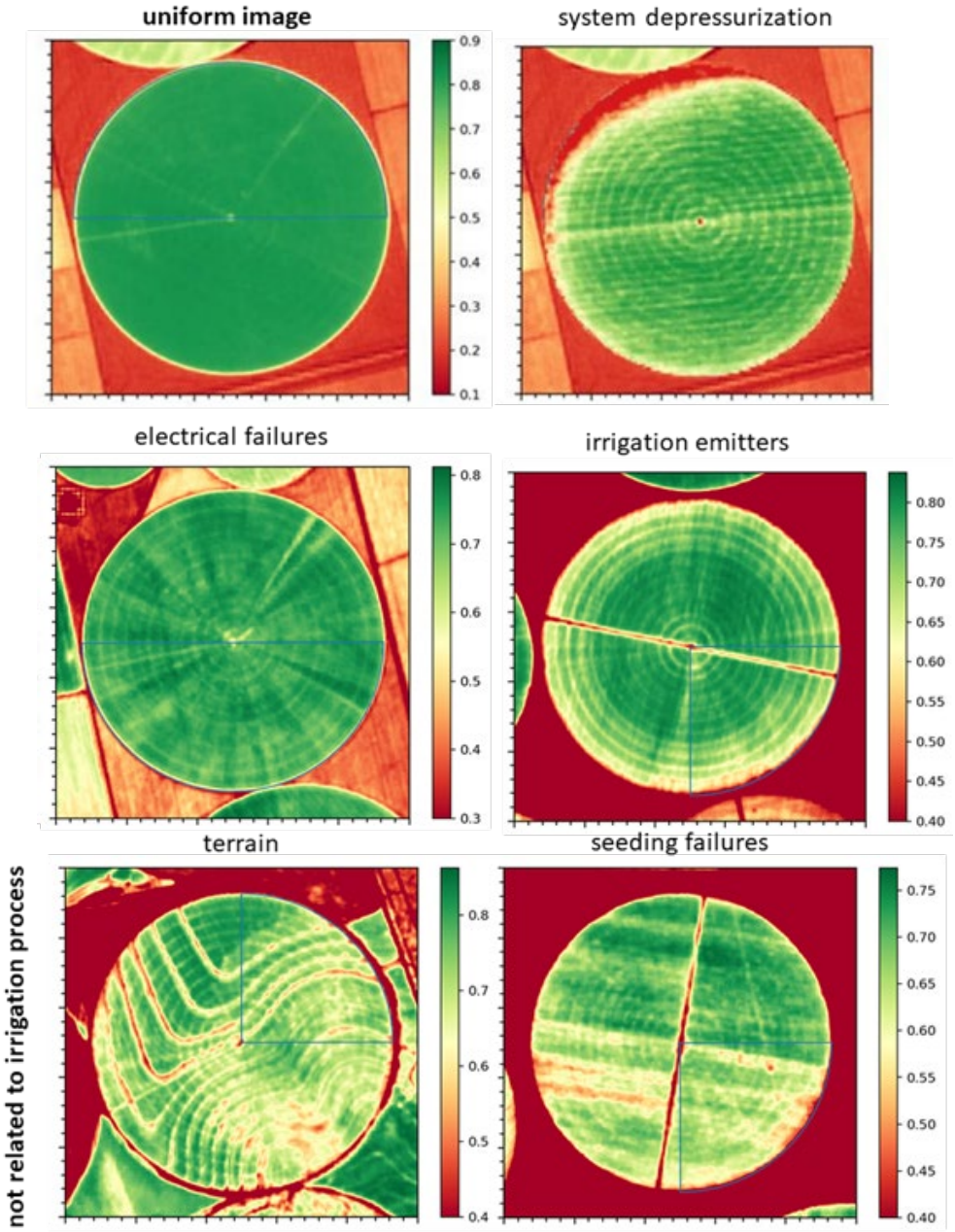


Field History & Management

Center Pivot Uniformity

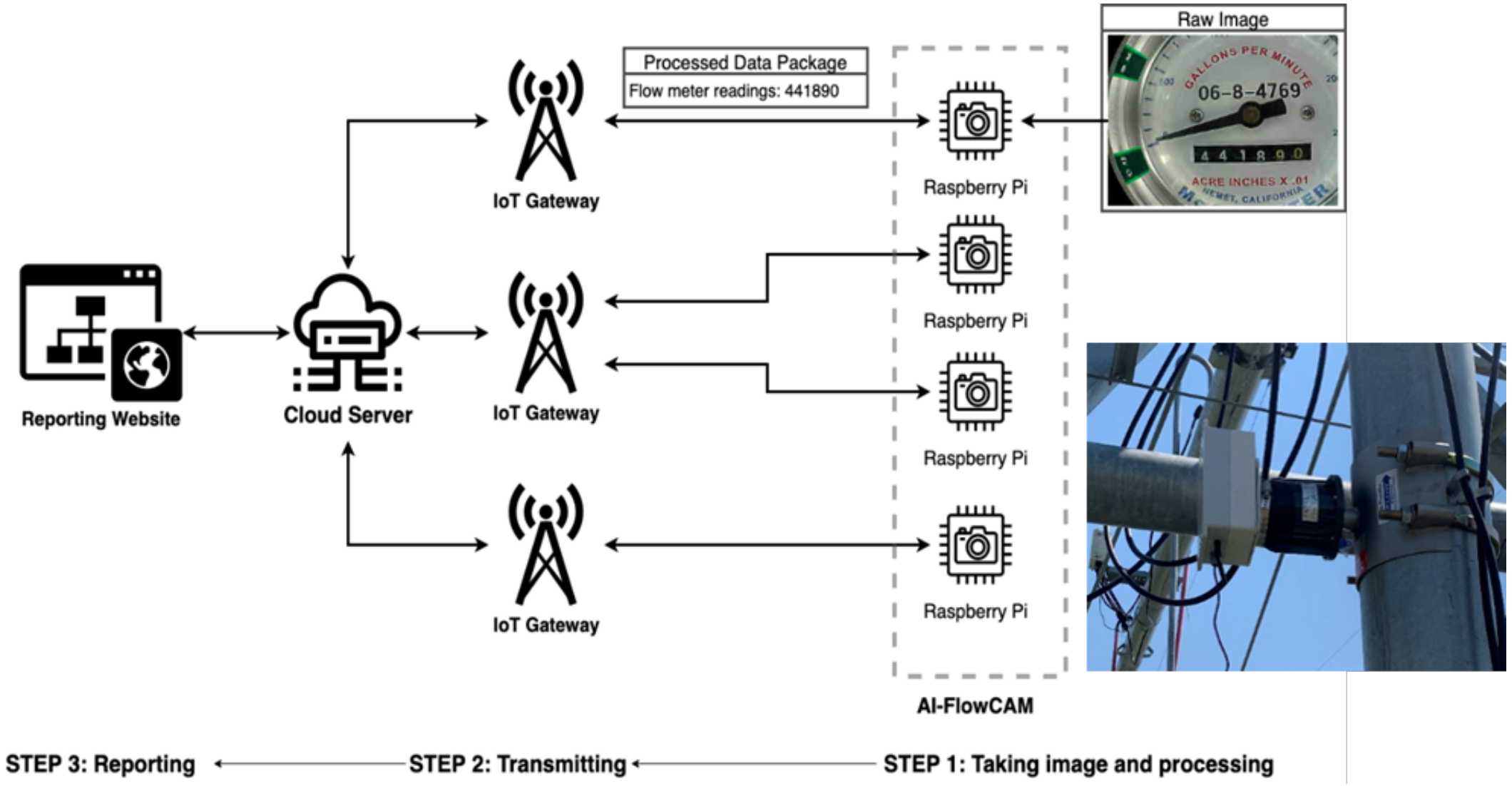


AI Modeling to Identify Source of Non-Uniformity



Boninsenha et al. (2023)

Deep learning algorithm for flow meter recognition



Liu et al. (2023)

Deep learning algorithm for flow meter recognition

Training and validating

- 2,000 images were used for training and 1,248 were used for testing
  - 1190 images correctly recognized (95.35%)
  - 46 images (3.69%) missing 1 digit
  - 12 images (0.96%) missing multiple digits
- Good “add-on” device to convert a mechanical flow meter to a digital flow meter.

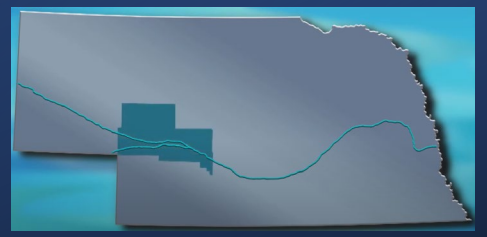
Some examples of correctly recognized images

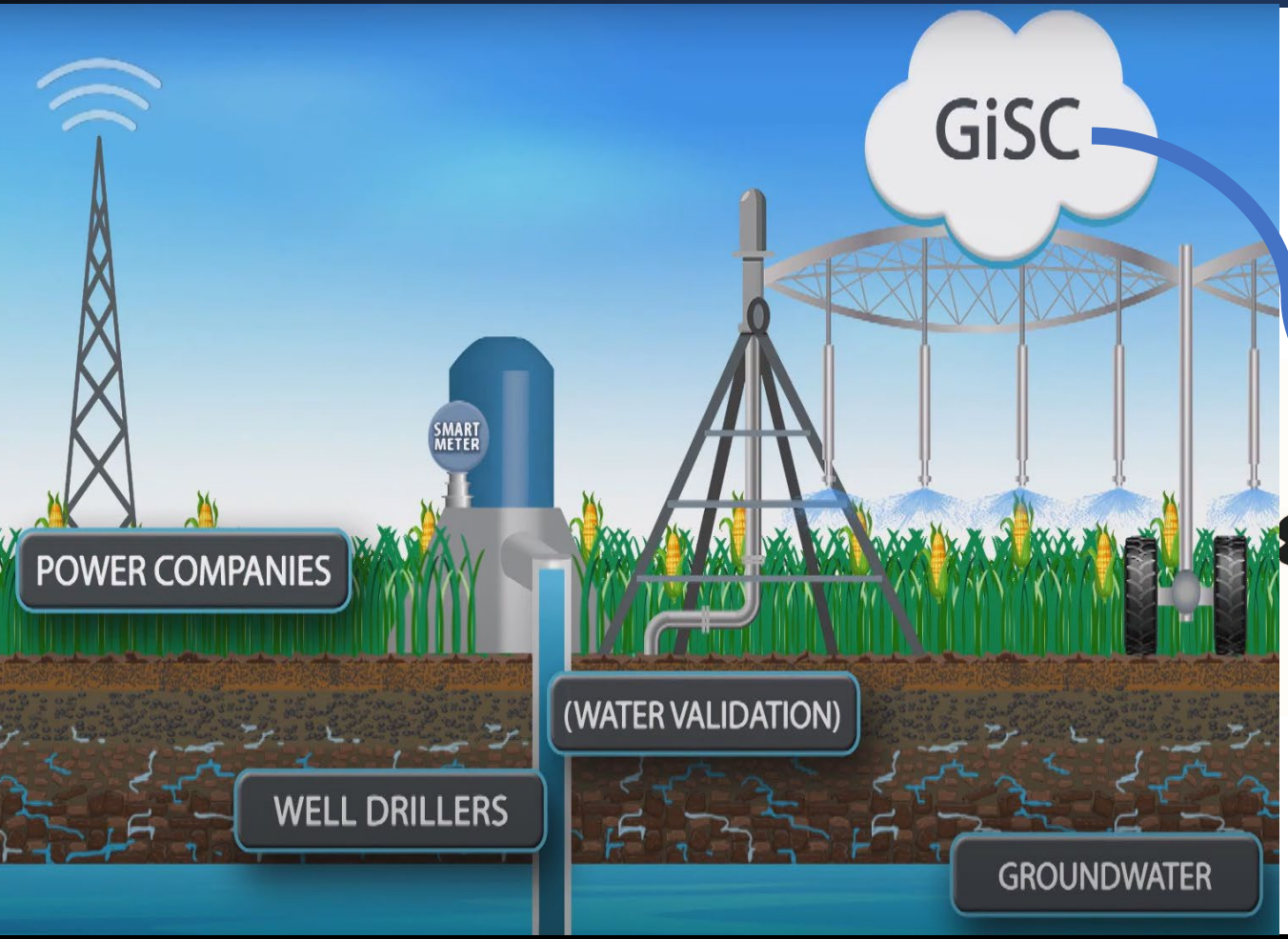
d. 362592

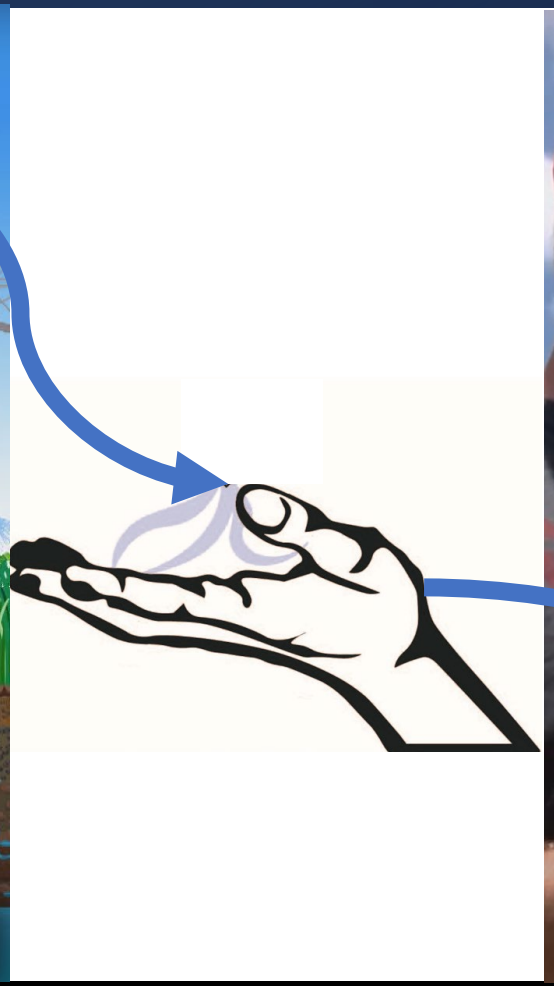
e. 687551

f. 012075

Largest Fixed IoT Deployment in the World: The TPNRD Water Data Program WDP





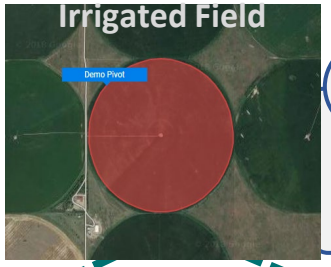


OVER 300,000 acres and 100% of Irrigators

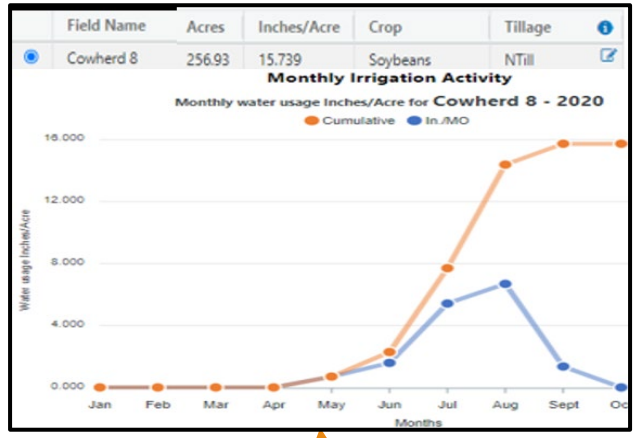
Twin Platte NRD – Water Data Program Overview

Collect – Automated Water Usage Measurements

Water Data Program



AgHub
Coop-Data Network



Well/Pump Flow Rate

FieldID: 2232
IrrigID: 123435BO
Cert_Acres: 136.162
...
WellID: 77354
Well_Status: A
Well_Use: I
Well_Pumprate: 900

Hours of Operation

FieldID: 2232
...
WellID: 77354
...
Elec_MBRSEP: 41116007
Elec_LOC: 1333304
Date: 06/20/2020
Elec_Hours: 17.05

900 GPM
X
17.05 Hours
=
0.02075 ft/acre
0.25 in/acre

Records Irrigation in AgHub

GISC

Filters

Select Custom Date Range

Year: 2018 | Month: Select...

Business: Select...

Farm: Select...

Crop Type: Select... | Tillage Practice: Select...

Filter Data | Reset Filter

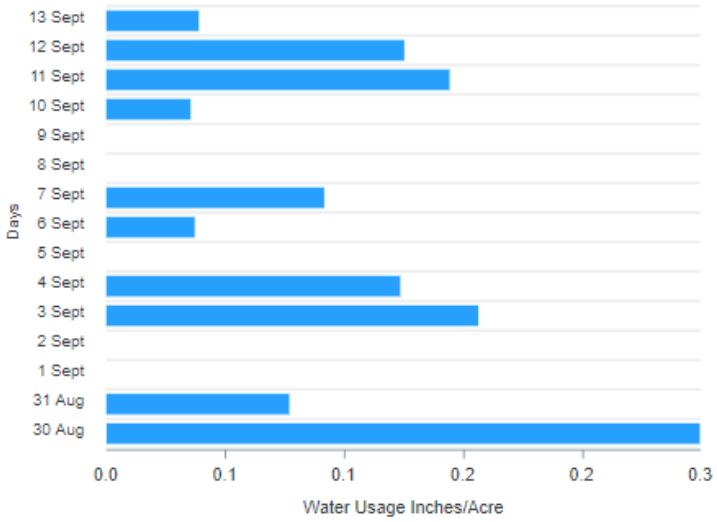
	Field Name	Acres	Inches/Acre	Crop	Tillage
◉	Cowherd 8	256.93	6.299		
○	E28	110.42	7.461		
○	F27	127.16	5.931		
○	F29	131.75	7.304		
○	F30	136.16	6.104		
○	F31	130.79	5.136		
○	F32	129.82	8.483		
○	G19	134.49	6.703		
○	G21	133.48	5.372		
○	J1	132.71	0		

Showing 1 to 10 of 25 entries

Previous | 1 | 2 | 3 | Next

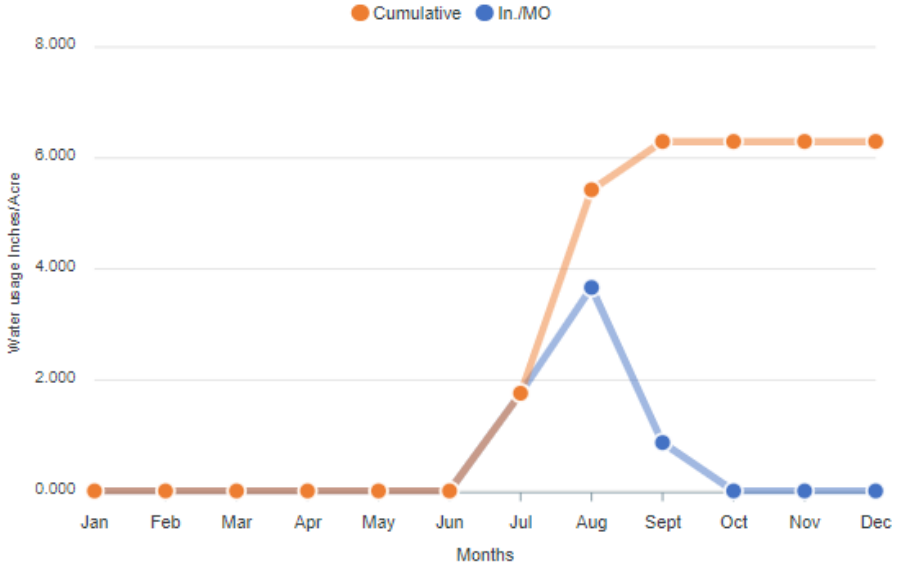
Most Recent Irrigation Activity

Daily water usage Inches/Acre for **Cowherd 8 - 2018**



Monthly Irrigation Activity

Monthly water usage Inches/Acre for **Cowherd 8 - 2018**



The Water Data Program is brought to you by TPNRD at no cost.

Extension Programming on Irrigation Water Management

More recent innovative and non-traditional research/extension programs that promote the adoption of more efficient Irrigation Water Management (IWM) across the continental U.S.

Programming Categories

- Competitions to promote efficiency
- Certificate programs
- On-farm research and demonstration
- Technology adoption infrastructure
- Urban water conservation

INNOVATIVE EXTENSION METHODS IN THE U.S. TO PROMOTE IRRIGATION WATER MANAGEMENT

Beyond 2020, VISION OF THE FUTURE Collection Research Brief

D. R. Rudnick, M. Stockton, S. Taghvaeian, J. Warren, M. D. Dukes, A. Kremen, C. G. Henry, J. Aguilar, B. Ortiz, A. Andales, C. A. Burr, X. Qiao, W. Liang, S. Walthour, S. H. Amosson

HIGHLIGHTS

- University extension has been playing a larger role, serving a larger number of irrigated farms.
- Extension programs in irrigation water management (IWM) have been transitioning away from lectures and field tours as the primary means of knowledge transfer.
- New IWM programs focus on experiential learning, development of practitioner networks, and industry participation.

ABSTRACT. *Promotion and adoption of irrigation water management (IWM) technology, tools, and best management practices are important as water availability concerns are addressed. Traditional extension programs have relied on lecture presentations, field tours, fact sheets, and on-station demonstrations to promote IWM practices and tools. However, these platforms tend not to provide the experience and opportunity for growers to identify and become comfortable with innovative solutions, such as new technology. To address these challenges and to appeal to an ever-changing client base, innovative and locally relevant extension and outreach programs have been devised to engage and educate growers. This article describes some of these programs that extend beyond previous traditional programs to connect growers with IWM.*

Keywords. *Demonstrations, Experiential learning, Grower competition, Outreach, Practitioner networks.*

Submitted for review in January 2020 as manuscript number NRES 13929; approved for publication as a Research Brief and as part of the National Irrigation Symposium 2020 Collection by the Natural Resources & Environmental Systems Community of ASABE in April 3 2020.

The authors are **Daran R. Rudnick,** Assistant Professor, Department of Biological Systems Engineering, University of Nebraska-Lincoln, Lincoln, Nebraska; **Matt Stockton,** Associate Professor, Department of Agricultural Economics, University of Nebraska-Lincoln, Lincoln, Nebraska; **Saleh Taghvaeian,** Assistant Professor, Department of Biosystems and Agricultural Engineering, Oklahoma State University, Stillwater, Oklahoma; **Jason Warren,** Associate Professor, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, Oklahoma; **Michael D. Dukes,** Director, Center for Landscape Conservation and Ecology, University of Florida, Gainesville, Florida; **Amy Kremen,** Project Manager, Department of Soil and Crop Sciences, Colorado State University, Fort Collins, Colorado; **Christopher G. Henry,** Associate Professor, Rice Research and Extension Center, University of Arkansas, Fayetteville, Arkansas; **Jonathan Aguilar,** Associate Professor, Department of Biological and Agricultural Engineering, Kansas State University, Garden City, Kansas; **Brenda Ortiz,** Associate Professor, Department of Crop, Soil, and Environmental Sciences, Auburn University, Auburn, Alabama; **Allan Andales,** Professor, Department of Soil and Crop Sciences, Colorado State University, Fort Collins, Colorado; **Chuck A. Burr,** Extension Educator, West Central Research and Extension Center, University of Nebraska, North Platte, Nebraska; **Xin Qiao,** Assistant Professor, Department of Biological Systems Engineering, University of Nebraska-Lincoln, Scottsbluff, Nebraska; **Weizhen Liang,** Post-Doctoral Research Associate, Panhandle Research and Extension Center, University of Nebraska-Lincoln, Scottsbluff, Nebraska; **Steven Walthour,** General Manager, North Plains Groundwater Conservation District, Amarillo, Texas; **Steve H. Amosson,** Professor, Department of Agricultural Economics, Texas A&M University, West Amarillo, Texas. **Corresponding author**: Daran Rudnick, 247 Chase Hall, East Campus, University of Nebraska, Lincoln, NE 68503; phone: 308-696-6709; e-mail: daran.rudnick@unl.edu.

Poor or ineffective irrigation management has had a negative impact on the quality and quantity of water resources, environmental health, and financial sustainability of agricultural areas. With concerns for future water availability coupled with increased competition for freshwater sources across varying sectors of society, the value of water conservation technologies and new practices to improve irrigation water management (IWM) have escalated. Numerous IWM methods and technologies are used by growers and land owners, such as soil water and plant sensors, daily estimates of evapotranspiration (ET), visual observation, mimicking neighbors, and the feel of the soil, among others (USDA-NASS, 2019; Rudnick et al., 2019). These methods vary widely in their ability to match irrigation with crop water needs. To mitigate the disparity among irrigators, extension services and water conservation programs (e.g., USDA-NRCS EQIP) have demonstrated, promoted, and incentivized the use of more effective techniques. Countless research efforts have been made to develop improved tools, technologies, and methods. This was done assuming that superior methods would naturally replace less effective methods over time. However, adoption has been slower than expected, as reflected in a survey by the USDA National Agricultural Statistics Service (USDA-NASS, 2019). Lo et al. (2019) explained that adoption of new methods requires that growers recognize the need to improve IWM, along with being informed of the tools available. However, due to the constantly proliferating technolog-

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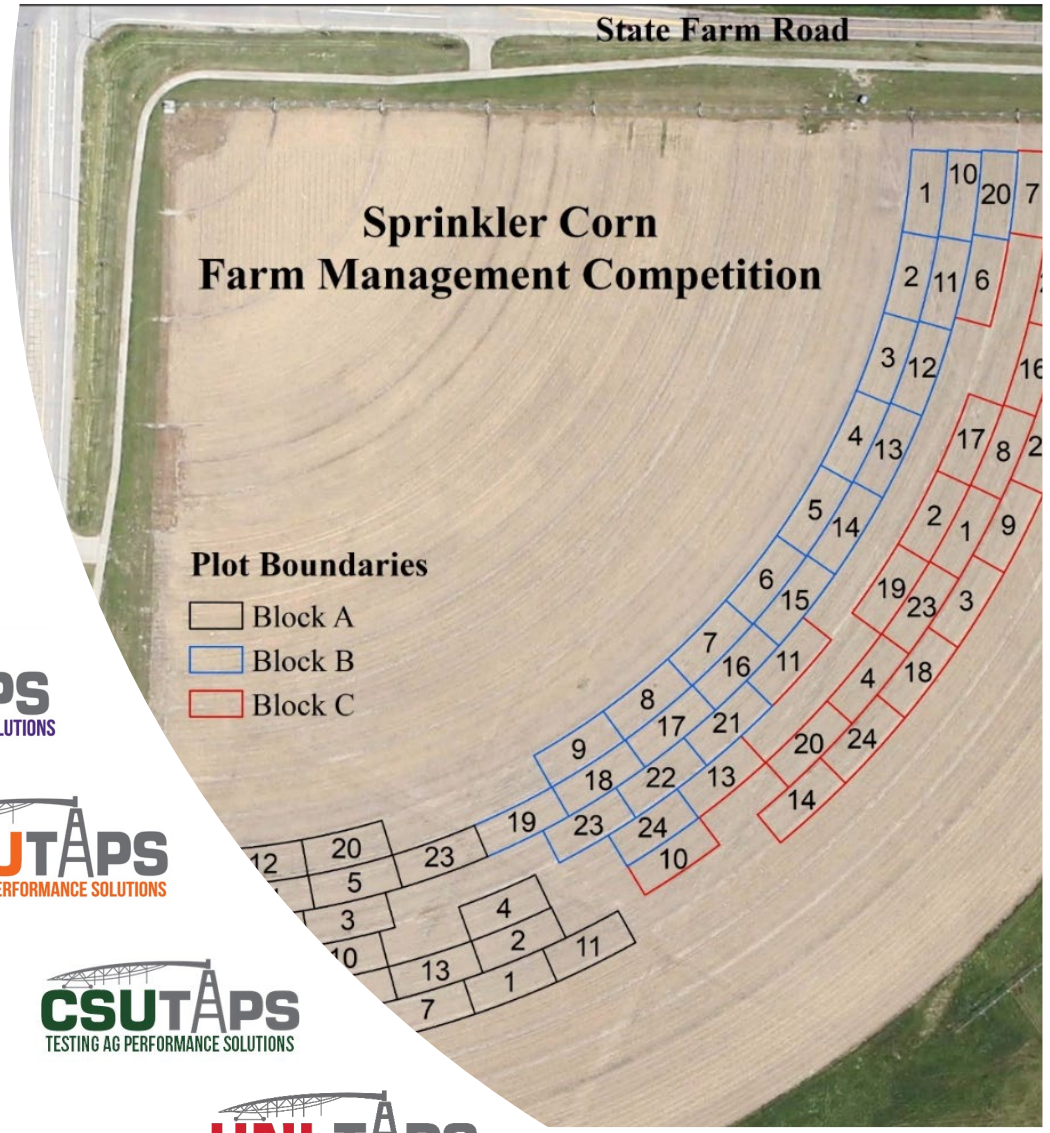
Testing Ag Performance Solutions (TAPS)

- Experiential learning approach
- Each “Farm” represents 3,000 harvested acres on paper
- Competitors’ decisions imposed on three randomized plots through the growing season

Management decisions:

- Insurance Selection
- Nitrogen Management
- Hybrid and Seeding Rate
- Irrigation Management
- Crop Protection (e.g., insecticide)
- Marketing Grain



KSUTAPS TESTING AG PERFORMANCE SOLUTIONS

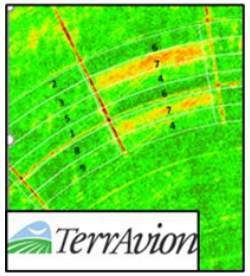
OSUTAPS TESTING AG PERFORMANCE SOLUTIONS

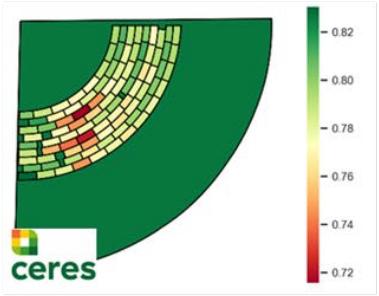
CSUTAPS TESTING AG PERFORMANCE SOLUTIONS

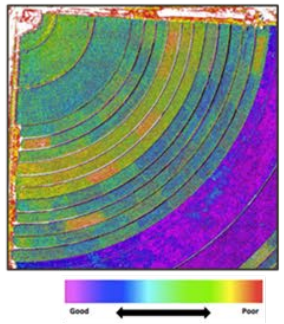
UNLTAPS TESTING AG PERFORMANCE SOLUTIONS

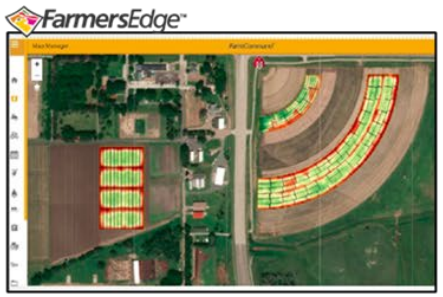
Technology and Data Collection

Imagery



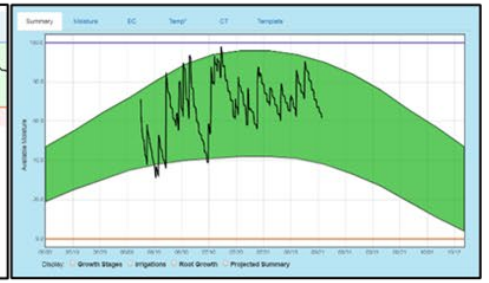




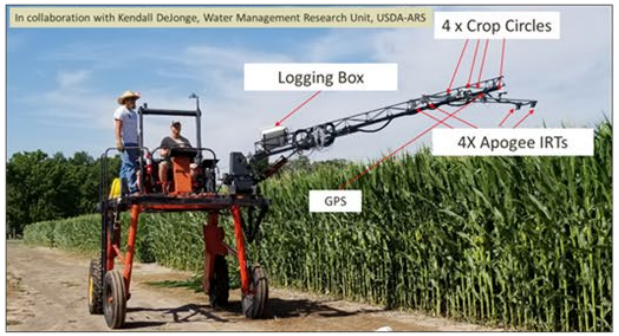


Weather Conditions

Soil Water Monitoring



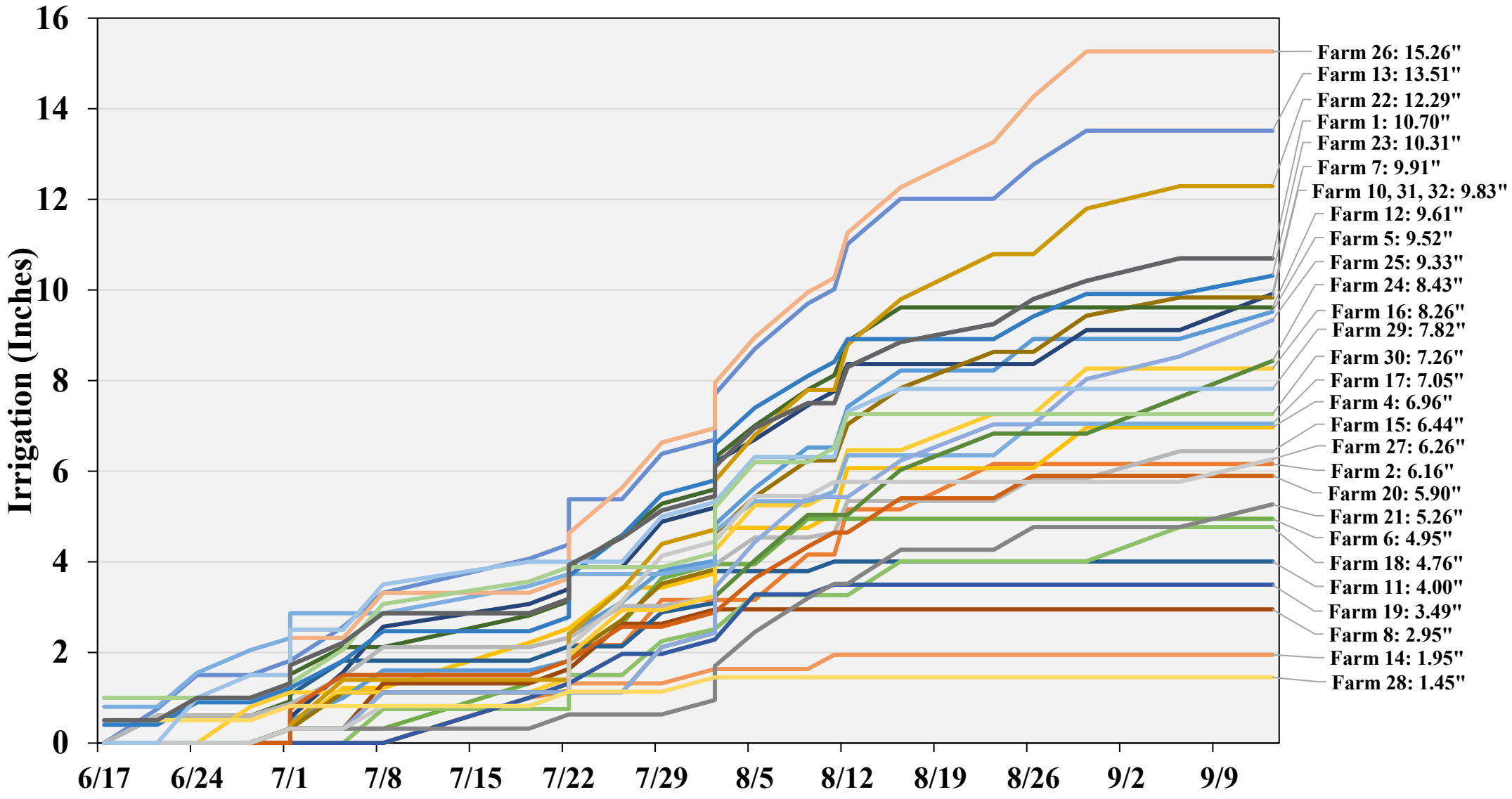
Plant Sensing



Soil & Plant Sampling

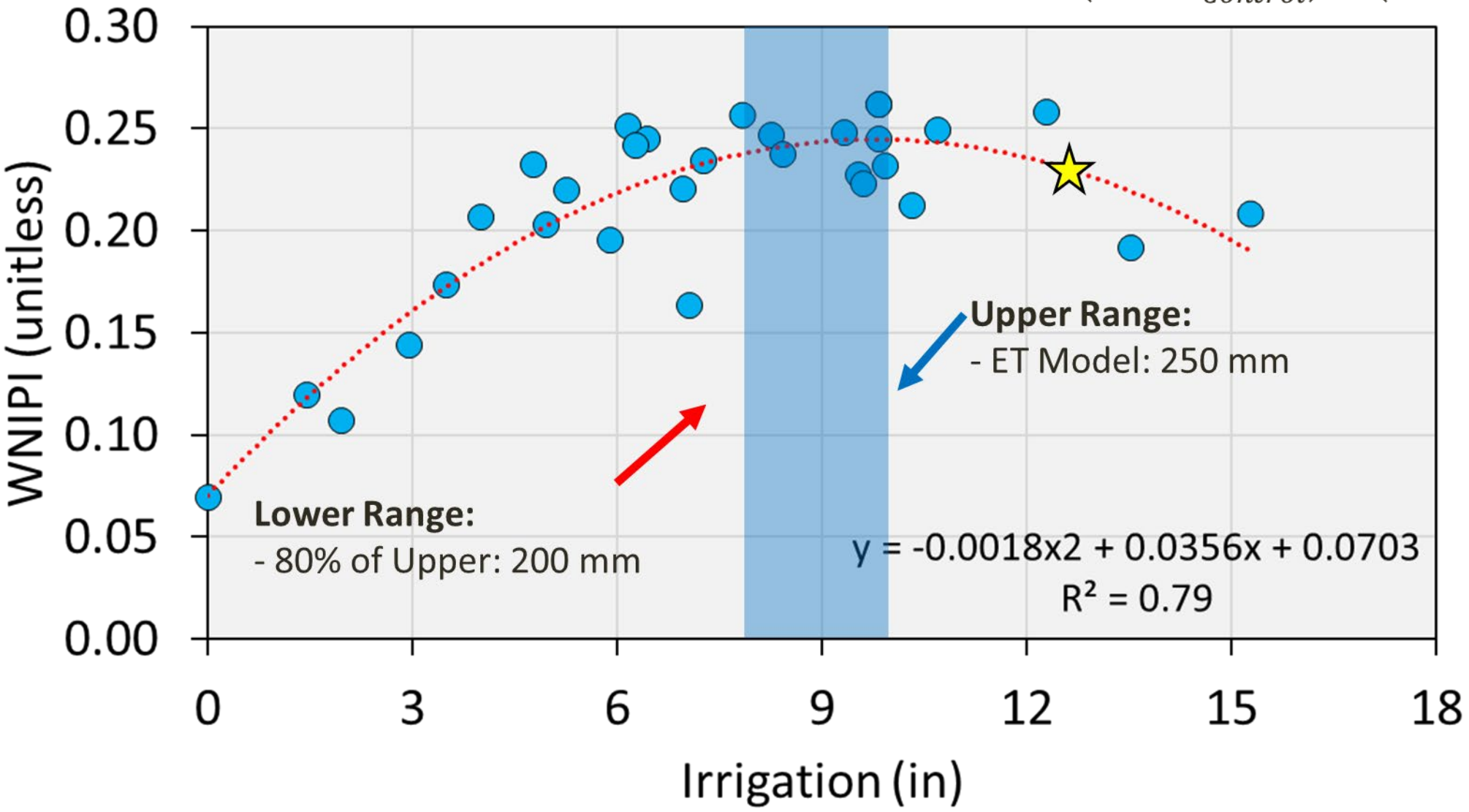
Scouting

2021 Management Decisions (Nebraska)

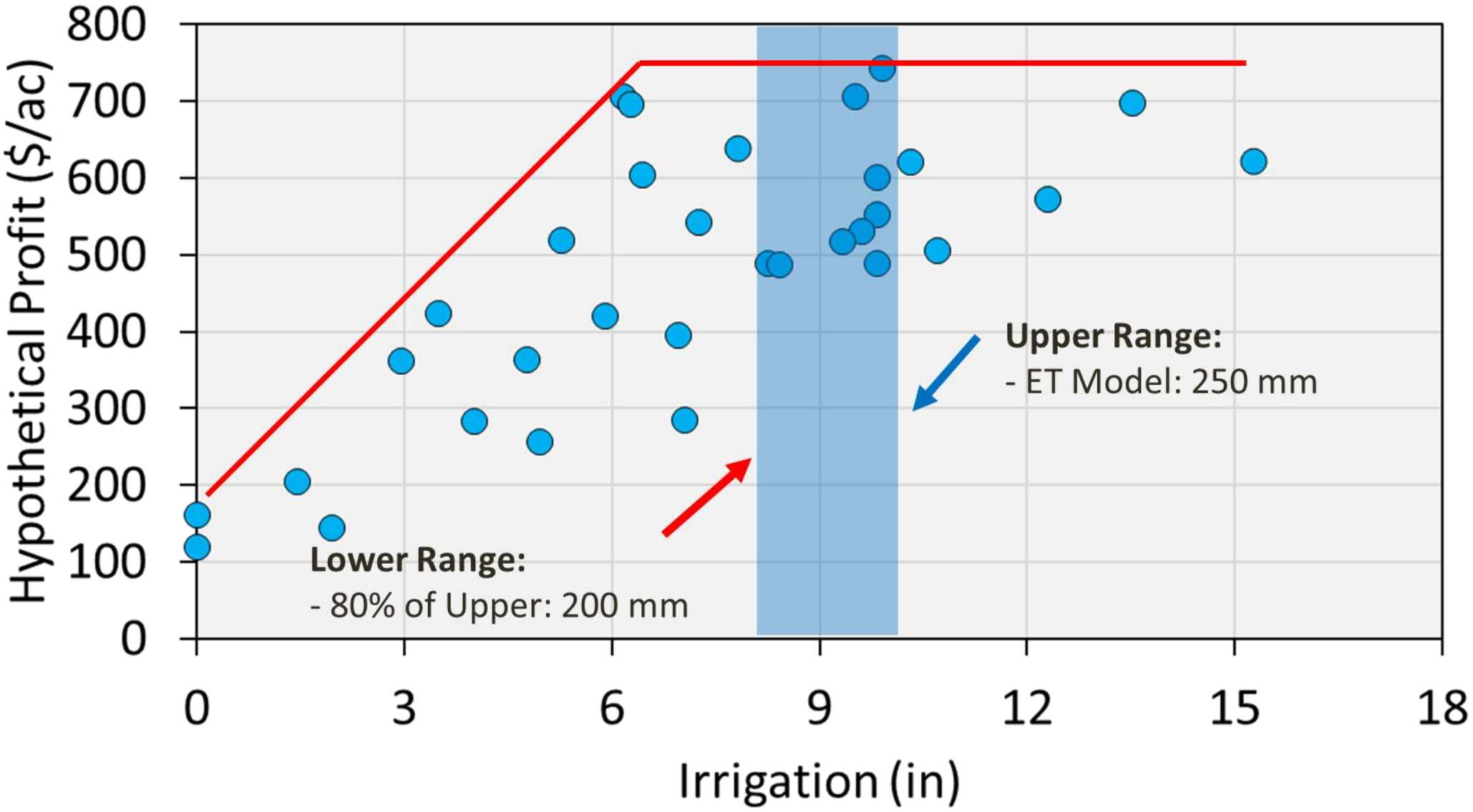


Irrigation Window

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

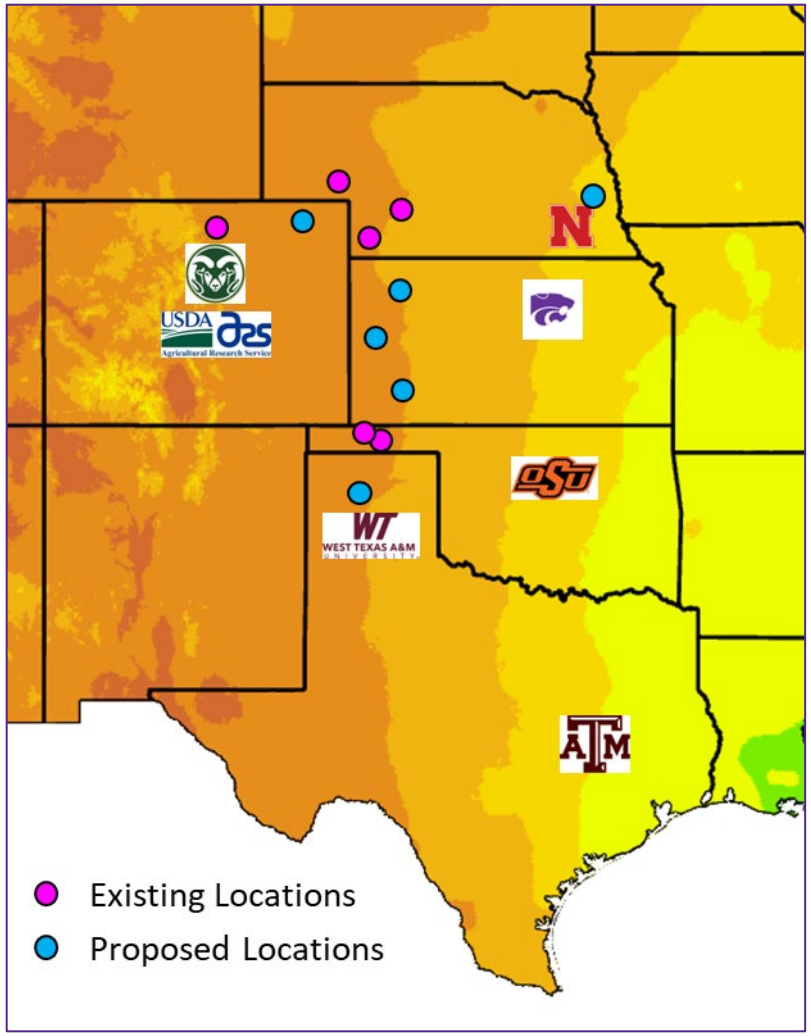


Irrigation Recommendation Window



NRCS Multi-State Conservation Technical Agreement

- Five State Partnership
  - KS, CO, NE, OK, and TX
- Duration: 5 Years
  - Year 1: $3.88 million
- Objectives:
  - Expand and improve TAPS and MI programs, ensuring high quality and fostering multi-state and inter-program exchange
  - Support producer and broad ag sector learning about precision and advanced management tools, technologies, systems, and strategies within and across states
  - Where appropriate and feasible, track resulting conservation efforts, and mindset and management shifts of TAPS and MI graduates
  - Explore and/or test incentives and evaluate TAPS and MI participants' interest and use
  - Facilitate and streamline TAPS and MI data collection, management, processing, and use
  - Leverage this partnership agreement to scale complementary work of TAPS and MI programs and successfully attract more public and private partners and funding for related study, research, and engagement



Source: https://www.arcgis.com/home/item.html?id=a727a4f6d5ab4fc5b1683d32dee45f54

Thank You!

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Professor and Director of Sustainable Irrigation
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Department of Biological and Agricultural Engineering
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