Irrigation Innovation Consortium

Public-private partnerships innovative research for improving irrigation technology and services

Four States Irrigation Council Annual Meeting
Jan 12, 2022, Fort Collins, CO

Timothy Martin, Exec Director, Irrigation Innovation Consortium
Fort Collins, CO

Irrigation Innovation Consortium

Who We Are: Irrigation industry leaders, researchers, and other partners working together to advance efficient and effective water management

Our Mission: To drive development and adoption of advanced irrigation technologies and strategies

What We Do: We support collaborative research, training, and demonstrations, to generate and share useful, actionable knowledge.

IIC's Founding Universities

Water for Food
DAUGHERTY GLOBAL INSTITUTE
at the University of Nebraska

COLORADO STATE UNIVERSITY

TEXAS A&M AGRILIFE

FRESNO STATE
International Center for Water Technology

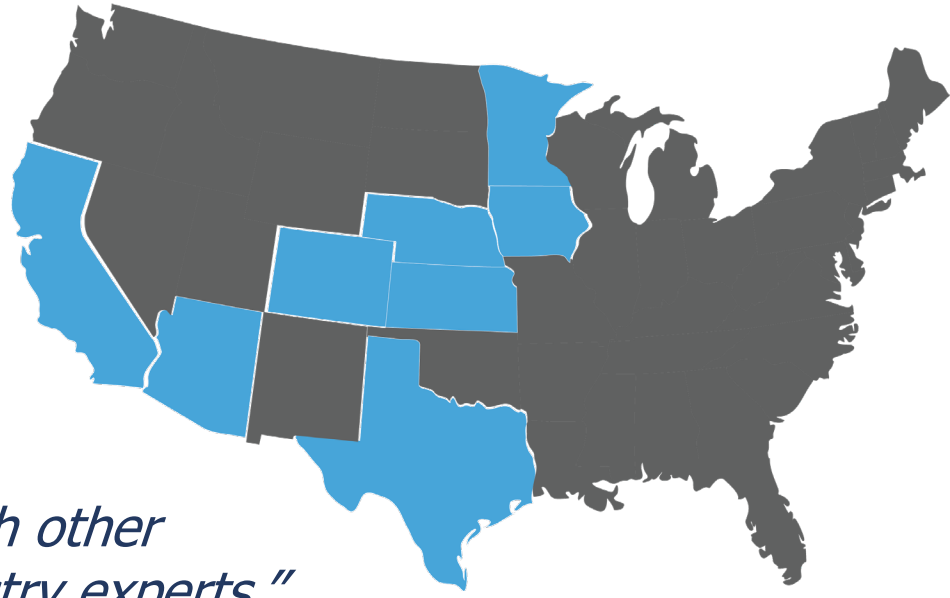
K-STATE
Research and Extension

More partners in our network

Aspiring Universe
Buena Vida Farm Trees & Produce
Digital Spring
NREL Transforming ENERGY
Rubicon
Dragon-Line Orange Mobile Drip Irrigation www.DragonLine.net
GiSC
The Climate Corporation
The University of Arizona
Perigo
olsson
Jack's Solar Garden
Nebraska Water Balance Alliance
University of Minnesota Driven to Discover®
McCrometer
planet.
70 Years Irrometer
Valley
REDtrac
USGA
Dynamax
FarmersEdge
CSURF Serving. Advancing. Enriching.

IIC Numbers

- 1:1 matching for a total investment of at least $10 million over five years.
- 30 collaborative research projects since our launch in 2018
- 45 contributing private and public organizations
- IIC has created 34.5 jobs and sustained 75 jobs
- Involved over 150 researchers, research techs, and students



"IIC connected us with other researchers and industry experts."
Trenton Franz, UNL

Driving adoption
Improving tools
Managing critical water resource challenges

Our Activities:

- Integrating irrigation management technologies
- Supporting cost-effective and scalable tools
- Encouraging effective irrigation scheduling and water delivery
- Training for advanced water management
- Building diverse knowledge networks
- Demonstrating potential benefits and savings (water, labor, other)
- Harnessing the creativity and capacity of public and private partners

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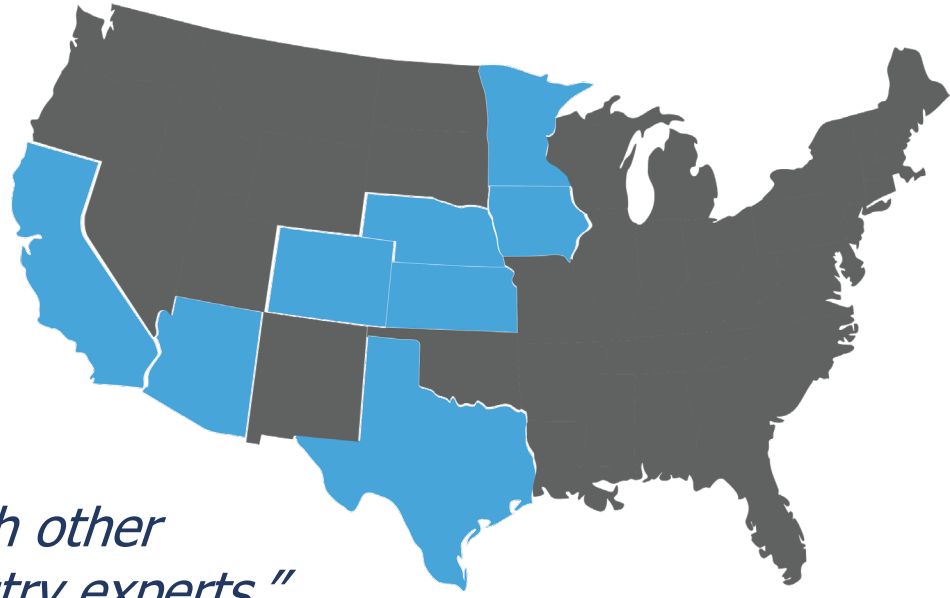

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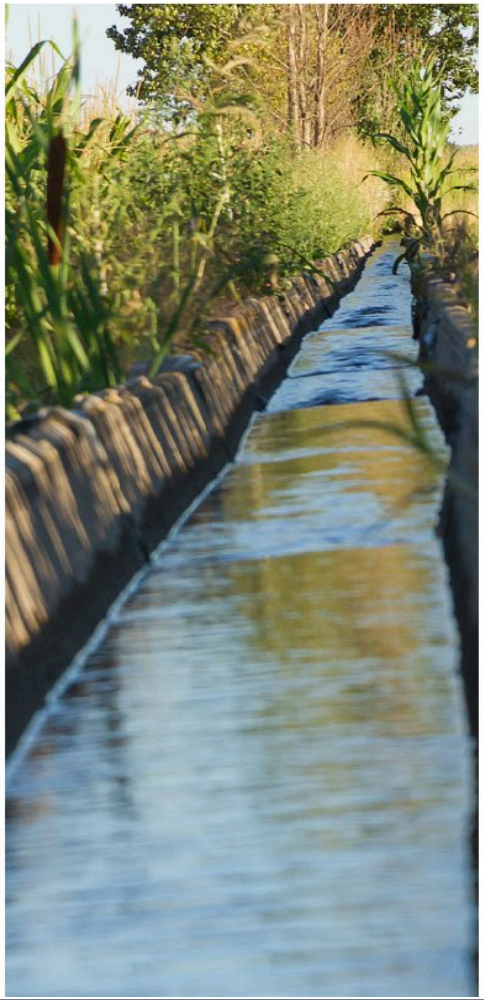
IRRIGATION INNOVATION CONSORTIUM

2018-2021



IIC Membership

- Founding Member
- Sustaining Member
- University Member

IIC Research Partners

Serve on Exec Committee or Research Steering Committee, guide and support research projects

Learn more: irrigationinnovation.org

Economic impact of the irrigation equipment and services industry

Why know the size of the industry?

Measure of growth over time

Measure of political clout

- More powerful lobby for industry's interests at national and regional levels

Manufacturer and supplier benchmarking

Information for investors and creditors

- Factors driving the industry and their relative influence
- Market share
- Investment risk

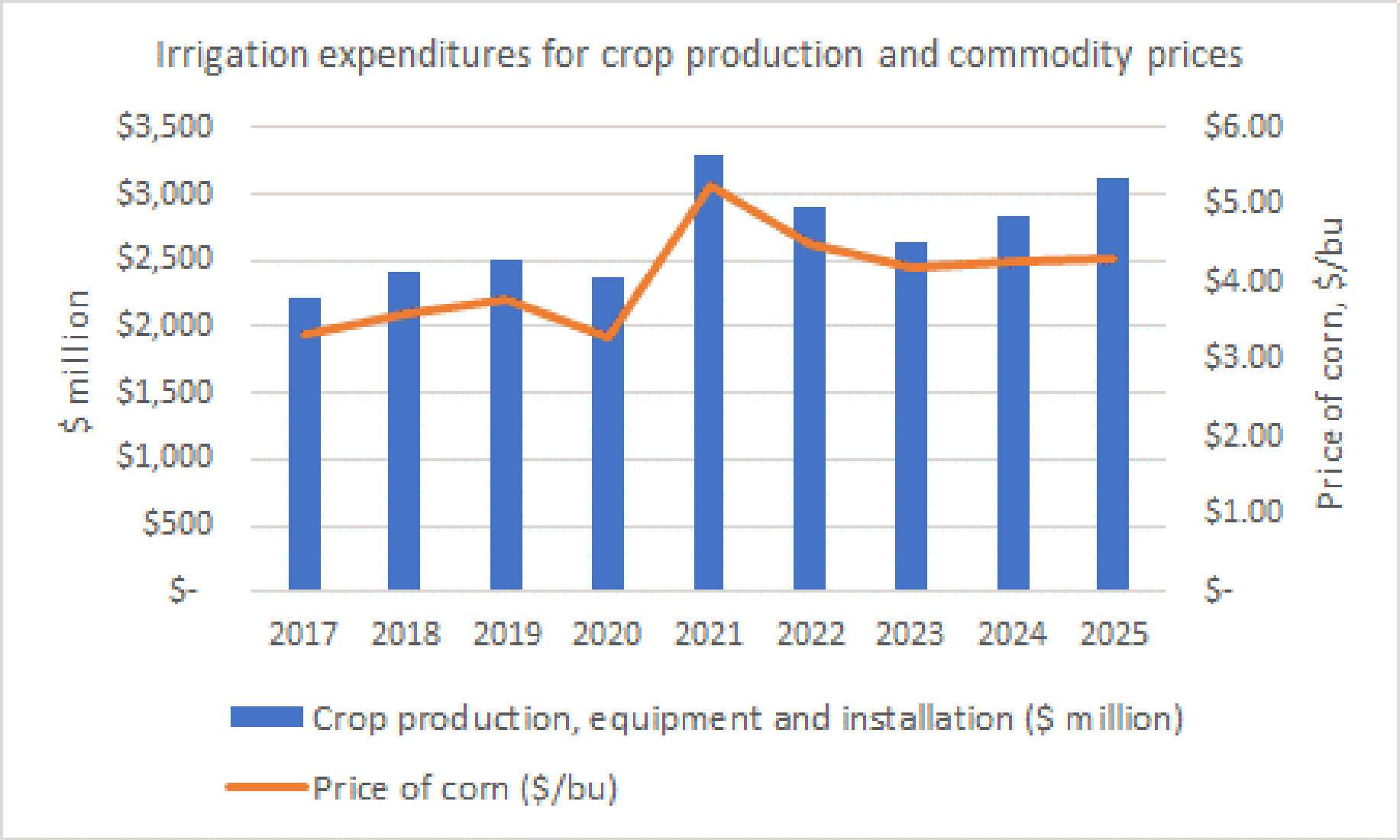
IIC Partners: Irrigation Association, & Headwaters Corporation, Colorado State, Kansas State, Fresno State, Texas A&M, University of Nebraska-Lincoln

Goal: To measure the full economic impact across all sectors of the irrigation industry.

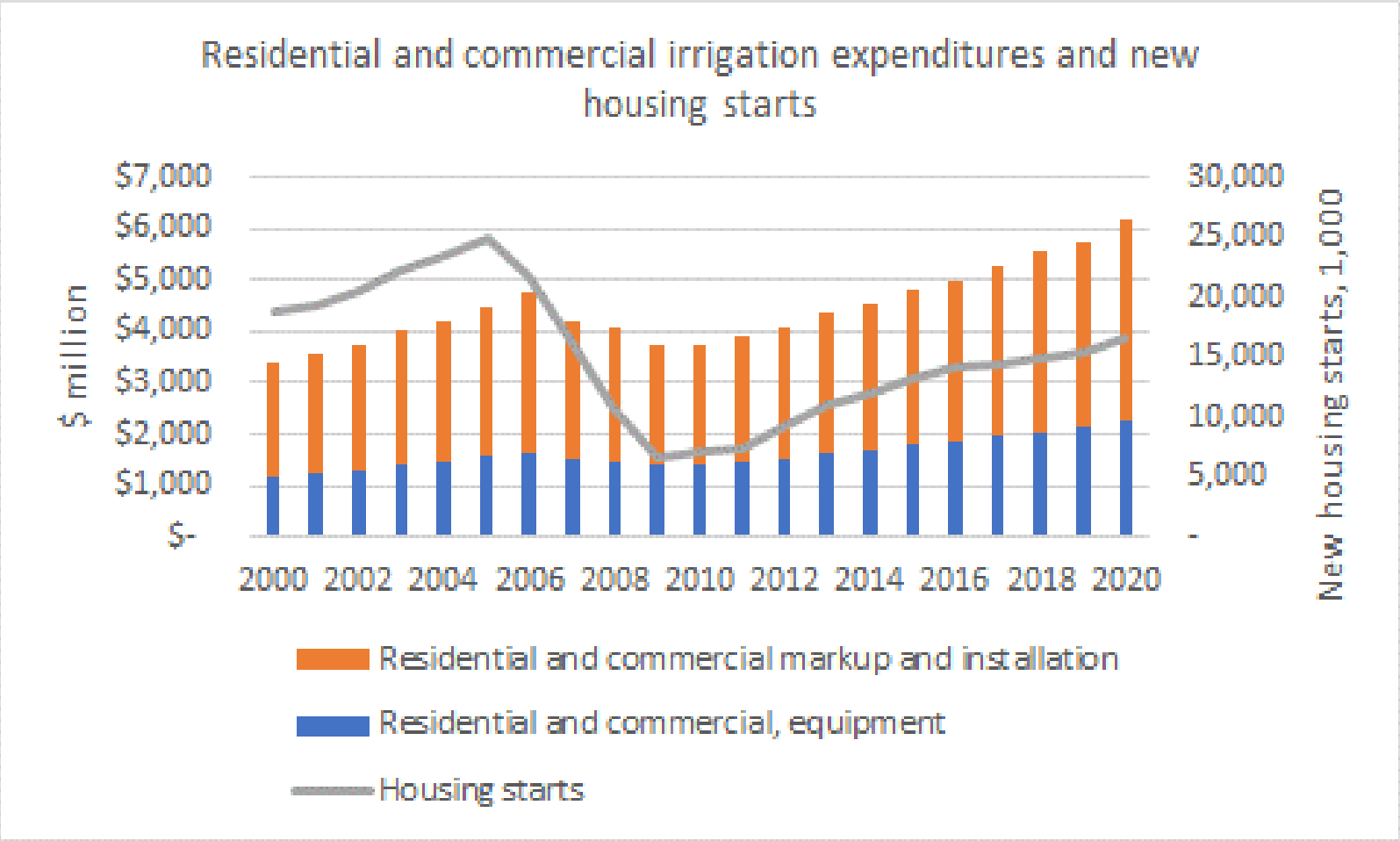
Result:

- Est. $9B direct economic impact, $23B incl indirect induced impacts
- 70,000 industry-wide jobs, 167,000 jobs incl secondary impacts
- Regulations and policies incentivizing demand for water-conserving tech will likely continue and advance

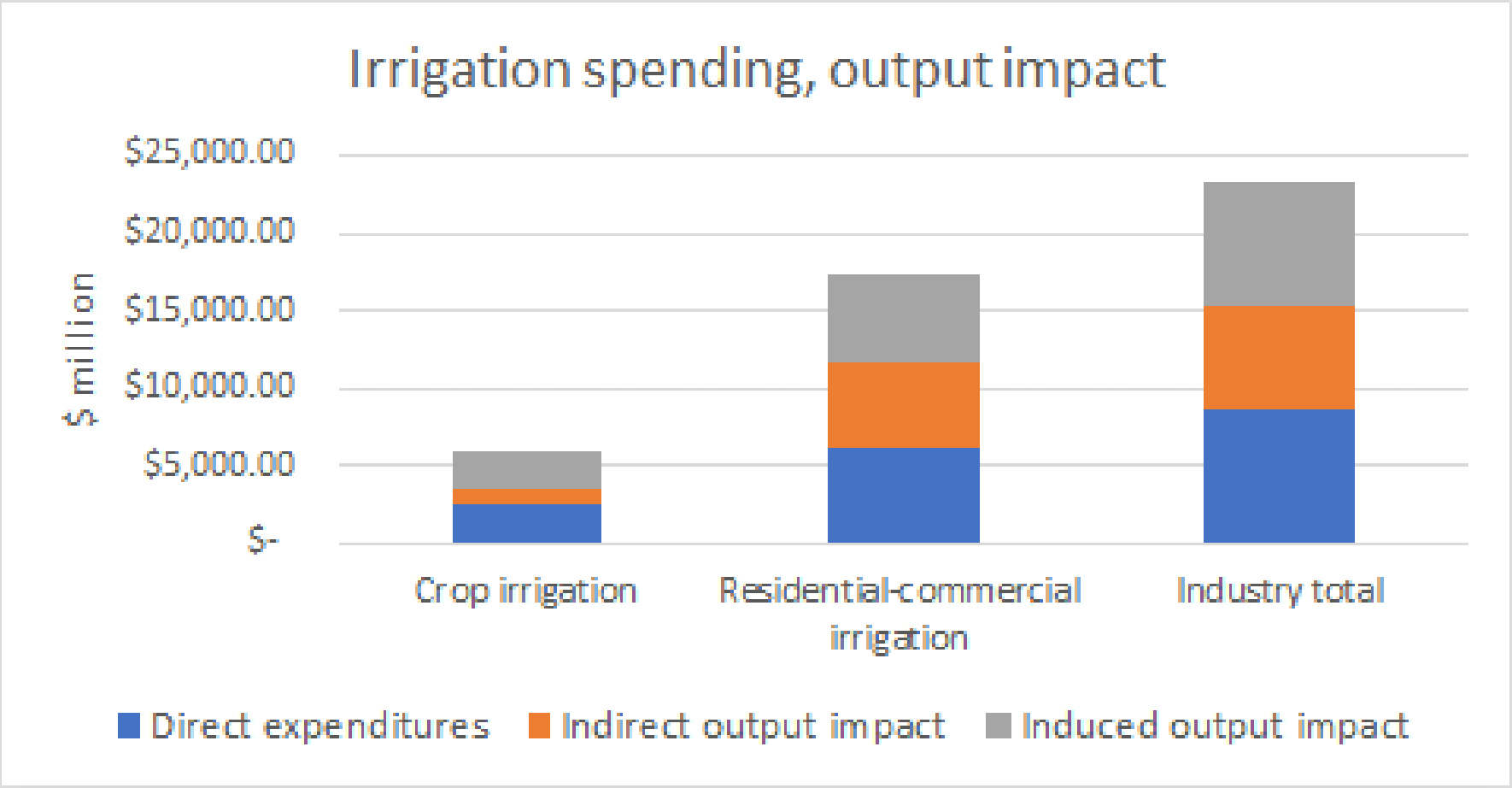
Snapshot of crop irrigation results



Crop expenditures by category



Impact of irrigation spending on GDP



Agriculture and landscape irrigation industry research needs survey and assessment

Survey respondent backgrounds:

- Consultant
- Education
- Gov't/Utilities
- Industry
- Landscape Contractor
- On-Farm

IIC Partners: Irrigation Association, Colorado State University

Goal: To better understand research areas that are currently the most important to the irrigation industry related to the development and adoption of water and energy efficient irrigation technologies.

The Survey – Bar Chart View: Total Respondents

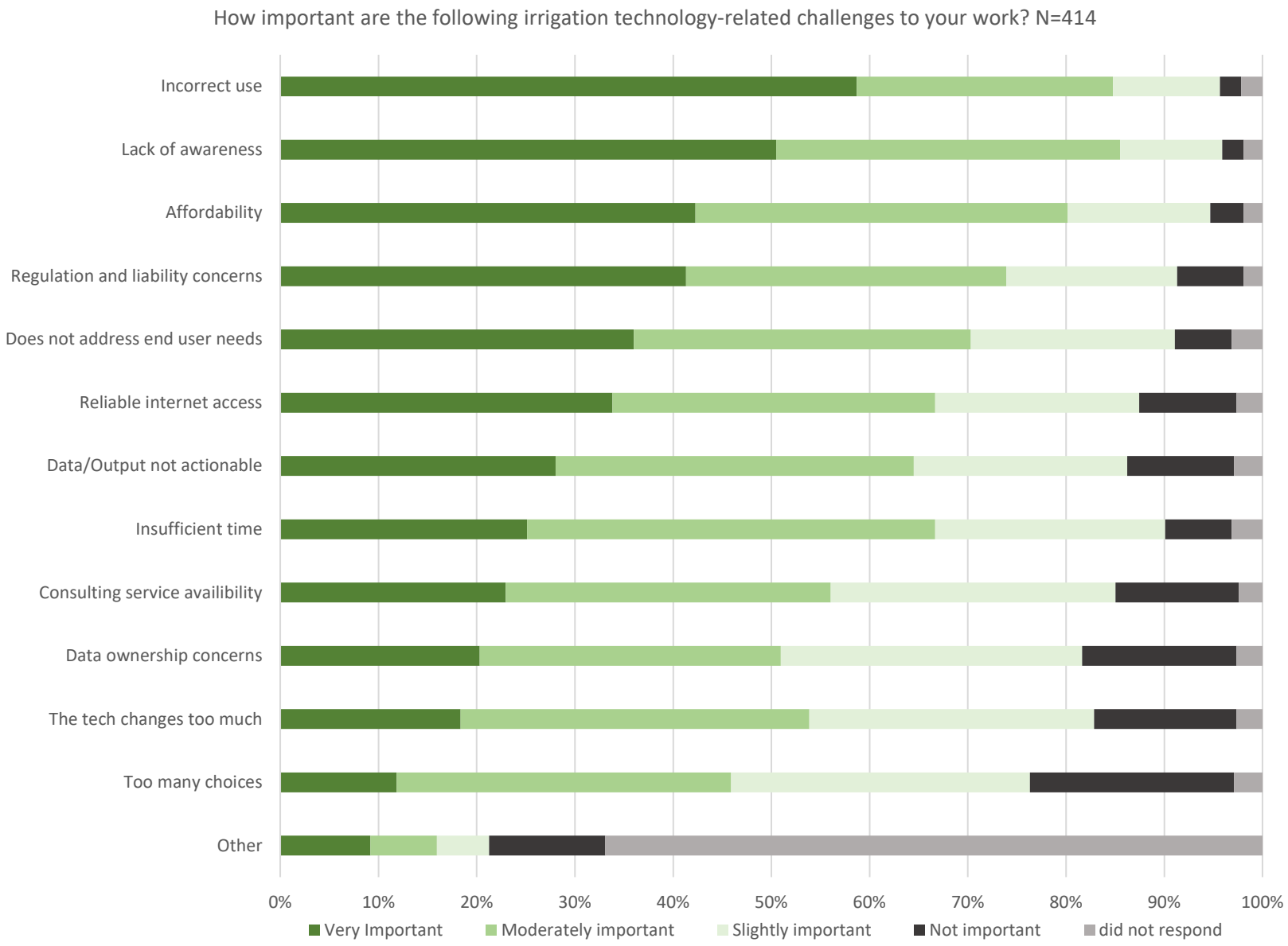
Themes/Trends

Challenges:

1. Awareness, incorrect use, affordability, actionable data, interoperability
2. Workforce training, aptitude

Solutions:

1. Innovate education and training
2. Develop standards and curriculum
3. Increase workforce development programs



Transforming eddy covariance flux stations for real-time flux and data delivery

Principal Investigator Dr. Christopher Neale in front of flux tower at Nebraska Innovation Campus

Partners: UNL, LiCOR

Goal:

- Create eddy covariance flux tower network across the 41°N in US

Result:

- 10 towers installed in IA, NE, CO, KS- 5 more will be installed
- Provides high-quality spatial information on daily crop water use (ET)
- Free, real-time data is accessible at: https://parallel41.nebraska.edu/#/
- Ground truths data from remote sensing sources

Quantifying irrigation water savings of agrivoltaics

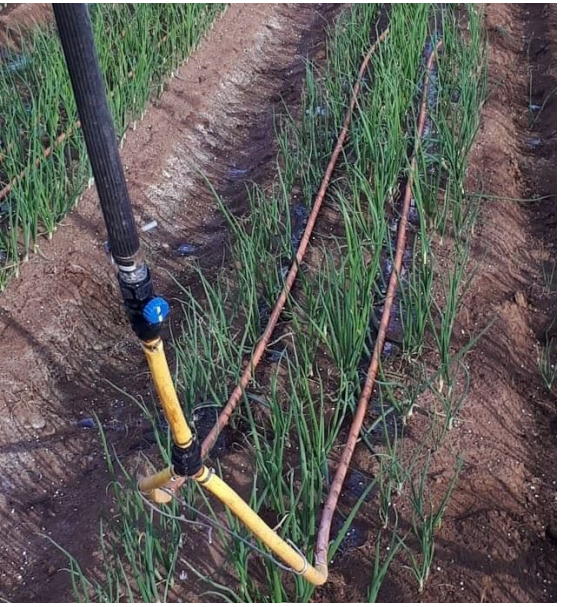
Industry partner Byron Komienk drives tractor through Jack's Solar Garden in Longmont, CO.

Partners: NREL, CSU, Jack's Solar Garden

Goal:

- Evaluate irrigation requirements/savings under and around solar panels with diverse crops
- Test production at different heights of voltaic systems
- Evaluate potential pollinator habitat creation
- Engage schools, government officials, farmers, and other stakeholders
- Evaluate income potential for farmers

Precision mobile drip for specialty crop vegetable production



Partners: Texas A&M, DragonLine, Dynamax, Valmont

Goal:

- Produce specialty crops in Texas Panhandle using mobile drip/ISSCADA plant-soil feedback system
- Significant economic incentive for dry canopy and high-value crops
- Potential to reduce evaporative losses-particularly helpful in semi-arid climates

Left: Mobile drip system irrigating onions
Right: Mobile drip system attached to center pivot via adaptor

Field testing new protocol for weather-based irrigation controllers

Wall of irrigation controllers being tested at Fort Collins, CO.

Partners: IIC, IA, NCWCD, ASABE

Goal:

- Evaluate the new performance protocol of landscape controllers (now approved as ANSI/ASABE S627 DEC2020)

About the new protocol:

- Raises the standard of testing from 30 to 90 days to test controllers in variable weather patterns
- Provides robust performance indication to industry and consumers

2021 Objectives:

- IIC is currently offering testing of landscape controllers
- Participants receive itemized performance tables & “quick-look” summary

Pivot automation for maize and soybean in the Great Plains

Sensors mounted to center pivot at Western Nebraska Research and Extension Center

Partners: UNL, Valmont, USDA-ARS

Goals:

- Compare accuracy of pivot mounted, stationary, and drone sensors
- Evaluate patented system (ISSCADA)

Results:

- Advanced labor-saving, precision irrigation technology
- Improved best management practices using sensor data to trigger irrigation events
- Expanded knowledge semi-arid environment automated irrigation
- Determined ISSCADA system is successful

2021 Goals:

- Incorporate multiple types of sensor data for higher quality recommendations
- Help Valmont ready the technology for the market

Connecting Field Performance to Watershed Health

Principle Investigator Dayle McDermitt gathers data from well in Sutherland, NE.

Partners: NEWBA, UNL, Olsson Engineering, GiSC, TPNRD

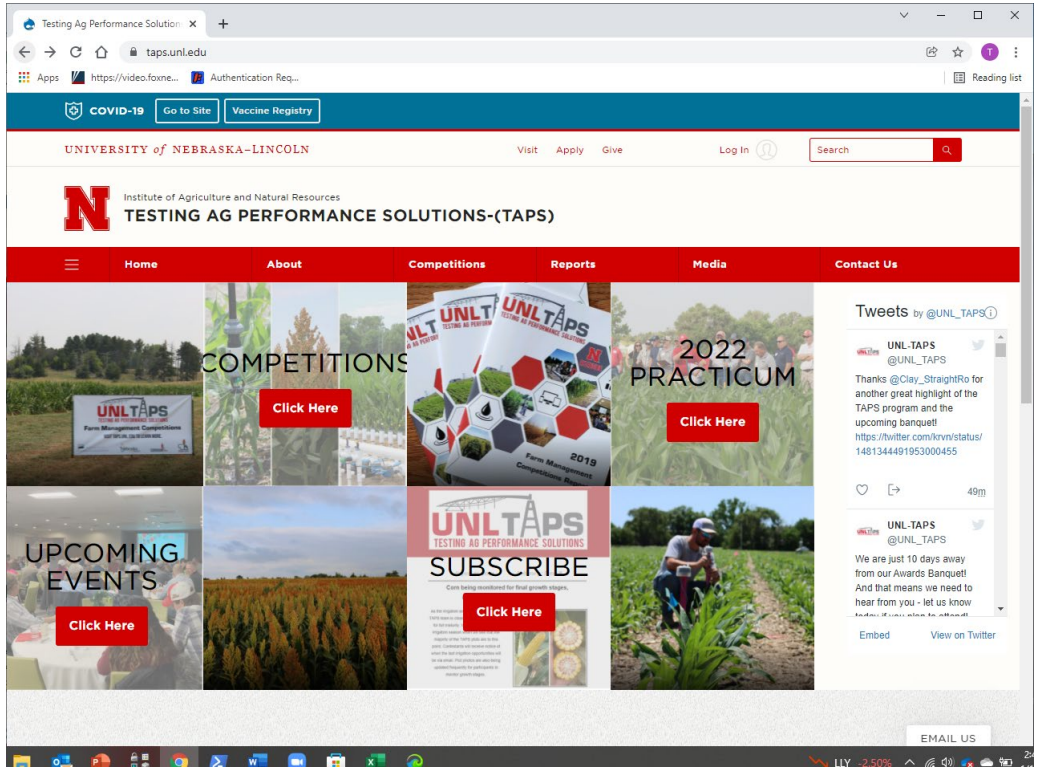
Goals:

- Determine accuracy of AgHub flow calculations
- Assist irrigators in satisfying state-mandated management plan

Results:

- Translated electrical use data into real-time consumptive water use data
- Scalable project, provides field and watershed level data
- Template for similar projects in different regions
- Collaboration of researchers, growers, and industry for common good

New IIC Research Project beginning 2022



Project: Testing Ag Performance Solutions (TAPS)
Based on UNL TAPS model

Grant Source:
Colorado Water Conservation Board

Location:
CSU: ARDEC

Hiring:
Seeking a program manager, location Fort Collins

IIC Research for 2022

Now seeking project concepts for 2022

Partners: university researchers and industry partner

Typical project cost: $200k-$300k

50% of project cost from IIC and 50% (or more) from industry

Duration: 1 to 1.5 yr

Process:

work with IIC on formulating idea
Step 1: 2-page concept
Step 2: Proposal and presentation
Selection by IIC's Executive and Research Steering Committees

IIC Associate Director

Will be advertising in January 2022

Responsibilities

- **Research in Irrigation technologies, adoption, practices**
- **Project Management**
- **Partner Relations**

Location

- **Fort Collins, or elsewhere**

IIC Projects and Locations

Project Title	State(s)
Predictive modeling of delivered water with power consumption data	CA
Radio wave moisture sensing technology	CA
Remote sensing decision support	CO
Underground wireless networks for soil moisture sensing	CO, KS, TX
Real time data from eddy covariance flux stations in Iowa and Nebraska	NE, IA
Remote sensing for irrigation schedule	KS
Machine learning for vertical irrigation	CO
Satellite and UAS Imagery for irrigation timing	CO, CA, NE, TX
Soil Moisture technology for turfgrass and landscape irrigation	CO, KS, TX

IIC Projects and Locations

Project Title	State(s)
Artificial Intelligence (AI) in crop water demand modeling	CA
Low pressure efficient media filtration system	CA
Irrigation and pumping plant efficiency tool	CO, KS
Remote sensing-based actual crop coefficients in irrigation scheduling	CO
Edge-of-Field monitoring for reducing nutrient runoff	CO
Optimizing irrigation of turfgrass with soil sensors, IoT LoRa, and AI	CO, KS
Remote sensing and precision irrigation in California orchards	CA
Economic impact study of the irrigation industry	USA
On-site solar-based nitrogen production	CA

IIC Projects and Locations

Project Title	State(s)
Field testing of weather-based irrigation controllers	CO
Center pivot automation with proximal sensing in the Great Plains	NE
Connecting real-time system performance to watershed health	NE
Testing landscape irrigation flow sensors	CO
Wireless sensor observations for crop evapotranspiration models	CO
Measuring crop water use with IoT sap-flow system	CO
Precision mobile drip and Variable Rate Irrigation for vegetable crop production	TX
Combining soil water supply and evaporative demand for irrigation scheduling	NE
Irrigation drip materials recycling	CA
Precision irrigation on golf fairways	TX, MN
Irrigation water savings in agrivoltaics systems	CO, AZ
Irrigation industry research survey and needs assessment	USA

Extended IIC Projects

Project Title	State(s)
Developing the Flux Network to support real-time evapotranspiration data	NE, IA, KS, CO
Advancing the Flux Network to support real-time evapotranspiration data	NE, IA, KS, CO
Multi-State Data Delivery via Flux Network Expansion	NE, KS
Advancing pivot automation for Maize and Soybean in the Great Plains	NE
Connecting Field Performance to Watershed Health	NE

To learn more about the IIC, its research, and activities visit:
irrigationinnovation.org

To learn more about joining the IIC contact:
Timothy.Martin@colostate.edu