

WATER CONSERVATION AND RE-USE

Irrigation Management Techniques to Optimize Water Use on Utah Farms



In Utah, the Colorado River supplies irrigation for nearly 400,000 acres of farmland, half of the total irrigation in the state. In 2022, the largest reservoirs (including Lake Mead and Lake Powell) in the Colorado River Basin decreased to 27% capacity, resulting in a 50% decrease in electricity generation. In response, the Bureau of Reclamation (BOR) announced the need for an additional 2 to 4 million acre feet of conserved water across the basin from 2023 to 2026 to protect Lake Mead and Lake Powell. Utah State University (USU) researchers are investigating how to optimize water use and utilize cost saving methods on farms while maintaining crop yields. This long term research project focuses on four areas: irrigation systems, irrigation management, crops, and soil, both in isolation and in combination to see which efforts produce the best results.



Project Location

USDA Southwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE



Teff and sorghum sudangrass plots/USU

KEY ISSUES ADDRESSED

In Utah, 52% of the water consumed supplies agriculture. To address the heavy water consumption by agriculture, the state is spending over 70 million dollars to improve water optimization on farms. To best use the funding, farmers and water managers need long-term studies to understand which aspects of irrigation management should be invested in, and which steps to take first. There is a lack of understanding of how to combine irrigation management techniques with crop and soil management strategies to better optimize water use. Examples include how different types of crops can maintain yields under partial and deficit irrigation. Additionally, farmers need to feel empowered to incorporate water optimization techniques. Researchers are including farmers in research trials and communicating results in demonstrations and workshops.

PROJECT GOALS

- Optimize agricultural water use in Utah to help reduce Colorado River water use by 1 to 2 million acre feet.
- Study the ability of different irrigation systems and management strategies, in isolation and in combination, to reduce water consumption, while still maintaining yields and cost effectiveness over time.
- Communicate water optimization tools and strategies with farmers through inclusion in research trials, workshops, and field days.

Online Tool for Farmers

Researchers created an online irrigation technology cost/benefit calculator. Farmers input parameters of their farm and choose irrigation technologies to calculate water savings and for what cost.



PROJECT HIGHLIGHTS

Height of Center Pivot Sprinklers Affects Water Loss:

Researchers tested sprinklers at low and mid elevations, and drip irrigation. The low elevation and drip irrigation reduced water use by 25% and improved irrigation uniformity of corn and alfalfa.

Season-Long Deficit Irrigation Simpler in Long-Run:

Researchers discovered year-long reduction in irrigation results in the same yields as targeted reduction, meaning it may be simpler for farmers to deficit irrigate all growing season instead of target irrigating.

Soil Moisture Sensors Optimize Water in Drought:

Researchers compared three irrigation scheduling technologies: 1) basing watering schedules on the local weather station, 2) soil moisture sensors, and 3) a model that automates irrigation scheduling through satellite and weather data. All reduced water use by 10-15%, especially in wet years.

Small Grain Forage as Alternative in Drought Years:

Researchers found that growing small grain forage, such as wheat, can be a more water efficient alternative to alfalfa and corn in drought years.

Empowering Farmers by Communicating Research:

Researchers host guided tours, demonstrations, and virtual field days. The 2020 virtual tour had over 100 attendants of farmers and crop advisors, with the majority of which citing knowledge gain.

Collaborators

- See online for full list of collaborators

CART Author: Jackelyn Alessi, Drought Learning Network (DLN), October 2024.

For more information on CART or DLN, contact Karlee Jewell (karlee_jewell@fws.gov) or Jackelyn Alessi (jalessi@nmsu.edu)

Visit CART:



LESSONS LEARNED

Researchers discovered promising techniques that combine farming strategies to optimize water use on farms, while still being cost effective for farmers. Mid-elevation sprinklers combined with 50% reduction in irrigation maintained yields of wheat, barley, and oat, while the lower elevation sprinklers worked better for alfalfa. Researchers concluded investing in the regular maintenance of sprinkler systems saves water cost-effectively, and may be a good starting point for farmers.

Researchers encountered difficulty managing the size of the project, and conducting experiments in real world conditions. As such, the research is heavily reliant on farmers to harvest and till land, and farmers who are enthusiastic about the research happening in their own backyard. Because the research is led by USU, funding lasts three to five years, but at least a decade of research is required to see how the treatments affect farmland over time. Researchers created a promotional video and presented their research at conferences and in media to secure funding and bring partners into the project.

NEXT STEPS

- Research and monitor impacts of different techniques in irrigation management and irrigation systems for at least ten years
- Research how soil management can be combined with irrigation strategies to best optimize water use
- Hold future demonstrations to inform farmers how they can start saving water relatively easily and cost effectively

For more information on this project, contact Matt Yost:

Matt.yost@usu.edu

