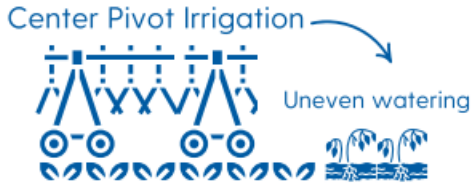


Irrigation System Uniformity and Performance Testing

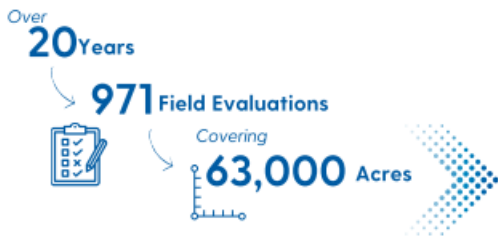
RELEVANCE No irrigation system can distribute water perfectly evenly across an entire field.



- Incorrect system pressure
- Worn, partially plugged or misplaced nozzles

- Any changes in system pressure or flow rate can alter the amount of water applied.
- Issues with irrigation performance cannot be detected with a visual inspection and require rigorous testing to assess.

RESPONSE In 2003, the University of Delaware and the Natural Resources Conservation Service began to conduct **performance appraisals** of center pivot irrigation systems enrolled in conservation programs.



Using the American Society of Agricultural and Biological Engineers (ASABE) testing standard S436.2.

Findings from 20 years of irrigation testing were shared along with recommendations for farmers at the 2024 Delaware Ag Week.



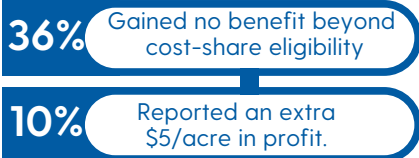
RESULTS The individual test results and recommendations were provided to each farmer to direct irrigation system upgrades and repairs.



Survey given at 2024 DE Ag Week on how they benefited from the testing:

- 25% Only valued the eligibility for NRCS cost-share funding
- 62% Used the test data to adjust their irrigation timer settings
- 12% Upgraded or replaced their sprinkler systems based on the results.

Farmers reported the following financial impacts:



Delaware farmers could earn an additional **\$857,000** annually through better system design and management.



\$48 million in cost-share funding became accessible for system upgrades after tests confirmed compliance with NRCS standards.

RELEVANCE

No irrigation system can distribute water perfectly evenly across an entire field. Center pivot irrigation involves a powered structure that rotates a steel pipe with sprinklers to water crops. However, these center pivots can distribute water unevenly due to factors like incorrect system pressure, as well as worn, partially plugged or misplaced nozzles. Each irrigation system is designed to operate at a specific pressure. The water flow through each sprinkler depends heavily on this pressure, and larger nozzles are more sensitive to pressure changes. If the well yield or pump efficiency changes, it can significantly affect the pressure, which in turn impacts the water application rate and uniformity. Any changes in system pressure or flow rate can alter the amount of water applied, leading to uneven irrigation. Poor uniformity can lead to too much or too little water on crops, which can reduce crop yield and waste water from deep infiltration or runoff. Unfortunately, most of the issues with irrigation performance cannot be detected with a visual inspection and require rigorous testing to assess.

RESPONSE

In 2003, a cooperative project between the University of Delaware (UD) and the Natural Resources Conservation Service (NRCS) began to conduct performance appraisals of center pivot irrigation systems enrolled in conservation programs. Over the past 20 years, a total of 971 field evaluations were performed covering approximately 63,000 acres using the American Society of Agricultural and Biological Engineers (ASABE) testing standard S436.2. At the 2024 Delaware Ag Week, findings from 20 years of irrigation testing were shared along with recommendations for farmers.

RESULTS

Individually each test gleaned valuable insights regarding irrigation system uniformity, overall water application level, and many unique and repairable problems. The individual test results and recommendations were provided to each farmer to direct irrigation system upgrades and repairs. During the 2024 Ag Week presentation, a live survey asked farmers how they benefited from the testing:

- 25% said they only valued the eligibility for NRCS cost-share funding.
- 62% used the test data to adjust their irrigation timer settings.
- 12% upgraded or replaced their sprinkler systems based on the results.

Further, the farmers who responded to the survey indicated the testing revealed key design insights about system pressure, sprinkler types, and flow rates. Farmers reported the following financial impacts:

- 36% said they gained no benefit beyond cost-share eligibility.
- 10% reported an extra \$5/acre in profit.
- 26% saw \$5–\$20/acre gains.
- 5% reported \$20–\$40/acre gains.
- 21% reported more than \$40/acre in added profit.

When these benefits were applied to all acres tested over the past 20 years, Delaware farmers could earn an additional \$857,000 annually through better system design and management. On top of this, \$48 million in cost-share funding became accessible for system upgrades after tests confirmed compliance with NRCS standards.

PUBLIC VALUE STATEMENT

Efficient irrigation is critical for maximizing crop yields, conserving water, and supporting sustainable agriculture. Over 20 years, the University of Delaware and NRCS evaluated 63,000 acres of center-pivot irrigation systems, helping farmers optimize performance and access \$48 million in cost-share funding for upgrades. The testing improved water application uniformity, increased crop yields, and led to financial gains, with some farmers earning over \$40 more per acre. These efforts benefit society by reducing water waste, protecting natural resources, and contributing to a more sustainable and resilient food system.

This information is brought to you by the University of Delaware Cooperative Extension, a service of the UD College of Agriculture and Natural Resources – a land-grant institution. This institution is an equal opportunity provider. Learn more at www.udel.edu/extension.