USDA NRCS
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Irrigation Information

Irrigation using Center Pivot systems is an art and a science. Knowing how to manage an irrigation system and associated equipment can make a big difference in yield, pumping costs, and the bottom line. By employing the practice of Irrigation Water Management (IWM), Illinois landowners can achieve greater success in their farming operation.

WHAT IS IWM—Irrigation Water Management?

IWM is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned and efficient manner.

Most center-pivot Irrigation systems are properly designed by their manufacturer. However, errors during assembly, improper retrofitting of replacement parts, wear, plugging caused by encrusting water, and other factors can degrade the performance of the irrigation system over time. Additionally, pumping capacity can also change with use. For these reasons, it is important to periodically check (evaluate) the performance of the irrigation system to ensure that it applies irrigation water in an efficient, effective and uniform manner.

What is an Irrigation System Evaluation?

To determine the performance of a center-pivot irrigation system, some "undercover work" is needed.

• Interview the irrigator, the person running the irrigation system; determine how the system is operated.

• Closely observe the system as it operates; measure its performance.

• Use a catch-can analysis to determine how uniformly (or not) the system applies water.

By this process, an irrigation system evaluation results in an Irrigation Water Management (IWM) Plan. This plan:

1. Promotes desired crop response (higher yields)
2. Conserves water
3. Minimizes water quality degradation
4. Minimizes irrigation-induced soil erosion
5. Promotes efficient, safe application of agricultural chemicals & fertilizer

While it sounds complex, the Irrigation System Evaluation is actually a logical examination of the irrigation system, its components and operation. For private landowners who have invested a large amount in the equipment and incur significant costs in pumping water, an IWM plan can ensure landowners get the greatest benefit from their investment.

STEP #1 Preliminary Information

The following information is needed:

• What kind of irrigation system is it? (Manufacturer, flow capacity, recommended operating pressure based on design and nozzle charts)

• How is the system operated?

(over)

• What is the current irrigation schedule? (How does irrigator determine when to irrigate and how much water to apply?)

• Are there utility company constraints? (What are the maximum number of hours the system can be operated each day?)

• At what speed does the system typically apply water?

• If chemigation or fertigation is practiced, is a backflow prevention device in place that has a check valve, low pressure drain, and vacuum breaker?

• Are there other particular management constraints or problems on the land or within the system?

STEP #2 System Details

The IWM Evaluation documents specific details of the center-pivot system and compares these observations to the original design and intent. Remember, a Center-Pivot Irrigation System is typically a well-designed and engineered piece of equipment, but will only operate optimally when the specifications of the manufacturer are followed. To do this, the evaluator must obtain or determine the following information:

- Brand, make, model
- Sprinkler type
- Drive type
- Distance to end tower (feet)
- Number of towers
- Distance to last nozzle
- Capacity of end gun

STEP #3 Time for a Reality Check

Here the evaluator observes actual irrigation system uniformity by employing a 'catch-can test.' This test reveals how well the system actually delivers irrigation water out to the crops at various locations along the length of the center-pivot arm. Keep in mind, the goal of irrigation is to supply adequate water to crop root zones in an effective and uniform manner. Remember to:

• Note weather and climatic factors (wind speed, temperature, and relative humidity) at test time.

• Perform test within 5% of design water pressure; observe pressures at various locations along the length of the lateral.

• During the test, apply at least 0.5 inch of irrigation water.

• Use at least 30 uniform collector catch-cans (with minimal opening of 3.2") to observe uniformity of application.

• Use statistical tools to quantify uniformity and amount of water applied.

STEP #4 What's Next?

The information gained by conducting an Irrigation Water Management Evaluation can clarify the true functionality of an irrigation system.

An irrigation schedule is developed based on results of the catch-can evaluation and on crop, soil, and climatic factors. This irrigation schedule provides guidelines on:

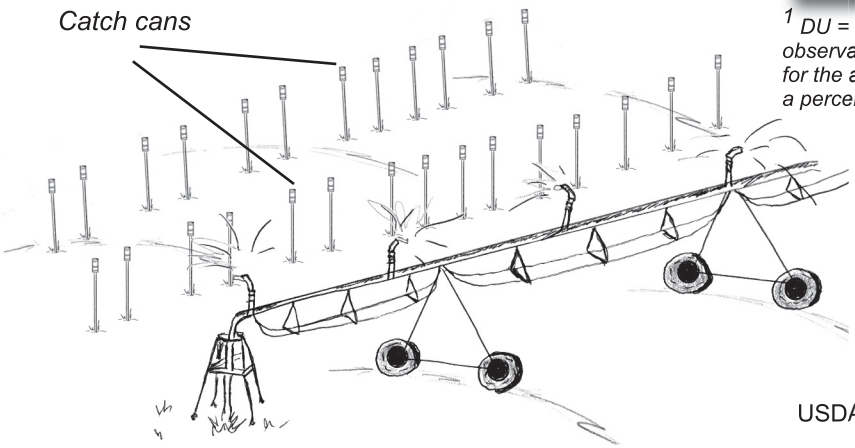
• When to irrigate
• How much water to apply (speed to operate the system)

For systems performing below the DU[1] standard (75%), the evaluation seeks to capture and account for potential causes of non-uniformity and develop suggestions for corrective actions. Common problems include:

• Incorrect system operating pressure
• Nozzle wear or scaling
• Flow and pressure variation
• Improper operation of end guns
• Variations in pumping plant
• Improper retro-fitting of equipment

Need to know more? Contact your local NRCS office. For Irrigation Water Management Practice Code 449 along with the Statement of Work, view the Field Office Technical Guide (FOTG) online at www.il.nrcs.usda.gov.

Catch cans



[1] *DU = Distribution Uniformity, is the average of the lower ¼ of catch-can observations divided by the average of all catch-can observations, weighed for the area of the field that each observation represents and expressed as a percent.*

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