Small Farms: Irrigation

Overview

What is Microirrigation and Irrigation Water Management?

Microirrigation systems are designed to distribute small amounts of water on or below the soil surface as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line.

Irrigation water management is the process of controlling the volume, frequency, and application rate of irrigation water.

How does microirrigtaion apply to urban and small-scale agriculture?

Irrigation is a challenge for many small-scale operations. Urban and small-scale agriculture often rely on water distribution sources and methods that are inefficient, meaning they utilize more water and energy than necessary – often at high cost to the producer. Microirrigation systems aim to help distribute water evenly and efficiently and maintain proper soil moisture for plant growth. Microirrigation is also used to provide irrigation water to establish trees and windbreaks.

Do I need to develop a water management plan?

Yes. A microirrigation system designed by NRCS requires an irrigation water management plan (IWM) that must be developed according to Iowa NRCS Conservation Practice Standard 449 Irrigation Water Management. An IWM plan helps the producer understand how to determine when to irrigate, ensuring the microirrigation system is used effectively.

Fortunately, NRCS can also assist with developing an IWM plan!

Should I test my irrigation water?

It is always a good idea to test your irrigation water. Some water is not suitable for irrigation and may cause damage to crops, irrigation systems, people, or the environment.

As a part of NRCS microirrigation, you must test your water for physical, chemical, and biological contaminants commonly found in the area – especially those that may cause clogging of microirrigation system emitters.

What is irrigation scheduling based on?

Irrigation scheduling is primarily based on a combination of soil, plant, and weather conditions to determine when and how much water to apply to crops.

Base irrigation timing on one or more of the following methods:

- Soil moisture monitoring with sensors *or* appearance and feel
- Plant monitoring
- Plant needs (evapotranspiration rate)

Base the volume (depth) of water needed for each irrigation event on the following factors:

- Available water-holding capacity of the soil at the crop rooting depth
- Crop-specific management allowed depletion (MAD)
- Current soil moisture levels
- Growth stage of current crop
- Distribution uniformity
- Water table contribution
- Computerized recommendation from irrigation scheduling software

Interested in microirrigation or irrigation water management?

USDA's Natural Resources Conservation Service (NRCS) can help you evaluate your options and develop a conservation plan to help you reach your goals.

USDA Service Centers are located in every Iowa county and can be easily found using the service center locator: nrcs.usda.gov/contact/find-a-service-center

Are there other irrigation requirements for NRCS programs?

Irrigation history is required for irrigation-related water conservation practices implemented through NRCS financial assistance programs, such as Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP).

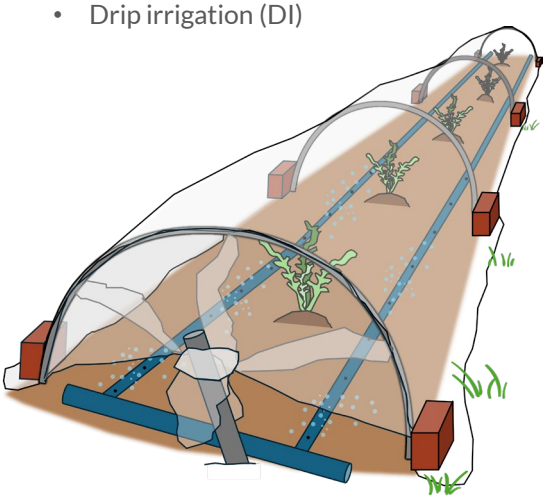
The land must have been irrigated in at least 2 of the past 5 years.

Any method of irrigation counts towards this requisite, including oscillating or garden sprinklers, hand watering with watering cans, or garden hoses.

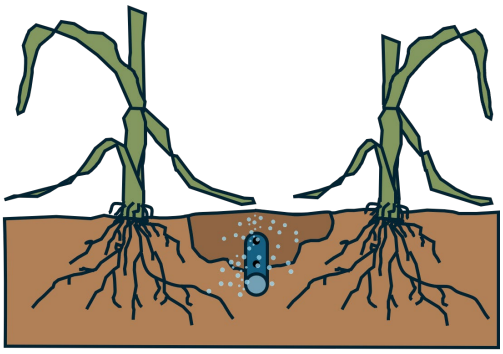
What are common types of microirrigation systems?

The common types of microirrigation systems are:

- Drip irrigation (DI)



- Subsurface drip irrigation (SDI)



- Misters and microsprinkers

Figures by M. Syversen, Iowa NRCS

Drip Irrigation:
For drip irrigation systems, water is applied at the soil surface as drops or small streams through emitters. The surface drip lateral lines should be installed along the plant row(s). The line should be anchored down by pins or buried 2 to 4 inches below loose soil or mulch (organic or plastic/fabric).

Drip irrigation performs best when intensive and accurate management of water is used, such as that for gardens.

Subsurface Drip Irrigation:
Subsurface drip irrigation is the application of water below the soil surface through emitters, with discharge rates generally in the same range as surface drip.

Tubing depth and spacing are soil and crop dependent, but the typical burial depth is between 4 to 24 inches. Subsurface drip irrigation involves high level of labor for installation and maintenance and performs best in systems with real-time automation and where plants require high-frequency irrigation or fertigation. In Iowa we may see this on row-crop fields, large vegetable farms, or turf management.

Misters and Microsprinklers:
When you hear "sprinkler", you may think of a portable lawn sprinkler attached to a hose. Lawn sprinklers are commonly used in small farm settings, but they are typically inefficient, do not distribute water uniformly, and can lead to plant health problems for crops that do not tolerate overhead watering .

Microsprinkler and mister systems discharge miniature spray through emitters in a more uniform fashion than your every-day sprinkler. A micro-sprinkler system typically can wet a larger soil surface area than either drip emitters or tapes. They may be applicable to certain vegetables and forages that prefer overhead watering - or in orchards and crop fields for frost protection.

How do irrigation and mulch work together?

Consider your mulch product and type when planning for crop irrigation.

Synthetic mulch - nonwoven geotextile fabric or plastic:

Nonwoven geotextile fabric, also known as landscaping fabric, is often used for weed control. It is permeable yet can partially obstruct rain or irrigation water. Plastic mulch is usually impermeable.

Irrigation can be done with sheets of synthetic mulches most effectively via drip tape, laid under the materials before/during application.

Irrigating with overhead sprinklers can still be done, as water seeps under the plastic or fabric, but monitor the soil moisture below the mulch to ensure crops receive adequate water.

Natural mulch - straw, wood chips, wool and other natural materials:
Natural materials can improve soil moisture and irrigation efficiency by moderating soil temperatures and reducing evaporation from soil surfaces…while providing other soil health benefits too!

While natural mulches are more receptive to overhead watering than synthetic ones, a drip line placed below the material will likely be more efficient.

Recordkeeping

Irrigation Water Management (449) through NRCS programs requires specific record keeping. Documentation for each irrigation events include:

- Date and location
- Crop and growth stage
- Method used to determine soil moisture, available water capacity, and soil moisture depletion
- Amount of water applied
- Rainfall/climate considerations

NRCS can teach you how to best take and keep these records – some irrigation computer programs can even do this automatically!