

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

IRRIGATION WATER MANAGEMENT

(Ac.)

CODE 449

DEFINITION

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

PURPOSE

Manage soil moisture to promote desired crop response.

Optimize use of available water supplies.

Minimize irrigation induced soil erosion.

Decrease nonpoint source pollution of surface and groundwater resources.

Manage salts in the crop root zone.

Manage air, soil, or plant micro-climate.

Proper and safe chemigation or fertigation.

Improve air quality by managing soil moisture to reduce particulate matter movement.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable to all irrigated lands.

An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying water to meet the intended purpose(s).

CRITERIA

General Criteria Applicable to All Purposes

Irrigation water shall be applied in accordance with federal, state, and local rules, laws, and regulations. Water shall not be applied in excess of the needs to meet the intended purpose.

Measurement and determination of flow rate is a critical component of irrigation water management and shall be a part of all irrigation water management purposes.

The irrigator or decision maker must possess the knowledge, skills, and capabilities of management coupled with a properly designed, efficient and functioning irrigation system to reasonably achieve the purposes of irrigation water management.

An "Irrigation Water Management Plan" shall be developed to assist the irrigator or decision maker in the proper management and application of irrigation water.

Irrigator Skills and Capabilities. Proper irrigation scheduling, in both timing and amount, control of runoff, minimizing deep percolation, and the uniform application of water are of primary concern. The irrigator or decision maker shall possess or obtain the knowledge and capability to accomplish the purposes which include:

General

How to determine when irrigation water should be applied based on the rate of water used by crops and on the stages of plant growth and/or soil moisture monitoring.

How to determine the amount of water required for each irrigation, including any leaching needs.

How to recognize and control erosion caused by irrigation.

How to measure or determine the uniformity of application of irrigation.

How to perform system maintenance to assure efficient operation.

Knowledge of "where the water goes" after it is applied considering soil surface and subsurface conditions, soil intake rates and permeability, crop root zones, and available water holding capacity.

How to manage salinity and shallow water tables through water management.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#), or visit the [electronic Field Office Technical Guide](#).

**SDTG Notice SD-309
Section IV
NRCS-October 2010**

The capability to control the irrigation delivery.

Surface Systems

The relationship between advance rate, time of opportunity, intake rate, other aspects of distribution uniformity, and the amount of water infiltrated.

How to determine and control the amount of irrigation runoff.

How to adjust stream size, adjust irrigation time, or employ techniques such as “surge irrigation” to compensate for seasonal changes in intake rate or to improve efficiency of application.

Subsurface Systems

How to balance the relationship between water tables, leaching needs, and irrigation water requirements.

The relationship between the location of the subsurface system to normal farming operations.

How to locate and space the system to achieve uniformity of water application.

How to accomplish crop germination in arid climates and during dry periods.

Pressurized Systems

How to adjust the application rate and/or duration to apply the required amount of water.

How to recognize and control runoff.

How to identify and improve uniformity of water application.

How to account for surface storage due to residue and field slope in situations where sprinkler application rate exceeds soil intake rate.

How to identify and manage for weather conditions that adversely impact irrigation efficiency and uniformity of application.

System Capability. The irrigation system must be capable of applying water uniformly and efficiently and must provide the irrigator with adequate control over water application.

Additional Criteria to Manage Soil Moisture to Promote Desired Crop Response

The following principles shall be applied for various crop growth stages:

The volume of water to be applied for each irrigation shall be based on plant available water holding capacity of the soil for the crop rooting depth, management allowed soil water depletion, irrigation efficiency, and water table contribution.

Irrigation frequency shall be based on the volume of irrigation water to be applied and/or available, crop evapotranspiration, and effective precipitation.

The application rate shall be based on the volume of water to be applied, the frequency of scheduled irrigation applications, soil infiltration and permeability characteristics, and the capacity of the irrigation system.

Appropriate field adjustments shall be made for seasonal variation and field variability.

Additional Criteria To Optimize Use Of Water Supplies

Limited irrigation water supplies shall be managed to meet critical crop growth stages.

If water supplies are insufficient to meet critical crop growth stage needs, modify plant populations, crop and variety selection, and/or irrigated acres to match available water supplies.

Additional Criteria to Minimize Irrigation Induced Soil Erosion

Application rates shall be consistent with field slopes, length of run, soil textures, and residue management for long-term soil productivity. Irrigation induced soil erosion shall be addressed by equipment modifications and/or management changes such as reduced application rates or use of mulches or polyacrylamides.

Additional Criteria to Decrease Non-Point Source Pollution of Surface and Groundwater

Irrigation water shall be applied at rates that minimize detachment of soil particles and transport of sediment, nutrients, and chemicals to surface waters and that minimize transport of nutrients and chemicals to groundwater.

Additional Criteria to Manage Salts in the Crop Root Zone

Adequate leaching or drainage is required to accomplish this purpose.

The concentration and distribution of soil salinity within the crop root zone shall be evaluated.

Crops with threshold salinity values that meet the producer's goal and yield expectations shall be selected. Decisions shall be based on the average root zone salinity and water quality variations expected during the growing season.

Increase the irrigation application volume by the amount required to maintain an appropriate salt balance in the soil profile (leaching requirement).

The leaching requirement shall be determined using the leaching procedure contained in the National Engineering Handbook (NEH), Part 623, Chapter 2.

Additional Criteria to Manage Air, Soil, or Plant Micro-Climate

The irrigation system shall have the capacity to apply the required amount of water at the desired rate for frost protection or crop and soil cooling as determined by the methodology contained in NEH, Part 623, Chapter 2.

Additional Criteria for Proper and Safe Chemigation or Fertigation

Chemigation or fertigation shall be done in accordance with all local, state, and federal laws.

The scheduling of nutrient and chemical application should coincide with the irrigation cycle in a manner that will not cause excess leaching of nutrients or chemicals below the root zone to the groundwater or to cause excess runoff to surface waters.

Chemigation or fertigation should not be applied if rainfall is imminent. Application of chemicals or nutrients will be limited to the minimum length of time required to deliver them and flush the pipelines. Irrigation application amount shall be limited to the amount necessary to apply the chemicals or nutrients to the soil depth recommended by label. The timing and rate of application shall be based on the pest, herbicide, or nutrient management plan.

The irrigation and delivery system shall be equipped with properly designed and operating valves and components to prevent backflows into the water source(s) and/or contamination of groundwater, surface water, or the soil.

Additional Criteria to Reduce Particulate Matter Movement

Sprinkler irrigation water shall be applied at a rate and frequency sufficient to reduce the wind erodibility index (I Factor) of the soil by one class.

CONSIDERATIONS

The following items should be considered when planning irrigation water management:

Consideration should be given to managing precipitation effectiveness, crop residues, and reducing system losses.

Consider potential for spray drift and odors when applying agricultural and municipal wastewaters.

Consider the effect of the irrigation water quality on the soil's physical and chemical properties, such as soil crusting, pH, permeability, salinity, and structure.

Minimize traffic on wet soils.

Consider the quality of water and the potential impact to crop quality and plant development.

Consider the effects on wetlands, wildlife habitats, riparian areas, cultural resources, recreation, and downstream water users.

Consider nutrient and pest management.

Consider scheduling leaching events to coincide with low soil nutrients and pesticides.

Consider improving nutrient management by use of irrigation water to apply nutrients closer to crop uptake (e.g. chemigation).

Water should not drift or come in direct contact with surrounding electrical lines, supplies, devices, controls, or components where an electrical short or other hazard could be created. Irrigation systems must not create an electrical safety hazard to humans or animals.

Consideration should be given to electrical load control/interruptible power schedules, repair and maintenance downtime, and harvest downtime.

Consider improving the irrigation system to increase water distribution uniformity.

PLANS AND SPECIFICATIONS

Provide documents that specify system operations, irrigation scheduling, monitoring, record keeping, and other components necessary for application and maintenance of this practice to achieve its intended purpose(s).

OPERATION AND MAINTENANCE

Necessary operation and maintenance items are addressed in the physical component standards of this standard.

REFERENCES

National Engineering Handbook, Part 652,
Irrigation Guide.

National Engineering Handbook, Part 623,
Irrigation