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 non-point 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, climate, water quantity and quality, etc.) must be present and capable of efficiently applying water to meet the intended purpose(s).

CRITERIA

Apply water in accordance with federal, state, and local rules, laws, and regulations.

Measurement. Measuring the flow rate and determining the water volume applied are critical components of irrigation water management. A water meter that measures flow rate and volume shall be an integral part of all irrigation systems.

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.

Manage soil moisture to promote desired crop response. Do not apply water in excess of the crop needs. Use the following principles for all crop growth stages:

- Base the total volume of water applied every irrigation on effective crop rooting depth, the available soil water-holding capacity for the crop rooting depth at the management allowed soil water depletion (MAD), a computed leaching requirement, and the irrigation efficiency.
- Base MAD on accepted agronomic practices for optimum growth of the crop.
- Base the irrigation frequency on the moisture level in the soil at MAD. Estimate frequency by determining the crop consumptive use (CU) and available moisture in the root zone.
- Base the application rate on the soil infiltration and permeability characteristics and the capacity of the irrigation system.

Make appropriate field adjustments for seasonal variations and field variability.

Optimize the water supplies. Manage limited water supplies to meet critical crop growth stages.

When estimated water supplies are insufficient to meet even the critical crop growth stage, the decision maker shall modify plant populations, crop and variety selection, and/or irrigated acres to match anticipated water supplies.

Minimize irrigation-induced soil erosion. Application rates shall be consistent with local field conditions for long-term soil productivity.

Decrease non-point-source pollution of surface and groundwater resources. Water application rates shall minimize transport of sediment, nutrients, and chemicals to surface waters and transport of nutrients and chemicals to groundwater.

Managing salts in the crop root zone. Increase the irrigation application volume by the amount required to maintain an

appropriate salt balance in the soil profile.

Base the leaching requirement on procedures contained in the National Engineering Handbook (NEH) Part 623, Chapter 2 and NEH, Part 652, chapters 3 and 13.

Managing air, soil, or plant micro-climate. The irrigation system shall have the capacity to apply the required rate of water for cold or heat protection as determined by the methodology contained in NEH Part 623, Chapter 2.

Proper and safe chemigation or fertigation. Follow all local, state, and federal laws while chemigating or fertigating.

Schedule nutrient and chemical applications to prevent runoff to surface waters or leaching of nutrients or chemicals below the root zone.

Do not chemigate or fertigate if rainfall is imminent. Apply chemicals or nutrients in the minimum length of time required to pressurize the system, deliver the chemicals, 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. Base the timing and rate of application 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.

Reducing Particulate Matter Movement. Apply sprinkler irrigation water at a rate and frequency needed to reduce the wind erodibility index (I Factor) of the soil by one class.

CONSIDERATIONS

Consider the following items when planning irrigation water management:

- Avoid traffic on wet soils to minimize soil compaction.
- Consider electrical load control/interruptible power schedules, repair and maintenance downtime, and harvest downtime.
- Consider improving the irrigation system to increase distribution uniformity or application efficiency of irrigation water applications.
- Consider potential for overspray from end guns onto public roads.
- Consider potential for spray drift and odors when applying agricultural and municipal waste water. Base timing of irrigation on prevailing winds to reduce odor. Consider irrigating at night in areas of high visibility.
- Consider quality of irrigation water relative to its potential effect on the soil's physical and chemical properties, such as soil crusting, pH, permeability, salinity, and structure.
- Consider the effects that irrigation water has on wetlands, water related wildlife habitats, riparian areas, cultural resources, and recreation opportunities.
- Consider the quality of water and the potential impact to crop quality and plant development.
- Equipment modifications and/or soil amendments such as polyacrylamides and mulches should be considered to decrease erosion.
- Give consideration to managing precipitation effectiveness, crop residues, and reducing system losses.
- Manage sprinkler water so as to not drift or come in direct contact with surrounding electrical lines, supplies, devices, controls, or components that would cause shorts or the creation of an electrical safety hazard to humans or animals.
- Management of nutrients and pesticides.
- Schedule salt leaching events to coincide with low residual soil nutrients and pesticides.

PLANS AND SPECIFICATIONS

Application of this standard may include job sheets or similar documents that specify the applicable requirements, system operations, and components necessary for applying and maintaining the practice to achieve its intended purpose(s).

OPERATION AND MAINTENANCE

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

The operation and maintenance (O&M) aspects applicable to this standard consist of evaluating available field soil moisture, changes in crop evapo-transpiration rates and changes in soil intake rates and adjusting the volume, application rate, or frequency of water application to achieve the intended purpose(s). Other necessary O&M items are addressed in the physical component standards considered companions to this standard.

IWM can be reported only when the format outlined in NEM Supplement NM523.00 is followed.

Obtain additional guidance from NEH Part 623, Chapter 2; NEH Part 652, Chapter 2, Irrigation; NEH Section 15; and the New Mexico Irrigation Guide.

Schedule irrigation using various soil moisture monitoring techniques to include, feel-and-appearance, electrical resistance blocks, and tensiometers.

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 should 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 which include:

A. General

1. 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.
2. How to determine the amount of water required for each irrigation, including any leaching needs.
3. How to recognize and control erosion caused by irrigation.
4. How to measure or determine the uniformity of application for an irrigation.
5. How to perform system maintenance to assure efficient operation.
6. 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.
7. How to manage salinity and shallow water tables through water management.
8. The capability to control the irrigation delivery.

B. Surface Systems

1. The relationship between advance rate, time of opportunity, intake rate, and other aspects of distribution uniformity and the amount of water infiltrated.
2. How to determine and control the amount of irrigation runoff.
3. 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.

C. Subsurface Systems

1. How to balance the relationship between water tables, leaching needs, and irrigation water requirements.
2. The relationship between the location of the subsurface system to normal farming operations.
3. How to locate and space the system to achieve uniformity of water application.
4. How to accomplish crop germination in arid climates and during dry periods.

D. Pressurized Systems

1. How to adjust the application rate and/or duration to apply the required amount of water.
2. How to recognize and control runoff.
3. How to identify and improve uniformity of water application.
4. How to account for surface storage due to residue and field slope in situations where sprinkler application rate exceeds soil intake rate.
5. How to identify and manage for weather conditions that adversely impact irrigation efficiency and uniformity of application.