NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

IRRIGATION WATER MANAGEMENT

(Acre)

CODE 449

DEFINITION

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

PURPOSE

Irrigation water management is applied as part of a conservation management system to support one or more of the following:

- 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 microclimate.
- Chemigation.

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

All work shall comply with Federal, State, and local laws and regulations. Water shall not be applied in excess of the needs to meet the intended purpose.

The irrigator shall have a knowledge and capability to manage and apply irrigation water in such a manner that the objectives stated under "Purpose" can be reasonably attained. The knowledge shall include as a minimum:

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.
2. How to measure or estimate the amount of water required for each irrigation, including the leaching needs.
3. The normal time needed for the soil to absorb the required amount of water and how to detect changes in intake rate.
4. How to adjust stream size, application rate, or irrigation time to compensate for changes in such factors as intake rate or the amount of water to be applied.
5. How to recognize erosion caused by irrigation.
6. How to estimate the amount of irrigation runoff from the area.
7. How to evaluate the uniformity of water application.
8. How to evaluate climatic data.

The determination that irrigation water management is being practiced shall be determined by evaluating the irrigator's knowledge and use of the principles of irrigation water management as described above. Irrigation water management shall be documented in writing.

Guidance for determining irrigation water requirements is contained in the Louisiana Irrigation Guide and the National Engineering Handbook (NEH), Part 623, "Irrigation", Chapter 2.

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 needed 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.
- The irrigation frequency shall be based on the volume of irrigation water needed and/or available, the rate of crop evapotranspiration, and effective precipitation.
- The application rate shall be based on the volume of water to be applied, the frequency of irrigation applications, soil infiltration and permeability characteristics, and the capacity of the irrigation system.

Additional Criteria To Optimize Use Of Water Supplies

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

On high water table soils, the water table shall be managed at a level that will allow the maximum storage of rainfall and provide the required moisture to the plant.

Additional Criteria to Minimize Irrigation Induced Soil Erosion

Application rates shall be consistent with local field conditions for long term productivity of the soil. On soils that are susceptible to irrigation induced erosion, the irrigation system should be operated so that the application rate is less than the basic soil infiltration rate as given in the Louisiana Irrigation Guide.

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

Water application shall be at rates that minimize transport of sediment, nutrients, and chemicals to surface waters and that minimize transport of nutrients and chemicals to groundwater.

The potential for nutrient losses is high if excess irrigation water is applied. Weather conditions must be considered before water and nutrients are applied. Nutrients should not be applied when rainfall is imminent.

The amount of nutrients to be applied must be determined according to the production level of the crop, the soil nutrient status, and the plant nutrient status. The scheduling of nutrient application should coincide with the irrigation cycle in a manner that will not leach nutrients below the root zone. The nutrient management plan shall be followed in the timing and rate of nutrient application. Net irrigation application should not exceed the available water holding capacity of the soil within the root zone.

The potential for movement of suspended sediment and organics from water-seeded rice fields is very high. To reduce the amount of suspended sediment, organics, nutrients, and pesticides leaving water-seeded rice fields, three alternatives have been approved by the LSU Agricultural Center for managing preplant flood irrigation water. Any of these alternatives will significantly reduce suspended sediment in preplant flood irrigation water when released from rice fields following water seeding operations. They are as follows:

Option 1. Water seeding in previous crop's residue.

a) Maintain previous crop's residue on the soil surface for eliminating all soil disturbing activities.

b) Apply a recommended preplant herbicide to kill volunteer vegetation.

c) Close levees and apply preplant flood.

d) Retain flood water until rice is planted.

Option 2 – Retention of flood water for a specified period of time following soil disturbing activities.

a) Close levees immediately following soil disturbing activities in the fall.

b) When soil disturbing activities take place during the preplant flood, retain flood water for at least 15 days following conclusion of soil disturbing activities or until a 50% reduction in suspended sediment has been achieved as indicated by the LSU Agricultural Center's Suspended Sediment Test Kit.

c) Apply a recommended preplant herbicide to kill volunteer vegetation, if needed.

d) Reflood and plant rice.

Option 3 - Clear Water Planting into a prepared seedbed.

a) Close levees immediately following soil disturbing activities in the fall.

b) When soil disturbing activities occur during the preplant flood, retain flood water for at least 15 days following conclusion of soil disturbing activities or until a 50% reduction in suspended sediment has been achieved as indicated by the LSU Agricultural Center's Suspended Sediment Test Kit.

c) Prepare a dry seedbed in the spring, close levees immediately and apply preplant flood.

d) Plant rice and release flood water.

Additionally, the quality of preplant flood water released from water-seeded rice fields can be further improved by draining the preplant flood through Filter Strips (393) and Grassed Waterways (412).

Suspended Sediment Test Kits are available at local LSU Agricultural Center Parish Offices.

The options listed above were developed for water-seeded rice systems where water leveling or "mudding in" is practiced for red rice control. Where red rice is not a problem and/or a producer owns or has access to a drill, another viable option is drill planting a herbicide resistant rice variety, thus reducing the potential for high suspended sediment loads from rice fields.

Additional Criteria to Manage Salts in the Crop Root Zone

The irrigation application volume shall be increased by the amount required to maintain an appropriate salt balance in the soil profile.

The requirement shall be based on 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 rate of water for cold or heat protection as determined by the methodology contained in NEH Part 623, Chapter 2.

The irrigation system must be capable of uniformly applying the required rate of water application based on the anticipated minimum temperature, maximum wind speed, and relative humidity.

Water application should begin when the temperature is above the critical temperature of the crop being protected. Water application should stop when the wet bulb temperature is above the critical temperature of the crop being protected. Careful consideration should be given to the wind speed as this increases evaporative cooling.

Additional Criteria for Chemigation

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

Weather conditions must be considered before applying chemicals. Chemigation should not be applied if rainfall is imminent. Application of chemicals will be the minimum length of time to deliver the chemicals and flush the pipelines. Irrigation application amount shall be limited to the amount necessary to apply the chemicals to the soil depth recommended by label. The timing and rate of application shall be based on the pest or nutrient management plan.

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.
- Modify plant populations, crop and variety selection, and irrigated acres to match available or anticipated water supplies.
- Consider potential for spray drift and odors when applying agricultural and municipal wastewaters.
- Equipment modifications and/or soil amendments such as polyacrylamides and mulches should be considered to decrease erosion.
- Consider the quality of water and the potential impact to crop quality and plant development.
- Quality of irrigation water should be considered relative to its potential effect on the soil's physical and chemical properties, such as soil crusting, pH, permeability, salinity, and structure.
- Avoid traffic on wet soils to minimize soil compaction.
- Consider the effects that irrigation water has on wetlands, water related wildlife habitats, riparian areas, cultural resources, and recreation opportunities.
- Management of nutrients and pesticides.
- Schedule salt leaching events to coincide with low residual soil nutrients and pesticides.
- Water should be managed in such a manner as to not drift or come in direct contact with surrounding electrical lines, supplies, devices, controls, or components that would cause shorts in the same or the creation of 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 distribution uniformity of irrigation water application.

PLANS AND SPECIFICATIONS

An irrigation water management (IWM) plan shall be prepared for the irrigator in keeping with the principles of this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s). The IWM plan shall include job sheets or similar documents that specify the applicable requirements for applying the practice. IWM plans shall include the following as applicable:

- Timing of irrigation.
- Method for measuring soil moisture.
- Method for adjusting irrigation to compensate for changes in the soil infiltration rate.
- Method for evaluating irrigation system uniformity.
- Method for measuring irrigation system application rate.
- Method for evaluating soil erosion.
- Method for adjusting the irrigation schedule(s) for chemical application.
- Method for recognizing excess runoff.

OPERATION AND MAINTENANCE

There are no operation and maintenance (O&M) aspects applicable to this standard. Necessary O&M items are addressed in the physical component standards considered companions to this standard.