SECTION FIVE

Irrigation Water Management Planning

Georgia's agriculture industry utilizes millions of gallons of water each year for irrigation purposes. Irrigated agriculture ranges from row crop farming to plant nurseries to orchards. Much of the concern with irrigation is with regard to efficiency, runoff and the capture and collection of runoff.

Many irrigation systems are inefficient and essentially waste water during the irrigating process. Irrigation efficiency may seem complicated; many producers may feel that their systems are simply too old to modify. In today's agricultural industry, producers have numerous opportunities to improve the efficiency of their system in a cost efficient way. Improved nozzles, metering, and computer software are all readily available to provide producers with a more efficient means of irrigating their cropland and monitoring plant water use.

Planning an irrigation schedule that best utilizes available water can reduce waste and runoff. Irrigation systems need to be routinely checked to ensure that water is being distributed uniformly and that there are no damaged pipes, sprinklers or nozzles. Irrigation meters provide producers with an accurate measurement of the amount of water that is applied to their crops and can also help identify pumping problems within their system. More information on the benefits of metering can be found in the UGA CES document, Water Meters as a Water Management Tool on Georgia Farms. An efficient system should range between 80 and 92% efficient. If a system is less than 80% efficient, producers should consider a system upgrade. There are several government sponsored irrigation system audit programs available and most system manufacturers can assist with an audit program.

Conservation practice components of Irrigation Water Management Planning section include:

Irrigation Tailwater Recovery System 447

Irrigation Water Management 449

Microirrigation 441

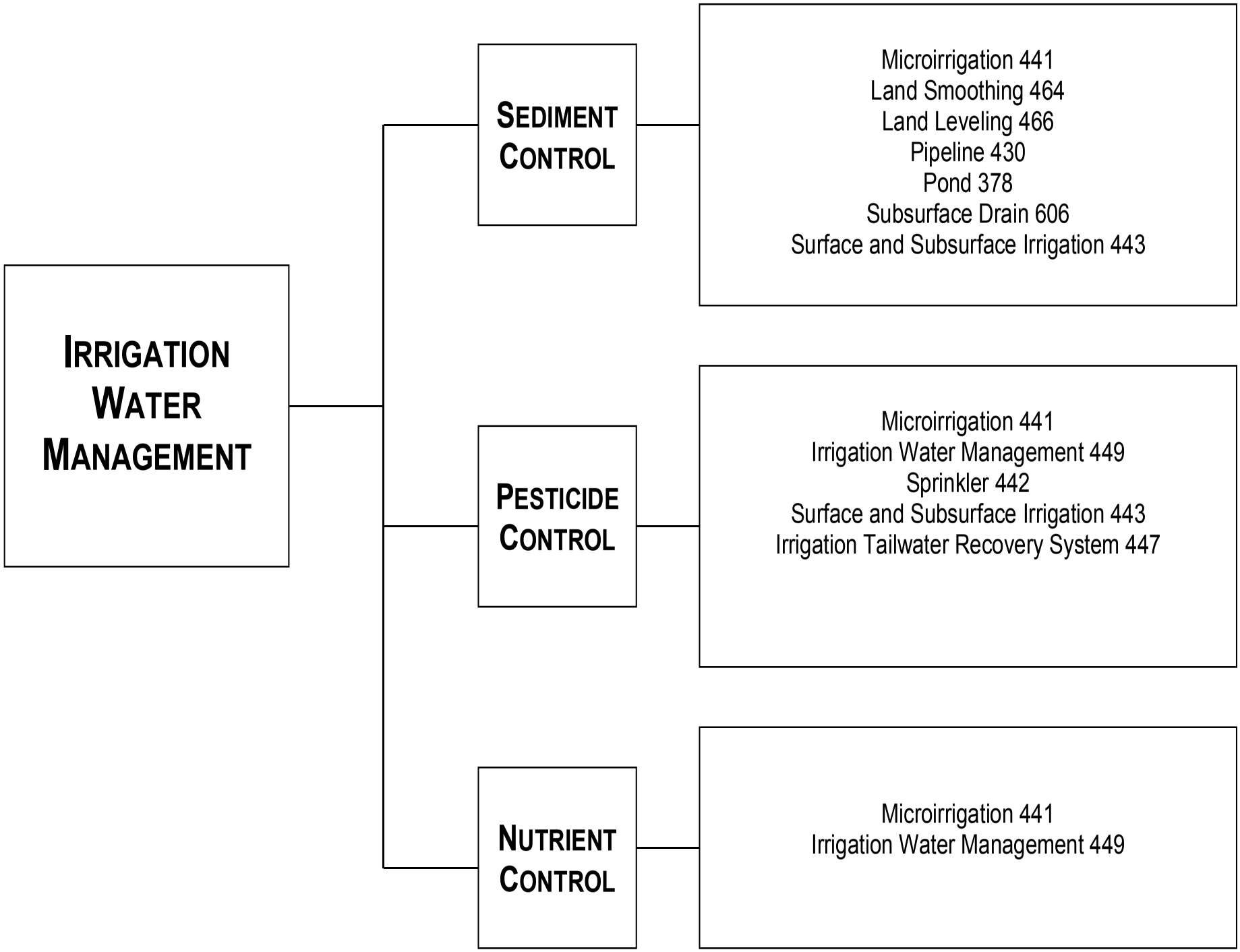
Pipeline 430

Pond 378

Sprinkler 442

Subsurface Drain 606

Surface & Subsurface Irrigation 443


IRRIGATION WATER MANAGEMENT
SEDIMENT CONTROL
Microirrigation 441
Land Smoothing 464
Land Leveling 466
Pipeline 430
Pond 378
Subsurface Drain 606
Surface and Subsurface Irrigation 443
PESTICIDE CONTROL
Microirrigation 441
Irrigation Water Management 449
Sprinkler 442
Surface and Subsurface Irrigation 443
Irrigation Tailwater Recovery System 447
NUTRIENT CONTROL
Microirrigation 441
Irrigation Water Management 449

IRRIGATION TAILWATER RECOVERY SYSTEMS (447) are designed to collect, store and transport tailwater for reuse in an irrigation system.

Water Quality Benefits

- Reduces runoff from fields
- Improves offsite water quality
- Traps sediment, sediment attached nutrients and chemicals from runoff water

When to Use

Tailwater recovery systems can be used with any irrigation system where runoff recovered from fields can be predicted, captured and reused.

How to Establish

Design storage facilities with adequate capacity to meet anticipated needs. Consider runoff volumes and rates, and anticipated application needs in determining storage facility size. Sumps, pits and storage facilities should be protected from erosion where applicable, and from storm events and sedimentation.

For more information, see *Additional Resources*.

Considerations and Costs

Consider any negative impacts on downstream flows and aquifer recharge volumes. Neighboring wetland hydrology may be altered by tailwater recovery and storage facilities.

Systems should be periodically inspected for damages; leaks and repairs should be made in a timely manner.

Contact your local conservation agent prior to beginning a tailwater recovery construction project in order to fully understand maintenance requirements.

Tailwater recovery systems are high in cost depending on size and material costs.

Effectiveness

In the greenhouse and container nursery industries, using a capture and reuse irrigation system has been found to reduce water use by 50% in studies.

Additional Resources

NRCS Conservation Practice Standard 447

IRRIGATION WATER MANAGEMENT (449) plans are designed to reduce irrigation water runoff by incorporating the rate, amount and timing of irrigation water into efficient water use planning.

A well designed and managed irrigation water management system can significantly reduce inefficient use

Water Quality Benefits

- Reduces soil erosion from irrigation
- Reduces nutrients and sediment in runoff
- Improves overall system efficiency
- Reduces leaching and deep percolation

When to Use

An irrigation water management (IWM) plan should be developed for all irrigated land and facilities.

How To Establish

Irrigation water management plans should address timing, capacity, application rates, and irrigation water collection and storage.

Numerous conservation practices are components of an irrigation water management plan. Irrigation water management should be a priority conservation concern. In developing an irrigation plan, consider all nutrients, chemicals and pesticides that may be applied. As part of these systems, planning may be needed to capture and store water for later use.

Costs and Considerations

Consider any impacts irrigation may have on wetlands, water related wildlife habitats, riparian areas, cultural resources and recreational opportunities. By controlling water application amounts, the potential for chemical and sediment transport in runoff can be significantly reduced.

Take care to manage nutrients, chemicals and pesticides, and to prevent transport into surface water and groundwater. Bordering irrigated land with grasses or legumes can reduce erosion.

Test water supplies prior to installing an irrigation system to ensure that the quantity and quality of water demanded can be achieved.

Costs associated with these practices include materials, installation, maintenance and repair. Inspect and repair all irrigation in a timely manner.

Irrigation systems can be moderate to high in cost.

Effectiveness

Irrigation management plans reduce the amount of water wasted and can also significantly reduce sediment, nutrients and insecticides entering water.

Additional Resources

NRCS Conservation Practice Standard 449

MICROIRRIGATION (441) is used as part of an irrigation system to efficiently apply water to the root zone of plants using low-pressure emitters.

Microirrigation allows for direct application of pesticides to individual plants

Water Quality Benefits

- Reduces soil erosion
- Improves water use efficiency
- Reduces sediment in runoff

When to Use

Microirrigation is ideal in areas where soil and topography can/needs to be irrigated and plants are compatible with microirrigation.

How to Establish

Design microirrigation systems to uniformly distribute water at an appropriate application rate. System capacity should account for losses due to evaporation, runoff, and percolation. Space emitters to adequately and uniformly provide water. Emitters can be drippers, microsprayers or misters.

For more information, see *Additional Resources.*

Considerations and Costs

Microirrigation is ideal for orchards, greenhouses, row crops, and residential and commercial landscapes. For small container nurseries with frequent container moving, microirrigation may not be ideal.

Microirrigation benefits include efficient water use, decreased foliar disease, and reduced opportunity for chemical loss and contamination. Microirrigation is also suited for chemigation.

Microsprayers work best with larger containers, as the flow rate may be too much for small plants. Multiple drippers may be needed for even water distribution. Drippers allow more plants to be irrigated at a time because of lower flow rates.

Test water supply prior to installation to ensure that both the quantity and quality of water demanded can be achieved. Microirrigation raises soil moisture levels which can reduce soil water storage capabilities, and can increase runoff. Plant growth rates and transpiration may decrease as a result of microirrigation.

Costs associated with this practice may include materials, installation and maintenance.

Microirrigation can be moderate in cost.

Effectiveness

Well-designed and managed microirrigation systems can potentially be 90-95% efficient. Converting field nurseries and container nurseries to microirrigation can provide an estimated 10% water savings. In studies, microirrigation has been found to be 74% efficient compared to conventional irrigation in vegetable production.

Additional Resources

NRCS Conservation Practice Standard 441

PIPELINES (430) are used to transport water for irrigation purposes.

Water Quality Benefits

- Allows for the transport of water for irrigation purposes without soil erosion or water loss resulting from evaporation or transpiration

When to Use

Pipelines can be installed when needed to transport water in a closed conduit from one point to another. Pipeline is used as a component of a irrigation system and is not a stand-alone conservation practice.

This practice standard is not applicable to surface gated pipes, sprinklers or microirrigation tubing.

How to Establish

Select pipeline materials that will withstand pressure, water surges and water hammer. Acceptable working pressure will be based on the type and diameter of pipe selected.

Valves or unions should be installed at low points in the pipe to allow for water drainage when necessary. Joints should be watertight, composed of a material that is compatible with pipe material and non-corrosive.

Depending on the type of piping material used, different specifications apply.

A check valve or back flow preventer may be needed to ensure the integrity of the system. If using pipeline as part of a chemigation system, a check valve should be installed.

Pipes should be protected from hazards such as traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction.

Revegetate any disturbed areas as soon as possible to reduce erosion.

For more information, see *Additional Resources*.

Considerations and Costs

During installation, disturbed areas should be protected with erosion prevention structures. Consider visual impacts prior to installation.

Maintenance for pipelines includes periodically inspecting valves, pressure regulators, switches and other equipment for proper function. Filling rates should be monitored. Drain pipes during cold weather to prevent freezing and bursting.

Pipelines are moderate in cost depending on the size and length of the pipe.

Effectiveness

As part of an alternative water supply or a waste management system, pipelines indirectly reduce negative water quality impacts.

Additional Resources

NRCS Conservation Practice Standard 430

SPRINKLERS (442) are used to efficiently apply pressurized water through nozzles to irrigated areas.

Sprinklers can efficiently apply water to targeted areas

Water Quality Benefits

- Reduces excessive water loss
- Reduces erosion
- Reduces water quality impairments

When to use

Use sprinkler irrigation systems as part of an overall conservation plan. All sprinkler systems should have an irrigation water management (IWM) plan.

When wastewater is used for irrigation purposes, a nutrient management plan (NMP) must also be developed and maintained. See pages 2.3 and 2.28 for more information on NMPs.

How to Establish

Sprinkler systems should have adequate capacity to efficiently irrigate crops. Systems used to apply wastewater to crops require sufficiently sized nozzles to prevent clogging. Backflow and anti-siphon preventative measures should be incorporated into sprinkler systems.

For more information, see *Additional Resources*.

Considerations and Costs

Monitoring may be necessary at the center pivot to reduce excessive water application. Filtering may be needed to reduce clogging if the water source contains particulate matter, algae or other materials.

Other conservation practices can be utilized in a sprinkler system to prevent soil erosion and runoff; however, benefits gained from implementing other conservation practices are reduced over an irrigation system. Careful monitoring is necessary to ensure that conservation practices efficiently reduce erosion and runoff.

Sprinkler irrigation can impact the water budget, downstream flows and use, and can negatively impact downstream water quality. Users should consider water quality impacts from soil erosion and sediment transport.

Costs of sprinkler systems may include installation, maintenance and repair. Monitoring is needed to ensure the efficiency of a system.

Effectiveness

Sprinkler systems can be 50-95% efficient, depending on the type of the system, cultural practices and management.

Additional Resources

NRCS Conservation Practice Standard 442
NRCS National Engineering Handbook, Part 6

SUBSURFACE DRAINS (606) are underground drains used to collect and remove excess water.

Water Quality Benefits

- Regulates the water table and encourages vegetative growth
- Prevents water from entering wet and heavy use areas
- Regulates sub-irrigated or waste disposal areas
- Reduces runoff
- Increases soil infiltration
- Reduces sediment and attached pollutant transport into surface water

When to Use

Subsurface drains can be used in areas where it will be beneficial to lower the water table or control surface and groundwater.

Only use subsurface drains when required drainage has been installed and other conservation practices are not meeting the operational needs.

How to Establish

Before installing a subsurface drain, inspect the area to determine if the site is suited for a drain. Use the Georgia Drainage Guide to determine tile spacing and depth of placement.

To effectively control water, install drains at the proper depth, spacing and location based on site conditions, topography, groundwater conditions, crops, land use and outlets.

Cover depth is dependent on the type of soil: mineral soils (2 feet) and organic soils (2.5 feet).

Materials used in subsurface drains should meet strength and durability requirements for the site. Filters may be used around conduits to reduce surrounding soil movement into the conduit.

For more information, see *Additional Resources*.

Considerations and Costs

Consider water quality impacts such as sediment delivery, changes in nitrate delivery to downstream water users, changes in the delivery of dissolved substances into aquifers, downstream water temperature changes, and impacts on the visual quality of downstream water.

Subsurface drainage can encourage the transport of nitrate-nitrogen into surface water, and can promote mellower soil conditions and reduce compaction potential.

Using subsurface drains and wetlands together can reduce soluble pollutant loadings in surface waters. Most of the nitrate-nitrogen can be removed by wetlands during spring and summer.

Effectiveness

Subsurface drainage can potentially reduce total runoff by 29-65%, peak runoff by 15-30%, sediment loss by 16-65%, phosphorus loss by 45%, and soil bound nutrient loss by 30-50%.

Additional Resources

NRCS Conservation Practice Standard 606
Georgia Drainage Guide

SURFACE AND SUBSURFACE IRRIGATION SYSTEMS (443) are designed so that all necessary water control structures have been installed to efficiently distribute irrigation water.

Water Quality Benefits

- Efficiently uses water
- Reduces soil erosion
- Reduces water usage and lowers pumping costs

When to Use

These systems can be used to apply irrigation water and/or chemical and nutrient applications to areas of need.

How to Establish

All federal, state and local regulations should be met.

Land should be suitable for irrigation applications. Water supply should adequately meet quality and quantity demanded, and system capacity should be adequate to meet crop demands.

Irrigation systems should be designed to distribute water using sound application methods.

Locate head ditches and pipelines where irrigation water can be uniformly distributed without causing soil erosion.

For more information, see *Additional Resources*.

Considerations and Costs

Erosion control structures may be needed in areas with steeper slopes. For surface irrigation, seepage control measures may also be necessary.

Collection facilities for tailwater and excess runoff should be included as part of an irrigation system.

Consider impacts on surface and ground water quality before chemical and nutrient applications.

Also consider impacts on the water budget, volumes and rates of runoff, changes in plant growth and transpiration, downstream flows, surrounding habitats and the movement of sediment in runoff.

Costs associated with this practice may include installation, maintenance and repair. All equipment should be inspected periodically for damages and repaired in a timely manner.

Effectiveness

Subsurface irrigation can potentially reduce water usage by an estimated 25%.

Additional Resources

NRCS Conservation Practice Standard 443