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HS910

Maintenance and Evaluation of Irrigation Systems used for Vegetable Production in Florida in the BMP Era[1]

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This publication is one of a series entitled Fertilizer and Irrigation Management in the BMP Era. This series is divided into nine principles described in the Introduction Chapter (HOS-897). This publication is part of Principle 5, "Irrigation Amount Must Reflect Crop Water Use ... No More, No Less." BMP implementation requires a global approach to production management. However, for presentation purposes, each aspect of vegetable production is described in a separate publication.

The uniformity of water application and efficiency in water delivery of an irrigation system tends to decrease with each operation because of aging, weathering and corrosion of different parts. The goal of irrigation system maintenance is to maintain system performance close to the initial benchmark operating values. Maintenance programs are different for each irrigation system type. On one hand, maintenance of flood or seepage systems may be limited to a pre-season system operational check, leak detection, and ditch/canals maintenance. On the other hand, maintenance programs of micro-irrigation systems generally involve filtration, chlorination/acidification, flushing and observation. Irrigation system with the highest efficiency and uniformity possible help ensure crop uniformity, conserve water, and reduce operation and maintenance costs.

Working Definition

Irrigation maintenance and evaluation is the management plan designed to maintain irrigation system components in good repair, so that each can perform according to manufacturer's specifications. Through repeated determinations of efficiency and uniformity, irrigation system evaluation aims at documenting the adequacy of a maintenance plan. Hence, irrigation maintenance and system evaluation should always be considered together.

General Irrigation Maintenance - Things to Do

- Determine, know and record pre-season benchmark operating values:
    - Know the level of efficiency at which your irrigation system was designed. Efficiency is defined as the ratio of the volume of water delivered by an irrigation system to the volume that is input to the system.

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- Know the uniformity of water application for each irrigation system. Periodically, check the uniformity. Improper maintenance may decrease uniformity.

- Establish a documented maintenance schedule:
  - Inspect the mechanical components as well as the irrigation lines.
  - Monitor the pump and power unit. This can be done by keeping records of performance and maintenance. Flow rate and pressure delivered by the pump as well as the energy consumption of the power unit should be recorded frequently. Records should be maintained on at least a bi-weekly or monthly basis.
  - Determine pre-set levels of maximum allowable deviations from benchmark values and consult with an irrigation specialist on what action to take when operating values exceed benchmark values by more that the allowable deviation.
  - Paint above-ground pipes black, especially pvc pipes to reduce algae growth inside pipes.
  - Use flow meters and pressure gauges to determine bench mark (pre-season) operating parameters.
  - Test water quality at least once yearly as changes in water quality parameters affect maintenance needs.

- Do these during the season:
  - Record flow meters to properly manage irrigation systems, specifically to measure the amount of water applied at each irrigation. Flow meters can indicate clogging problems when decreasing flow rates are measured.
  - Monitor pressure gauges to properly manage the operation of pressurized irrigation systems. Together with flow meters, pressure gauges also help detect leaks in pipelines or clogged emitters, and they provide a means of monitoring pumping efficiency.
  - Clean and maintain filtration equipment.
  - Check for leaks on seals, gaskets, and fittings.
  - Control valves and pressure regulators should be checked for proper operation and flow. Lubrication may be necessary. Wires and tubes should be checked for damage and repaired as necessary.

Flood (Seepage) Irrigation Maintenance - Things to Do

- Maintain pump and well in good repair.
- Remove debris and control weeds in ditches and canals.
- Maintain water level control structures operational.
- Consider tail water recovery.

Overhead Irrigation Systems (Solid Sets, Traveling Guns, Linear Moves, Center Pivots) - Things to Do

- Follow manufacturers maintenance recommendation for all motors, engines and pumps.
- Sprinkler nozzles should be inspected for wear and malfunctioning and replaced as necessary.
- Contact a Mobile Irrigation Laboratory in your region. A mobile irrigation lab is typically a two-person team that performs irrigation system evaluations at the request of an owner/operator. The mission is to promote water conservation, and water quality protection, by evaluating, at no charge, irrigation systems in agricultural and urban areas.

Microirrigation Maintenance - Things to Do

- Use filters compatible with drip irrigation (200 mesh or equivalent) and water source.
- Use chemical treatment to prevent emitter plugging due to microbial growth and/or mineral precipitation. Chlorination is the most common method for treating bacterial slimes. If the microirrigation system water source is not chlorinated, it is a good practice to equip the system to inject chlorine to suppress microbial growth. Since bacteria can grow within filters and chlorination may create iron-hydroxide precipitates, chlorine injection should be done before filtration units.
- Acid may be used to lower the pH of irrigation water to reduce the potential for chemical precipitation and to enhance the effectiveness of the chlorine injection. Acid may be injected in much the same way as fertilizer; however, extreme caution is required.
- Scale inhibitors, such as chelating and sequestring agents are being marketed for use in microirrigation systems to prevent plugging.
- Algae blooms which may occur in ponds may be effectively treated with copper sulfate.
- Flush drip irrigation lines regularly to minimize sediment build up. A regular maintenance program of inspection and flushing will prevent emitter clogging.
- Flush all fertilizer from the lateral lines prior to shutting the irrigation system down when fertigating to avoid clogging problems.

Additional Readings

Causes and Prevention of Emitter Plugging in Microirrigation Systems, Bull. 258, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/AE032

Efficiencies of Florida Agricultural Irrigation Systems, Bull. 247, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/AE110

Florida Backflow Prevention Requirements for Agricultural Irrigation Systems, Bull. 217, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla.

Backflow Requirements When Using Public Water Supplies, Bull. 248, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla.

Potential Impacts of Improper Irrigation System Design, Bull. AE73, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla.

Design of Agricultural Irrigation Systems in Florida, Bull. 294, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/AE064

Microirrigation on Mulched Bed Systems: Components, System Capacities, and Management, Bull. 245, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/AE042

NRCS Conservation Standard, Irrigation System, Sprinkler Code 442