Irrigation Management

Irrigation Systems

Irrigation practices are widely used by fruit growers, nursery, green house and vegetable growers alike. Chemigation, the practice of applying fertilizers and or pesticides to crops through irrigation systems, is also used by some farmers. Chemigation can allow nutrients and pesticides to be timed according to crop needs rather than physical application constraints, but ease of application may lead to overuse. Plant nutrients applied through chemigation must only be used within accordance of an approved pest and pesticide management plan. This should incorporate the principles of Integrated Pest Management (IPM).

With irrigation, there is a potential for movement of pollutants such as sediments, organic solids, pesticides, metals, micro organisms, salts and nutrients from the land into ground and surface water. Minimizing the discharge of pollutants while reducing water waste and improving water use efficiency are the goals of irrigation management. Setting up an irrigation management plan will help to address irrigation scheduling practices, efficient application, proper utilization of tail-water, drainage and runoff, and backflow prevention. Determining and controlling the rate, amount and timing of irrigation water in a planned and efficient manner is essential for water conservation. Careful irrigation management can minimize leaching and reduce the potential for pesticide and nutrient contamination of groundwater and decrease runoff, erosion, and transport of nutrients and pesticides to surface water.

An irrigation system may be portable, or it may be established on the land to be irrigated. System components may include wells, a storage reservoir, a conveyance system, a sprinkler or trickle system, suitable pumps and a recycle storage pond to capture irrigation water down slope of the operation.

For further information refer to Soil Conservation Service Field Office Technical Guide (FOTG) in the Engineering Field Manual.

Irrigation best management practices include systems to prevent chemical backflow to the water source during chemigation. The purpose is to prevent contamination of a water source by installing devices that prevent chemicals from entering the irrigation water source. Various backflow prevention systems include an air gap, a check valve with vacuum relief and low pressure drain, double check valve, a reduced pressure principle backflow preventer and an atmospheric vacuum breaker. You must assess the characteristics of the chemical that can backflow, the water source and the geometry of the irrigation system before selecting a system.

An efficient irrigation system involves a planned system of crop irrigation that concentrates on water use. This system will ensure efficient use and distribution minimizing runoff or deep percolation and, eliminate soil erosion. Various systems may be used such as drip or trickle. All necessary facilities are installed for efficiently applying water directly to the root area of plants by means of applicators such as porous tubing or perforated piping; all under low pressure. A trickle system may allow for a reduction in runoff because it is constructed of one main line with a control head leading to laterals placed in the field. There is a potential for contamination of shallow groundwater if chemigation is used. A sprinkler irrigation system applies water by means of perforated pipes or nozzles operated above ground under pressure. Proper management of the system controls runoff and prevents negative impacts to downstream surface waters. Chemigation with this system allows management of nutrients, wastewater and pesticides however; poor management may cause contamination to surface and groundwater. Surface and subsurface irrigation systems, with proper management, will prevent downstream pollution associated with runoff and percolation including elevated temperatures of receiving waters.

Planning for irrigation water management involves determining and controlling the amount and timing of irrigation water in an efficient manner. This plan will help to minimize the loss of dissolved substances and sediments from the irrigation system to surface or groundwater. Efficient use of available irrigation water will promote the desired crop response, control water loss and protect water quality. The grower must know how to determine when irrigation water should be applied and how to measure or estimate the amount of water required for each irrigation. When scheduling irrigation times consider factors such as; soil properties, crop type, drought sensitivity and status of crop stress, stage of crop development, availability of a water supply and climatic factors. To properly irrigate consider adjustments to the water stream, rate and time, and management of runoff.

A tail-water recovery system is a facility designed to collect, store and transport irrigation tail-water for reuse in the farm irrigation system. This system will help to increase water efficiency and reduce possible contamination to the water supply by recovering irrigation water for reuse or proper disposal. The efficiency of irrigation water use is increased by using runoff water for additional irrigation or reducing the amount of water being diverted. In a tail-water recovery system, sediments, and substances attached to them, such as salts, metals, soluble nutrients and pesticides are trapped; decreasing the impacts to water quality downstream. Recovered water with high salt or metal content can be disposed of in an environmentally safe manner and location.

Water measuring devices such as an irrigation water meter, flume, weir or other device may be installed in a pipeline or ditch to monitor water use. These devices measure the flow rate and/or application of water and the total amount of water applied to the field with each irrigation. This information can assist in maximizing the efficiency of irrigation scheduling and equipment.

When planning an irrigation system, consider:

- The location of water courses, wells and wetlands relative to the area irrigated and the need for vegetated separating distances. This distance should be about 25 feet between irrigation areas and wetlands. If the area slopes or is adjacent to pristine or sensitive wetlands, the distance should be increased.
- Permeability of soils.
- The potential runoff of nutrients or pesticides to surface waters.
- Controlling surface runoff, erosion and leaching.
- Trickle or drip systems to control the amount and timing of water delivery to the crop.
- Developing and using water budgets and water balances for each crop grown.
- Adjusting stream size, application rate or irrigation time to compensate for changes in intake rate or the amount of water to be applied.
- Controlling erosion
- Estimating the amount of irrigation runoff from an area and how to control or limit the amount.
- Evaluating the uniformity of water application so it may be conserved.

For further technical information contact NRCS.