

Small Scale Solutions for your Farm

Selecting an Irrigation System

Irrigation can be expensive. Before you install an irrigation system, it is very important that increased yield and better crop quality will result in sufficient increase in income to offset the cost of installing and operating the irrigation system. This starts with choosing the right system.

Four Classes of Irrigation Systems:

- Sprinkler
- Surface
- Drip (or Micro-irrigation)
- Subsurface

Before deciding what method of irrigation to use, it is important to know how much and what quality of water is available, the soil type and slope of your crop fields and what crops you plan to irrigate. For instance, if you are mostly going to produce vegetables, then a drip system is most appropriate, while row crops are good candidates for surface and sprinkler systems.

Sprinkler irrigation is generally a high pressure and high flow irrigation system. Water is pumped and distributed through laterals and sprayed by system sprinkler heads. This system is often used on small farms because it is adaptable to a wide range of soil and field conditions.

Surface irrigation water is applied by flowing across the field in furrows. This is usually done where field slopes are flatter and the soils are less sandy. The water must make it across the field without over-watering the upper portions and without causing erosion.



Example of irrigation for a small system

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Drip irrigation or micro-irrigation systems apply water at a slow rate to crops at or below the soil surface through low pressure, low volume devices such as drip emitters, drip tape, micro spray and bubblers. Water is supplied through small diameter pipelines. Drip tape or pipeline with emitters can be either laid on the ground or buried a short distance below the surface. They are sometimes placed under a plastic sheet, which further conserves water and will help control weeds. Micro spray and bubblers are usually operated a small distance above the ground level. These systems are ideal for many vegetable and flower crops as well as orchards and vineyards.



Low-cost system

Drip irrigation systems are easy to install, are not affected by wind and are very efficient. Drip systems need to be designed so that they provide a uniform application of water across the field. These systems can be used on steeply sloping fields by using pressure compensating emitters or by placing lines across the slope. Drip emitters are best for vineyards, micro sprays for orchards and drip tape for vegetables.

Drip irrigation requires a high level of management and maintenance. The emitters and drip tape have very small discharge openings that are easily clogged. All drip irrigation systems require clean water to prevent clogging. For this reason, a filter is always required in a drip system. If a well is supplying the water, a fine mesh screen filter will work, unless the well is producing a large amount of sand. In that case, a centrifugal sand separator may be required. Water from a pond or stream will require a sand filter to remove sediment, algae and other impurities that will clog the emitters. All filters need to be cleaned on a regular basis. A method of flushing the lines should be provided at the lower end of the system.

Many drip systems, especially those that use surface water may experience algae and bacteria growth in the lines which will eventually clog the emitters. These problems can be controlled by periodic injections of chlorine into the system. Periodic injections of a mild acid solution may be needed if you experience a build-up of mineral deposits such as iron, calcium or magnesium.

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Subsurface Irrigation. If your field has a tile drainage system, and the conditions are right, you may be able to modify the system to apply irrigation water. You need a nearly level field and a water control structure at the outlet to control the water level in the tile system.

This allows you to hold back water that would otherwise leave the field and make it available to the crop. You can also add water by pumping into the system upstream of the water control structure. Careful management of this system is required to balance this system between irrigation and drainage modes.



Selecting a System

There are a variety of sprinkler systems to choose from; portable hand move, solid set, traveling gun, end tow and wheel roll. The uniform application of water across the field can be a problem with sprinklers. If a system is not uniform, some areas of the field will be over watered and others under watered. It is also important that the sprinkler system deliver water at a rate that matches the soil's ability to absorb it. Very tight (high clay) soils can present a problem.

Applying water faster than the soil can result in runoff and possibly erosion.

Water quality and quantity must be considered before selecting a sprinkler system. You need to have a good supply of water so that the system can operate without running out of water. A large well or pond is required for this type of irrigation system. If your water supply is high in iron or sediment, it may cause a discoloration of your crops and make it difficult to market them.

Portable hand-move systems are the least expensive but require the most labor.

Permanent solid set systems have the advantage of being easily automated and can also be used for frost protection. Solid set systems need weed control around risers to increase riser visibility and prevent riser damage caused by farm equipment.

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End tow and wheel roll systems/portable systems have the advantage that long lines can be moved by tractor or motors which will reduce labor requirements but will add to the initial cost of the system.

Traveling gun systems have the advantage of covering large field areas with each pass, but the high pressures at which they operate will cause you to spend more on fuel. In addition, large sprinkler water drops may damage some crops.



Sprinkler system

Which system is best for me?

This is a decision you will need to make based on the crops you grow, the water supply available to you and the soils and slopes in your field. It will depend on how much you are willing to invest initially, how much labor you have available, and how much time you want to spend managing the system.

Associated Costs

When selecting an irrigation system, you need to consider both the initial system cost and the operating costs of the system. The exact cost can only be determined once a system is designed, but the following table can act as a guide:

Type	Estimated Costs
Well and Pump	\$5k to \$10k each
Hand Move System	\$2k to \$ 3k/acre
Solid Set System	\$4k to \$ 8k/acre
Traveling Gun	\$1k to \$ 8k/acre
Drip System	\$2k to \$ 4k/acre
Subsurface	\$3k to \$ 6k/acre

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Technical and Financial Help Is Available

Whether you measure your farm in terms of feet or acres, your local Natural Resources Conservation Service (NRCS) office has experienced conservationists that can help you develop a Conservation Plan to conserve, maintain, and restore the natural resources on your land and improve the long-term health of your operation.

There is no charge for our assistance. Simply contact your local office to set up an appointment. You may also be eligible to receive financial assistance. Your NRCS office will explain any programs that are available so you can make the best decision for your operation. All NRCS programs and services are voluntary.

For More Information

Visit the [Natural Resources Conservation Service](#) or visit farmers.gov/service-locator to find your local NRCS office. You can also check with your local USDA Service Center, then make an appointment to determine next steps for your conservation goals.

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

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NRCS conservationist assisting small scale farmer with developing a customized conservation plan.

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