A GUIDE TO WATER QUALITY & EFFICIENCY ON THE FARM

FARMING IS IMPORTANT

The United States has approximately 900 million acres of agricultural land. Farmers provide us with an abundant supply of food, make an important contribution to the economy, strengthen their local communities, and act as stewards of the land.

GOOD LAND & WATER MANAGEMENT PAYS!

There is a lot to know about owning or managing agricultural land, and it can be overwhelming! We wrote this guide to help you put together a management plan that works for you.

Along with ensuring quality water for you, your community, and surrounding ecosystems, proper management of your resources can pay off economically by increasing long-term property value and productivity. With a little planning, you can efficiently manage your land and water and benefit too!

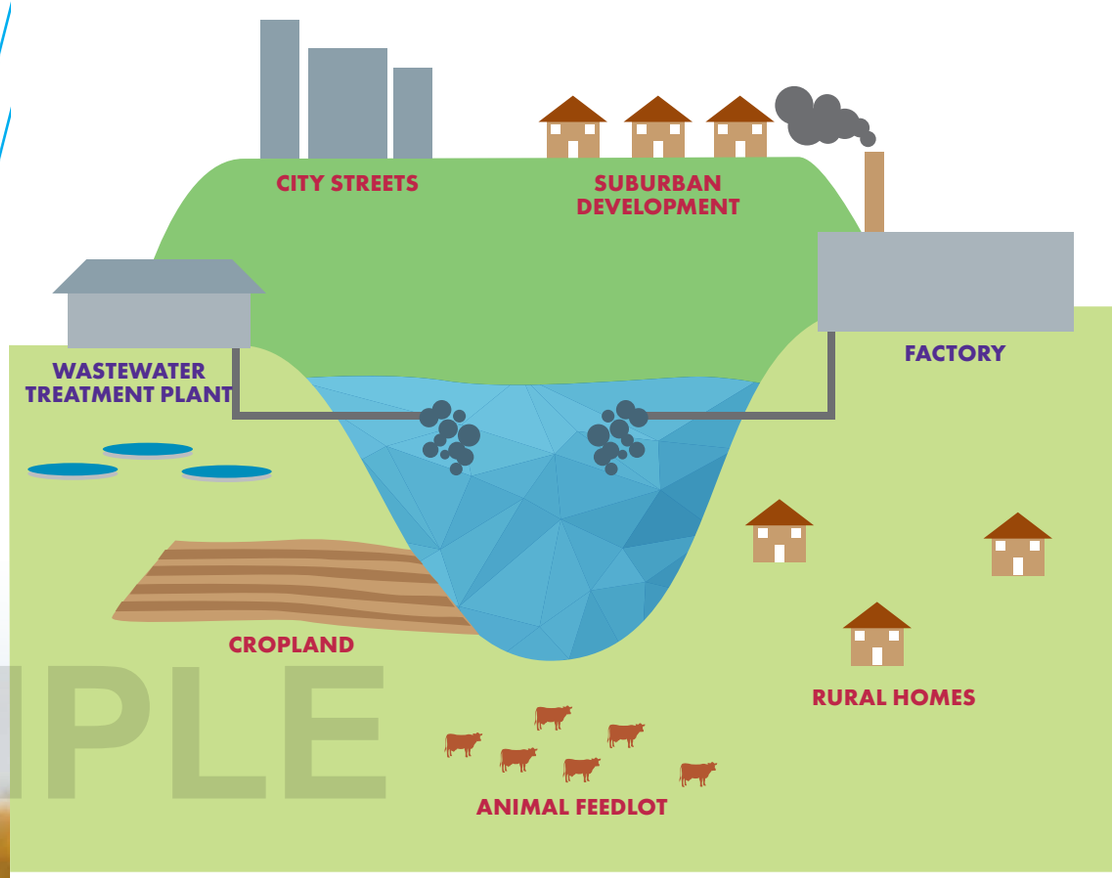
WATER QUALITY

ACCESS TO CLEAN WATER IS A VALUED RESOURCE

Fresh water found in the ground and on the surface is an important source of water for drinking, agriculture, and recreation. But freshwater reservoirs are often susceptible to contamination from a variety of sources including runoff of chemical fertilizers, pesticides, and animal waste from farming operations.

WATER POLLUTION SOURCES

KEY
POINT SOURCE
NONPOINT SOURCE



Sources of groundwater and surface water pollution are classified as "point" or "nonpoint" pollution. **Point source** pollution comes from a single source and can usually be traced back to its origin. **Nonpoint source** (NPS) pollution is the result of many dispersed pollution sources and is often called "runoff." NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the water moves, it picks up pollutants, finally depositing them into lakes, rivers, wetlands, oceans, and groundwater. Pollution originating from agricultural land is most often nonpoint source pollution. The good news is, management practices are very effective in reducing runoff and protecting water quality. And many government programs are available to help farmers design and pay for better land and water management approaches.

MANAGEMENT

HOW TO MANAGE SEDIMENT, NUTRIENTS, AND PESTICIDES

Water and land management plans are an important part of any agricultural operation. This book will help you identify best management practices (BMP) that are right for your farm or agricultural site. Proper management of sediment, nutrients, and pesticides can bring significant benefits to you and your community—and can help you protect water quality and save money, too.

SEDIMENT

Soil erosion can be caused by either water or wind and occurs when soil is removed and carried elsewhere. Soil erosion has many negative on-farm and off-farm impacts.

On-farm impacts may include low fertility levels and crop yields, development of gullies in the field, less water infiltration into the soil, and more runoff after storms.

Off-farm impacts may include eroded soil deposits in depressions and adjacent fields, decreased water quality, the decline of nearby aquatic ecosystems, clogged drainage systems, and other costly problems.

Management practices to reduce erosion

Soil erosion can be a big problem in the maintenance of productive agricultural land as well as for water quality. Sediment-control practices are an important part of any management system.

Crop residue management is the practice of conserving the remains of a crop on the field, including stalks and stubble (stems, leaves, and seed pods).

Benefits: Crop residues increase irrigation efficiency, minimize soil erosion and runoff, improve the soil over the long term by increasing organic matter, and can increase future crop yields, lower fuel bills and water usage, and minimize wear and tear on farming equipment.

Residue considerations:

- Some crops produce more residue than others
- Narrower rows and higher plant populations increase residue at harvest
- Bailing and grazing will reduce residue cover

Tillage systems loosen the soil and help to create a soil environment favorable for crop growth. Tilling helps to prepare the seedbed, kill weeds, manage residues, and incorporate nutrients into the soil. There are many different types of tillage systems. Choose the one that fits your farm's specific needs. When developing a tillage system, it may be helpful to experiment with a few different methods on small areas of land.

Tillage considerations:

- The shallower the tillage, the more residue will be left on the surface
- Slow tillage will leave more residue on the surface
- Excessive tillage can decrease organic matter, reduce biological activity in the soil, and reduce the soil's nutrient-holding capacity

Conservation tillage and **reduced tillage systems** refer to any system of cultivating where at least 30% crop residue remains on the surface at the time of planting. When compared with conventional tillage systems, which turn over the soil completely, choosing a conservation tillage system provides many benefits.

Benefits: A conservation tillage system will reduce erosion and soil and water loss, increase the level of oxygen in the soil while providing a good environment for insects and other organisms, help protect young plants from harsh weather conditions, and reduce farm labor.

Types of conservation tillage systems:

- **Ridge-till** is a conservation tillage system where row crops are planted on ridges that are three to six inches above the troughs or furrows. During planting, crop residues are cleared from the ridge tops and moved into the adjacent furrows.
- **Strip-till** is a conservation tillage system where the soil is left undisturbed from harvest until planting except for the strips (which can be up to a third of the row width). The strips are cleared of residue and tilled before or during the planting operation.
- **No-till** or **direct seeding** is a reduced tillage system where tilling occurs only at the time of seeding, leaving the crop residue undisturbed from harvest to planting. Crops are planted by opening a narrow slot of sufficient width and depth to obtain proper seedbed coverage. Before seeding, a maximum amount of crop residue is maintained (more than 70% residue cover). No-till can be used for almost any crop in almost any soil.

FACT: Conventional tillage systems lead to water waste and soil erosion. By using conservation tillage systems, farmers can reduce soil erosion by ***50%***

Contour farming is the practice of planting crops perpendicular to the land's slope and at level, constant elevations. Parallel furrows and crop rows act as reservoirs to catch and retain rainwater, increase infiltration, and promote a more uniform distribution of water. Contouring is very effective for farming on hillsides and promotes better water quality and crop yields.

Benefits: Contour farming reduces chemical and nutrient runoff, wear on farming equipment, soil erosion, and loss of sediment from the land. Contour farming is most effective when implemented with strip cropping, vegetative barriers, and terracing practices.

Contour strip cropping is a crop rotation and contouring system to minimize soil erosion and protect water quality. Equal-width strips of meadow or small grain are alternated with row crops planted along the contour.

Benefits: Contour strip cropping may reduce fertilizer costs by providing natural nutrient inputs, minimizes soil erosion and runoff, and protects water quality.

Terracing is an erosion reduction practice in which horizontal terraces are established on sloped lands. Terraces are designed to catch rainwater and guide it along to another location, such as a grassed waterway.

Benefits: Terraces improve water and soil quality, reduce runoff and erosion, and provide cover and habitats for wildlife.

Water and sediment control basins (WASCOBs) can be used on irregular land where contour farming, strip cropping, and terraces practices are difficult to implement. A WASCOB is an embankment built perpendicular to areas of concentrated flow on a field. WASCOBs are commonly built in a parallel series and are designed to trap runoff and sediment.

Benefits: WASCOBs reduce runoff and sediment loading, prevent field gullies, and control erosion on irregular land.

Cover crops are crops such as rye, buckwheat, legumes, and grasses that provide soil cover during winter and protect soils from wind and water erosion.

Benefits: Cover crops provide seasonal soil protection, control erosion, and improve soil fertility.

Grassed waterways are natural or manmade, broad, shallow channels that are seeded with grass or another suitable vegetation.

Benefits: Grassed waterways carry runoff across the grass (which slows the water) from terraces or other areas of water concentration without causing erosion or flooding.

Windbreaks are an effective way to protect soil from erosion.

Benefits: Planting rows of grasses, trees, and shrubs perpendicular to the wind direction helps to protect the soil against the erosive forces of wind and water.

NUTRIENTS

In most agricultural operations, chemical fertilizers and manure containing nitrogen (N), phosphorus (P), and potassium (K) are applied to crops and soils to support growth. Nitrogen and phosphorus are the greatest concerns when it comes to water quality and are the main points of focus of nutrient management plans. Nutrient management is especially important on slopes, on soils with high nutrient levels, and in environmentally sensitive areas. Improper application and management of nutrients can cause problems with local and downstream water quality. Nutrients lost from farms that enter surrounding waterways and aquifers can cause eutrophication—a high nutrient concentration resulting in harmful algae blooms that can cause plant and fish death, oxygen depletion, and contamination of drinking water supplies.

Nutrient management

Proper management of nutrients produces crop yield benefits while minimizing environmental impact. No single nutrient management system will control a particular pollutant in all situations. It's best to design a system specific to the conditions on your farm.

Properly managing your farm's nutrients will help to save money, enhance profitability, and protect local water resources.

- **Know what you have.** Test and sample your soils regularly. This will allow you to determine your soil's and crop's specific nutrient needs and apply only the amount of nutrients necessary.
- **Know what and how much you are applying.** Know and understand the nutrient content of chemical fertilizers, manure, compost, and other materials you use. Use the recommended amount for the crop you want to grow, as manure and other nutrients should be applied to crops based on their specific needs. Know how much you're applying, and calibrate your fertilizer spreader. Applying too much, especially at the wrong time, can increase nutrient loss, runoff, and pollution.
- **Know how and when to apply.** It's best to not apply fertilizers or manure when the soil is saturated, frozen, or snow covered or when a storm is on the way. Don't exceed crop nutrient requirements or apply nutrients near surface waters. Applying nutrients at the right time and place can maximize uptake by the crop and reduce loss to environment. Try splitting the total amount of fertilizer into two or more applications during the growing season rather than applying it all at once.

Nutrient management practices

Precision farming, or **site-specific management**, is a nutrient management practice that uses information and technology-based systems for the management of crops. This method allows the farmer to tailor nutrient application to specific plots or sections within a field. The amount of nutrients applied within fields varies based on soil tests and global positioning system (GPS) monitoring and is fitted to crop needs.

Benefits: Precision farming allows farmers to reduce the costs of seed, water, and chemicals while increasing crop yields and reducing environmental impacts.

GPS grid sampling and **flow meters** are used to tailor nutrient application rates to the needs of each soil type rather than using the same rate across an entire field. This is called variable-rate application; it is an important technique because farm fields (especially larger fields) typically contain several soil types.

RIPARIAN BUFFER DON'TS:

- **Do not** farm up to the edge of a stream or waterway
- **Do not** allow livestock access to the riparian zone
- **Do not** remove trees, shrubs, or other vegetation from a riparian zone

Banding, side-dressing, and **injection** are nutrient management practices that place nutrients where they are most likely to be used and taken up by crops. Banding methods place nutrients around the seed or seedlings at planting. A banding treatment after the crop is planted is called a side-dress application; nutrients are applied in surface or subsurface bands along the sides of plant rows.

Cover crops help nutrients stay in the soil where plants can use them.

Riparian buffers are areas of permanent vegetation often situated between livestock confinement areas, cropland, or grazing land and environmentally sensitive areas like river, streams, or wetlands. It's recommended to use native shrubs, trees, and other native vegetation.

Benefits: Buffer strips intercept nutrient runoff and help to prevent it from entering surface water, provide habitats for local wildlife, and slow floodwaters and rainwater runoff.

INTEGRATED PEST MANAGEMENT

1 PREVENT ~ 2 MONITOR ~ 3 INTERVENE

1 PREVENT	2 MONITOR	3 INTERVENE
Pick the best crops for growing conditions; rotate crops	Check crops regularly for weeds and pests; keep beneficial pests	If necessary, intervene to control pests using minimal chemicals

PESTICIDES

Pesticides, including insecticides, herbicides, and fungicides, are used to kill agricultural pests. Improper management of these chemicals can lead to water contamination through direct application and runoff, fish and wildlife death, and contamination of food sources.

Pesticide management practices

To reduce contamination from pesticides, farmers can properly manage their pesticide use through **integrated pest management (IPM)** techniques. IPM techniques vary from farm to farm and depend on soils, climate, pest history, and crop conditions.

Benefits: IPM techniques encourage limited pesticide use and natural barriers and minimize pesticide movement from the field.

Integrated pest management programs use a range of methods to maintain economical crop production while minimizing the risks of pesticide use to humans, animals, plants, and the environment. Options include monitoring, mechanical trapping devices, natural predators, biological pesticides, and, if appropriate, chemical pesticides.

- **Pesticide selection is important.** Know your product! Select a pesticide that will have less impact on the environment. Know the pesticide's sorption properties (how tightly the pesticide is held by the soil surfaces) its water solubility (the amount of pesticide that will dissolve in water) and its persistence (how long it remains in the environment). Pesticides with high sorption and low solubility are less likely to leach into groundwater and be transported by runoff. Pesticides with low persistence are likely to break down into less harmful compounds before moving into the surrounding environment.
- **Timing.** Most often, contamination events happen when pesticides are applied at the wrong time, such as just before a heavy rainfall or when runoff can easily move the newly applied pesticide into nearby water bodies. It's best to apply pesticides only when they are needed and during conditions when pesticide movement to the groundwater or surface water is least likely.
- **Sprayer calibration.** To apply the correct amount and to avoid application errors, make sure your sprayers are calibrated regularly. Most application errors occur because of incorrect pesticide concentration in the tank, a mixing error, incorrect sprayer output per unit area, or a calibration error. Calibration errors are often due to improper travel speed or nozzle pressure or the use of faulty or worn nozzles. Calibration errors can be minimized by properly matching sprayer discharge rate, swath width, and travel speed.
- **Avoid sensitive areas.** Be aware of sensitive areas, such as wells and surface water. When applying pesticides near these areas, be sure a buffer zone is in effect to control any runoff.

Consider some alternatives to chemical pesticides:

- Biological pesticides, which target specific pests
- Microbial pesticides, which employ microorganisms, including fungi, viruses, and bacteria
- Pheromones, which disrupt normal pest mating behavior
- Growing healthy, well-adapted crops, because healthy crops and soils are less affected by pests

Proper storage of fertilizer and pesticides

Properly designed storage facilities for fertilizers and pesticides are safer for workers and minimize the risk of point source contamination.

An ideal storage facility incorporates:

- Separate storage of fertilizers and pesticides
- Secondary containment of small spills resulting from normal mixing and loading operations
- Secondary containment of large, accidental spills or leaks
- Proper facilities to collect, store, and recycle excess spray solutions and rinsates
- A dry area for storing empty containers and other waste before disposal

LIVESTOCK

If not properly managed, livestock and animal waste on farms may contribute to nutrient and pathogen pollution of surrounding surface water and groundwater through leaching and runoff. Nutrient loading can cause harmful algae blooms and oxygen depletion as well as the contamination of drinking water supplies. Uncontrolled grazing can degrade riparian areas. Good livestock management makes your property more valuable and protects water quality and wildlife habitats.

Livestock confinement areas or **animal feeding operations** are facilities where animals are kept and raised in confined spaces. These operations are often major sources of animal waste. Runoff from poorly managed facilities can carry various pathogens, such as bacteria and viruses, and nutrients that have the potential to cause water quality problems. Groundwater may also become contaminated through the seepage of waste or leaching. Farmers can limit nutrient loss and leaching by properly storing and managing livestock and animal waste.

Effective livestock management practices:

- Minimize barnyard and manure runoff into streams and other waterways
- Properly store manure for use during the growing season
- Manage animals and manure to maintain field quality and control animal traffic near bodies of water
- Keep detailed records

HOW TO REDUCE MUD:

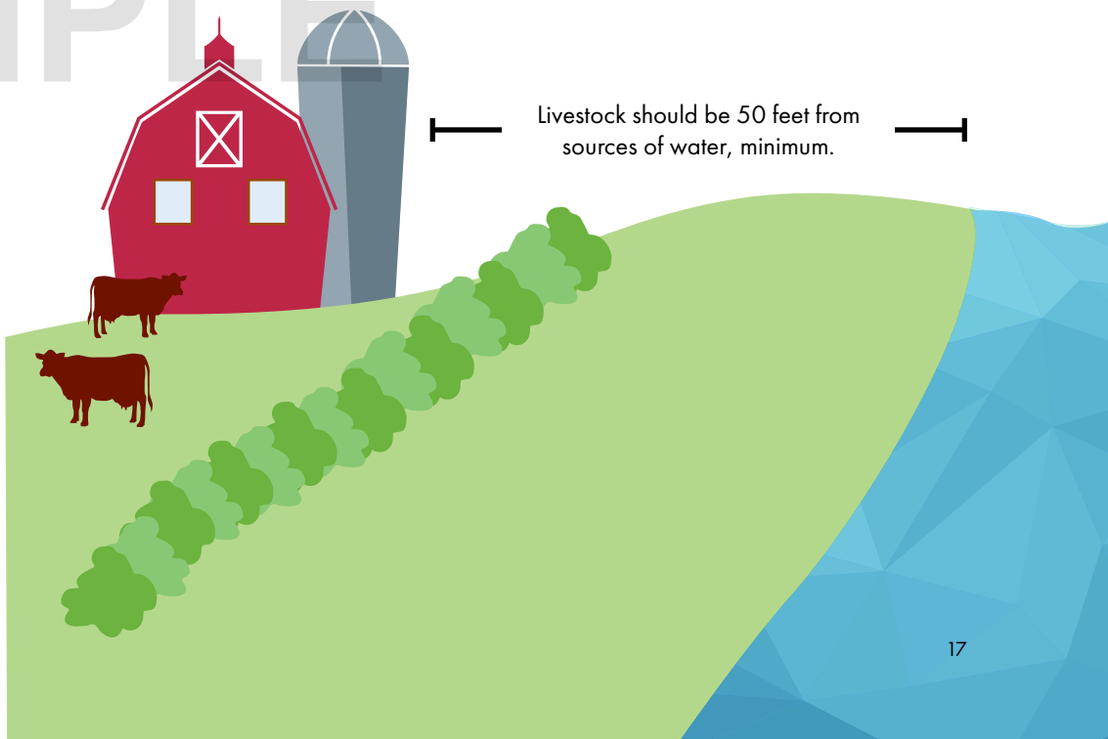
- Remove animal manure from stalls every one to three days
- Use a footing material in high-traffic areas—footing should be at least 6 to 12 inches deep and include materials such as hog fuel, wood chips, and gravel
- Install gutters and downspouts that divert rainwater away from the confinement areas on all buildings

Management practices

Reduce mud. Excess mud in or around livestock confinement areas can lead to increased surface erosion and runoff. Mud may harbor bacteria and other pathogens that can cause disease and water contamination, and it serves as a breeding ground for various insects. Standing in mud can be unsafe for animals too.

Reduce barnyard runoff. When designing your space, make sure to place the water supply well upslope from the barnyard.

Maintain healthy riparian vegetation. Filter strips slow runoff and filter microorganisms, nitrogen, phosphorus, organic matter, and sediment before they reach a waterway. Filter strips can keep fecal coliform and other pathogens from entering the water supply.



Remember:
Grazing in the filter strip should not be permitted. To protect water quality, fence animals out of streams, ditches, and riparian vegetation areas. Plant and maintain native trees, shrubs and ground covers along streams.

Keep manure piles protected from rain and surface runoff. It's best to store manure piles on high, well-drained areas far (at least 100 feet away) from surface waters. Manure piles can be covered in many ways, from pinned down tarps to more high-tech storage areas with roofs and concrete floors.

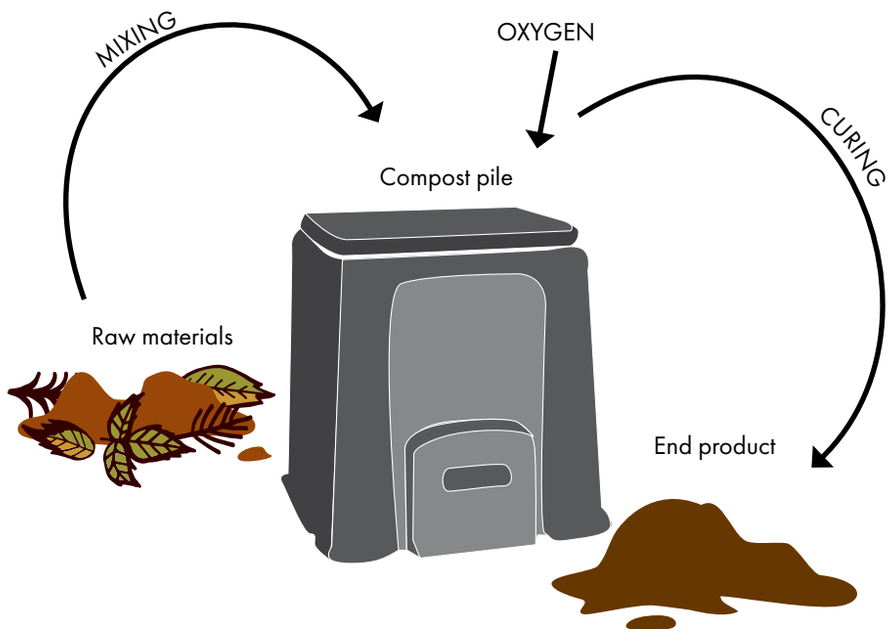
Options for manure storage:

- **Stockpiling.** Solid manure and livestock bedding are piled up and covered with a plastic tarp to reduce odors and flies and minimize leaching. The pile should have a small slope (1–3%) to facilitate drainage to a vegetated filter strip.
- **Dry stack.** A dry stack is a three-walled manure storage facility with a slightly sloped concrete floor.
- **Composting.** Composting requires taking the pile's temperature and turning it regularly to mix and aerate it. This method provides a place for bacteria to thrive and kills most disease-causing organisms, reduces the size of the manure pile, provides a more stable source of nitrogen, and reduces leaching. The final product of this manure-storage method is profitable.
- **Hauling away.** This method requires a dumpster or other semiportable holding structure in which to store manure. As needed, the waste is picked up for reuse on other cropland.

Keep clean-water runoff from flowing through livestock facilities and manure storage piles. Provide gutters and downsprouts that move clean runoff away from buildings and storage areas.

Prevent livestock overgrazing. Overgrazing exposes soils, increases erosion, and may destroy vegetation buffer strips necessary for water quality filtration.

THE COMPOST PROCESS



Practices that reduce the impacts of grazing on water quality:

- Adjust grazing intensity, or try rotational grazing. Be sure to provide time for regrowth.
- Keep livestock out of sensitive areas, such as buffer strip areas
- Provide alternative sources of water and shade
- Keep livestock off pastures in the winter

Provide alternate drinking areas away from surface water. Use fences and water gaps to limit access to streams and rivers on your farmland. If this is not an option, allow animals to access only a small section of the stream or river. During drought conditions, be sure to provide shade and shelter for animals if they are kept outside, and keep drinking water clean and access constant. Consider spraying animals with a water mist if the situation worsens.

SOIL

Soil health is an important factor in any agricultural operation. Healthy, fertile soil is able to absorb, transmit, and retain water and nutrients for optimal plant growth. Healthy soils absorb and store rainwater more efficiently, while pores allow water to penetrate deeply. Healthy soils increase profitability and provide environmental protection. Soil's organic matter can be managed in many ways to maintain chemical balances, avoid compaction, and reduce erosion and runoff.

Soil management practices

Manage organic matter. Healthy soils are high in organic matter and contain a variety of living organisms. Organic matter enhances soil's water and nutrient holding capacity and protects soil from erosion and compaction. Practices such as crop residues and cover crops, applying manure or compost, and mulching help to maintain an abundance of organic material in the soil.

Prevent compaction and avoid excessive tillage. Soil compaction is often caused by heavy animal or equipment traffic or by leaving bare soil exposed during heavy rains. Compaction reduces soil's ability to absorb and transmit water and nutrients.

Benefits: Reduced-tillage practices minimize organic matter loss and runoff.

Maintain a healthy chemical balance. Nutrient management practices help to prevent overfertilization and allow for the application of nutrients at the right time and place. Add nonchemical approaches such as crop rotations, cover crops, and manure management.

Reduce erosion and runoff. Bare soil is vulnerable to wind and water erosion. Protect soils by leaving crop residue on the surface between growing seasons.

Benefits: Groundcover reduces erosion and runoff while also providing habitats for soil organisms, such as insects and earthworms.

Mulch. Mulch can help to control weeds, warm the soil, and reduce evaporation. Organic mulches like straw, hay, grass clippings, pine needles, and leaves conserve moisture in the soil too.

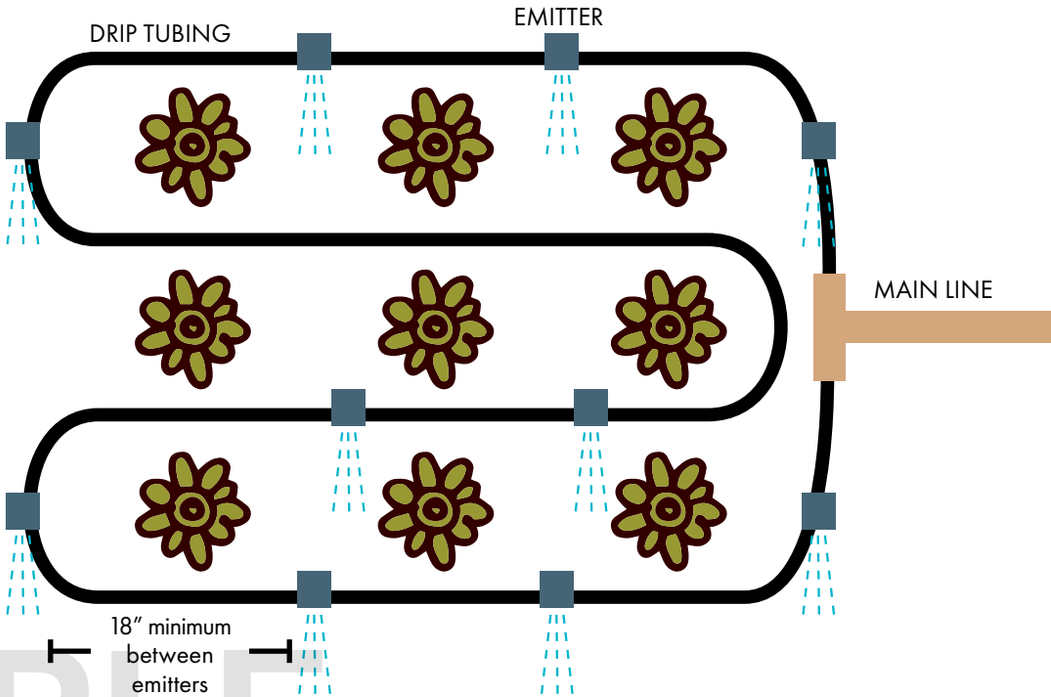
Monitor your soil. Soil tests will give you information on soil pH and levels of phosphate, potash, magnesium, and calcium. Soil moisture sensors are available for easy monitoring.

WATER EFFICIENCY

GLOBALLY, AGRICULTURE IS THE BIGGEST CONSUMER OF FRESH WATER SUPPLIES.

Globally, agriculture is the largest consumer of freshwater. Often, water use in agricultural production is inefficient, with only a small part of the water that's used being used effectively. So, how can we grow food with less water? Valuable freshwater is most commonly lost through runoff and evapotranspiration, leaks in irrigation systems, growing plants unsuited to the local climate, and excessive fertilization methods. By improving the efficiency of irrigation and other agriculture methods, farmers can save water and money year round. Increasing water efficiency is especially important in water-stressed, drought-prone areas!

DRIP IRRIGATION



IRRIGATION

Irrigation is needed when the water needs of plants cannot be satisfied through natural precipitation. Irrigation supplements natural precipitation while protecting crops from freezing or wilting. Ideally, irrigation should aim to precisely cover the deficit between a crop's water needs and what it can take up naturally from the soil. Inefficient irrigation may cause water quality problems through erosion and the transportation of nutrients and pesticides.

Farmers can reduce pollution and improve water use efficiency by considering the following:

- Crop type
- Irrigation scheduling
- Irrigation methods
- Irrigation maintenance
- Recycling, capturing, and storage

Water efficient irrigation methods

Different crops require different amounts of water, both daily and throughout the growing period. Crops with high daily needs and long growing seasons require much more water than those with lower daily needs and shorter growing seasons. This knowledge is vital when implementing irrigation scheduling.

Soil moisture-monitoring methods provide a good assessment of a crop's water needs and allow for effective irrigation scheduling. They provide climate information and adjust the system to account for hot, windy, or dry conditions.

Many soil moisture–monitoring methods are available:

- Feel and appearance method
- Gravimetric methods
- Gypsum blocks
- Granular matrix sensors
- Tensiometers
- Capacitance or frequency domain sensors
- Neutron probes

Soil water capacity provides an estimate of how much water the soil is able to hold between irrigation or precipitation events. The ability of soil to hold water depends on properties such as soil porosity, soil type, and soil water tension. Soil capacity assessments are often difficult for individual farmers to implement, but the information may be available for certain regions.

Evapotranspiration is loss of water from the soil by evaporation and by plant transpiration. Evapotranspiration depends on temperature, wind, and the amount of incoming solar radiation (that's sunlight!). Evapotranspiration rates are an important consideration in irrigation scheduling.

Know climate and weather patterns. Knowing the weather allows farmers to adjust and schedule irrigation according to weather events. Keeping the weather in mind may save water, money, and reduce equipment wear and tear.

Monitoring how much water is used is an important part of implementing successful irrigation scheduling. Accurate readings can be obtained through direct or indirect measurement methods.

FACT: Most irrigated farms use 2-3 times more water than their crops need and waste between ***50%*** and ***80%*** of irrigation water through leaks, runoff, and evaporation.

Irrigation methods

Choosing an efficient irrigation method can help you save on water and energy costs.

The three most commonly used irrigation methods:

- Surface or gravity irrigation
- Sprinkler irrigation
- Drip irrigation

Surface irrigation refers to a group of irrigation methods including basin, corder, and furrow irrigation, that rely on gravity to distribute water over the surface of the land. These methods are very wasteful—the crop uses less than 10% of the water applied to the land. Surface irrigation methods are not recommended, as they are not water efficient and may lead to a decrease in water quality.

Sprinkler irrigation refers to a group of irrigation methods that imitate natural rainfall. Water is carried through pipes and sprayed onto the land through sprinkler heads. Conventional sprinkler irrigation systems spray water into the air, where a large amount is lost to evaporation (especially on hot or windy days). Low-energy precision application (LEPA) sprinkler systems are a more efficient alternative, as they spray water only at the base of the plant. LEPA systems are highly efficient and will save on both water and energy costs.

Drip irrigation, or micro-irrigation, delivers water to the soil surface, directly onto the roots of plants through a system of pressurized pipes and drippers. This method delivers water to crops slowly and consistently. It is highly efficient and is not time or labor intensive. This method allows water and nutrients to be more easily absorbed, thereby conserving water, increasing crop yield, and decreasing erosion. Timers can be integrated into most drip irrigation systems.

Irrigation maintenance

Irrigation audits are important to the maintenance of an efficient system. Audits test an irrigation system's performance and monitor its use of water over an extended period of time. Irrigation audits can help farmers to develop more efficient and effective methods for their land.

The phases of an irrigation audit are as follows:

- Data collection, including a map of the field and information on crop types, field slope, and soil types
- An on-site audit
- An audit report and options to improve on the current irrigation system

Check for leaks often. Repair leaks in the irrigation system as soon as you find them. Know the life expectancy of sprinkler heads and other parts of the system, and replace them as needed.

Recycling, Capturing, and Storage

Water recycling, capture, and storage is beneficial to local ecosystems, increases the resilience of farming operations during drought conditions, and saves water and money too. Practices that recycle, capture, and store water include the following:

On-farm water storage or holding ponds capture and store rainwater and irrigation runoff for use later in the season.

Rainwater harvesting is a water-capturing method that is most practical in areas where short periods of heavy rainfall are followed by long dry stretches.

Tailwater return systems recover and reuse water for irrigation.

Rain gardens are designed to trap runoff water from impervious surfaces. Rain gardens reduce flooding and drainage overflow and protect surrounding waterways, such as rivers, streams, and lakes, from pollution.

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WaterSense, U.S. Environmental Protection Agency
www.epa.gov/watersense

For more information about Water Education Group, visit www.watereducationgroup.com