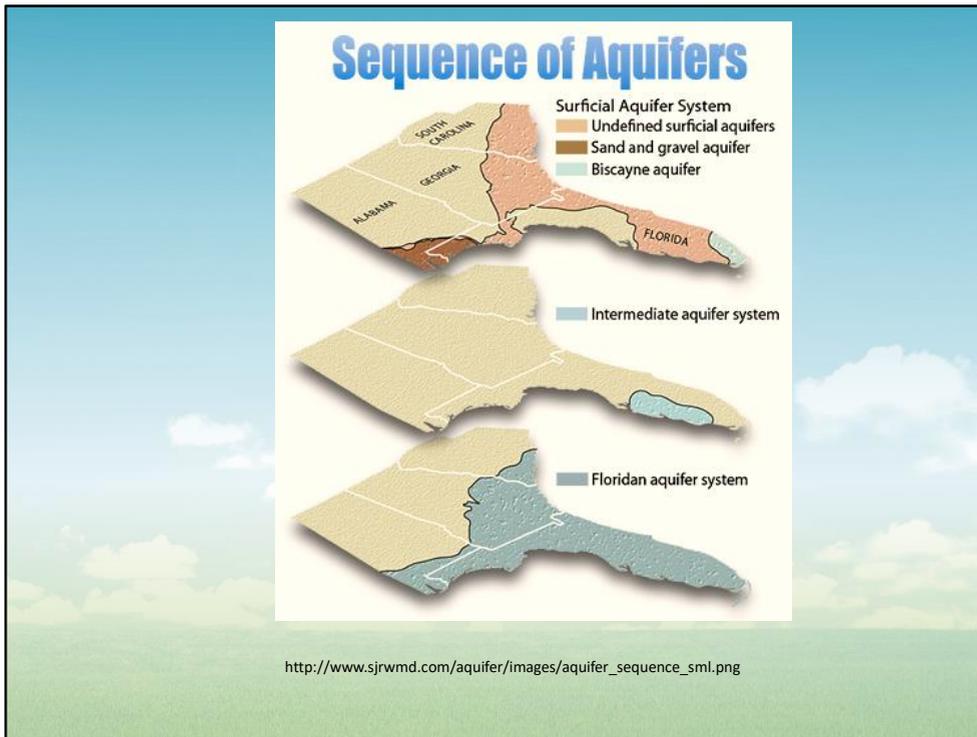


Florida Irrigation



Essential Questions

- How is rainfall important to irrigation?
- What is the difference between rainfed crops and irrigated crops?
- What are some of the different types of irrigation practices?

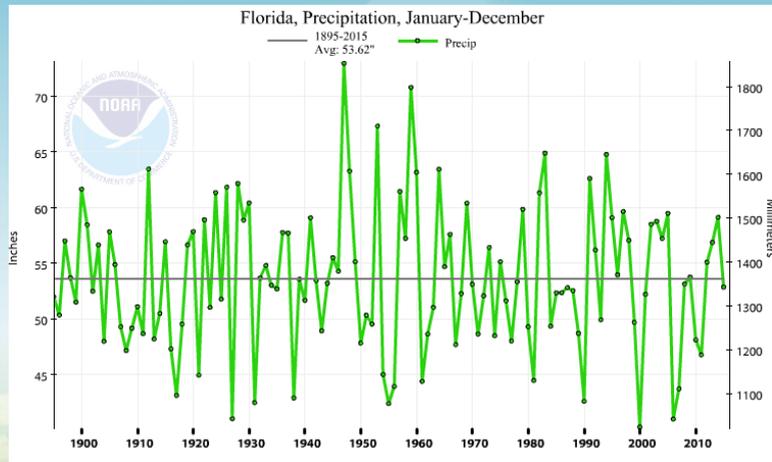


An aquifer is a body of saturated rock through which water can easily move, so think of an aquifer as a huge underground water storage area. Aquifers must be both permeable and porous, allowing water freely transmit to wells and springs.

They can be composed of different types of earthen materials, such as sand, shells and limestone. Freshwater generally fills the uppermost part of aquifers, while salt water is present at greater depths.

The water stored in the aquifer is replenished, or recharged, by rainfall. However, not all of the rain reaches the aquifer. Most of the water evaporates or runs off the land into surface waters, like lakes, rivers and streams, before it has a chance to soak into the ground. The remaining water recharges the aquifer in limited areas.

Rainfall in Florida

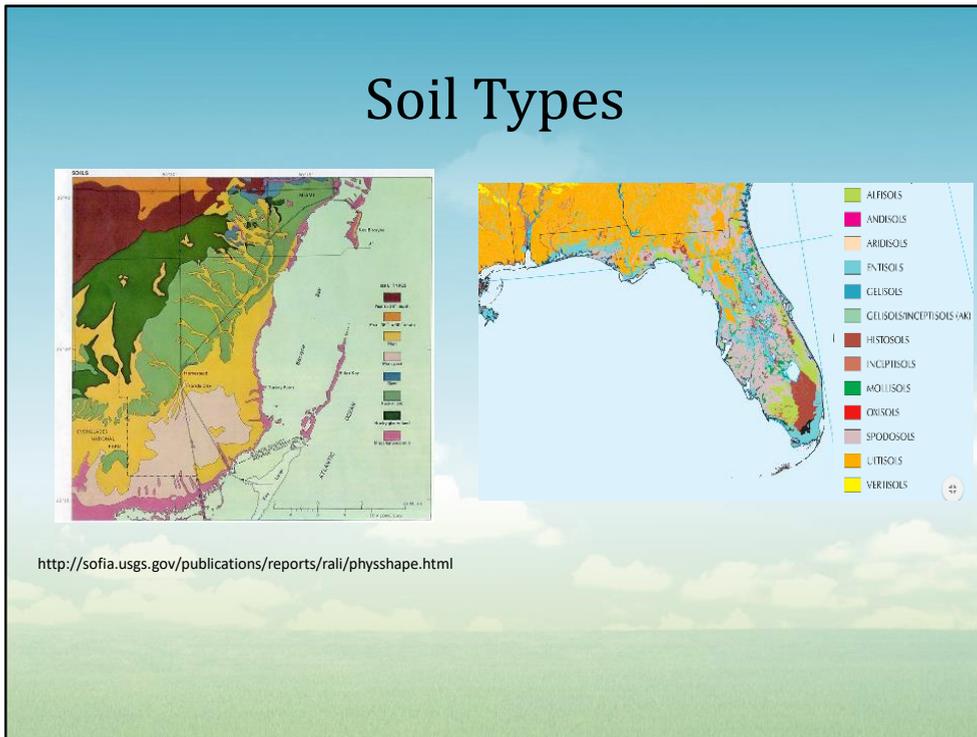


http://www.ncdc.noaa.gov/cag/time-series/us/8/0/pcp/yttd/12/18952015?base_prd=true&firstbaseyear=1895&lastbaseyear=2015

Even though the average annual rainfall in the state is about 54 inches, the amount of rainfall the state actually receives varies from year to year. These variations have a significant impact on the water resources that are available to agricultural interests across the state.

Florida averages nearly 54" of rainfall each year, but the amount of rain observed across the state varies depending on location. The wettest parts of the state are the Panhandle and southeastern coast, while the Florida Keys tend to be one of the drier places. Most of the rain that falls in Florida is convective rainfall, meaning it forms from water that has evaporated from the Earth's surface due to the heat of the sun. In the northern part of the state there are two rainy seasons, one during the winter with the passage of cold fronts, and one during the summer. The summer rainy season typically starts in the southern part of the state in late April and moves north by June.

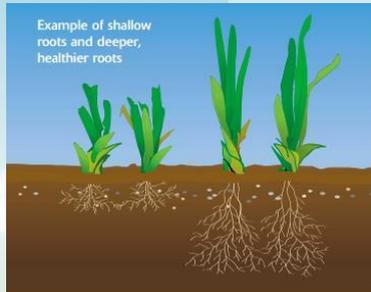
Soil Types



Florida has many different soil types. The soil type determines how much and how long water can be retained by the soil. For example, sand does not hold water long, while clay has a much higher water holding capacity.

All soils are made up of mineral materials (sand, silt, and clay), organic material (decomposing plant parts), water, and air. The parent material of the soil varies greatly by region. Florida's soils are quite unlike those of its surrounding states. The State of Florida has the largest total acreage of Aquods (wet, sandy soils with an organic-stained subsoil layer) on flatwood landforms in the nation. Aquods are the wet organic soils, characterized by a shallow fluctuating water table. Most of these areas in Florida have been cleared and are used as cropland or pasture. Aquods are naturally infertile, but they can be highly responsive to good management.

Water availability affects root growth



http://www.swfwmd.state.fl.us/publications/files/waterwise_landscapes.pdf

Irrigation should allow a little stress on the root system in order to encourage deeper root growth. Shallow roots will require more frequent waterings.

Water is an essential piece of photosynthesis and moves nutrients through various plant parts. It is important also in cooling the surfaces of land plants by transpiration. The total water requirement for a plant is the amount of water lost from the plant plus the amount evaporated from the soil. These two processes are called evapotranspiration. These processes can be influenced by: Weather conditions, (temperature, cloud cover, wind, and relative humidity) mulching, plant type and size, and number of plants growing in a given area.

Water moves downward through a sandy coarse soil much faster than through a fine-textured soil such as clay or silt. Soil moisture influences both hydrological and agricultural processes, and is part of the water and energy cycles through evapotranspiration.

Moisture in the soil feeds all organisms (plants, plant roots, and animals). It carries nutrients into the soil that promotes plant growth. Overwatering can deplete oxygen levels in the soil, which can lead to diseases in the root system. Underwatering can lead to slow growth, poor production and the eventual death of crops.

Pivot Irrigation



http://aspenranchrealestate.com/Irrigation_For_Growing_Hay



<http://www.corbisimages.com/stock-photo/rights-managed/42-26915651/aerial-irrigation-center-pivot-irrigation-circles>

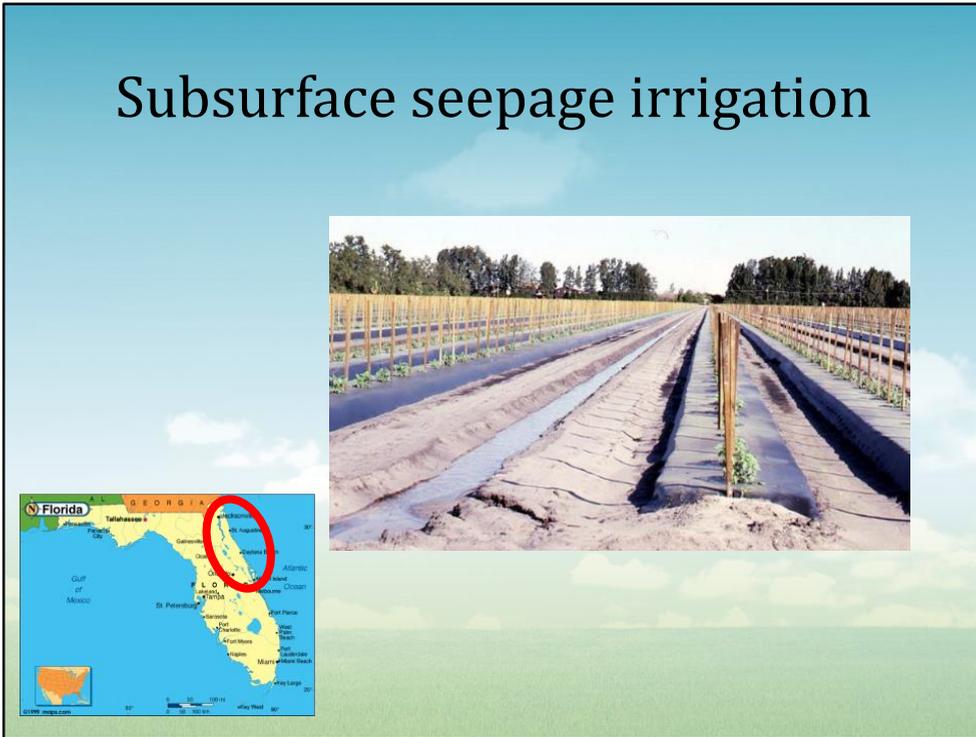
Up in the Florida panhandle, pivot irrigation is used for peanut and corn production.

“Advantages: reliable, consistent means of irrigating crop fields. Good, consistent coverage of crop areas. Uses water very efficiently.

Disadvantages: expensive to install. Typically requires an expensive electric well pump to power the system. “Circle in a square” configuration leaves corners dry and un-irrigated. Requires engineered delivery system. The mechanisms are complex, and when they break down, can require expensive repairs.”

http://aspenranchrealestate.com/Irrigation_For_Growing_Hay

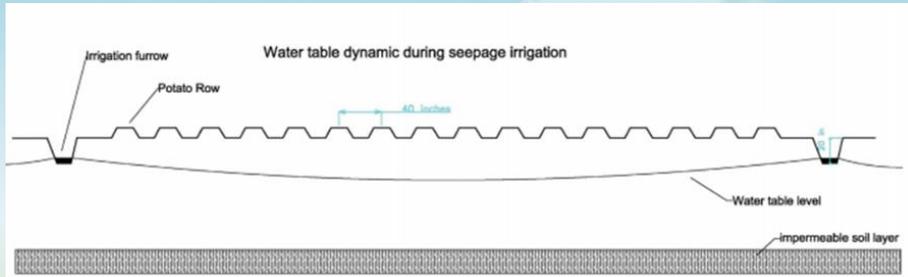
Subsurface seepage irrigation



In North east Florida, subsurface seepage irrigation is used because the water table is high. Row ditches are filled with water for irrigation. Wetting of the soil requires capillary action to wet the root zones. The row ditches also remove excess water from heavy rainfall events, so plants do not drown.

Subsurface irrigation usually includes retention canals and ponds to keep the water on the farm. It is better for the water to remain on the farm for reuse, than to flow into the freshwater rivers and lagoons.

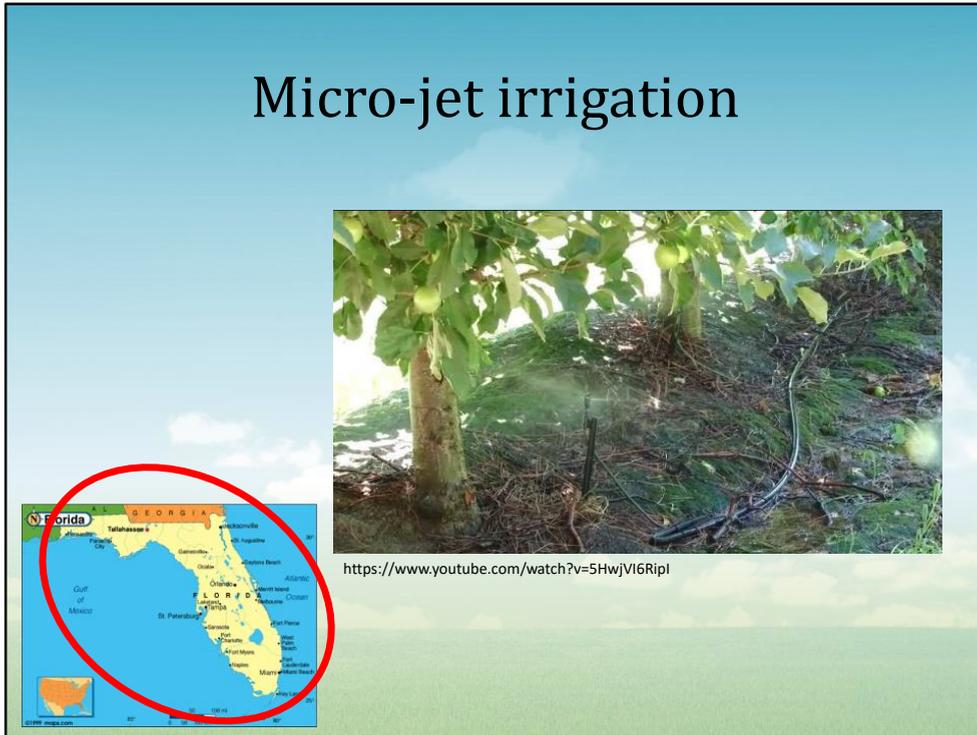
Subsurface Seep / Drip combo



<http://edis.ifas.ufl.edu/pdf/HS/HS121700.pdf>

This is a diagram of how the water filled canals raise the water table. Capillary action in the soil will draw the water up to the root zone.

Micro-jet irrigation



Micro jet irrigation is a great way to deliver water to the root zone of a tree. By placing emitters right at the tree, water is not wasted in areas with not trees. Liquid (soluble) fertilizer can also be injected into the water stream. This minimizes fertilizer leaching and runoff from rain. This type of irrigation is used throughout Florida.

Farm Fertilizer Injection into Irrigation



Fertilizer is commonly injected into the irrigation line.

This is an example of fertilizer tanks for a farm. The fertilizer will be injected into the irrigation water stream and delivered to the plants.

Cold Protection



<http://nwdistrict.ifas.ufl.edu/phag/2014/01/11/satsuma-protection-in-cold-weather-extremes/>

One advantage of micro jet irrigation is that it can also serve as a method of frost protection. When temperatures sink into the low 30oF or colder, trees are in danger of being killed. Water application during cold temperatures provides protection from the damage. When water freezes, a small amount of heat is released. If there is continuous watering and freezing, then the tree can survive a cold night. Even if the fruit drop, the tree will produce the next season.

Overhead and cold protection

- <http://safeshare.tv/>



- <https://www.youtube.com/watch?v=mzD6eH4fmlw>

Drip irrigation on raised bed and covered with plastic mulch

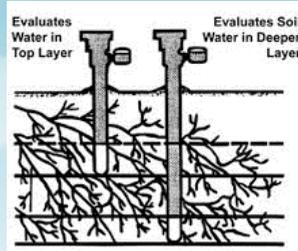


Drip irrigation is another type of best management practice for growing row crops. Although you can use drip irrigation alone, it is best to use it in combination of polyethylene mulch. Black mulch is best when planting in cool weather because it absorbs heat from the sun, as well as blocking out weeds. White – on – black mulch is best when planting in hot temperatures. The white reflects the sun's rays, while the black underneath still blocks weed growth. Often farmers will "double crop" on the same bed. For example, they may grow tomatoes, and then plant cucumber. This way they extend the use of the drip irrigation and mulch.

Water Conservation Tensiometer



<http://www.specmeters.com/tensiometers/>



<http://www.uwyoextension.org/highplainscropsite/monitor-soil-moisture-to-increase-irrigation-efficiency-what-options-do-you-have/tensiometerinfield/>

Tensiometers are a type of pressure gage that measures the dryness of the soil. Soils that are saturated with water will read near zero. When the gage shows 8-10 cbars, it tells you that is a good time to irrigate. Rain water does not pass through plastic mulch.

Water Conservation Rain Gauges



<http://www.stormdebris.net/Rain.html>

Rain gages are useful if no plastic mulch is used.

Water Conservation Cisterns & Capturing Rain Water



<https://alaskamastergardener.community.uaf.edu/2012/06/12/got-gravity-10-steps-to-set-up-low-tec/>

Some people have come up with creative ways to collect rainwater. This shows a gutter downspout (on the right) dropping water into a series of buckets connected by tubing. This irrigation system runs from the gravity weight of the water in the white tank.

Your Florida Vegetable Garden - Microirrigation

- <http://safeshare.tv/>



- https://www.youtube.com/watch?v=F_e9YOrdryls

Pressure Regulators



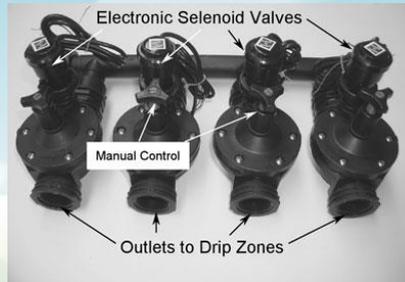
<http://floridawaterstar.com/technicalmanual/irrigation/pressureregulationmasterinline.html>



<http://www.toro.com/en-us/sports-fields-grounds/irrigation/landscape-drip/Pages/Model.aspx?pid=pressure-regulators>

Pressure regulators may be needed in 2 places 1) from the initial water source (40psi) for the PVC to carry water, and 2) from the PVC to the poly pipe that delivers water to the drip tape. Drip tape needs to operate at about 10 psi, so a 15 psi pressure regulator can be used to compensate for pressure loss due to friction.

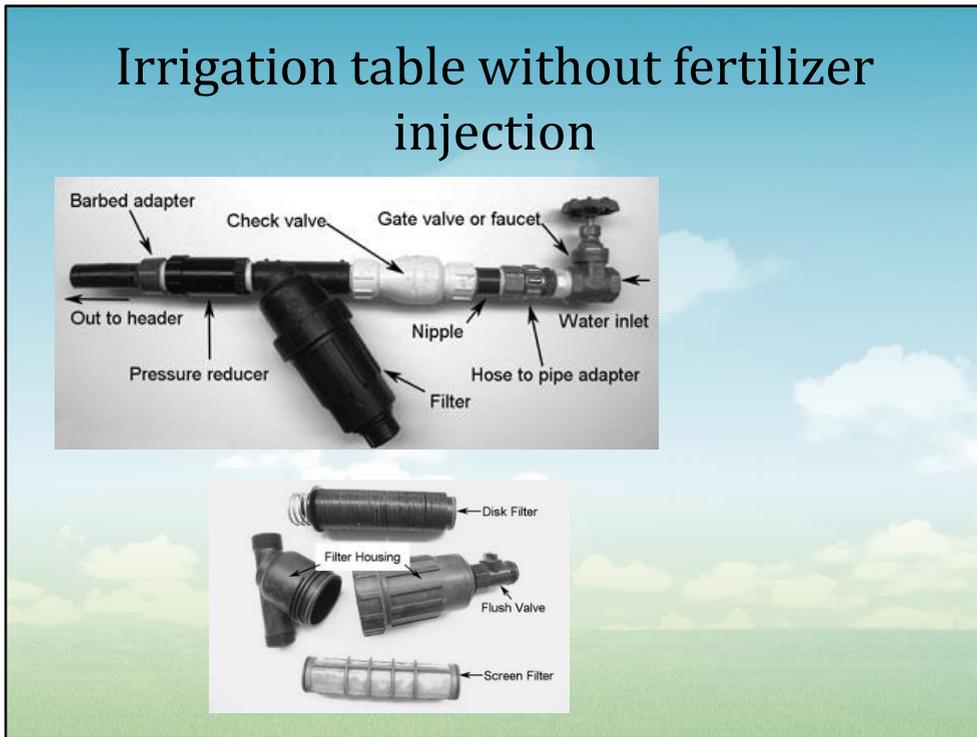
Solenoid valve



http://aces.nmsu.edu/pubs/research/agmech_eng/rr-773/welcome.html

Solenoid valves are a type of switch and open a valve to an irrigation zone (which may have several drip lines). Lawn timers are wired to the solenoid valve to turn on and off the irrigation automatically, much like they do for a person's yard.

Irrigation table without fertilizer injection

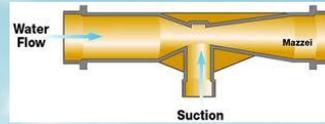


This shows several parts of the irrigation water table put together. Frequently, lengths of PVC will be used to connect parts to make attachment (and mistakes) easier. The bottom picture shows the filter taken apart. The filter has to be cleaned and cleared of rubble and debris from well water every 2 weeks.

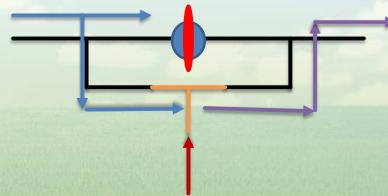
Venturi Injector for Fertilizer



<http://www.dripworks.com/category/mazzei-suction-style-fertilizer-injectors>

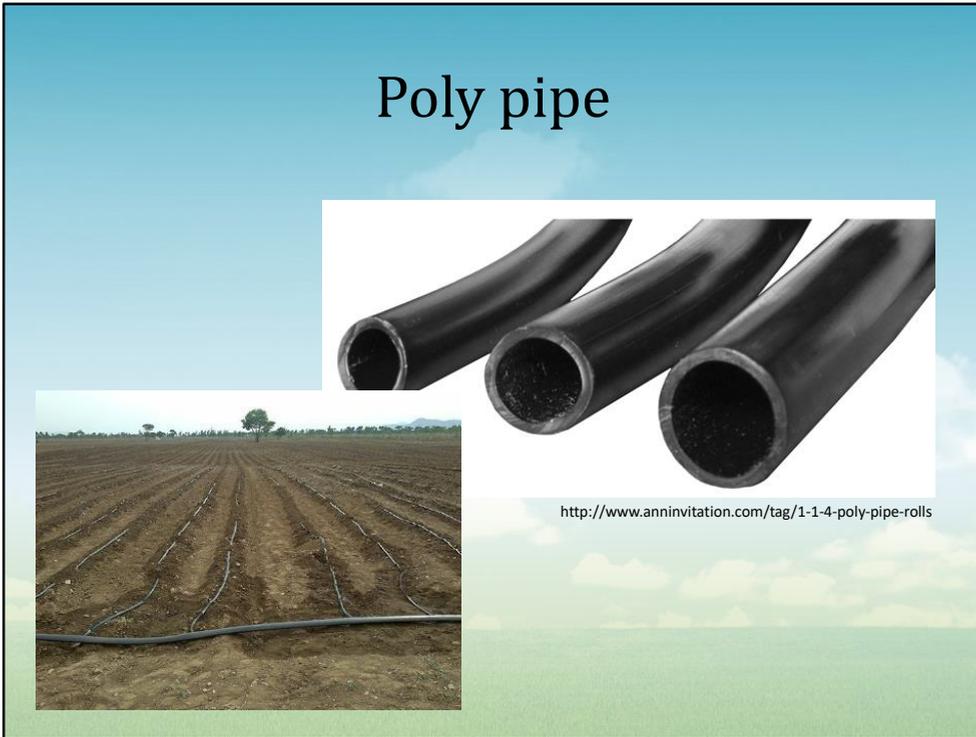


http://mazzei.net/venturi_injectors/



The Venturi injector is a very inexpensive way to suck liquid fertilizer up from a 5 gallon bucket. Notice the venturi injector sits out on an arm parallel to the main water flow. When in use, the ball valve of the main line has to be closed to force water to travel down the arm and across the venture. The pressure caused by the venture causes the liquid fertilizer to be sucked into the water stream and delivered out to the drip tape.

Poly pipe



Poly pipe is used to attach lines of drip tape to. The width of the polypipe needed will depend on the total length of drip tape in the zone. The calculation formula is provided in the written lesson.

Drip tape and connectors



The drip tape is held on to the poly pipe with a connector fitting. A hole punch makes a small hole. The slim barbed end of the connector is pushed through the hole. The drip tape is slid over the wider end, and the blue piece screws over the tape to lock it in place.

Connecting Drip Tape



<https://alaskamastgardener.community.uaf.edu/2012/06/12/got-gravity-10-steps-to-set-up-low-tec/>

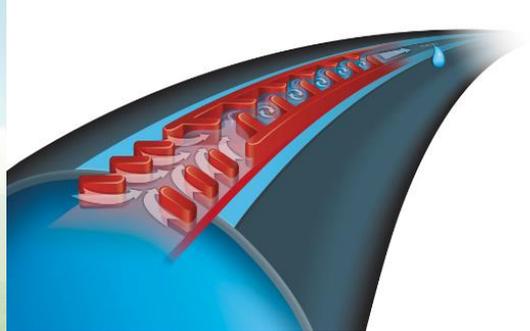
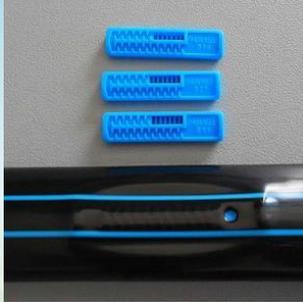
The hole punch (right) is used to make a small hole in the poly pipe (left). Then the drip tape connector fitting is pushed into the hole.

Drip Tape Connectors



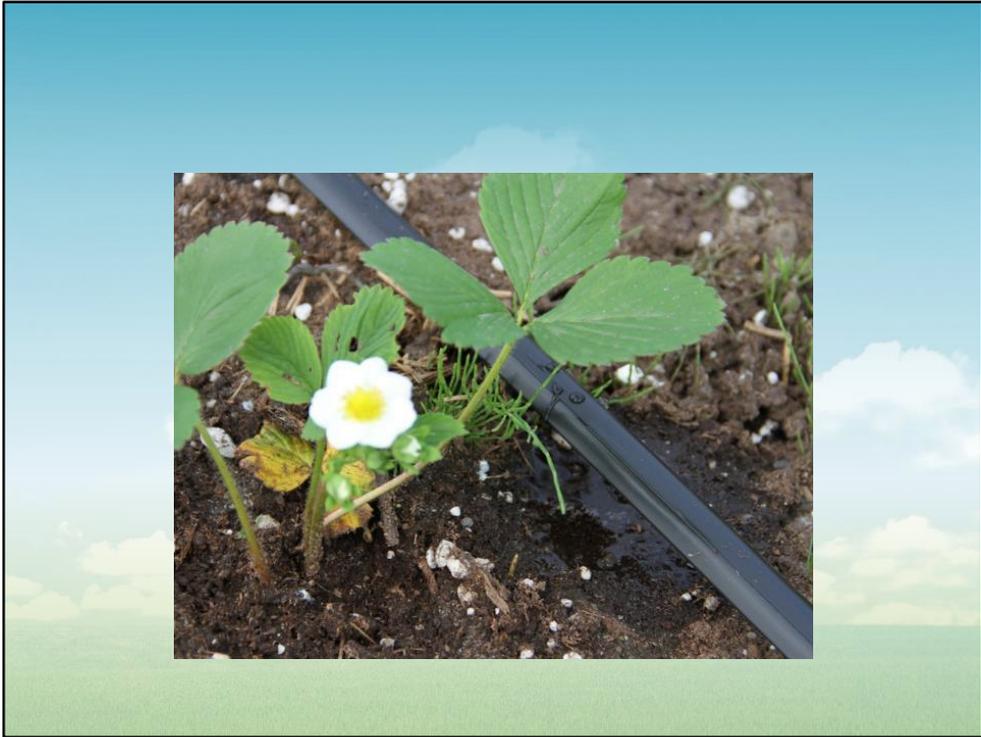
There are a variety of drip tape fittings to accommodate needs. Most common ones used are leak repair fitting (left), poly pipe connectors (right) and end caps (not pictured) that close off the far end of the drip tape.

Drip Tape



<http://www.dripworks.com/category/aqua-traxx-tape>

When drip tape is laid on the ground, the holes should be facing UPWARD to avoid dirt from entering. Each emitter has a dirt deterrent piece to keep soil out of the line. This prevents emitters from getting clogged.



This show drip tape in action! Drip tape is placed near the plant roots. Notice water comes out of the top, where the emitter is.



<http://www.snakeroot.net/farm/Driprirrigation.shtml>



It is possible to use drip tape without irrigation (top), but the soil will dry out quickly on a hot day. Using plastic mulch traps humidity and discourages soil water loss due to evaporation.

Drip Irrigation for Fruits and Vegetables

- <http://safeshare.tv/>



- <https://www.youtube.com/watch?v=flc5ZytIHZI>

Micro Sprinkler Irrigation

- <http://safeshare.tv/>



- <https://www.youtube.com/watch?v=rGgLKaPU9ww>