

Community CROPS Drip Tape Demonstration

Sustainable Irrigation definition by ATTRA: "Irrigation practices farmers can continue to use to produce agricultural products at reasonable cost while ensuring that irrigation and drainage do not degrade the quality of land, water, or other natural resources"

1. How to improve irrigation efficiency

- Efficiency with drip irrigation exceeds 90%, whereas a sprinkler system is between 50-70% efficient.
- It starts with the soil! Organic matter acts as a sponge, increasing the water storage capacity of your soil.
- Reduce seepage loss.
- Check all connections regularly.
- Reduce evaporation in fields through selection of irrigation method and mulches.
- Schedule irrigation based on soil moisture and plant needs.
- Get a rain gauge to accurately track irrigation levels through rainfall.
- Do not over-fertilize crops. This causes flushes of growth that use more water.
- Control weeds, which compete for water.
- Time plantings to take advantage of natural precipitation. Watch the forecast and sky.
- Know your flow. Time how long it takes to fill a 5-gallon bucket.

2. Why use drip or trickle irrigation for vegetable production

- achieve even irrigation
- directly reach plant roots
- minimize evaporation loss
- avoid water on leaves (minimize disease)
- irrigate everything at once (hands-free!)

3. Drawbacks to drip or trickle irrigation

- clogged emitters from poor water quality
- may be more expensive to install/maintain
- edge of wetting zone may have salt buildup
- may be in the way of cultivating



4. Suppliers

- Dripworks, CA: Commercial pricing available, wide selection, tons of tips provided
- Nolt's Midwest Produce Supplies, IA: Closer to NE, decent selection
- Peaceful Valley, CA: Many market farm products in addition to irrigation supplies

5. Parts required for 1/4 acre (Commercial pricing through Dripworks)

- Garden Hose (hardware store)
- 3/4" Spin Clean Filter; 200 mesh (FYHLSS200, \$11.65)
- Garden Hose Cap (hardware store)
- 3/4" Pressure Regulator; 12 PSI (PRSLHH12, \$7.50)
- Easy Loc Hose Beginning (ELFH, \$0.75)
- Header Line Tubing (1/2" recommended) (12100, \$9.54 for 100ft.) Lifespan: 8 years
- 1/2" Plug (hardware store) or Male Hose End with Cap (ELMC, \$0.55ea)
- TapeLoc x .250 Barb with Valve (LSBSO \$1.55ea)
- Punch for the fittings you use (PUY, \$4.20)
- 8 mil Low Flow T-Tape with 8inch OC emitter spacing (T808LR, \$198.00 for 7500ft.)
- Repair Couplings (LSC, \$0.64ea)
- Goof Plugs (38GP, \$0.31ea & 14GP1, \$0.45/10)
- U-Pins (SUHD, \$8.30/100)



Total Cost before T-tape = \$71.35, 2800 feet (partial roll) of T-tape at \$.0264/ft. = \$73.92

GRAND TOTAL = \$145.27



6. Bed layout, design and installation

- Lay out straight rows of equal length.
- Make each line no more than 300 feet in length (depending on flow rate).
- Cultivate each bed one last time before laying drip. Lay the drip, then mulch immediately after.
- One row of drip line is sufficient for two rows of plants at 12 inch spacing.
- Flow perpendicular to hills. Each 2.3 feet of elevation will increase the water pressure by 1 PSI.
- It is preferable to install on a warm, sunny day to help the tape relax.
- Pin down lines immediately.
- Lay out lines before plants fill in completely.

Formula for calculating the number of lines possible per system

1. Flow is 10 GPM = 600 GPH
80% of 600 GPH = 480 GPH
2. 14 beds are 4' wide, using 2 lengths each, 100 ft. long
(14 X 2 X 100 = 2800 feet of T-tape needed)
3. 8" emitter spacing, Low flow = 20 GPH/100ft. or .20 GPH/ft.
4. 2800 feet X .20 = 560 GPH needed
5. 560 GPH / 480 GPH = 1.17 zones (Round up to 2 zones.)

7. Watering Frequency

Each emitter on T-tape will wet up to a 1 foot diameter area at the surface and spread to a 1-2 feet diameter area underground. Emitter spacing of 8 inches is sufficient for most row crop vegetables.

Here is a guideline for how much water your plants need:

- Right after planting = hand water if very warm or windy, or run drip for 2-3 hours.
- While plants are growing = one inch of water (4-5 hours on drip) each week.
- A couple weeks before harvest and during harvest = two-three inches water each week (10-12 hours on drip). (Cut back water before harvest of some crops like tomatoes for better flavor.)

8. Troubleshooting

- Walk the lines regularly to check for leaks.
- Roll up tape in winter and store away from mice.
- Plan for disposal, recycling or re-purposing of drip.

- Flush the filter occasionally.
- Make clean cuts on your repairs (keep sharp scissors around).

9. Other

- Higher mil T-tape or emitter tubing is better for perennial applications-use with layflat.
- If using pond or steam water for irrigating, a better filter is required.
- Rainwater catchment is possible, but requires vertical height to create pressure.
- Fertigation is an option with drip systems. Here are methods of installing the Venturi injector:

Option I: Venturi installed around a point of restriction such as a regulator valve or gate valve which creates a differential pressure thereby allowing the injector to produce a vacuum.

Option II: Installed in conjunction with a centrifugal pump to boost pressure through the Venturi thereby creating a differential pressure and producing a vacuum for chemical induction downstream from the pump.

Option III: Venturi installed in main flow line with flow control valve on bypass line.

Option IV: Installed directly in the main flow line with total flow of the system moving through the Venturi.

The following information is from dripdepot.com:

Type of plants	Number of drippers and spacing
Flowers	One dripper {.5 gph} in clay soil, spaced every 16-20". One dripper {1 gph} in loamy & sandy soil spaced every 12-16"
Vegetables	One dripper {.5 gph} in clay soil, spaced every 18". One dripper {1 gph} in loamy & sandy soil spaced every 12-16" or See drip soaker line.
Small shrubs and roses (up to 2' high)	One dripper {1 gph} per plant in clay soil. One to two {1 gph }drippers in loamy & sandy soil, spaced 12-16"
Medium shrubs and small trees (2-4' high)	Two drippers 1 gph per plant in clay soil spaced 8" from center. Two {2 gph} spaced 10-12" from center or 3 (1gph) drippers in loamy & sandy soil, spaced 12-16" apart
Medium shrubs and small trees (4-6' high)	Six drippers .5 gph in clay soil spaced 20-24" apart in a loop around the tree. Two to three {2 gph} in loamy soil spaced 16-18" apart in a loop around the tree or 4 {1gph} drippers in sandy soil, spaced 12-16" apart in a loop around the tree.

This chart illustrates different emitter spacing options for various types of plants.

Explanation of Threaded parts:

Some drip irrigation parts such as pressure regulator, backflow preventer, filter and others have threads. Most have the option of either pipe thread (PT) or hose thread (HT) and within the thread type you will have the option of female or male.

- FPT = Female Pipe Thread
- MPT = Male Pipe Thread

- FHT = Female Hose Thread
- MHT = Male Hose Thread

Thread types have these acronyms:

- NPT = National Pipe Thread (this encompasses all sizes and genders)
- GHT = Garden Hose Thread (always 3/4", can be male or female)

You cannot mix thread type unless you use an adapter first. If you mix thread types your system will leak, guaranteed.

To create a leak free connection, GHT and NPT threads differ.

- GHT creates a water-tight seal by applying pressure against a washer that is seated in the female part of the fitting.
- NPT creates a water tight seal by tightly sealing the male and female threads.

Therefore, remember these two rules:

- **Never** use Teflon tape or pipe cement on GHT. Hand tightening is usually sufficient for GHT.
- **Always** use Teflon tape or pipe cement on NPT. NPT threads usually require more than hand tightening to seal properly.

10. Additional Resources

Drip Works, dripworksusa.com

Drip Depot Online Classroom, http://www.dripdepot.com/article/drip_irrigation_online_classroom

Measuring and Conserving Irrigation Water, http://attra.org/attra-pub/irrigation_water.html

Soil Moisture Monitoring: Low-Cost Tools and Methods, http://attra.org/attra-pub/soil_moisture.html

Rainwater Harvesting Manual,
http://www.twdb.state.tx.us/publications/reports/rainwaterharvestingmanual_3rdedition.pdf

University of Florida, http://edis.ifas.ufl.edu/topic_vegetable_irrigation



Community CROPS is a 501(c)(3) organization which helps people work together to grow healthy food and live sustainably.

Funding for this class was provided by the USDA Agricultural Marketing Service's Specialty Crop Block Grant Agreement #18-12-092.