

WATER MANAGEMENT

Drip Irrigation



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SECTIONS

Section 1: Designing your drip irrigation system

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INTRODUCTION

Irrigation

Drip tape is the way to go for most vegetable systems. They require lower pressure compared to overhead irrigation, delivering it right to the root zone of the crop. There are higher quality tapes and tubes for potential re-use and for burying as subsoil-irrigation. For growing in pots or grow-bags, irrigation lines are often paired with small drippers that are staked into pots or hang above and drip into them.

Drip-tape users usually do not need high pressure, and can settle for anything from a 10 gallon per minute (gpm) to 120 gpm pump, depending on how much area and how far it is from your pump. Sizing a pump to your system is best left to a good sales person.



Fertilizing through Drip Irrigation



Chemigation is the practice of adding a chemical to irrigation water in order to fertilize, clean the irrigation system or adjust the characteristics of the water or soil. Fertigation is the most common form of chemigation, focusing on adding a chemical to increase fertility.

Unless you plan to mix an entire irrigation application by hand, chemigation and fertigation require a fertilizer injector. This piece of equipment allows you to feed a chemical or fertilizer into the irrigation line at a selected rate. Popular brands of injectors are Mazzei, Dosatron, and Chemilizer. The Mazzei injector is less adjustable than the positive displacement pumps. Of the positive displacement pumps, the Chemilizer is probably the best at handling acid-injection, as it keeps its gaskets and seals away from the injected material. Dosatrons are the most common positive displacement pump, and there are many generics as well. For very small scale uses, the Hozon injector is an option, but they do not work well with drip tape.

Any form of chemigation, including fertigation, requires a backflow prevention device to stop irrigation water from being siphoned back down the well where added chemicals can contaminate groundwater supplies. Be sure to use the appropriate model of backflow prevention device if you decide to chemigate.



Berry Hill Irrigation, Drip Depot, and Trickl-Eez are three supply companies specializing in the irrigation needs of vegetable growers.



SECTION 1

DESIGNING YOUR DRIP IRRIGATION SYSTEM

Properly setting up an irrigation system is a science that requires a bit of math and creativity. The following considerations have examples to help you get started with drip irrigation.

Primary Considerations

- Determine what area you need to irrigate, in terms of total area and the number of linear feet. For example, you have 10 beds, 50 ft long, 5 ft apart center-to-center, and they are 30 inches across. The total area is $((10 \text{ beds} \times 5 \text{ ft apart}) \times 50 \text{ ft long}) = 2,500 \text{ sq. ft.}$ With a 30 inch bed top you probably only need one line of drip tape, placed along the center of the bed. So that is $10 \text{ rows} \times 50 \text{ ft long} \times 1 = 500 \text{ linear feet.}$

- Determine how much water you will need to deliver. One inch of water per week is recommended as a general rule. That is 27,154 gallons of water over one acre (43,560 sq. ft). For 2,500 sq. ft. that is $27,154 \text{ gal} \times (2,500 \text{ sq. ft.} / 43,560 \text{ sq. ft.}) = 1,558$ gallons of water per week.
- The last step determines how much time to run your system, and it is highly dependent on your system's parameters. We have 500 linear feet with one line per bed. A common drip tape output is 0.45 gallons per minute (gpm) per 100 linear feet. We would have 5 sets of 100 linear feet ($500 / 100$). Our total system output is $5 * 0.45 \text{ gpm} = 2.25 \text{ gpm}$. If we need 1,558 gallons of water then it would take 692 minutes of run time, or 11.5 hours. Over the course of seven days, that would be 1.6 hours per day ($11.5 / 7$).



Process for Getting Started

- Define your market goals and how much area you might need to plant at a time. Does the size or shape of that area change throughout the year, or move to areas farther from a water source? This would help determine what amount of drip tape and pump support you would need.
- Talk to a mentor.
- Research equipment online.
- Visit a trade show or dealership.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.





DRIP IRRIGATION

COMMON QUESTIONS

01

What kind of drip tape is available, and what is best for me?

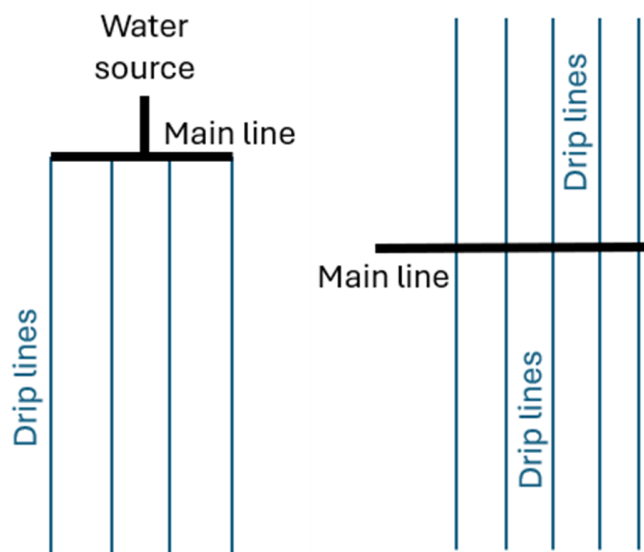
- Drip tape is sold according to its thickness, spacing between emitters, and its flow rate in gallons per minute (GPM) per every 100 ft or gallons per hour (GPH). For multi-year use a thicker walled tape would be better. For a densely planted crop a tighter emitter spacing is better. For sandier soils, a higher flow rate is better.
- **Common flow rates** include 0.25 GPH, 0.3 GPH, and 0.5 GPH
- **Common emitter spacings** include 6", 12", 18", 24", 30" and 36"
- Drip tape is not the same as drip tubing, tubing is ridged and circular in cross section, while drip tape flattens when not pressurized and is more supple. Drip tape is cheaper per unit of distance, but less durable.
- Drip emitters are available in pressure compensated and uncompensated forms. Pressure compensated line usually costs more, but helps to ensure a more even application, especially on long lines.

02

I hate plumbing, so tell me how much plumbing is involved.

You will need a **filter**, a **backflow preventer**, a **pressure reducer** (down to 15 PSI), and **valving** to turn on zones or individual rows. You might also need to create a valved bypass if you choose to fertilize through the tape. There are kits available that make this easy! You will want extra drip tape unions, and unions, elbows and tees for your header line.

Unless you are using a relatively short single line of drip irrigation, you will need some kind of manifold, header or mainline to dispense water to individual lines. Larger diameter tubing carries water more efficiently since there is less loss of flow due to friction. Using larger diameter pipes or tubing can help cover areas that are farther from the water source. Below are some examples of common layouts for drip irrigation.



If you are irrigating a large area, multiple crops, or have a limited water supply compared to your water demand, breaking fields into zones that are controlled by valves can help. Since each zone is only a fraction of the total area, the flow required to operate a single zone is also only a fraction of the total.

By rotating between different zones a much larger total area can be irrigated with the same water source.

03

Are there risks to fertilizing through drip tape?

The most important risk is contaminating groundwater through backflow into your well. That is why it is essential to plumb in a check valve or backflow preventer. Another risk is that some fertilizers can plug emitters in the drip tape. Be sure to use solution-based fertilizers that dissolve, or dilute suspended fertilizers like fish emulsion enough so that they can get through. An additional filter may be necessary, and you should flush the lines after all fertilizer has been passed through to ensure that emitters are cleared.

Even with filters, drip emitters can become clogged with deposits created from chemical interaction between the fertilizer and components of your water. Much like household faucets and showerheads, things that are naturally in well water can precipitate out and restrict flow. Issues with calcium and iron are common in Michigan wells.

Biofilms and Algae can also present issues with clogging emitters and are often exacerbated in the presence of fertilizers.

04

What are the benefits of applying fertilizers through drip irrigation?

Drip irrigation applies irrigation, and fertilizer in the case of fertigation, directly to the soil surface above the root zone. This reduces losses and side effects from applying fertilizer using a sprayer or broadcasting method since vegetation and other surfaces are not being covered with the fertilizer solution.

The application rate of drip irrigation is consistent and relatively slow. This makes it easier to control the application of fertilizer and keep the applied nutrients in the root zone.

05

Can drip tape be unclogged if the emitters are plugged or restricted?

Button emitters (AKA punch in emitters) can sometimes be disassembled and manually cleaned with brushes, soap and water.

There are some solutions, including organic solutions, that may be added to the irrigation water to help unclog emitters. See attached link for chemical treatment of clogged emitters in the resources section below.

Flushing the water through the drip lines shortly after the fertilizer application can help to prevent clogging

Opening the end caps on the lines and flushing the lines may help in the case of coarse particles that are not already lodged in the emitters.

In some cases, replacement of the drip tape / tubing may be easier and more cost effective. This is a more favorable option the older your system is.

06

Is drip tape recyclable?



It is not commonly accepted by recyclers, and is usually thrown away as trash. Biodegradable drip tapes have not made it to market yet.

Avoid burning, burying, or dumping discarded drip irrigation materials. Disposal via landfill is currently the most responsible option.

07

How do I lay or install drip tape?



Drip tape comes in rolls. One way to do it by hand is to anchor the loose end and pull the roll to the end of your row, unspooling the tape as you walk. Another way is to put a broom handle through the roll, and support the roll on the rungs of a step ladder at the end of the row and while you pull the loose end out. There are machines that can inject drip tape through a tube at various depths under the soil as well, and others that lay drip tape at the same time as plastic film mulches.



RESOURCES & PARTNERS

Necessary Resources

- **Resource for chemical treatment of clogged emitters:**
https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/666031/maintaining-a-drip-irrigation-system-for-perennial-horticulture.pdf

Partners

- Irrigation dealerships
- Conservation Districts