Sattin Hill Farm Course
Module 10: Irrigation

Introduction

This module is all about irrigation: overhead vs. drip irrigation, irrigation system design, your water source, running water lines on your farm, timers, hand watering, and sources for finding irrigation supplies.

Josh recommends designing your irrigation system initially with your overall farm design. If you set up your farm and try to add irrigation, you'll likely run into complications. When designing your field blocks, start with irrigation plans. If you're growing tunnels, there are also great systems for irrigation.

Overhead vs. Drip Irrigation

The first question to consider is whether to use overhead or drip irrigation. Josh uses both and recommends them. This gives you the ultimate flexibility between controlling the moisture in the soil and having the option to cool down the plants from above when needed.

Benefits of Overhead: One of the main benefits of overhead irrigation is the convenience of not having to work around drip lines in the bed. Drip lines require more time to set up and remove when flipping beds, tend to get clogged, and must be worked around when cultivating your crops. Once you get used to it as part of your system, it's doable, but it still requires a lot of time. The larger your farm is, the more time it takes.

At Sattin Hill Farm, Josh primarily uses overhead irrigation like a mister for cooling down crops on hot days and then uses drip irrigation for the majority of the watering. He will run overhead in the warmer months several times a day for short bursts to bring the temperature down inside his tunnels. It's especially helpful for cooling down crops like leafy greens.

Another advantage of overhead irrigation is when it comes to direct seeding. Overhead will provide a much more even soaking, which can help a lot for better germination of direct sown crops. The ideal scenario is to direct sow a whole block of beds with the same kind of seed and have overhead irritation to evenly soak the block. However, in Josh's small-scale context, he has a variety of crops in each bed, all growing in the tunnel. While one directly sown bed might benefit from overhead, the crop in a bed right next to it might benefit more from drip. This is something to keep in mind when deciding where to plant different crops.

Drawbacks of Overhead: One negative aspect of overhead irritation is contending with wind. Josh experienced this when managing Raleigh City Farm. Most of the field blocks were set up with overhead irrigation, but frequent high winds led to the water being blown all over the place and not providing even coverage. This can be a big problem.

Benefits of Drip Irrigation: Drip irrigation is better for locations with consistently high winds. It allows the water to go directly into the soil without the risk of being blown around. It's also much better for crops like tomatoes, cucumbers, peppers, eggplants, etc. These crops generally do better when their foliage remains dry (preventing disease). Drip allows you to direct water to the roots of the plant while keeping the plant itself dry.

As opposed to overhead, drip irrigation helps to conserve water. Instead of being sprayed over a large general area, water is directed to only where it's needed. Drip irrigation is a good option if you are in an area where water is very expensive or not readily available.

Drawbacks of Drip Irrigation: If minimizing your usage of plastic is a consideration, drip lines consume a considerable amount of plastic and need to be replaced every so often.
Drip lines can also be accidentally cut when harvesting or weeding, especially by hired hands when first learning the new systems. This leads to more time spent on repairs.

When determining what kind of irrigation to use, keep your soil type in mind. If you have very sandy soil, drip irrigation might not be ideal. In sandy soil, the water from drip irrigation will drain straight down and through the soil rather than spreading out and evenly saturating the bed.

Standardization

If all of your beds and field blocks are standardized to the same size, everything will work seamlessly when setting up your irrigation system. Day-to-day operation and maintenance will also be much smoother and more efficient.

Water Source

When you're considering the purchase of a property to start a farm or adding a farm to your existing property, the water source for your irrigation will need to be a primary consideration. Where will the water come from? What is the quality of the water? How much water is available?

Well Water: Josh lives in a suburban area on a two-acre lot with a well. He has a separate line from the well that bypasses the house and runs directly to the farm for irrigation. He knows the limitations of his well and works within them. With a limited water supply, he couldn't expand his growing area beyond what it currently is.

In addition to the supply, you need to determine if the flow rate (gallons per minute) will be adequate for what you are trying to accomplish. Every well is rated for particular gallons per minute at a specific pressure. This calculation determines what kind of pump is installed in the well. When Josh had to replace the pump in his well, he asked the technician how much water it could pull and how much he could run it. This information is beneficial when determining how often you can irrigate your growing area.

City Water: City water can get very expensive, depending on your location. It is very convenient because you don't have to manage it as you do with a well. Filtering city water to remove chlorine and chloramines is also something to consider.

Rainwater: There was a rainwater catchment system at Raleigh City Farm when Josh was managing there, but it often had issues. Josh recommends that if you have a rainwater catchment system, you also have a backup water source when needed. Having a hybrid system with a backup plan to run on city water is ideal.

Flow Rate

Every sprinkler head and drip system will give you a required flow rate, calculated in terms of gallons per minute. This will inform how you design your irrigation system and how much of your system can be running at a given time. Based on the flow rate of your water source, you can then figure out how much it will allow you to run at one time. For example, Josh can't run all of his overhead sprinklers in one 100' tunnel simultaneously. He doesn't have a high enough flow rate. A lot of water is required to run even a small commercial farm.

Water Filtration

Josh has a sediment filter at the beginning of the water line that comes from his well to the farm. It's common with well water to get some mineral content or the occasional larger particulates. These could clog and damage valves and timers, so adding a simple sediment filter is always good.

Water Lines

The main water line that sends water from the house to Josh's backyard farm is a ¾" black plastic irrigation line. In retrospect, he would've chosen a 1" pipe to increase flow. When you run long lines, there's greater resistance for the water to push through, which in turn lowers the flow rate. Josh recommends contacting a local irrigation specialist for professional advice when laying out your system. They can tell you exactly what you need for your flow rates.

It's best to bury your permanent irrigation lines whenever possible. It keeps things tidy and protects the lines from being tripped on and damaged. It keeps the lines a little bit cooler in the summertime, and you don't have to deal with weeds growing around them either.

A drain valve is on both ends of Josh's main irrigation lines, allowing him to drain everything out in preparation for a freeze. At the top of the line is a "T" with a valve that allows air in to facilitate draining.

Hose Fittings

There are many different kinds of irrigation fittings on the market. Quick fittings sound appealing with the flexibility to disconnect and reconnect lines quickly. However, Josh found they would pop off from time to time and leave water spraying everywhere. He has since switched to standard barb fitting with hose clamps to connect his lines. While not as quick and flexible, he hasn't had to deal with as many leaks or fittings popping off.

Timers

Timers are an excellent addition to help streamline your irrigation system, but it's important to remember that there is no "set it and forget it" with anything when it comes to farming. The length of time you leave your irrigation system on will change throughout the season. It's also relative to your water flow, how many zones are connected to your system, soil type, and the temperature. Using timers can prevent you from needing to check your irrigation system every single day.

Growing in tunnels can allow you to have a more consistent timer schedule than growing in the open field. In tunnels, the variable of rain isn't a factor. You will still need to experiment with your watering schedule by trying it out for a couple of days to determine if your soil is too wet or too dry and then make changes accordingly.

Another benefit of using timers is that they can allow you to go away for a day or even a weekend and not be stressed about your crops staying hydrated. However, you wouldn't want to leave it for more than a couple of days without somebody checking on it.

Manual mode is also a nice option with timers. If you need just a little extra water in a specific zone on a hot day, you can just push a button and go work on another task.

Josh uses the same Melnor programmable timer in each of his three tunnels at Sattin Hill Farm. Standardizing them all to be the same simplifies things greatly. Each timer is mounted on a post where it's up high enough to easily see and make adjustments without bending over. Each timer controls two zones for overhead and two zones for drip. Pressure reducers are coming off the lines that go to the drip irrigation zones. The timers can be set to come on multiple times a day.

When using overhead as a mister to drop temperatures on hot days, you can program them to come on several times a day for shorter durations. The timers also allow you to stagger the different zones that are running. This is especially helpful in Josh's context as he doesn't have enough pressure to run the entire tunnel at once.

Farmers Friend Irrigation Kit

Josh purchased the overhead irrigation kit from Farmer's Friend LLC, which is a tailored package for his 14' x 100' caterpillar tunnel.

The kit is composed of one main line that runs along the top of the tunnel, with shorter lines branching off of the main. Sprinkler heads are installed at the ends of those shorter lines, all of which hang down from the main line in the center of the tunnel.

The sprinkler heads spin when in use to create a mist that perfectly spans the width of the tunnel. It does an excellent job of soaking everything evenly. There is also a check valve installed above every sprinkler head to prevent water from dripping once the water has been turned off.

One drawback Josh has noticed is that the plastic sprinkler heads tend to fall out when temperatures drop in the winter. The heads are friction fit, so when the plastic shrinks due to the cold, they fall out. He is going to remove them next season to avoid this preemptively.

Josh's biggest modification to the overhead irrigation kit was dividing it into two zones. This was out of necessity since he lacked the flow rate to water all 100' simultaneously.

A benefit he's experienced by having two overhead zones is that he can water different parts of the tunnel in different ways. For example, if one block was just direct-seeded, he can run that zone longer until everything germinates. In the same way, he can run the other zones accordingly based on the needs of the crops.

Sattin Hill Farm Drip Irrigation Setup

Josh prefers Toro Aquatrax drip tape, with 8" spacing between emitters. It's made of thicker, longer-lasting plastic. When emitters are 12" apart or further, you lose the ability to soak the soil evenly. But if wider spaced crops are planted at each emitter, even coverage may not be the goal. If it is, smaller spacing between emitters will be more effective.

One thing to consider with drip tape is that you need lower water pressure to prevent blowing out the lines, typically between 8 and 15 PSI. Josh uses a 10 PSI pressure reducer for his drip lines. He has one main header where all the lines split off. Each bed gets three lines of drip tape, with certain crops only getting two. For example, if he's planting only one row of squash down the center of a bed, he'll run two lines of drip tape on either side of the crop. If he's planting four rows of lettuce, he'll run three lines of drip to go in between the rows. He'll also run three lines for direct-seeded crops like carrots and radish.

Each header line that runs across the front of four beds is equipped with three valves per bed. The valves allow for easy on and off. Before reconnecting drip lines, Josh recommends always opening the valves for a few seconds to blow out the dirt that will inevitably get into them.

Hand Watering

Even with both overhead irrigation and drip irrigation systems in place, it's essential to be able to hand water if needed. There will inevitably be areas of a bed that tend to dry out faster than others. You may not want to re-irrigate the entire bed or section. Having a system in place to enable you to hand water different sections will come in handy in these kinds of situations.

If you've ever tried to drag a garden hose between beds or out somewhere out in the field, you know what a hassle it can be. To avoid this, Josh uses a hose reel made by Hoselink. A hose reel setup lets you pull out a hose wherever you need it without damaging other crops. Josh has one mounted on each end of the tunnel for easy access to any spot in the tunnel. He uses “bumpers” made from scrap PVC pipe to keep the hose in the walkways and prevent it from being dragged through a bed.

They also make larger hose reels that mount on a cart with wheels. This would work well for a larger farm, enabling you to pull it to the end of a section where you need it, pull the hose straight out to water, and then pull it straight back.

Irrigation Sources

In addition to Farmer’s Friend LLC, Josh has also used Drip Works, Drip Depot, and Berry Hill Irrigation to purchase supplies. When it comes to the less specialized components, you can also typically find a good variety of supplies at your local hardware store.