Phase 4: Keep Living Roots in the Soil

Small Farm, Big Ideas
Solar Fresh Produce is a 3 acre CSA farm in Buffalo, MN operated by Sarah Lindblom since 2015. This season, I was able to build a caterpillar tunnel with a grant from the Mill City Farmer's Market Next Stage Grant program.

Update from Phase 3
Summer and fall are wrapped up and it is time to move into winter growing. One of the challenges of the caterpillar tunnel is deciding how to best use the prime real estate. For example, it is always difficult to decide if summer crops should be extended or removed to make way for the next plantings. Because fruit ripening slows down anyway, winter crops need time to get established, and customers are looking for the seasonal next-best-thing, my opinion is that it is best to pull the summer crops when their season is over and keep moving forward.

Why Keep Living Roots in the Soil?
Many farmers prefer to do fall tillage, and while this does have some benefits (mainly getting a head start on spring field prep), it has several disadvantages. Bare soil that has been tilled is prime for erosion and carbon loss, and it damages the soil aggregate that has been established during the growing season. Keeping living roots in the soil provides a blanket of protection, especially if there is no snow cover inside the tunnel. Without tillage the soil will maintain its structure and continue to function by cycling nutrients and holding in moisture and microbe habitat. Cover crops are one way to achieve this, however I used some other approaches that allow for some winter harvests.

Crops to Grow in Winter
The main winter crop I wanted to grow was spinach, but to maintain some crop diversity and mitigate risk I also grew a greens blend, endive, carrots and kale. Spinach and the greens blend were direct seeded first. I used an earthway seeder to direct seed the spinach. The greens blend was interplanted with basil crop by sprinkling the seeds around and in between the residue and lightly incorporating in a type of rely planting. This seed blend was made up of the end of seed packets that I wasn’t going to use anymore or were starting to get old. It was mostly Tokyo bekana, and romaine, but also included assorted other greens like beet greens and herbs. (see phase 3).

After I removed the tomato plants I transplanted kale and endive. Because crop growth is slow, watering is not needed during the winter months. Try to hydrate the soil as much as possible in the fall.

Most crops did well except for the transplanted crops, which were probably transplanted too late. The most successful crop was spinach, which overwinted the best, although some greens like lettuce, cilantro, and Tokyo bekana also survived until spring.
Creating Endwalls
My original plan was to build more permanent and elaborate endwalls by framing in doors with lumber, however when temperatures starting dropping and I needed something quick, my plan became much more simplified.

I used the plastic that I had trimmed from the ends in the spring and attached these into the existing wiggle wire channel using additional wiggle wire and layering it onto the existing wire and plastic from the main body of the structure. This way, I did not have to remove any wiggle wire. Because I was using a separate piece of plastic, I was able to line it up flush with the structure and secure it flat against the end openings instead of having to bunch up the excess plastic and secure it at the bottom. This helps prevent the plastic from becoming loose and flapping around, which is what happened in the spring when the plastic was still one piece extending out from the main structure.

This ended up being a simple yet effective solution. I was able to install the plastic with one person and a ladder on a calm day. Make sure to leave extra plastic on the endwalls at the edges for easier removal and replacing later on. To create an “entrance”, there is one corner of the structure that is not fully secured so I can easily enter the tunnel at the endwalls without having to lift the sidewall plastic. I hope to create a more permanent and weather proof entrance at some point.

The manufacturer does now carry an end wall kit if you are looking for something prefabricated and more permanent.

Using Season Extending Techniques Within the Tunnel
To further protect the crops inside the tunnel, I used steel quickhoops that can be easily placed over the beds by pushing one end into the ground and then bending over the bed and pushing the opposite end into the ground. They are easily removed when needed. Agribon fabric was then pulled over these hoops. Additional layers of fabric or plastic can be added over the hoops as needed. The fabric is secured at the ends and then at points along the bed. Because the beds are protected from the wind, the fabric does not need to be secured extensively and is much easier to cover and uncover. It is helpful to uncover the crops on sunny days and to recover at night or on cloudy days.
Winter Harvesting

There are a few considerations for winter harvesting. I harvest on a warm sunny morning when the crops are thawed and appear happy. Because of low light, crop growth stops almost completely during the winter. It is important to leave enough leaves on the plants if you hope for a spring regrowth. If you remove all or almost all the foliage, do not plan for additional harvests. Some crops can survive colder temperatures while others cannot. It may be advisable to blanket harvest any tender crops (like lettuce) before temperatures drop below freezing, but some experimentation with fabric can help extend the harvest through a cold spell. Even though you may not have your usual washing and packing area available during the winter, it is still important to wash greens and keep food safety in mind. I make sure to have my kitchen sink, salad spinners and prep areas clean and ready to wash greens before I harvest so they can be washed and bagged quickly after harvest.

Next Up

In Phase 5: Incorporate Livestock, I will discuss challenges and opportunities of market gardening with free range laying hens. I will suggest some ideas for excluding free ranging chickens from the caterpillar tunnel while also incorporating animal byproducts in a safe way. I will take a look at spring prep and planting in the caterpillar tunnel. I will also discuss some overall impressions and lessons learned from this project and present the final Soil Health Report Card to document your soil health testing results.
pH Test
The fourth soil health test in the report card is the pH Test. This is a test of the chemical properties of your soil, but the pH also affects physical and biological properties of soil and plant growth.

To complete this test you will need:

- Soil Samples
- A pH meter
- Buffer solutions
- Distilled water

For the alternate method

- Soil Samples
- Vinegar
- Baking soda
- Distilled water

Method:

Collect multiple soil samples. They can either be tested individually or mixed together to get an average across the sample area.

Make a slurry by combining 1 part soil to 2 parts distilled water in a container. There should be enough of this slurry so the pH meter’s probe can be completely submerged. Wait 15 minutes for sample to settle. At this point, use the buffer solutions to calibrate your pH meter if needed according to directions. My pH meter uses a small screw driver to adjust the pH on the side to calibrate. Rinse the pH meter between calibrating solutions and after calibrating. Insert probe completely into water and soil mixture and wait for a reading to appear and stabilize. Record this pH in the Soil Health Report Card.

Alternate Method:

I decided to try another method of pH testing that does not require a pH meter.

Gather a soil sample from different locations in your fields and either test them individually or mix them together to get an average. Place equal amounts into two separate containers (about ½ cup per container). Add one-half cup of vinegar to the soil and check for a reaction. If the soil fizzes, your soil is likely alkaline and has a pH level of 7-8.

If the soil does not fizz after adding vinegar, combine the soil in the other container with distilled water and one-half cup of baking soda. If there is fizzing, your soil is likely acidic with a pH level of 5-6.

If there’s still no reaction, your soil pH is probably neutral, about 6.5

Analysis:

Using the pH meter, the reading came out as 6.7.

Using the vinegar and baking soda, there was no reaction with either which would also point to a neutral pH.

References