Phase 2: Minimize Soil Disturbance

Managing Temperature
Once constructed I was able to start getting to know the structure. There are various automated roll up sides available but I use the manual methods of opening and closing which gives me more opportunities to monitor plant development. If you decide to go the manual route, be aware that the caterpillar tunnel heats up very quickly once the sun is out and needs to be vented to prevent burning the plants. Also note that sides should be closed during a rain event. This prevents water from collecting in the plastic and stretching.

I planned to build end walls right away but after delays, I decided to just cut the extra plastic from the ends and reserve it for the fall when I can make end walls that will provide some better protection this winter.

Prepping For Planting
Reducing tillage has been a goal of the farm for the last several years after seeing the soil compaction and weed pressure caused by tillage. Also, as someone who is not mechanically inclined, I would rather rely on hand tools that don’t require fossil fuel, are quiet, are inexpensive, and are totally feasible to use on my small scale. This type of soil prep does have several disadvantages—it does not warm the soil as quickly in the spring, it can be more difficult to plant into (especially direct seeding), it’s more labor intensive and it’s more time consuming.

Small Farm, Big Ideas
Solar Fresh Produce is a 3 acre CSA farm in Buffalo, MN owned and operated by Sarah Lindblom since 2015. I (Sarah) was fortunate to connect with the Sustainable Farming Association early in my venture which provided some of the “how” behind the “why” of regenerative farming. My mission is to strengthen the local food community through the use of regenerative farming practices. I strive to be a steward of the environment and to delight customers with delicious and nutrient dense food. The soil health principles help me do just that. This report is possible because of a $2,160 grant from the Mill City Farmers Market Next Stage Grant Program to implement soil health principles in a caterpillar tunnel.

Update from Phase 1
When tightening the billow prevention rope, do not pull too tight because it can damage plastic. I noticed an area along the top purlin where the plastic was ripped because of friction with the rope.
Despite these challenges, CSA customers who choose Solar Fresh prefer a long term and regenerative approach even if it might take a little longer to get some produce. This reduced tillage over time will hopefully help reduce weed pressure, improve soil structure, and build the microbiome of the soil, and these have benefits for plant health that reduce the use of inputs.

Benefits from reduced tillage might take a little time to become obvious but it’s worth the wait. Some things I’ve noticed in reduced tillage areas is more earthworms, less weed pressure, better water holding capacity, better soil structure, and less compaction. Hopefully I will be able to measure these with the soil quality testing.

I wanted to wait to prep the beds until after the tunnel was built because I knew the construction would require walking in the planting areas. After the tunnel was constructed, I got to work broadforking each bed, and then used a wheel hoe with a stirrup hoe attachment to run through the beds. One bed had some spring flower bulbs, so I did not fork that area and simply hand weeded.

I created three beds within the hoop structure with two walkways in the inside and a walkway along each edge. The design of the planting area depends on your goals, what you’re planting and how you plan to manage those crops. So far this method has been working well for me with spacing and moving around inside the tunnel. I also created a walkway going across the tunnel at the half way point for ease of harvesting.

Two of the six beds (or 1/3 of the caterpillar tunnel) were not planted immediately because of time delays, so I used a piece of silage tarp to cover that area until I was able to broadfork.
Setting up Drip Irrigation

In order to water the plants in the caterpillar tunnel, I decided to use a drip irrigation system that I have used in the past. To reduce plastic, I re-used old mainline, garden hose, valves, connectors, endcaps and drip tape. Holes in drip tape can be repaired by cutting out the damaged section and re-connecting with a connector. Just make sure when attaching connectors and valves to use the space on the drip tape between emitters to avoid leaks. It is no doubt easier to just use new tape, hoses and fittings, but with a little determination a decent system can be set up with salvaged parts. It also helps to think ahead and store drip tape properly and in the lengths/areas where they will be used again.

How often and how long you run the drip irrigation depends on the pressure and gallons per minute of water. You can figure this out by seeing how long it takes to fill a bucket from the system and do some math, but I usually use a more intuitive method and check moisture levels in the soil and observe plant health. The time irrigating also depends on how much total area is being irrigated.

Instead of setting up the mainline at one end of the tunnel, I set it up in the middle going across. This creates 6 individual beds that you can irrigate accordingly and a walkway in the middle for easier movement within the structure. It does use up more real estate this way, so depending on your goals it might be better to set up mainline irrigation at one end with no break in the middle.

Planting

After all the buildup and waiting, it is finally time to plant! My plans changed because of the delays in the spring and I got to planting summer crops right away including tomatoes and basil (Genovese basil and Holy Basil) on May 28th 2020. My tomato plants were a little larger than desired however they transplanted just fine even with the delay. I direct seeded a row of arugula along the shoulder of the basil bed to keep that soil covered and take advantage of the space and irrigation while things are growing. The arugula and basil have been the first crops to harvest from the tunnel for the CSA so far.

Planting the remaining 1/3 of the hoop house will be discussed in phase 3. In the meantime, those beds have been occulted to reduce weed pressure. I had hoped to incorporate cover crops at this point (oats and buckwheat), but because of time constraints occultation has been an easier, less expensive method although not as beneficial as cover cropping. I plan to still incorporate a cover crop at some point this summer, fall and next spring.

In the next phase, I will continue to plant and develop the beds in the caterpillar tunnel to increase crop diversity, and I will maintain plants with pruning, trellising, and harvesting. I will harvest some of the first crops for the CSA and try out the earthworm test.
Slake Test
The second soil health test in the report card is the Slake Test. This is another good test of soil structure, and gives a visual sense of what happens to the soil during a heavy rain event. It is an indication of biological activity and energy flow.

To complete this test you will need:

- Hardware cloth
- Half Gallon Mason Jar
- Soil Sample(s) (dry) with location and date label(s)
- Camera
- Water
- Soil Health Report Card to record data
- Alternate method can use a plastic bottle instead of hardware cloth and mason jar

Method:
Collect soil sample in advance (sample should be air dry). You may want to collect several location samples to compare—just make sure to mark location info when collecting and label samples. For this report I will demonstrate one sample from inside the caterpillar tunnel. Taking a photo will allow me to compare one location over time.

Make a hardware cloth or mesh container that fits into your mason jar or other vessel. (You can also cut off the top of a bottle and invert it so the opening points down into the bottle, and then tape or connect the two pieces.) Fill the mason jar container with water so the soil sample will be totally submerged.

Submerge the soil sample and set a timer for 5 minutes. At the 5 minute mark, take a photo of the slake test results. You may want to take photos along the way to help assess stability class as well. Use the Slake test Stability Class Criteria table to determine the stability class for the sample and record it in the table. You can re-dip the sample and record stability class after dipping cycles if applicable.

### Slake Test Stability Class Criteria

<table>
<thead>
<tr>
<th>Stability Class</th>
<th>Criteria for assignment to stability class</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>Soil too unstable to sample</td>
</tr>
<tr>
<td>1</td>
<td>50% structural integrity lost within 5 seconds after insertion in water</td>
</tr>
<tr>
<td>2</td>
<td>50% structural integrity lost within 5-30 seconds of insertion of water</td>
</tr>
<tr>
<td>3</td>
<td>50% structural integrity lost within 30-300 seconds of insertion in water or less than 10% of soil remains after 5 dipping cycles</td>
</tr>
<tr>
<td>4</td>
<td>10-25% of soil remaining on sieve after 5 dipping cycles</td>
</tr>
<tr>
<td>5</td>
<td>25-75% of soil remaining on sieve after 5 dipping cycles</td>
</tr>
<tr>
<td>6</td>
<td>75-100% of soil remaining on sieve after 5 dipping cycles</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Test Date</th>
<th>Sample Location</th>
<th>Photo (end result)</th>
<th>Stability Class after 5 Min+ dipping cycles</th>
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<tbody>
<tr>
<td>5/20/2020</td>
<td>7/7/2020</td>
<td>caterpillar tunnel</td>
<td>(See photo 8)</td>
<td>3</td>
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</tbody>
</table>

(USDA, 2020)
Clod after 5 minute immersion test result stability class 3

References


Special Thanks:
Mill City Farmer Market Next Stage Grant
Solar Fresh Produce CSA Members
Farm Farm CSA (Heather and Jimmy Bauman)
Constance Carlson
Jerry Ford
Wright County Extension

9 Use five dipping cycles to determine stability class