Do different soil covers differ in their efficacy for production of organic greens?

IN A NUTSHELL
As a follow-up to Brent and Gillian’s tarp trial last year, these growers evaluated the difference among tarp, landscape fabric and clear plastic for greens production.

Key Findings
- Occultation worked consistently for weed and residue management. Between tarp and landscape fabric, landscape fabric is much easier to manage.
- Clear plastic was not effective during shoulder seasons, when temperatures aren’t warm enough.
- The soil covers did not affect crop yield differently.
- Soil moisture retention was better with occultation, and soil moisture was highest under landscape fabric.
- Depending on farm and time of year, soil temperature peaked under all covers and uncovered soil, suggesting that occultation does not increase soil temperatures to a point that negatively affects soil biology.

RESULTS

Yield

There was no consistent yield difference among lettuce grown after the three different soil covers at Jones Family Greens (Figure 1; P>0.10).

For the first succession, Matt also compared lettuce grown in holes of landscape fabric. Yield was the highest in this treatment (P<0.01), but we don’t know if this result is consistent across the season.

Yield was lowest in the untreated plots (P<0.01), but these sections - which he left open for 3-9 weeks - are not representative of Matt’s standard way of growing greens. For this reason, the yield deficit control plots should be interpreted with caution.

Weed and Residue Control
The New Farm: Tarps worked a little bit better than fabric in terms of decomposing stubble and residue. But weed control between beds was easier to control with landscape fabric, which can be overlapped.

Earth to Table Farm: Both the landscape fabric and silage tarp dealt well with residue, but left enough on the surface to require some labour for removal. This was especially true for arugula and baby kale, which left substantial or stringy stems that gummed up the seeder.

Jones Family Greens: While clear plastic worked very poorly in shoulder seasons as it just enhanced the growth of some weeds, it was effective at weed control mid-summer (2).

BACKGROUND
With the benefits of minimum-till systems becoming well established, appropriate ecological methods for weed control that do not disturb the soil are needed. Results from Brent and Gillian’s 2018 farmer-led research trial showed that using silage tarps resulted in an 82% reduction in tillage, faster growing crops, and reduced labour for lettuce and spinach crops (1).

As an iteration of the 2018 trial, these growers were curious to know how different soil covers perform.

- Covering with clear plastic (i.e., solarization) induces weeds to germinate and they die due to the high temperatures.
- Covering with dark opaque materials like silage tarp and landscape fabric (i.e. occultation) induces weeds to germinate and they die due to the absence of light.

METHODS
The growers compared different soil covers as outlined in Table 1. They recorded soil temperature using HOBO Pendant® MX Water Temperature Data Loggers w/Bluetooth, and made observational notes about management including handling the different covers; Matt, Chris and Jon recorded yield and labour; and Matt also recorded soil moisture. See Matt’s experimental design on page 2.

EXPERIMENTAL DESIGN FOR THE THREE FARMS

<table>
<thead>
<tr>
<th>Farm</th>
<th>Treatments</th>
<th>Crops</th>
<th>Experimental Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones Family Greens</td>
<td>1. Silage tarp, landscape fabric</td>
<td>Lettuce mix, Brassica greens, Cheiranthus</td>
<td>- Two areas, each with 4 sections, each 4 subsections</td>
</tr>
<tr>
<td></td>
<td>2. Clear plastic, landscape fabric</td>
<td>Brassica greens, Cheiranthus, cruciferous greens, brassicas, brassica</td>
<td>- Each area divided into 4 sub-areas, each 4 subsections</td>
</tr>
<tr>
<td></td>
<td>3. Uncovered, light cultivation to remove weeds</td>
<td>Brassica greens, Cheiranthus, cruciferous greens, brassicas, brassica</td>
<td>- Each area divided into 4 sub-areas, each 4 subsections</td>
</tr>
<tr>
<td>The New Farm</td>
<td>1. Silage tarp, landscape fabric</td>
<td>Lettuce mix, Brassica greens</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
<tr>
<td></td>
<td>2. Clear plastic, landscape fabric</td>
<td>Brassica greens, Arugula</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
<tr>
<td></td>
<td>3. Control, tilling</td>
<td>Brassica greens, Arugula</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
<tr>
<td>Earth to Table Farm</td>
<td>1. Silage tarp, landscape fabric</td>
<td>Lettuce mix, Baby kale</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
<tr>
<td></td>
<td>2. Clear plastic, landscape fabric</td>
<td>Baby kale</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
<tr>
<td></td>
<td>3. Control, RCS power-fan</td>
<td>Baby kale, Arugula</td>
<td>- Full beds randomly assigned to treatment for each succession</td>
</tr>
</tbody>
</table>

REFERENCES

THANKS TO OUR PROJECT FUNDERS
Earth to Table Farm

SOIL HEALTH

THANKS TO OUR PROJECT FUNDERS

WEED CONTROL

[Continued on page 2]
RESULTS continued

Labour

All growers reported that the tarps were the most difficult to use because of their weight and general awkwardness, especially compared to landscape fabric that is lighter weight and pinned.

Tarps were also susceptible to water pooling, which makes them even heavier; and tarp is hard to store because of its bulk.

Brent, Gillian and Matt held down the tarps by burying the edges. This was very time consuming. Chris and Jon didn’t find securing the tarps as time consuming because they used pallets to hold down the tarps. The pallets worked well even with their “crazy winds”!

Soil Moisture

For each succession, Matt measured soil moisture twice: 1) before he placed the covers and 2) right after he removed the soil covers (4 measurements/section/time).

Soil moisture retention was better with occultation (+15% more moisture on average; P=0.02). Clear plastic was similar to the untreated plots (P=0.11).

Soil moisture after cover removal was highest for landscape fabric (P<0.01). Nonetheless, tarps retained sufficient soil moisture for seeding throughout the season.

Soil Temperature

All three farms used HOBO Pendant® MX Water Temperature Data Loggers w/Bluetooth buried at 5cm to record soil temperature under the different treatments.

Soil temperature at Jones Family Farm. Daytime soil temperature was consistently highest under clear plastic, followed by tarp, fabric and untreated bare soil.

Soil temperature at The New Farm. Daytime soil temperature was consistently higher in uncovered tilled soil as compared to untilled soil under tarp and landscape fabric.

Soil temperature at Earth to Table Farm. At different points throughout the year, daytime soil temperature was highest under tarp, landscape fabric and tilled bare soil.

Soil temperature at the The New Farm was consistently higher under uncovered tilled soil. This suggests that increased temperature from occultation may not negatively affect soil biology.

Acknowledgements

We thank Dubois Agrinovation for donating the landscape fabric used at Jones Family Greens and Earth to Table Farm.

REFERENCES
