

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



SOIL HEALTH



WEED CONTROL



Farmer-Researchers

Matt Jones
Jones Family Greens - West

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Earth to Table Farm - West

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The New Farm - West

Project timeline:
Spring - Fall 2019

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.

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.

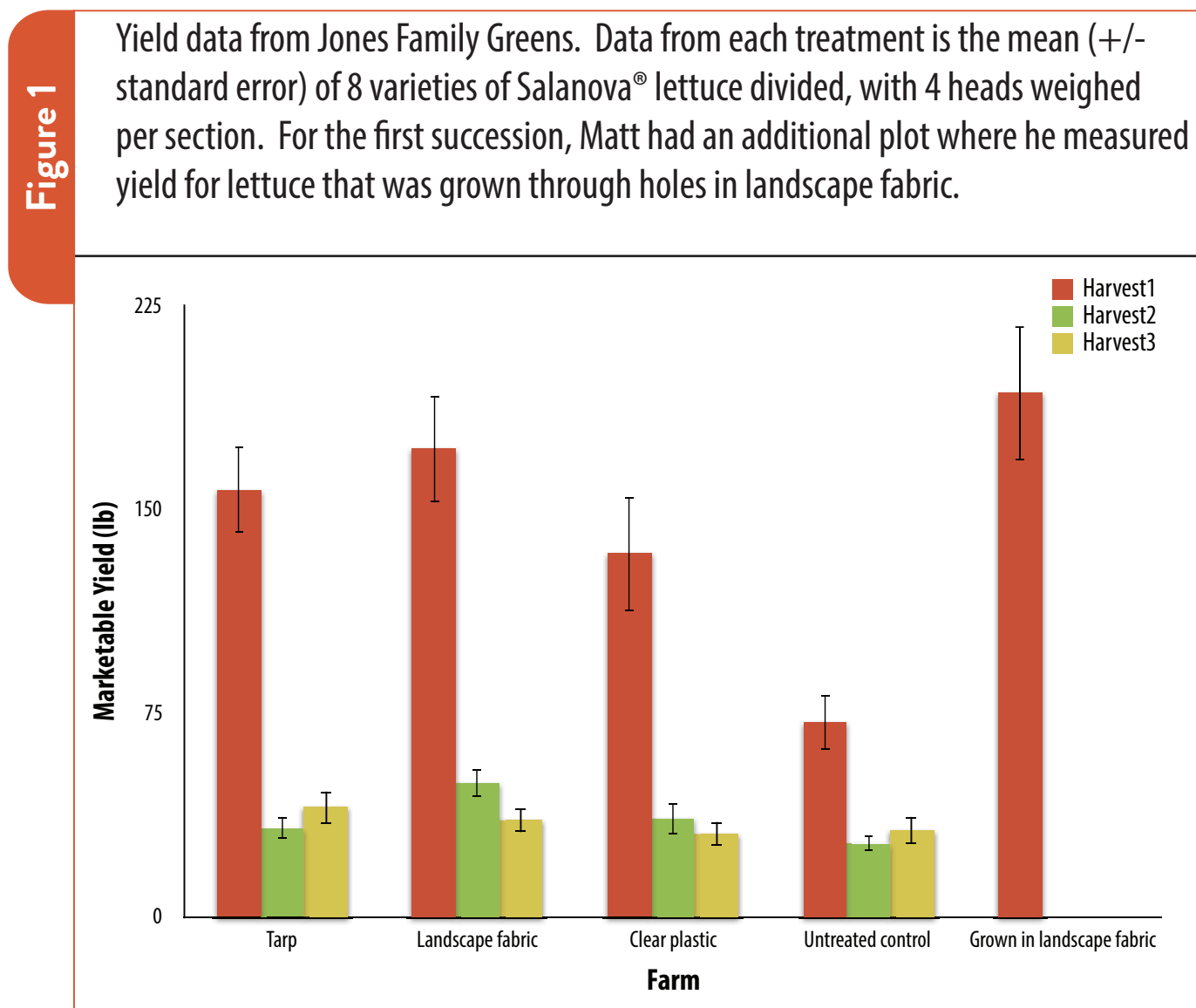
METHODS

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](#).

Farm	Treatments	Crops	Experimental Design
Jones Family Greens	1. Silage tarp	Lettuce mix	Two areas, each with: - 4x60' rows, one per crop group - Each row divided into 4x15' sections, which were randomly assigned to a treatment - 3 successions
	2. Clear plastic	Brassica greens	
	3. Landscape fabric	Chenopodiaceae greens (spinach, chard, beets)	
	4. Untreated; light cultivation to remove weeds	Roots (carrots and beets)	
The New Farm	1. Silage tarp	Lettuce mix	Full beds randomly assigned to a treatment for each succession. - 4 successions
	2. Landscape fabric	Brassica greens	
	3. Control; tilling	Arugula	
Earth to Table Farm	1. Silage tarp	Lettuce mix	Full beds randomly assigned to a treatment for each succession. - 1 succession with full beds of lettuce and 1 with half beds of baby kale and arugula
	2. Landscape fabric	Baby kale	
	3. Control; BCS power-harrow	Arugula	

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 sections ($P < 0.01$), 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: 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).



Photo: Clear plastic working ineffectively during the shoulder season at Jones Family Greens.

Labour - [see page 2](#)

Soil Moisture and Temperature - [see page 2](#)

TAKE HOME MESSAGES

Occultation was a robust means of weed and residue elimination prior to planting throughout the trial, while solarization was only effective during the hotter part of the growing season. In this study, no method prevented subsequent weed growth.

For specific methods of occultation, there were no consistent or dramatic differences in residue management or crop yield between landscape fabric and silage plastic. Landscape fabric, however, was consistently easier to work with than silage tarp, making it the future cover of choice for these three farms. (If you do use tarps, Chris and Jon found that can be effectively held down with pallets.)

Soil moisture retention was better with occultation and soil moisture after cover removal was highest after landscape fabric.

Depending on the time of year and farm, soil temperature peaked under tarp, clear plastic and tilled soil. Consistent with other research, the greatest temperature increase relative to other treatments was via solarization. In contrast, occultation didn't necessarily increase soil temperature above uncovered soil. This suggests that concerns about its negative effect on soil biology may be unwarranted.

[Continued on page 2]

REFERENCES

1. Preston and Flies. 2019. <https://efao.ca/researchDocs/notiltartarlettuce-preston-flies-efao2018-1548811141.pdf>
2. Mefferd. 2019. The Organic No-Till Farming Revolution: High-Production Methods for Small-Scale Farmers.

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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"!



Photo: Gillian laying landscape fabric at The New Farm.

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.



Photo: Experimental set-up of one succession at Jones Family Greens.

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.

Figure 2 Soil temperature at Jones Family Farm. Daytime soil temperature was consistently highest under clear plastic, followed by tarp, fabric and untreated bare soil.

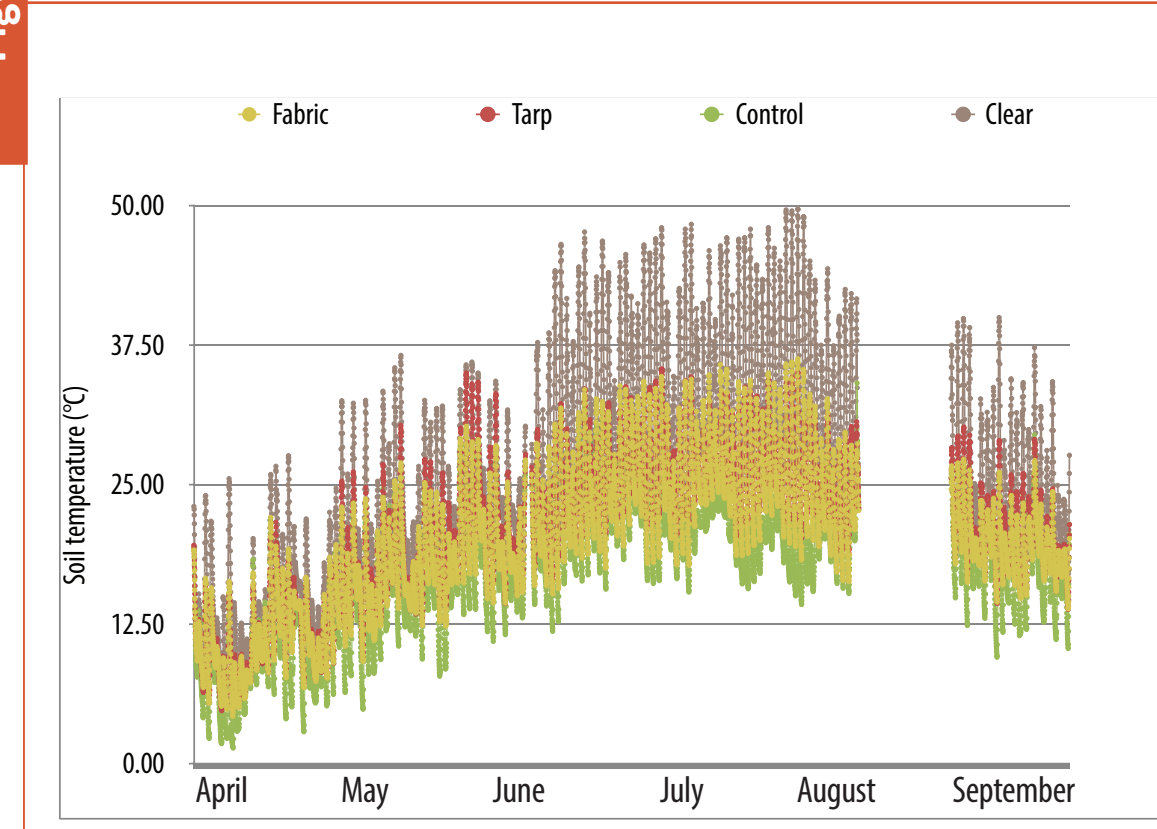


Figure 3 Soil temperature at The New Farm. Daytime soil temperature was consistently higher in uncovered tilled soil as compared to untilled soil under tarp and landscape fabric.

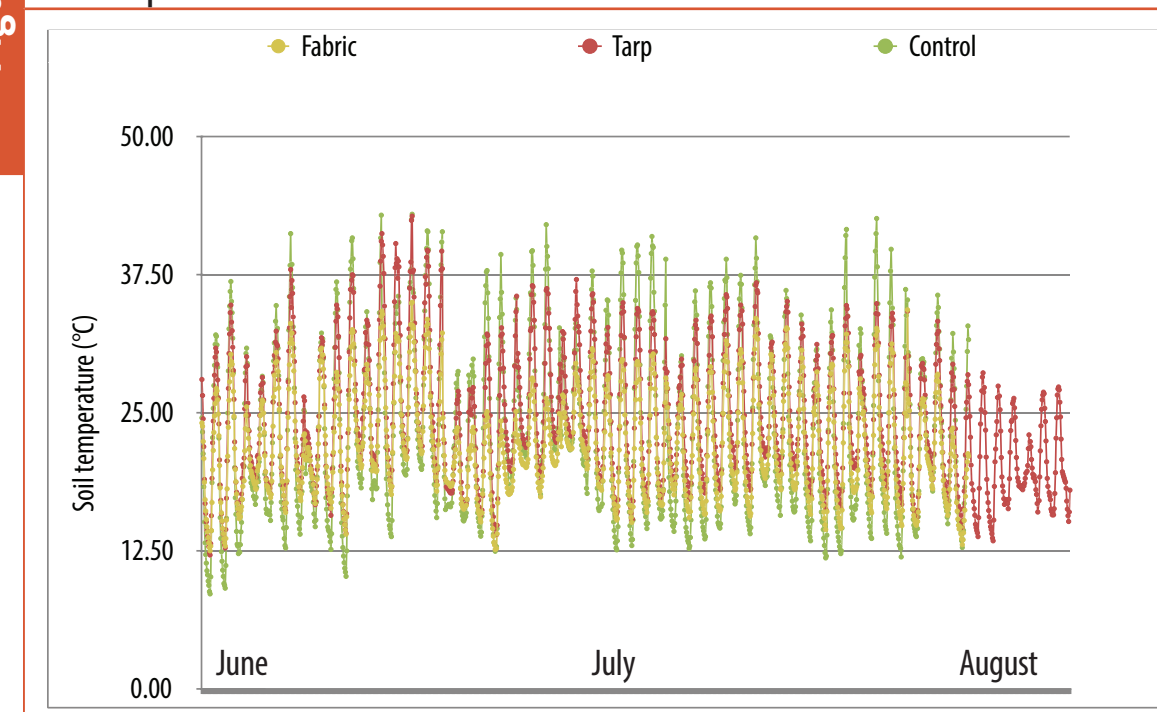
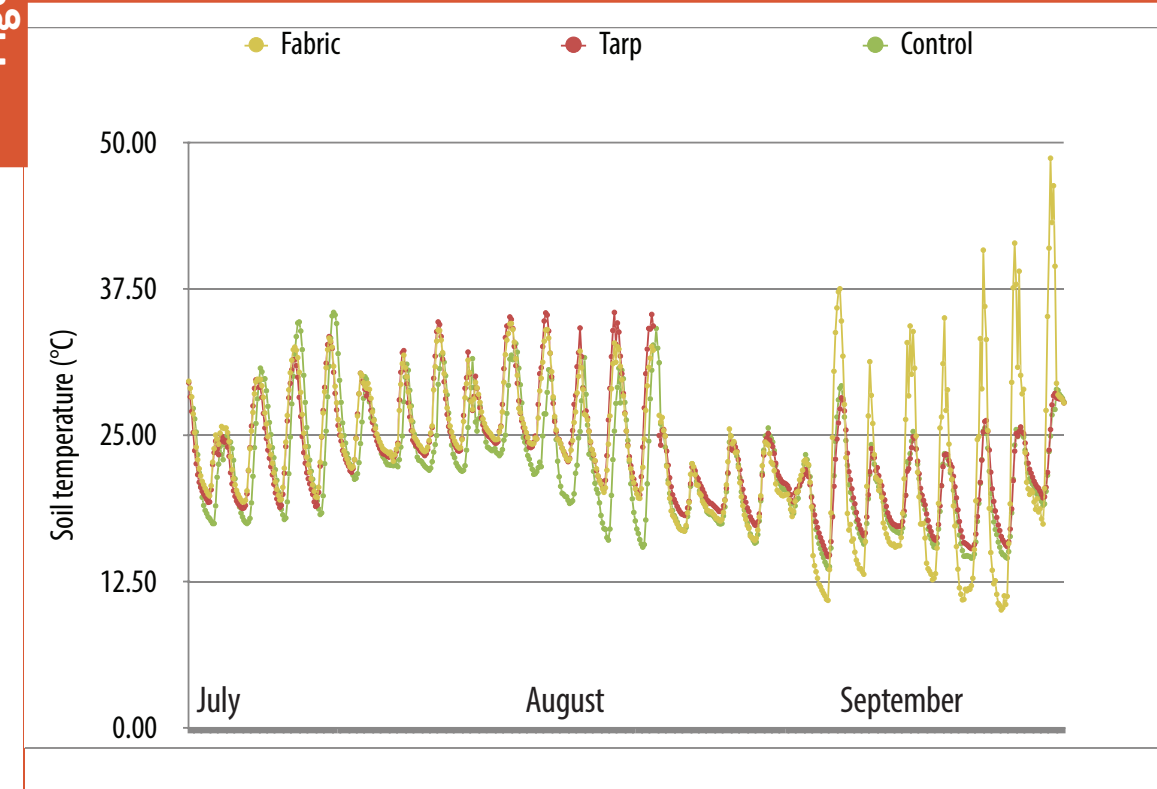


Figure 4 Soil temperature at Earth to Table Farm. At different points throughout the year, daytime soil temperature was highest under tarp, landscape fabric and tilled bare soil.



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

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REFERENCES

1. Preston and Flies. 2019. <https://efao.ca/researchDocs/notiltarpletuce-preston-flies-efao2018-1548811141.pdf>
2. Mefferd. 2019. The Organic No-Till Farming Revolution: High-Production Methods for Small-Scale Farmers.

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