The following summary is part of Cedar Circle Farm's report on No-Till Strawberry Production for the Climate Adaptation Fellowship (CAMF) program in 2020-21 and subsequent work in 2022. To learn more about CAMF you can visit the website www.adaptationfellows.net.

This work was done by the farm's Research & Development Manager Nic Cook, along with fellowship partner Heather Bryant from UNH Extension. If you have any questions, please reach out to Nic at nic@cedarcirclefarm.org.

Final Report

Economic Analysis

During the 2021 strawberry fruiting season, we failed to get yield/revenue data to go along with the cost of production data for establishing the no-till strawberries. Without this piece of information the cost benefit analysis can only look at the differences in production costs for no till vs conventional strawberries.

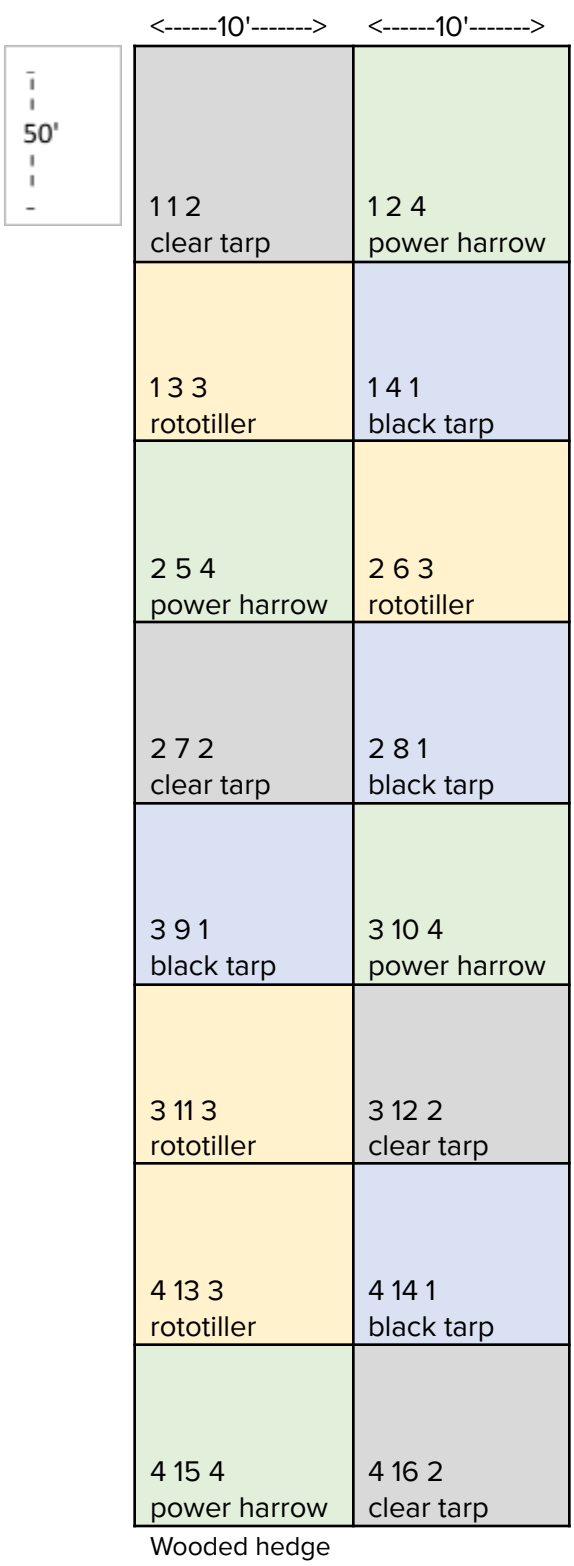
Nevertheless, the analysis leads to one very interesting conclusion. The cost of production for the no-till system was $2,084 less than the conventional till system on a per acre basis (attached). The main cost difference in the two strawberry production systems was a 32% decrease in the amount of hand labor that went into the no-till system compared to the conventional system in 2020 and 2021. Particularly for organic and no-spray farms, hand weeding is a significant cost. If this decrease is typical, it would enable a farm to tolerate some amount of yield reduction and still maintain profits.

Strawberry Termination Study

After realizing the economic analysis was not going as originally planned, we added a component in early fall 2021. One challenge CCF has identified for the long-term success of their 4 year no-till rotation plan, is how best to terminate the strawberries at the end of their fruiting year. Strawberries are a perennial plant, so while their productive capacity wanes over time, the plants themselves do not die and need to be killed to make room for the next crop. In a conventional system that would be accomplished with tillage or herbicides. CCF would prefer a no-till or reduced till alternative that does not involve herbicides.

In August we set up a trial with four termination treatments, black plastic tarp, clear plastic tarp, shallow cultivation with a power harrow, and shallow cultivation with a rototiller. The plots were laid out in a random complete block design with 4 treatments and 4 replications. Each plot was 10' X 50' and contained one of the four treatments described above. The field was mowed closely and the treatments were applied on 8/4/21. The tarps were left in place for 20 days. See Figure 1 for a map of the field layout.

Figure 1: Map of strawberry termination trial.



On 8/24/21 immediately after removing the tarps we collected initial data on strawberry termination and weed control. It is impossible to know for certain in the fall if the strawberries were successfully killed, so we used resistance to hand pulling as a proxy. We threw a hula hoop into each plot and then moved it left or right until it was centered over the strawberry row and counted how many plants were visible inside the hula hoop and whether or not they resisted hand pulling (an indication they are likely alive). We also assessed weed pressure in each plot using a 1-5 scale with the following ratings.

1 = no weeds
2 = minor weed pressure, just a few
3 = medium pressure, mostly in walkways
4 = significant pressure in in cropping rows
5 = flowering weeds

See Table 1 for preliminary results.

Table 1: Strawberry Termination Data

Treatment	Avg # of Plants Likely Alive*	Avg Weed Rating*
Black Tarp	10.25 A	1.0 B
Clear Tarp	8.75 AB	3.0 A
Rototiller	1.25 BC	4.0 A
Power Harrow	0.75 C	4.0 A

*Treatment averages with the same letters after them are not statistically different from each other.

While preliminary, the data is interesting. It indicates that while the two shallow tillage treatments appear to do a better job of terminating the strawberries they also lead to more weed pressure compared to the black tarp treatment. As mentioned above increased weed pressure will lead to increased labor costs.

The clear tarp did not appear to be as effective as the black tarp and we suspect that has to do with the difficulty of getting good tarp-soil contact in the field as even after close mowing the cropping rows were slightly raised compared to the walkways.

We collected this data again in summer 2022, measuring to what extent the strawberries themselves become weeds in the subsequent vegetable crops, and weed pressure more generally in the plots.

Summer 2022 Addendum

After data collection in 2021 was completed, CCF no-till drilled a winter rye cover crop at the same rate across all treatments. The plots were marked with flags that could be driven over with equipment and measurements were made from well-defined corners so that we could recreate the plots if any flags were lost.

The original cropping plan for that field in 2022 was mixed vegetables, but due to labor shortages CCF chose to make it a season long fallow. The rye planted in 2021 was roller crimped on June 11, 2022. On August 12, 2022 we collected data on weed pressure in the plots using the same rating system from the 2021 season.

Results are summarized in Table 2 below.

Table 2: Strawberry Termination Study

	2021	Aug 2021	Aug 2022
Treatment	**Avg # of Plants Likely Alive***	**Avg Weed Rating***	**Avg Weed Rating***
Black Tarp	10.25 A	1.0 B	3.5 A
Clear Tarp	8.75 AB	3.0 A	3.0 A
Rototiller	1.25 BC	4.0 A	1.75 A
Power Harrow	0.75 C	4.0 A	2.5 A

*Treatment averages with the same letters after them are not statistically different from each other.

No strawberry plants were found alive in 2022, indicating all treatments effectively terminated the strawberries. While weed pressure appeared to be lower in the two shallow tillage treatments, those differences were not statistically significant. Consequently, we are confident all four treatment options are effective at termination and worth continued consideration. Potentially the farmer's choice of system should be made based on availability of supplies, equipment and labor.

If future work is done on this topic, it would be interesting to continue looking at weed pressure the year after shallow tillage vs tarping treatments from an economic perspective to see which treatment(s) lead to reduced labor costs. It would also be interesting to add a short-term cover crop like buckwheat immediately after shallow tillage but before drilling rye for the winter, or conversely to immediately follow shallow tillage with a summer cover crop that would winterkill leaving the ground covered with residue for the winter.