



Northern NY Agricultural Development Program 2014 Project Report

Inter-Row Cover Crops for Plasticulture Vegetables

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Cooperating Producers:

- . Adam Hainer, Juniper Hill Farm, Essex County
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Background:

Plasticulture production of vegetables in Northern New York has brought many benefits to farmers such as in-row weed control, moisture retention, soil heating and earlier yields. However, this bare row-middle system requires additional challenges in weed management. Conventional farms using herbicides may pose a negative impact to the environment, as measured by Environmental Impact Quotients (EIQs). A standard program requires up to four herbicides resulting in a high EIQ of 97.4 per acre. Further, given the diverse nature of NNY vegetable farms, there is not a single herbicide approach that works well across multiple crops grown on plastic.

Organic farms do not use herbicides, but instead cultivate between rows. This a high labor input on farms where labor is already a major constraint. Cultivating also reduces soil organic matter, which decreases microbial activity and tilth. Bare row middles also contribute to surface runoff and contamination of adjacent water bodies and wetlands. A living inter-row cover crop could be a sustainable solution to these problems bringing

numerous benefits: reduced soil erosion, improved harvest conditions, reduced labor, increased organic matter, and reduced soil splashing.

Methods:

On May 1, 2014, we laid black plastic mulch and drip tape to form 2 beds at the CU Willsboro Farm on a Stafford Sandy Loam. On May 2 we transplanted onion seedlings (variety 'Candy') 8 inches on center, 3 rows per bed in 1- foot long blocks. Each block had the same cover crop treatment planted on both sides so the onions were flanked by the treatment, and each treatment was replicated 4 times (see plot plan in Appendix).

The 4 treatments were:

- Winter Triticale– a winter grain, a cross between wheat and rye
- Winter Tricale and Dutch white clover – a winter grain and a legume
- Annual ryegrass – this is not a grain and was included for comparison
- Control – no cover crop, cultivation for weed control

Planting rates:

- Triticale – 150 lbs seed/acre
- Dutch white clover – 20 lbs seed/acre
- Annual ryegrass – 20 lbs seed/acre

By sowing a winter grain in spring we avoid the vernalization process of winter. Without vernalization, winter grains grow only leaves without forming a seed stalk, making them more competitive with weeds, while avoiding excessive growth. Dutch white clover is slow to establish and does not initially compete well with weeds. By mixing clover with triticale, the triticale serves as a nurse crop, giving the clover a better chance to become established by mid-summer.

We also included annual ryegrass as a treatment. This is not a winter grain but is inexpensive and very quick to become established and competes well with weeds.

Weed sampling protocol:

- The above ground cover crop and weed biomass were sampled on three dates (June 24, July 1, and August 18) and then mowed after each sampling.
- For each plot, a 31cm x 31cm quadrant was placed along the side of the growing bed and in the middle of the inter-row area.
- All above ground biomass was collected from within the quadrat area. Cover crops and weeds were separated and then placed in the drying ovens.

Results:

To successfully use cover crops between plastic-mulched rows there are two main challenges:

getting the cover crop established before weeds can dominate and then getting a decent crop yield (in this case, onions) in spite of competition from the cover crops.

Cover crop establishment

Annual ryegrass was the most aggressive at competing with the weeds, with the best cover crop to weed ratio, but it was also competitive with the onion crop. The outer rows of onions yielded smaller bulbs than the inner rows, in large part due to this competition.

Cover Crop:Weed ratio - Average of 4 replications	
	Cover Crop:Weed ratio
Triticale	6.23
Triticale and Dutch white clover	4.75
Annual ryegrass	8.75
	<i>Note: the larger the number, the more successful the cover crop was at suppressing weeds</i>

The two cooperating growers experienced very poor establishment of the cover crops in their plantings. This was due in large part to a delay of at least a week in getting the cover crops planted after the plastic mulch was laid. In both cases the weeds had a head start and none of the cover crops was able to establish itself enough to compete. The field planting at the Extension Learning Farm in Canton experienced similar difficulties and was considered a failure without better timing and an efficient way to keep the cover crop mowed once established.

Onion Yields

Onions are graded and priced by their size. At harvest, we graded them and tracked the numbers of bulbs in each grade per treatment. We then compared yields in the 2 outer rows with the center row to determine if the center had an advantage over the outer rows that were closer to the competing cover crop. Bulb grading standard:

- Colossal: >4" diameter
- Jumbo: >3" diameter
- Large: >2" diameter
- Small: <2" diameter

The outer rows yielded more lower-grade (smaller) onions than the inner rows due to competition from the cover crops (data included in appendix). The control treatment (cultivation) that provided the least competition consequently produced the best yields in those outer rows. Even the row middles showed a reduced yield in the cover crop treatments versus the control treatment of bare ground.

Conclusions/Outcomes/Impacts:

A cover crop between the rows of plastic mulched beds has the potential to protect bare soil from erosion, reduce soil splashing and improve harvest conditions while adding organic matter to the soil. Conventional growers could establish a cover crop, then apply an herbicide to stop its growth, and leave the dead sod in place as a mulch for the growing season. Organic growers need to mow the cover crop regularly to reduce top growth and keep the cover manageable. Because living cover crops have to be aggressive enough to out-compete weeds, they also compete with the desired crop.

Establishing the cover crop is problematic. It must be sown the same day the plastic mulch is laid to give it a chance to compete with weeds that are germinating. Weather conditions after sowing have a large impact on how well the cover crop establishes. Drip irrigation lines are laid under the plastic reach only the crop in order to conserve water. If a dry spell or conversely, days of heavy rains follow planting, the cover crop may have poor germination and be slow to establish. When conditions are ideal, the cover crop can be quite successful but there is little the grower can do to control those conditions.

In conclusion, the results from this and previous studies done on this practice show that results are variable. Conventional growers may have more success by stopping competition from the cover crop with herbicides. Organic growers are taking a larger risk using living cover crops between the rows. If a flail-type mower is available and the aisles are wide enough to allow one pass of the mower each week to keep the cover crop in check, competition may be minimized. But without an effective, efficient method of mowing, growers are taking a risk using this method. And even a mowed cover will be competitive with the crop.

Growers are encouraged to try these methods on a small scale with their own equipment to see if they can develop a method that works for their operation. We do not recommend a broad adoption of this method at this time.

Outreach:

We held a field meeting with Judson Reid on July 28 at the Willsboro Farm for 24 growers. Participants were able to see the various treatments first hand. Many of the attendees had not used plastic mulch and were seeing the effective weed control it provided within the row for the first time. The dense cover crop treatments between the rows were lush in late July, showing how aggressive these inter-row covers can be. We repeated this meeting with Judson Reid on July 29 at the Extension Learning Farm in Canton for 25 growers.

For more information:

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