

Optimizing Tillage and Cover Crops for Small- and Medium-Scale Organic Vegetable Farms

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The Need

Organic farming, and consumer demand for organic products, has been steadily increasing across the United States. In New York, the number of certified organic farms has almost doubled since 2011, and nationally, the organic product market topped \$60 billion in 2020. In the Northeast and upper Midwest, organic farmers have traditionally relied upon intensive and frequent soil tillage for weed control. But while some tillage is important to vegetable crops, excessive tillage is detrimental to long-term soil quality, contributing to loss of soil nutrients and erosion, reducing soil's ability to retain water, and releasing excess carbon. This project seeks to identify profitable and sustainable practices that enhance soil health and resilience to climate change, while helping organic farmers successfully balance crop productivity, costs, soil health and labor requirements to achieve long-term profitability.

The Approach

The researchers carried out field experiments using organic practices on four farms in New York, Maine and Michigan. The trials tested up to six levels of tillage, from 7- to 8-inch-deep soil disturbance to no tillage at all, in combination with three types of mulch: straw/hay, compost or no mulch. They also compared two no-till systems: one where black plastic tarps were placed on soil for six or more weeks before planting and one without tarps. The researchers also tested the impact of cover crops on weed growth and eventual crop yields.

The Impacts

The farming trials showed:

- Both no-till and shallow tillage (less than 4-inch soil disturbance) practices produced crop yields similar to conventional deep tillage (7-8-inch disturbance), though no-till farming required significantly more labor.
- Hay/straw mulch was found to lower crop yields due to increased pest pressure, especially in the no-till trial.
- Black plastic tarps reduced labor for no-till farming but increased labor compared to conventional deep tillage.
- Placing tarps over soil for three or more weeks killed 95-100% of weeds and kept down early season weed pressure.
- Tarping increased crop yields and reduced weeds at harvest for no-till and shallow-till trials, with similar results to conventional deep tillage.
- Compost mulch increased vegetable yields, especially in no-till systems, but it also caused excess phosphorus in soils.

The researchers have shared their findings at 43 farmer outreach events, including meetings and field days, which have reached 1,975 participants. Among these events were a series of intensive, daylong farmer-to-farmer workshops in New York and Maine on Tarping for Reduced Tillage in Small-Scale Vegetable Systems.