

Survey of Farmers in New York Reveals Challenges and Opportunities in Soil Health

Soil Health

Cedric Mason (cwm77@cornell.edu) and David Wolfe (dww5@cornell.edu), Cornell University

The condition of a farm’s soil has a vital impact on crop production and the environment. Healthy agricultural soil holds adequate nutrients, absorbs heavy rainfall, and stores water. But in many annual production systems these functions are compromised by tillage, which diminishes soil organic matter and creates compaction, ultimately restricting crop growth while increasing susceptibility to drought, erosion, and nutrient losses. Healthy soils, containing substantial levels of organic matter and beneficial pore space, can be developed over time by reducing tillage and using cover crops. But to put in place, both strategies require significant investments of time and resources, while the benefits may vary with context and can require some years to take effect.

To help clarify exactly what costs and benefits farmers in New York experience when using these soil health-

enhancing practices, we conducted a state-wide survey during the winter of 2017-18. Over 180 farmers from 46 NY counties provided information about the crops they grow, and how using reduced tillage and cover crops have impacted their farm business. From the survey results, we identified the most frequent expenses and benefits (Table 1).

The most common benefit of both reduced tillage and cover crops was less erosion or sedimentation repair. Greater yield was reported by 52% of farmers using reduced tillage, and by 50% of those using cover crops. Lower yield was reported by 10% and 3% of farmers using reduced tillage and cover crops respectively (Table 1). Note that costs and benefits reported in Table 1 go beyond revenue associated with yield, to include increases or decreases in annual input costs, as well as capital investment costs (e.g., new equipment) or avoided costs (e.g., drainage system installation).

When asked about profitability, less than 5% reported that either practice had a negative net impact (data not shown).

Our survey also found distinctions in the costs and benefits depending on the type of cash crop being produced, for example greater yield of cash crops attributed to the use of cover crops was more frequently reported for vegetable systems than for corn and soybean, while corn and soybean systems in particular were more likely to benefit from forage uses of cover crops (data not shown). Our study results

Table 1. Common costs and benefits of reduced tillage and cover crops ranked by prevalence among New York farmers of all crop types. The percent of farmers who reported each cost or benefit is given in parentheses; n = 125 for reduced tillage and n = 149 for cover crops.

		Benefits of reduced tillage	Costs of reduced tillage	Benefits of cover crops	Costs of cover crops
Rank	1	Less erosion or sedimentation repair (83.2%)	Specialized tillage equipment (48%)	Less erosion or sedimentation repair (83.9%)	Cover crop seed costs (89.9%)
	2	Less labor, fuel, or equipment use (74.4%)	Specialized planting equipment (48%)	Greater yields of cash crops (50.3%)	Cover crop termination costs (51.0%)
	3	Greater yields (52%)	Greater herbicide-related costs (34.4%)	Lower fertilizer inputs (47.0%)	Planting or rolling equipment (modification, purchase, or rental) (45.0%)
	4	Easier or faster harvest (38.4%)	Increased labor (12.8%)	Source of animal forage (use/sale) (32.2%)	Additional research, scouting, or labor (18.8%)
	5	Lower fertilizer inputs (28.8%)	Lower yields (10.4%)	Lower herbicide inputs (28.9%)	Greater nitrogen requirements (12.8%)
	6	Access to cost-share programs (16%)	Other costs (4%)	Less labor, fuel, or equipment use (19.5%)	An outside party is hired to plant and manage my cover crops (6.7%)
	7	Lower herbicide inputs (15.2%)	NA	Access to cost share programs or incentives (15.4%)	Lower yields of cash crops (3.4%)
	8	Avoided drainage investments (12%)	NA	Easier or faster harvest (15.4%)	Other costs (3.4%)
	9	Less irrigation (10.4%)	NA	Avoided drainage investments (13.4%)	Other effect on income (0.7%)
	10	Lower insecticide inputs (9.6%)	NA	Less irrigation (11.4%)	NA
	11	Other cost savings (0.8%)	NA	Lower insecticide inputs (9.4%)	NA
	12	Other effect on income (0.8%)	NA	Other effect on income (2.7%)	NA

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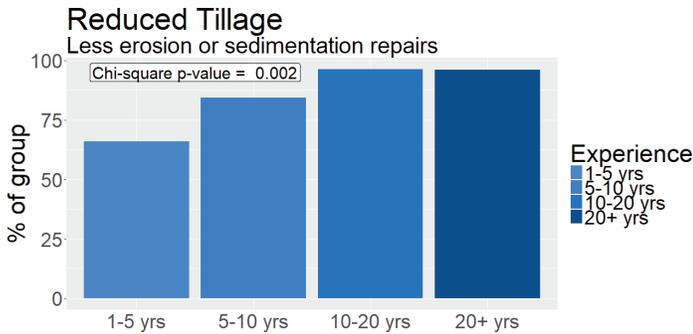


Fig 1. Reducing tillage helps protect against erosion, especially when practiced for more than 10 years.

highlight the differences that exist between cropping systems, and show that any decision to implement a specific soil health practice should be made on a case-by-case basis, carefully evaluating both the positive and the negative impacts that could occur following a shift in management practice.

Some benefits that result from these practices are realized over many years as the productivity and function of the soil is gradually improved. We asked farmers how long they had been using reduced tillage and cover crops, and found that there was an association between the length of time a farmer had been using those practices and what benefits they saw; farmers that had been using reduced tillage or cover crops the longest saw greater benefits. One such benefit is less erosion. While about 66% of farmers who had used reduced tillage for less than 5 years reported this benefit, after 10 years that number had risen to almost 100% (Fig 1). Similarly, among farmers



Fig 2. The use of cover crops can result in greater yields of cash crops, but this benefit is most common when the practice is in place for 10 years or more.

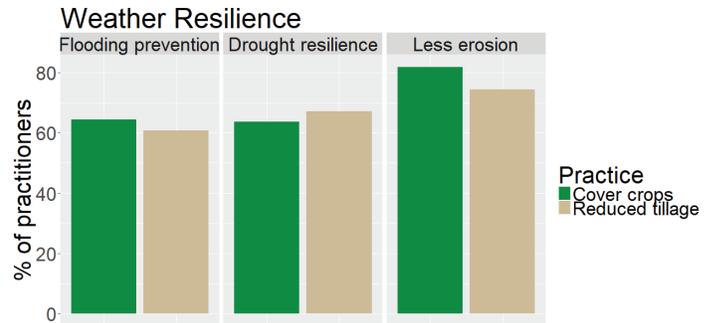


Fig 3. Over 60% of farmers surveyed confirmed that reduced tillage and cover crops help protect against extreme weather events.

who used cover crops, greater yield of cash crops was more frequently associated with long-term cover crop use (Fig 2).

We also wanted to know if farmers in New York state are improving their resilience to severe weather events by using soil health practices. Rainfall patterns in the region could change in the future, and we hypothesized that enhanced soil health provides protection against flooding and erosion from especially heavy downpours, due to the presence of stable aggregates and the soil's increased capacity to absorb water. That same healthy soil may also help a farmer during times of drought by storing water in the soil profile and making it available for crop growth. Both reduced tillage and cover crops were found to help farmers cope with extreme weather events, with over 60% reporting resilience benefits (Fig. 3).

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