11-way cover crop mix planted after wheat

Interseeded cover crop mix

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Soil Health Case Study

John and Jim Macauley, Macauley Farms LLC, NY

Introduction

John Macauley, his father Jim, and his brother Jeff operate their family's beef and crop farm in northwestern New York. Due to macroeconomic conditions in 2017, the Macauleys converted their dairy to beef and currently manage 80 cattle. The family owns all 1,106 acres of cropland they operate—200 are on river bottom, 339 are for hay and pasture, while the remaining 567 on rolling hills above the Genesee River are the focus of this study. John practices no-till and nutrient management on all 567 acres through a four-year rotation of one-year grain corn, two years of soybeans, and one year of wheat. He follows the wheat with cover crops, matching the acres, which varies season to season.

John found conventionally tilling his crops took too much time. He also wanted to save on equipment costs, reduce erosion, and improve soil tilth. In 2009, he received financial and technical assistance from his local USDA Natural Resources Conservation Service (NRCS) office through an Environmental Quality Incentives Program (EQIP) contract to begin no-tilling wheat. In the first year, the Macauleys struggled to get the grain drill set at the right depth. They experimented by adding weights but eventually decided to buy a bigger drill. By 2012, they expanded to no-till corn and now use no-till for all crops on the 567 acres.

Jeff, Jim, and John Macauley

In 2012, the Macauleys received another EQIP contract to add cover crops after wheat, hoping to reduce compaction, improve weed control between wheat and corn, and improve water infiltration. Planting cover crops following wheat harvest allows more time for cover crops to establish before winter. John currently plants a 12-way mix before corn and a seven-way mix before soybeans. In general, the mixes include oats, cereal rye, radishes, winter peas, and hairy vetch. Each year, John designs the cover crop seed mixes and rates to achieve his erosion and nitrogen (N) fertilization goals. John buys most of his cover crop seed locally but blends the mixes himself.

In 2014, John began planting his cash crop into the living cover crop and terminating the cover after planting. This practice, known as "planting green," allows the cover crop to grow longer, which means more biomass production, greater suppression of weeds and pathogens, and drier fields allowing earlier planting.

Prior to 2012, the Macauleys were putting all their nutrients, both organic and inorganic, on their fields at planting. John is happy with his current mid-season, split application of N on 254 acres of corn and wheat to complement the no-till program. Eventually, John hopes to lower his reliance on inorganic nutrients with the right cover crop mix.

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budgeting was used to analyze the marginal benefits and costs of adopting no-till, cover crops, and nutrient management on the

Farm at a Glance

COUNTY: Livingston, NY

WATERSHED: Genesee River

CROPS: Grain corn, soybean, & wheat

FARM SIZE: 1,106 acres

SOILS: Clay, loamy, & gravelly soils on flat & rolling hills

SOIL HEALTH PRACTICES: No-till, cover crops, & nutrient management

15′ no-till drill

USDA
United States Department of Agriculture
Natural Resources Conservation Service

American Farmland Trust

Macauley Farm. The study was limited to only those income and cost variables affected by the adoption of these practices. The table on page two presents a summary of these economic effects revealing that, due to the three soil health practices, John's net income increased by $44 per acre per year or by $25,036 annually on the 567-acre study area, achieving a 135% return on investment.

By eliminating three tillage passes with their switch to no-till, the Macauleys are saving around $72 per acre annually in machinery and labor expenses. John is also happy to not be picking rocks anymore, which were kicked up by tillage. He spends about $23 an acre each year on an additional herbicide application to manage weeds.

Despite significant upfront annual costs for cover crops ($53 per acre) and the labor and equipment to blend seed mixes ($1.72 per acre), John knows cover crops are worthwhile given they control weeds, reduce erosion, minimize compaction, increase infiltration, and increase the rate of organic matter build-up in his fields.

John recognizes how important split application of N can be for reducing nutrient runoff while optimizing crop fertilization needs. He has been able to maintain his yield and believes the extra $13 per-acre-per-year for split application is worth it. John enhances his knowledge of soil health practices by spending about 44 hours a year on learning the latest in no-till technologies and implementation at conferences and field days. John also watches YouTube videos to help him learn.

To estimate the water quality and climate benefits experienced on one of John's 13-acre fields, USDA's Nutrient Tracking Tool was used and found that the Macauley's use of no-till, cover crop mixes, and split application of commercial fertilizers reduced N, P, and sediment losses by 72, 90, and 99% respectively.

Closing Thoughts

John believes that continuing to find ways to improve his soil health will provide him with even greater returns in the future. He is currently experimenting with different cover crop mixes to supply nutrients, thereby reducing reliance on inorganic N, P, and micronutrients. He also lets the cover crops do the tillage for him and manage the weeds. "I am focused on building my soil health and letting nature do some of the work for me. I may not be setting records for high yields, but at the end of the day, I've got more money in my pocket instead of shelling it all out upfront," says John.

Economic Effects of Soil Health Practices on Macauley Farms LLC, NY (2018)

Increases in Net Income			
Increase in Income			
ITEM	PER ACRE	ACRES	TOTAL
None Identified			$0
Total Increased Income			**$0**
Decrease in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Machinery cost savings due to no-till (3 less passes/yr)	$72.28	567	$40,984
Ceased rock picking saving 12 hrs labor/yr	$0.27	567	$153
Weed control by cover crops saves 1 sprayer trip	$12.00	122	$1,464
Soil health practices reduce soil nutrient losses due to .51 tons/ac less erosion	$1.61	567	$914
Total Decreased Cost			**$43,515**
Annual Total Increased Net Income			**$43,515**
Total Acres in this Study Area			**567**
Annual Per Acre Increased Net Income			**$77**

Decreases in Net Income			
Decrease in Income			
ITEM	PER ACRE	ACRES	TOTAL
None Identified			$0
Total Decreased Income			**$0**
Increase in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Increased herbicide cost due to no-till (1 more application)	$23.14	323	$7,475
Cover crop costs	$53.43	122	$6,518
1 day to mix cover seed (8 hrs labor)	$0.83	122	$102
Portable seed mixer & tote box	$0.89	122	$109
Increased machinery cost due to switch from single to split fertilizer	$12.60	254	$3,200
Residue & tillage mgt learning activities (44 hrs/yr)	$1.90	567	$1,074
Total Increased Cost			**$18,479**
Annual Total Decreased Net Income			**$18,479**
Total Acres in this Study Area			**567**
Annual Per Acre Decreased Net Income			**$33**

Annual Change in Total Net Income = $25,036

Annual Change in Per Acre Net Income = $44

Return on Investment = 135%

This table represents costs & benefits attributed to no-till, cover crops, & nutrient management over the 567-acre study area as reported by the farmer. • All values are in 2018 dollars • Prices used: Nitrogen: $.30/lb, Phosphate: $.39/lb, (Estimated Costs of Crop Production in Iowa—2018, ISU). • Sheet & rill erosion benefits are based on estimated N & P content of the soil & 2018 fertilizer prices. • Return on Investment is the ratio of Annual Change in Total Net Income to Annual Total Decreased Net Income expressed as a percent (i.e., net profit/cost of investment) • Financial assistance from NRCS was not included in the partial budget analysis as it is not an economic effect of soil health practices themselves. • For study methodology, see https://farmland.org/soilhealthcasestudies. For USDA's Nutrient Tracking Tool, see https://www.oem.usda.gov/nutrient-tracking-tool-ntt. For USDA's COMET-Farm Tool, see http://cometfarm.nrel.colostate.edu. • Rounding errors may result in minor discrepancies in calculated results. • This material is based on work supported by a 2018 USDA NRCS CIG grant: NR183A750008G008.

For more information about this study or to discuss soil health practices, please contact

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