

Cover Crops



No-Till or Low-Till



Nutrient Management



HaR-Go Farms Organic Dairy, NY

SOIL HEALTH CASE STUDY



DECEMBER 2020



Summer sunset behind the HaR-Go farmstead and pasture

Steve Gould, his father, John, and mother, Sue, own and operate HaR-Go* Farms, a 400-head organic dairy, established in 1956 in northwestern New York. They own 600 of their 650 acres. To improve economic viability and environmental sustainability, the family farm transitioned to organic in 2008 and began implementing soil health practices in 2009. The farm is divided into 200 acres of pasture and a 450-acre, five-year crop rotation of three years of hay (270 acres), one year of corn (90 acres), and one year of 45 acres each of soybean and sorghum. This study focuses on the 450-acre rotation where no-till, cover crops, and nutrient management practices have been implemented to varying degrees since 2009.

Typical of New York dairies, the Goulds grow hay for their herd while minimizing erosion and nutrient loss. Between their hay and pasture, the Goulds always have 72% of the farm under perennial cover. The Goulds further increase soil organic matter by using manure as a primary source of fertilizer.

In 2009, to save time, fuel, and wear and tear on machinery, the Goulds experimented by no-tilling 20 acres of hay. In 2013, they began no-tilling triticale as a cover crop between corn and soybeans or sorghum to provide additional feed for their herd. In 2015, they started adding red clover to 30 acres of the triticale. At present, they no-till all 90 acres of hay planted each year and 90 acres of triticale. They observed that switching to no-till improved soil moisture, germination,

and crop density. No-till also allowed them time to apply nutrients before planting the triticale. The cover crops suppress weeds while providing extra feed and extra nitrogen from the clover worth about \$10 per acre to the following crop. Note, because they are an organic farm and cannot use synthetic herbicides, the Goulds use conventional tillage for weed control prior to planting corn and soybeans.

In 2016, the Goulds developed a Comprehensive Nutrient Management Plan, purchased a manure injector, and hired a manure application firm. They began regularly testing their soil and manure to better match crop nutrient requirements. Planting triticale after manure application in the fall also allows it to scavenge nutrients before going dormant in the winter. The farm received financial and technical assistance from the USDA Natural Resources Conservation Service (NRCS) and the state of New York for these efforts.**

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budget analysis was used to analyze the marginal benefits and costs of adopting no-till, cover crops, and nutrient management on HaR-Go Farms. The study was limited to only those income and cost variables affected by the adoption of these practices compared to the farm's prior performance. The study does not include changes associated with the transition to becoming organic. The table summarizes these economic effects revealing that, due to the three soil health practices, the Gould's net income increased by \$11 per acre per year or by \$4,780 annually on the 450-acre study area, achieving an 18% return on investment.

The Goulds eliminated two tillage passes by switching to no-till for hay establishment, saving over \$13 per acre annually and \$5 per acre each year since they no longer need to pick rocks. The use of no-till and cover crops also decreased sheet and rill erosion by 0.6 tons per year, worth about \$0.65 per acre per year based on the value of soil nutrients no longer running off. Soil loss was minimal to begin with, because the hay provides perennial cover for three years.



Steve Gould in triticale cover crop

Farm at a Glance

COUNTY: Genesee County, NY

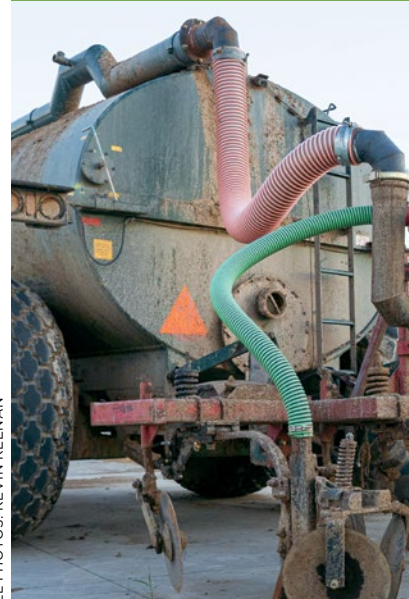
WATERSHED: Genesee River Watershed

CROPS: Hay, corn grain, corn silage, soybean, sorghum, & pasture

FARM SIZE: 650 acres; 200 milking cows plus 200 dry cows & heifers

SOILS: Fine-loamy soils on gently sloping to steep rolling hills

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



Manure injector



While incurring annual costs from planting cover crops (\$56.60 per acre), the farm is increasing their forage (about \$180 per acre annually less \$100 per acre in harvest costs). The \$30 per acre per year for injecting manure on 270 acres of hay and 90 acres of corn are offset by more efficient nutrient use, since manure is now applied in the root zone at the optimum time and rate for maximum plant uptake. The Goulds also spend an additional \$1.50 per acre annually for a crop advisor to optimize nutrient management and use of cover crops. Steve estimates spending over 15 hours a year (\$415 or about \$1 per acre in learning costs) attending soil health workshops, reading articles, and talking with his crop advisor.

The USDA's Nutrient Tracking Tool (NTT) was used to estimate the water quality benefits on one of Steve's 10-acre fields in the study area, finding that the



Grazing dairy cows

Gould's use of no-till, cover crops, and nutrient management reduced nitrogen, phosphorus, and sediment losses by 41%, 39%, and 29%, respectively. The USDA's COMET-Farm Tool estimates that their soil health practices on the same 10-acre field resulted in a 158% reduction in total greenhouse gas emissions, which

corresponds to taking one car off the road each year.

Closing Thoughts

The Goulds' soil health journey occurred by trial and error. John says, "To be successful with triticale, we had to plant and fertilize it by early September, which meant harvesting corn by August. We went to a shorter season corn to do that." The Goulds observed that the soil health practices have improved their soil tilth, and cover cropping has improved their nutrient management by suppressing weeds associated with manure application. They also believe cover crops have improved their bottom line by producing high-quality forage. Overall, the Goulds' investment in soil health has led to reduced erosion, improved soil quality, better allocation of time and equipment, and better weed control.

ECONOMIC EFFECTS OF SOIL HEALTH PRACTICES ON HAR-GO FARMS ORGANIC DAIRY, NY (2018)

Positive Effects			
Increase in Income			
ITEM	PER ACRE	ACRES	TOTAL
Feed value of harvesting triticale as forage	\$280.15	90	\$25,214
Total Increased Income			\$25,214
Decrease in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Nitrogen provided by red clover	\$10.43	30	\$313
Machinery cost savings from planting hay using no-till (2 less passes/yr)	\$13.55	270	\$3,658
Eliminated rock picking	\$5.06	270	\$1,366
Soil health practices reduce soil nutrient losses due to 0.6 tons/ac less erosion	\$0.65	450	\$293
Total Decreased Cost			\$5,631
Annual Total Increased Net Income			\$30,844
Total Acres in this Study Area		450	
Annual Per Acre Increased Net Income			\$69

Negative Effects			
Decrease in Income			
ITEM	PER ACRE	ACRES	TOTAL
None Identified			\$0
Total Decreased Income			\$0
Increase in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Cover crop costs	\$56.60	90	\$5,094
Cost of harvesting triticale as forage	\$100.00	90	\$9,000
Increased machinery costs due to injection of manure on hay & corn acres	\$30.17	360	\$10,862
Nutrient management consultant fees	\$1.54	450	\$693
Soil health learning activities (15 hrs/yr)	\$0.92	450	\$415
Total Increased Cost			\$26,064
Annual Total Decreased Net Income			\$26,064
Total Acres in this Study Area		450	
Annual Per Acre Decreased Net Income			\$58

Annual Change in Total Net Income = \$4,780

Annual Change in Per Acre Net Income = \$11

Return on Investment = 18%

* HaR-Go comes from the names of Steve's grandparents, Harold and Rose Gould, who bought the farm in 1956. **The Goulds received financial assistance through the Conservation Stewardship Program (2010-19), Environmental Quality Incentives Program (2017-19) & the NYS Dairy Accelerator Program (2016), which is not included in the analysis because it is not an economic effect of the soil health practices. • This table represents costs & benefits of no-till, nutrient management, & cover crops over the 450-acre study area as reported by the farmer. • All values are in 2018 dollars. • Standard prices: Organic hay: \$195/ton (Source: NASS National Organic Grain and Feedstuffs Report, Dec. 19, 2018). • Sheet & rill

erosion benefits are based on 2018 fertilizer prices & methods from the 2009 NRCS Interim Final Benefit-Cost Analysis for the EQIP Program. • Return on Investment is the ratio of Annual Change in Total Net Income to Annual Total Decreased Net Income, as a percent (i.e., net profit/cost). • For information about: (1) study methodology, see farmland.org/soilhealthcasesstudies; (2) USDA's Nutrient Tracking Tool, see ntt.tiaer.tarleton.edu; (3) USDA's COMET-Farm Tool, see cometfarm.nrel.colostate.edu. • This material is based on work supported by 2018 USDA NRCS grants: NR183A750008G008 & NR182C31XXXXC001.

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

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