Cover Crops | No-Till or Low-Till | Nutrient Management

Gary Swede Farm LLC, NY
SOIL HEALTH CASE STUDY

JULY 2019

Jay Swede, his father Gary, and his brother Ryan farm 4,500 acres of cropland on rolling terrain in northwestern New York. The farm splits the acreage among three rotations: grains, vegetables, and feed grown for a 2,000-cow dairy partnership. The rotations are moved throughout all 4,500 acres. Although they are using soil health practices on all crops, for simplicity's sake this study focuses on the 1,500-acre dairy rotation that includes 1-year sweet corn, 3-years alfalfa, 1-year corn silage or corn for grain.

In 2005, Jay tried strip-till to address soil compaction and erosion and to reduce costs. The Swedes began with 100 acres of sweet corn and grain corn but struggled getting the seed placed in the center of the strip. This led them to invest in autosteer in the second year and a satellite-based navigation system in the third year to guide the planter. In just a few years, they were strip-tilling all 1,500 acres in the dairy rotation.

Rye after corn silage has been a popular cover crop in New York, and the Swede farm was no exception. Jay moved to planting oats instead around the same time he switched tillage operations. Oats fit better into their new system and rye often got out of control in the spring, whereas oats die over the winter. However, oats can get too big, sealing the ground in the spring and keeping the soil excessively wet. Jay addressed this by reducing the seed population at planting and adding radishes and wheat to deal with erosion and compaction. Currently, Jay plants 450 acres of cover. He drills a blend of oats and radishes in two rows of strip-till strips, then goes back and drills the wheat in the other two rows. Having the oats between wheat helps manage the large root mass of wheat, which can get in the way of cash crop seed placement.

When the Swedes joined the dairy partnership in 2010, they began applying manure through injection into the soil or top spreading onto the cover crops according to their Comprehensive Nutrient Management Plan. They are accounting for nitrogen and phosphorus in the manure, seeing better nutrient efficiencies due to injection, and putting less nitrogen on upfront by using a split application. More recently, they started using variable rate nutrient application and Adapt-N, a precision nitrogen recommendation tool for corn. Their yields have increased over the years as a result, despite using the same amount of nitrogen.

Soil Health, Economic, Water Quality, and Climate Benefits

Today, Jay uses strip-tillage, cover cropping, and nutrient management on his 600 acres of sweet corn and corn silage. He also uses reduced tillage on the 300 acres of alfalfa he plants each year. Because the alfalfa is in for three years, it makes up the remaining 900 acres in the dairy rotation. These changes have led to many benefits. According to farm records, Jay's sweet corn yields are up by over 31%, and corn silage yields have increased by more than 36% since 2005. Jay believes half of those increases (or about $72 per acre) are attributable to his soil health practices.

The Swedes eliminated three passes by strip-tilling their corn. This means less compaction, increased water infiltration, and savings in fuel, labor, and machinery maintenance. When combined with reduced tillage for his hay crop, Jay's savings average about $23 per acre. However, he spends about 10 hours each year setting up his corn planter to handle residue from the previous crop.

Despite sizable upfront costs for cover ($51 per acre), Jay thinks it's worth it because it reduces compaction and absorbs nutrients from fall

Gary Swede

Farm at a Glance

COUNTY: Genesee County, NY

WATERSHED: Genesee River & the Great Lakes Basin

CROPS: Corn silage, grain corn, sweet corn, wheat, alfalfa & vegetables

FARM SIZE: 4,500 acres total, 1,500 dairy rotation

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

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

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applied manure. Cover also increases soil organic matter. This cost is offset by Jay's nutrient management activities that save him $41 per acre for purchases of phosphorus and potassium. Keeping the soil covered and minimizing tillage has also reduced erosion by nearly two tons per acre. The value of the nutrients in the soil saved is over $2 per acre (NRCS, 2009).

Jay enhances his knowledge of soil health practices by spending about 16 hours a year attending conferences and field days and meeting with ag consultants.

To estimate the water quality and climate benefits experienced on one of Jay's 25-acre fields, USDA's Nutrient Tracking Tool was used and found that Jay's use of strip-till, cover crops, and nutrient management reduced N, P, and sediment losses by 40, 92, and 96% respectively. On the same field, USDA's COMET-Farm Tool estimates that Jay's soil health practices resulted in

a 560% reduction in total greenhouse gas emissions, which corresponds to taking three cars off the road.

Partial budgeting analysis was used to estimate the benefits and costs of adopting no-till and strip-till, cover crops, and nutrient management for the Swede Farm. The study limited its focus to variables affected by the adoption of these soil health practices. The table below presents a summary of these economic effects. Jay improved his bottom line by $55 per acre and by $82,257 on the 1,500 acres in this study by adopting the soil health practices.

Closing Thoughts

"In a recent wet year, the best corn was where the cover crops were," Jay says. While still learning, Jay feels that he has hit his stride with the soil health practices he's adopted and is seeing great results from relatively minor changes to his operations. "The second year we did strip-till, even though the corn was only 8" tall, we had roots going down about a foot." He says his ground is more "workable," and he has observed better infiltration and decreased runoff and erosion in his fields following heavy rains. He also believes he has improved his bottom line by reducing his operating costs, tightening up his management of nutrients, and producing higher yields.

ECONOMIC EFFECTS OF SOIL HEALTH PRACTICES ON GARY SWEDE FARM, LLC (2018)

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Yield Impact Due to Soil Health Practices	$71.95	600	$43,168
Total Increased Income			**$43,168**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Reduced Machinery Cost due to Reduced Tillage	$23.43	1,500	$35,152
Nutrient Savings due to Nutrient Mngmnt.	$40.65	600	$24,390
Value of Decreased Erosion due to Soil Health Practices	$2.25	1,500	$3,369
Total Decreased Cost			**$62,911**
Total Increased Net Income			$106,079
Total Acres in the Study Area			1,500
Per Acre Increased Net Income			$71

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
Cost of Setting up Planter to Handle Residue	$0.72	600	$432
Cover Crop Costs	$51.00	450	$22,950
Residue and Tillage Mgmt. Learning Activities	$0.07	1,500	$98
Cover Crops Learning Activities	$0.22	450	$98
Nutrient Management Learning Activities	$0.16	1,500	$244
Total Increased Cost			**$23,822**
Annual Total Decreased Net Income			$23,822
Total Acres in this Study Area			1,500
Annual Per Acre Decreased Net Income			$16

Annual Change in Total Net Income = $82,257

Annual Change in Per Acre Net Income = $55

Return on Investment = 343%

This table represents costs and benefits over the entire study area (1,500 acres) as reported by the farmer. • All values are in 2018 dollars. • Crop prices used in the analysis: Corn: $3.55/Bu, Sweet Corn: $75/Ton. Sources: Crop Values 2018 Summary, USDA, NASS (Corn), Jay Swede (Sweet Corn). • Fertilizer prices used in the analysis: Phosphate: $.39/LB, Potash: $.27/LB. Source: Estimated Costs of Crop Production in Iowa—2018. • Sheet and rill erosion benefits are based on estimated nitrogen and phosphorus content of the soil and 2018 fertilizer prices. Source: NRCS Interim Final Benefit-Cost Analysis for the Environmental Quality Incentives Program, 2009. • For information about study methodology, see http://farmland.org/soilhealthcasestudies. For information about USDA's Nutrient Tracking Tool, see https://www.oem.usda.gov/nutrient-tracking-tool-ntt. For information about USDA's COMET-Farm Tool, see http://cometfarm.nrel.colostate.edu. This material is based on work supported by a USDA NRCS CIG grant: NR183A750008G008. • Jay has been receiving technical and financial assistance through a Conservation Stewardship Program (CSP) contract (2016 to 2020). This support allowed Jay to experiment with new cover crop mixes and new nutrient management split application techniques on a few hundred acres. The CSP income is not included in the analysis given the mismatch in years and acres between the contract and the study. Readers can assume that during the contract years, Jay received additional net income from CSP.

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

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