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JULY 2019

Soil Health Case Study

Eric Niemeyer, MadMax Farms, OH

Introduction

Eric Niemeyer's MadMax Farms lies in the middle of the Upper Scioto Watershed in Ohio. Eric is a first-generation farmer in his 15th farming season producing corn and soybeans. He has learned many lessons the hard way by trying different ideas and learning what practices work best on his 1,250-acre operation.

His soils are mainly silt and clay loams. Although many of his fields have flat or slightly rolling terrain, Eric saw the impact of erosion when gullies formed in low areas or where soil washed away in areas of concentrated water flow. More importantly, he recognized that using conventional tillage practices made it difficult to consistently grow a profitable crop.

Consequently, Eric spent time educating himself at workshops, field days, and conferences, and by reading about soil health practices. When Eric decided he needed to change how he farmed, he sought the help of Charlie Walker, his right-hand man and a longtime no-till innovator. Following Charlie's advice, Eric converted his cropland to no-till and adopted variable rate fertilizer application technology (VRT) in 2011. To address surface or sub-surface drainage issues, Eric repaired sub-surface drainage tile, gullies, and eroded areas. He also began taking soil tests every two years instead of every four.

In 2014, he started planting cover crops on his entire farm. Eric prefers using multi-species mixes and customizes them based on whether he is planting corn or soybeans. In addition, he fine-tunes his cover crop recipe based on what soil health outcomes he is trying to achieve. These include breaking up compaction layers, increasing water infiltration, increasing organic matter, and improving nutrient availability. Eric became such a believer in cover crops that he started a cover crop consulting business in 2014. He also seeds cover crops for other farmers using his customized, high clearance seeder during the growing season. Eric continues educating himself about soil health practices for his farm and for his consulting businesses. Half of Eric's significant learning costs have been attributed to his farm operation and included in this study.

Soil Health, Economic, Water Quality, and Climate Benefits

Combining cover cropping, no-till, and VRT has produced many benefits. Eric can *see* and *smell* the improvements in soil health, which he believes have led in part to increased yields. Since 2014, his per acre yields have gone from 165 to 195 bushels for corn and from 45 to 65 bushels for soybeans. He estimates at least half of these improvements are the result of his soil health management system and attributes the rest to good weather and better varieties.

Better soil health has also led to better nutrient cycling, improved weed management, and less disease and insect pressure. These changes, along with more precise nitrogen (N) applications allowed Eric to cut N for corn by over 5%. More importantly, he has been able to cut phosphorus (P) and potassium applications by 50% for both corn and soybeans. As a result, he is saving almost $18 per acre each year on fertilizer. Better soil health has allowed Eric to reduce his soybean seeding rate, saving $5 per acre. Similarly, he has nearly eliminated the need for residual herbicides

Farm at a Glance

COUNTY: Marion & Delaware Counties, OH

WATERSHED: Upper Scioto Watershed

CROPS: Corn & soybeans

FARM SIZE: 1,250 acres

SOILS: Silt loam & clay loam soils, flat to slightly rolling terrain with slopes from 0 to 10%

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

USDA United States Department of Agriculture
Natural Resources Conservation Service

American Farmland Trust

by planting "green" into growing cover crops, terminating them with a roller crimper. This saves him over $18 per acre. His fungicide costs have decreased as well, reducing soybean seed treatment cost by $6 per acre.

Eric believes the use of biological amendments have also contributed to his success by enhancing soil health and nutrient availability. He spends about $30 per acre for the biologicals.

Eric's no-till system has lowered labor and machinery expenses by $35 per acre. Cost savings from eliminating his tillage equipment allowed Eric to upgrade and increase the size of his planter. This led to more timely planting and helped Eric increase his farming operation from 500 acres in 2011 to 1,250 acres today.

Reduced no-till expenses are offset by increased costs for one additional fertilizer pass and cover crop planting and termination costs. Nevertheless, the benefits of using all three soil health practices have increased the overall profitability of the farm.

To estimate the water quality and climate benefits experienced on one of Eric's 110-acre fields, USDA's Nutrient Tracking Tool was used and found Eric's use of no-till, cover crops, and variable rate applications reduced his N, P, and sediment losses by 58, 74, and 88%, respectively. On the same field, USDA's COMET-Farm Tool estimates that Eric's soil health practices resulted in a 494% reduction in total greenhouse gas emissions which corresponds to taking 17 cars off the road.

Partial budgeting analysis was used to estimate the benefits and costs of adopting no-till, cover crops, and variable rate fertilizer applications on MadMax Farms. The study limited its focus to variables affected by the adoption of these soil health practices. The table presents a summary of these economic effects. Eric improved his bottom line by $38 per acre and by $47,569 on the 1,250 acres in the study area by adopting the soil health practices.

Closing Thoughts

Eric's motivation for adopting soil health practices has been to "make dead soil alive again." He also enjoys the challenges of understanding management nuances needed to be successful. For example, Eric loves fine-tuning cover crop recipes to achieve desired outcomes for every field, tweaking the planter setup, timing cover crop termination to successfully "plant green," and understanding herbicide chemistries and other inputs to lessen negative impacts on cover crops and soil health. Eric also relishes the fact that "cover crops are like miracle workers holding the soil in place," and he credits all three soil health practices with now being able to reliably raise a profitable crop on marginal soils where profitability was not always guaranteed before.

Economic Effects of Soil Health Practices on MadMax Farms (2018)

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Yield Impact Due to Soil Health Practices	$69.00	1,250	$86,250
Total Increased Income			**$86,250**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Nutrient Savings due to Soil Health Practices	$17.51	1,250	$21,881
Reduced Seeding Rate for Soybeans	$5.00	625	$3,125
Pesticide Savings due to Soil Health Practices	$18.75	1,250	$23,438
50% Reduction in Treated Soybean Seed	$6.00	625	$3,750
Reduced Machinery Costs Due to Reduced Tillage	$35.45	1,250	$44,317
Field Repair Savings due to Soil Health Practices	$1.00	1,250	$1,250
Total Decreased Cost			**$97,761**
Annual Total Increased Net Income			$184,011
Total Acres in this Study Area			1,250
Annual Per Acre Increased Net Income			$147

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
Variable Rate Application Cost	$3.00	1,250	$3,750
Increased Soil Testing Every Two Years	$10.00	1,250	$12,500
Residue and Tillage Mgt. Learning Activities	$1.17	1,250	$1,465
Cover Crops Learning Activities	$5.86	1,250	$7,326
Nutrient Management Learning Activities	$3.32	1,250	$4,151
Using Biologicals in Furrow	$30.00	1,250	$37,500
Increased Machinery Costs due to Change in Nutrient Management	$6.30	1,250	$7,875
Cover Crop Costs	$49.50	1,250	$61,875
Total Increased Cost			**$136,442**
Annual Total Decreased Net Income			$136,442
Total Acres in this Study Area			1,250
Annual Per Acre Decreased Net Income			$109

Annual Change in Total Net Income = $47,569

Annual Change in Per Acre Net Income = $38

This table represents costs and benefits over the entire study area (1,250 acres) as reported by the farmer. • All values are in 2018 dollars. • Crop prices used in the analysis: Corn: $3.55/Bu, Soybeans: $8.60/Bu. Source: Crop Values 2018 Summary, USDA, NASS. • Fertilizer prices used in the analysis: Nitrogen: $.30/LB, Phosphate: $.39/LB, Potash: $.27/LB. Source: Estimated Costs of Crop Production in Iowa—2018. • 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. • Eric is receiving technical and financial assistance through a Conservation Stewardship Program (CSP) contract (2016-2020). This support allowed Eric to conduct tissue testing and Haney soil testing on 300 of his 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, Eric received additional net income from CSP.

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

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