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

Homewood Farms, OH
SOIL HEALTH CASE STUDY

FEBRUARY 2020

Converted strip-till tool hooked to low-compaction tractor

Dan Lane's Homewood Farms lies in the Upper Scioto watershed in central Ohio. Dan and his wife, Jennifer, have been farming for 30 years and own 60% of the 1,830 acres of corn and soybeans they grow. The terrain is flat to slightly rolling with silt and clay loam soils. Dan started farming with his father, John, in 1990 and took over in 2000.

In the past, the Lanes would chisel-plow and use two-field cultivator passes for the corn and soybeans. The Lanes applied their phosphorus (P) and potassium (K) with the planter ahead of corn and then side-dressed with anhydrous ammonia. Then, as now, the Lanes do not apply fertilizer to the soybean crop.

To eliminate runoff and protect his soils, Dan began strip-tilling and banding dry fertilizer on all his corn in 2003. By injecting fertilizer five to six inches deep, banding with strip-till allows Dan to apply fertilizer where and when it's needed. He also began soil testing. Dan believes banding dry fertilizers is the most efficient way to maintain fertility and profitability.

In 2014, Dan transitioned to reduced tillage on all acres ahead of soybeans by using a one-pass operation with a high-speed vertical tillage tool before planting beans in the spring. That same fall, Dan tried planting cover crops after his corn, broadcasting cereal rye and incorporating it with vertical tillage. Later, when Dan began planting soybeans with a twin row planter, he used the same planter to plant a mixture of barley and hairy vetch cover in the fall after the soybeans, followed with a strip-till pass. Dan has achieved a synergy between strip-tilling and cover cropping because he can plant corn in the spring between the rows of cover crops in a consistent seedbed.

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budgeting analysis was used to estimate the marginal benefits and costs of adopting strip-till, nutrient management, and cover crops on the Lane Farm. The study was limited to only those income and cost variables affected by the adoption of these practices. The table on page 2 presents a summary of these economic effects revealing that, due to the three soil health practices, Dan's net income increased by $56 per acre per year or by $102,366 annually on the 1,830-acre study area, achieving a 142% return on investment.

Dan believes the most significant benefit from using all three soil health practices has been a 40-bushel per acre increase in corn yields since 2008, which increased income on the corn acres by $142 per acre per year.

Using a strip-tiller he converted from an older planter bar, Dan's strip-till system saves him three passes over the field, or about $24 per acre each year, in machinery and labor costs compared to conventional tillage. Strip till also provides an optimal environment for corn because the soil warms up sooner and the seedbed offers consistent seed depth with enough nutrients to grow quickly and early. The cost savings from avoided purchases and maintenance of tillage equipment allowed him to increase his planter size, which also helps achieve earlier planting.

Dan believes that multiple banded nutrient applications (during the strip-till pass in the fall, with the planting pass, and then with a Y-drop sidedress nitrogen application to the growing crop) result in a more efficient use of nutrients. As Dan's corn yields have increased, information from soil testing and nutrient management planning led him to apply more P, K, and

Dan and Jennifer Lane

Farm at a Glance

COUNTY: Delaware, OH

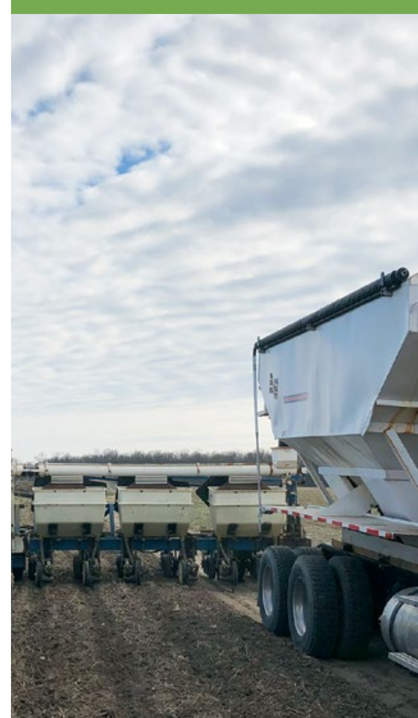
WATERSHED: Upper Scioto River

CROPS: Corn & soybeans

FARM SIZE: 1,830 acres

SOILS: Silt & clay loam soils on flat to slightly rolling fields

SOIL HEALTH PRACTICES: Strip-till, nutrient management, cover crops



Refilling converted strip-till tool with fertilizer in the field micronutrients, raising fertilizer costs by $65 per acre annually.

The 400 acres of cover crops planted every year before corn cost Dan $27 per-acre-per-year in seed and planting costs. By slowly integrating cover crops at a pace he can handle, Dan believes he is protecting and building organic matter in his soils, leading to better infiltration and more moisture retention. Though Dan strip-tills and bands all his acres, he only plants cover crops on acres he owns, fearing loss of his investments to the high development pressure in his county.

Dan's soil health management system has come with learning costs and challenges. He estimates he spends two weeks a year reading publications from soil testing labs and private agronomic consultants. His biggest challenge is getting everything done. Dan prefers to make his strips in the fall but also has to finish harvesting


Dan Lane

and planting cover crops. Furthermore, Dan's switch from cereal rye to a barley and hairy vetch mixture requires use of his twin row planter, which takes more time and must be done earlier in the fall to ensure establishment.

To estimate the water quality and climate benefits experienced on one of Dan's 140-acre fields, USDA's Nutrient Tracking Tool was used and found that Dan's use of strip-till, cover crops, and banding of fertilizers reduced N, P, and sediment losses by 35, 84, and 99% respectively. On the same field, USDA's COMET-Farm Tool estimates that his soil health practices resulted in a 55% reduction in total greenhouse gas emissions, which corresponds to taking 7.5 cars off the road.

Closing Thoughts

Dan is very focused on his bottom line and feels he has zeroed in on a suite of soil health practices that help get his crops started right and early in the spring, while providing efficient feeding of nutrients throughout the growing season. At the same time, reduced tillage practices and integration of cover crops have protected the soil, reduced the washouts, and improved infiltration and soil moisture for the crop, all while generating increased returns on his farm.

ECONOMIC EFFECTS OF SOIL HEALTH PRACTICES ON HOMEWOOD FARMS (2018)

Increases in Net Income			
Increase in Income			
ITEM	PER ACRE	ACRES	TOTAL
Increased corn yield due to soil health practices (40 bu/ac)	$142.00	915	$129,930
Total Increased Income			**$129,930**
Decrease in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Machinery cost savings due to strip-till (3 less passes/yr)	$24.25	1,830	$44,372
Total Decreased Cost			**$44,372**
Annual Total Increased Net Income			**$174,302**
Total Acres in this Study Area			**1,830**
Annual Per Acre Increased Net Income			**$95**

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 fertilizer cost due to increased corn yields (40 lbs/ac more N, 52 lbs/ac more P, 120 lbs/ac more K)	$64.67	915	$59,182
Cover crop costs	$27.00	400	$10,800
Soil health practices learning activities (80 hrs/yr)	$1.07	1,830	$1,954
Total Increased Cost			**$71,936**
Annual Total Decreased Net Income			**$71,936**
Total Acres in this Study Area			**1,830**
Annual Per Acre Decreased Net Income			**$39**

Annual Change in Total Net Income = $102,366

Annual Change in Per Acre Net Income = $56

Return on Investment = 142%

This table represents costs and benefits of strip till, nutrient management, and cover crops over the 1,830-acre study area, as reported by the farmer. • All values are in 2018 dollars. • Prices used: Corn: $3.55/bu (Crop Values 2018 Summary, USDA, NASS). Nitrogen: $.30/lb, Phosphate: $.39/lb, Potash: $.27/lb (Estimated Costs of Crop Production in Iowa—2018, ISU). • 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). • For study methodology, see farmland.org/soilhealthcasestudies. For USDA's Nutrient Tracking Tool, see ntt.tiaer.tarleton.edu. For USDA's COMET-Farm Tool, see 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

- Brian Brandt, American Farmland Trust, Agriculture Conservation Innovations Director, bbrandt@farmland.org, 614-430-8130
- Denise Shafer, Delaware County NRCS, District Conservationist, 557 Sunbury Rd # A, Delaware, OH 43015, 740-362-4011

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