



Strawberry patch and corn field



Farm is permanently protected

Soil Health Case Study

Boots and Robin Hetherington + Morgan and Kevin Bond, B&R Farms, PA

Introduction

B&R Farms, in Schuylkill County, Pennsylvania, is a 424-acre farm run by Boots and Robin Hetherington alongside Morgan and Kevin Bond (their daughter and son-in-law). Boots is the seventh generation to run the farm, and Morgan will be the eighth. The family's main cash crops are 300 acres of corn and soybeans, 60 acres of permanent hay on the steeper slopes, a pick-your-own strawberry operation, and a spring greenhouse. The combined 360 acres of cash crop and hay serve as the Study Area for this analysis.

Boots and Robin have focused on conservation since the 1980s, when they started on the farm. When Morgan and Kevin assumed a larger role in 2008, they adopted no-till and then cover crops in 2017. They implement these practices on their own land (117 acres) and rented land (307 acres).

All owned land is permanently protected under agricultural conservation easements, supported with funding from state and county sources and the federal Farm and Ranch Lands Protection Program (FRPP). As a family farm, Boots and Robin have plans for the next generation and

became the first Schuylkill County farm under easement in 1999. They view the easements as a way to protect the farm from potential development and ensure they will be able to transfer ownership to their children. Morgan and Kevin say this long-term outlook carries over to how they think about soil health. They are not sure what the future of farming will look like, but they know they will need healthy soil to be successful.

Initially, Boots adopted no-till because he was attracted by the savings in time, labor, and fuel. He received financial support from the Pennsylvania Resource Enhancement and Protection Program (REAP) and NRCS EQIP to pay for a no-till drill.¹ Now, the family values no-till for reducing erosion, an easier planting experience, and higher crop yields, mostly due to the less compact and more fertile soil.

The family grew oats on the farm to use as straw for the strawberries but found oats difficult to grow so switched to certified rye. In 2017, Boots and Kevin decided to use seeds from the rye crop to plant a cover crop following corn and soybeans.

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budgeting analysis was used to estimate the marginal benefits and costs of switching from conventional tillage to no-till with cover crops on B&R Farms. The analysis includes only income and cost variables affected by the adoption of these practices compared to the baseline. The table on page 2 summarizes these economic effects, revealing that B&R Farms' net income rose by approximately \$20 per acre per year or about \$7,055 per year on the 360-acre study area, achieving a 42% return on investment. This means that for every dollar invested in soil health, B&R Farms receives \$1.42.



Boots and Robin Hetherington with Morgan and Kevin Bond, who hold their daughter

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FARM AND RANCH LANDS PROTECTION PROGRAM

Farm at a Glance

COUNTY: Schuylkill County, PA

WATERSHED: Susquehanna

CROPS: Corn, soybeans, hay, certified rye, strawberries, greenhouse

FARM SIZE: 424 acres

SOILS: Silt loam

SOIL HEALTH PRACTICES: No-till, cover crops



No-till corn field

The family believes their adoption of no-till and cover crops has resulted in a 10% yield increase for both soybeans and corn. Although other factors could be at play, Boots attributes most of the yield increase to better soil fertility from the soil health practices, as their soybean yield is now consistently above 40 bushels per acre, something that rarely happened before adopting the soil health practices. Morgan says another reason for higher yields is improved planting accuracy from planting directly into the rows of rye.

Since adopting no-till, B&R Farms has been able to reduce the number of planting passes from four to one for soybeans, three to one for corn, and five to one for hay. Overall, no-till saved labor and reduced machinery costs² by about \$32 per acre. Kevin also found that switching to the no-till drill saved roughly \$500 in specialized parts, since the new equipment uses similar parts to other farm equipment.

The addition of cover crops means an increase in costs. Cover crop

establishment after corn is less expensive than after soybeans because they broadcast rye seeds after corn harvest (\$9 per acre) but drill rye seeds after soybean harvest (\$34 per acre).³ However, they minimize cover crop cost by harvesting their own seeds from the certified rye planted for straw the previous year, saving about 50% compared to purchasing rye seed. This benefit is not included in this analysis as the certified rye is grown outside of the study area. Overall, the cover crop after corn costs \$41 per acre while the cover crop after soybeans costs \$67 per acre. Each year the family spends time researching no-till and cover crops online and talking to experts.

The Hetheringtons and the Bonds have witnessed less soil running off their fields thanks to no-till and cover crops. To estimate the water quality benefits experienced on one of their 7-acre fields, USDA's Nutrient Tracking Tool was used. The family's use of no-till and cover crops reduced nitrogen, phosphorus, and sediment

losses by 85%, 96%, and 99%, respectively. USDA's COMET-Farm Tool estimates that their soil health practices, on this same field, resulted in a 200% reduction in total greenhouse gas (GHGs) emissions, corresponding to taking one car off the road,⁴ and helping the farm go from being a net emitter to sequestering GHGs.

Closing Thoughts

B&R Farms has seen firsthand the benefits of adopting soil health practices. In the summer of 2018, torrential rains washed out many fields across central Pennsylvania, leaving some farmers with a year of lost crops. But B&R Farms still had a crop to harvest. In dry years, the family has been grateful for the increased soil moisture from the soil health practices, as their fields have not become dangerously dry, which occurred before the practices. The soil health practices have led to improved average yields, an improved bottom line, and increased resilience to extreme weather conditions.

Economic Effects of Soil Health Practices for B&R Farms (2021)

Positive Effects			
Increase in Income			
ITEM	PER ACRE	ACRES	TOTAL
Increased corn and soybean yields (by 10%) due to no-till and cover crops	\$44	300	\$13,283
Total Increased Income			\$13,283
Decrease in Cost			
ITEM	PER ACRE	ACRES	TOTAL
Machinery cost savings from reductions in multiple passes due to no-till	\$32	308 ⁵	\$9,948
Cost savings due to interchangeable equipment parts			\$500
Total Decreased Cost			\$10,448
Annual Total Increased Net Income			\$23,731
Total Acres in this Study Area		360	
Annual Per Acre Increased Net Income			\$66

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	\$54	300	\$16,153
Cover crops learning activities (4 hr/yr)			\$105
No-till learning activities (16 hr/yr)			\$419
Total Increased Cost			\$16,676
Annual Total Decreased Net Income			\$16,676
Total Acres in this Study Area		360	
Annual Per Acre Decreased Net Income			\$46

Annual Change in Total Net Income = \$7,055

Annual Change in Per Acre Net Income = \$20

Return on Investment = 42%

1. Financial assistance was excluded from the analysis because it is not an economic effect of soil health practice use. 2. The machinery costs include the cost of labor, depreciation, interest, insurance, housing, repairs, and fuel. 3. The University of Illinois Farmland Field Operation report says "broadcast seeding, 20ft" costs \$8.79 per acre while a "no-till drill, 10ft" costs \$33.37 per acre (2020 prices). 4. The COMET Farm analysis compares the 2000-2007 before soil-health years to the 2008-2020 post soil-health years. 5. The study area is 360 acres, including 60 acres of hay and 300 acres of corn and soybeans. Since the hay is reseeded every 8 years, we assume that on average, 8 acres of hay are reseeded every year. This brings the yearly cropland acres to 308 per year.

This table represents costs and benefits over the entire Study Area (360 acres) as reported

by the farmer. • All prices are in 2020 standard prices in the analysis. The prices used are as follows: Corn: \$4.30/bu, Soybeans: \$11.15/bu, (Source: Crop Values 2020 Summary, USDA, NASS). • Prices are stated as per acre values for items that vary by area. Price such as learning costs, which don't vary by area, are only given as total costs. • Return on Investment is the ratio of net profit to the cost of investment, or in this case, Annual Total Change in Net Income/Annual Total Decreased Net Income. • For study methodology, see farmland.org/soilhealthcasestudies; for USDA's Nutrient Tracking Tool, see oem.usda.gov/nutrient-tracking-tool.ntt; and for USDA's COMET-Farm Tool, see cometfarm.nrel.colostate.edu. • This material is based on work supported by a USDA NRCS grant: NR203A750013G023. USDA is an equal opportunity provider and employer.