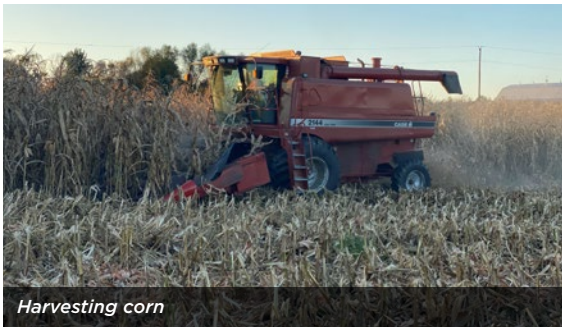
Cover Crops

Crop Rotation

Circle G Farms, KY
SOIL HEALTH CASE STUDY

AUGUST 2025



Harvesting corn

Spencer Guinn, along with his wife Carly, have owned and operated Circle G Farms in central Kentucky since 2012, when they bought an old dairy farm. They soon transitioned the pastures to crop production, establishing a rotation of corn and soybeans. During the winter, the fields were usually left fallow, with only a small portion planted in winter wheat. They now farm 250 acres: 150 acres are in a corn-soybean rotation, 55 acres in a rotation of heirloom corn, winter rye for grain, and soybeans, and the remaining acres are in pasture for their 25 beef cows or in produce. The Guinns have used no-till and a nutrient management plan for livestock manure since they started farming this land, so those practices are not included in our analysis, as those start-up costs have become part of their baseline operations. This case study focuses on the 205 acres in row crops, where the Guinns have implemented conservation crop rotation and cover crops.

When Spencer started farming, he intended to produce cattle and grain at a larger scale, but land acquisition is difficult in central Kentucky, forcing him to pivot and find crops, niche markets, and farming practices to maximize what they had. The first farm he rented was owned by a local Natural Resources Conservation Service (NRCS) employee who used cover crops, which got Spencer interested in the practice. A cousin who had been an early cover crop adopter served as a mentor. Though Spencer had been planting 20 acres of cereal grain over the winter since 2012 to wet wrap for hay, he began cover cropping the whole row crop acreage in 2017, planting a rye/crimson clover mix after both corn and soybeans. In 2018, Circle G Farms received a 5-year NRCS EQIP contract to help offset the cost of their cover crop program.[1]

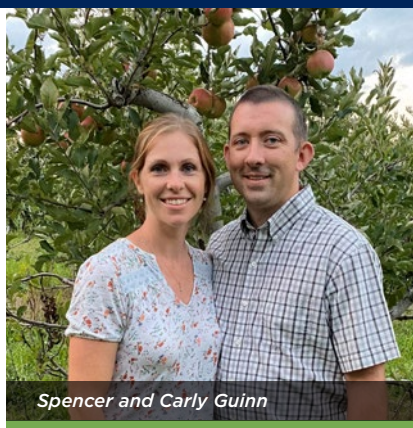
For the past three years, Spencer has been planting corn and soybeans green into over-wintered cover crops and spraying to terminate the same day. He's also experimented with planting green and waiting two to three weeks before burn-down and has seen some of his highest yields ever. Around the same time, he began growing heirloom corn to sell to local distilleries or mill into cornmeal and grits. In 2019, he changed his rotation to plant rye before soybeans, selling the rye to distilleries and to other farmers as cover crop seed. These niche markets and value-added products helped the Guinns diversify and improve their bottom line.

In 2023, Spencer joined AFT's Kentucky Climate-Smart Cereal Rye Cover Crop Initiative, which supports cereal rye as both a cover and cash crop. Through the program, Spencer receives financial and technical assistance to expand his rye use, improving soil health, climate resilience, and local grain markets.

Soil Health Economic & Environmental Estimated Outcomes

Partial budgeting analysis was used to estimate the marginal benefits and costs of conservation crop rotation and cover crops on Circle G Farms. The study was limited to only those income and cost variables affected by these practices. The table on page 2 summarizes these economic effects, showing that, due to the two soil health practices, the Guinns' net income decreased by $5/ac/yr on the 205-acre study area. The Guinns view this modest decrease as a worthwhile investment in long-term soil health and resilience, especially given the additional agronomic benefits for his home state. As Spencer put it, "I'm willing to take the hit if the long-term goal is that rye becomes a viable crop for Kentucky."

Circle G Farms' largest increase in net income, $66/ac/yr, is attributed to yield improvements after adopting cover crops. Although Spencer saw a yield drag the first two years, by year three his yields started to break even and are now consistently above the county average for corn and soybeans.



Spencer and Carly Guinn

Farm at a Glance

COUNTIES: Boyle & Lincoln, KY

WATERSHED: Quirks Run-Salt River

CROPS: Corn, rye for grain, & soybeans

FARM SIZE: 250 acres (205-acre study area)

SOILS: Silt loam; flat hilltops and rolling hills of 2–12% slopes

SOIL HEALTH PRACTICES: Conservation crop rotation & cover crops

Rye grown for distilleries

American Farmland Trust

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Soil Health Case Study

Circle G Farms, KY

The farm's other increase in income comes from shifting 20 acres of wheat production for hay to 20 acres of rye for grain and cover crop seed, a $195/ac/yr increase. While rye production involves higher chemical and nutrient inputs, it eliminates the need for two machinery passes previously required for hay. Additionally, the farm capitalizes on niche markets by selling rye as seed and as grain for distilleries, which command premium prices.2 It is worth noting that while the Guinns saw above average yields on rye from 2018 to 2023, their rye yield in 2024 was very low, which Spencer attributes to extreme weather events that year.

Adopting cover crops also reduced costs. Healthier soils allowed Spencer to eliminate insecticide use on soybeans and GMO corn saving $3/ac/yr. "The mat of cover I get from the rye and crimson clover is thick enough to suppress weeds—as long as I kill what's there at planting," he says. These changes eliminated an entire herbicide pass for both soybeans and GMO corn, reducing the cost of machinery by $6/ac/yr.

Soil samples have shown improvements in organic matter and cation exchange capacity (CEC), with recent results well above Kentucky averages. Spencer has also observed greater drought resilience, which he attributes to cover cropping.

Cover crops account for the largest cost increase on the farm at $74/ac/yr. Fertilizer costs have increased as a result of cover crop adoption as well, as Spencer has had to increase the amount of nitrogen he applies on corn and has changed application timing. "I wait to put down nitrogen until the rye is dying or dead because it seems to tie N up and not let it go if the rye sucks it up before the plant's gone. That's been a learning curve and a change." Spencer has also increased the amount of potash he applies on corn and soybeans, though he has reduced his amount of phosphorus. Overall, fertilizer costs have increased by $12/ac/yr.

Finally, Spencer estimates that he spends 35 hours a year learning about soil health practices.

Closing Thoughts

While the conservation practices implemented at Circle G Farms resulted in a negative return on investment over the study period, this translated to a relatively modest reduction in overall net income -$5/ac/yr. For the Guinns, that tradeoff is well worth it. Soil health practices are an integral part of holistic, responsible agriculture, and their farm name reflects these values. The Circle G brand represents the Guinn family's commitment to full circle agriculture. Says Spencer, "We use the livestock on pastureland that can't be cropped. We use their manure to fertilize our crop fields, and we use cover crops to absorb and release those nutrients for our row crop enterprise."

—Lia Raz, American Farmland Trust

ECONOMIC EFFECTS OF SOIL HEALTH PRACTICES ON CIRCLE G FARMS, KY (2023 PRICES)[3]

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Yield increases due to cover crop adoption (+11% corn, +6% soybeans)	$66	205	$13,546
Increase in net income due to adding 20 acres of rye for grain to rotation	$7	27.5	$195
Total Increased Income			**$13,742**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Pesticide cost savings due to cover crop adoption	$3	205	$621
Machinery cost savings due to eliminating burndown pass	$6	205	$1,226
Total Decreased Cost			**$1,847**
Annual Total Increased Net Income			**$15,589**
Total Acres in this Study Area			**205**
Annual Per Acre Increased Net Income			**$76**

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
Cover crop costs	$74	177.5	$13,080
Fertilizer cost increase due to adoption of cover crops	$12	205	$2,532
Soil health practices learning activities (35 hrs)			$1,004
Total Increased Cost			**$16,616**
Annual Total Decreased Net Income			**$16,616**
Total Acres in this Study Area			**205**
Annual Per Acre Decreased Net Income			**$81**

Annual Change in Total Net Income = -$1,028

Annual Change in Per Acre Net Income = -$5

Return on Investment = -6%

[1]Circle G Farms received $75/ac/yr through the NRCS EQIP Program (2018–2022) for cover crops. This is not included in the analysis because cost-share is temporary and not received by all. [2]Farmers selling cereal rye to distilleries typically receive between $12 and $16/bu. For the purposes of this case study, we used a price of $12.50/bu, on the low end of what someone selling rye to a distillery might receive. This is not the price Spencer Guinn receives for his rye. [3]This table represents estimated average costs and benefits attributed to adopting two soil health practices over the 205-acre study area, where corn, rye, and soybeans are grown, as reported by the farmer. • Rounding of per acre values may result in minor discrepancies in totals. • Prices used: Corn Grain: $5.65/bu, Soybeans: $13.26/bu, Wheat: $7.06/bu (USDA NASS, *Crop Values Summary, 2019-2023 avg*); Nitrogen: $.63/lb, Phosphate: $.61/lb, Potash: $.54/lb (ISU, *Ag Decision Maker: Estimated Costs of Crop Production, 2019-2023 avg*); Rye: $12.50/bu (DTN Progressive Farmer. August 2023. *Cover Crops for Distilling Generate Profits.*); 2023 labor rate: $29.23/hr (U.S. Bureau of Labor Statistics, 2023, *Supervisors of Farming*). • For information about study methodology, see farmland.org/soil-health-economic-case-study-methods • This material is based on AFT's work supported by a USDA NRCS Cooperative Agreement #NR223A750010C003.

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

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