Cover Crops

Crop Rotation

Hebbe Farms, WI
SOIL HEALTH CASE STUDY

DECEMBER 2024

Planting corn into green rye cover crop

JIM HEBBE

As a third-generation farmer and former Land Conservation Director for the Green Lake County Land Conservation Department, Jim Hebbe manages 1,300 acres of rolling hills in Green Lake and Fond du Lac counties in Wisconsin. This study focuses on 1,100 acres of corn, soybeans, and winter wheat where Jim uses conservation crop rotation (CCR) and cover crops.

In the 1980s, Jim adopted no-till across his farm. The machinery and time savings made it an easy choice with immediate economic benefits. However, the adoption of no-till is not included in the analysis for this study since it is part of Jim's normal operations.

Within the study area, Jim previously planted 600 acres of corn, 400 acres of soybeans, and 100 acres of winter wheat. Jim's CCR includes decreasing corn by 100 acres and increasing soybeans and wheat by 50 acres each. While corn, a high-residue crop, was once encouraged on steep slopes to control erosion, Jim has found that a more diverse rotation still controls erosion while improving yields, mitigating production risk, and spreading out his workload over the year.

Jim occasionally tried cover crops starting in the 1980s, but they were an added cost with no perceivable benefit. Over time, though, Jim noticed that while no-till prevented most sheet and rill erosion, heavy rains could still cause ephemeral erosion. He wondered how else he could protect the soil, his most valuable resource, when it occurred to him that no-till is just one component of a conservation system. In 2013, Jim began consistently cover cropping on 100 acres and experimenting with planting green into living cover crops.

Now, Jim averages 400 acres of rye after corn and soybeans, and 150 acres of multi-species mix (clover, tillage radish, and wheat or rye) after winter wheat. Rye provides more residue after low-residue soybeans. After corn, rye helps control water hemp in soybeans. Jim appreciates the nitrogen fixation of the multi-species mix and loves seeing native pollinators visit this cover crop. In the end, though, Jim notes, "the number one reason I plant cover crops is to keep the soil covered and reduce erosion."

Establishing a cover crop after corn can be challenging. Jim finds drilling cover crops can be better than broadcasting, but it takes more time and money. In the last few years, he's transitioned to growing his own rye seed (outside the study area) to lower his seed costs and prevent the introduction of new weeds.

During drought, Jim used to worry cover crops would take moisture from his cash crops, but he notes, "the soil is more resilient and able to get crops through a stressful, dry period." Additionally, he sees less ponding after large rain events.

Soil Health Economic Estimated Outcomes

Partial budgeting analysis was used to estimate the marginal benefits and costs of CCR and cover crops on Hebbe Farms. 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 soil health practices, Jim Hebbe's net income increased by $2/ac/yr on the 1,100-acre study area, a 7% return on investment (ROI).

The biggest economic benefit Jim has experienced is due to yield increases across all crops since adopting CCR and cover crops. He attributes a yield increase of 3% for corn, 6% for soybeans, and 4% for wheat to his use of cover crops, leading to an average of $31/ac/yr increase overall.

Jim experienced one decrease in cost due to adopting cover crops. When corn follows his multi-species cover crop mix, he reduces

Jim Hebbe in his no-till corn field with rye cover crop residue

ASHTON HEBBE

Farm at a Glance

COUNTY: Green Lake & Fond du Lac, WI

WATERSHED: Upper Fox River

CROPS: Corn, soybeans, & wheat

FARM SIZE: 1,300 acres (1,100-acre study area)

SOILS: Sandy loam & silty loam on rolling hills averaging 4-5% slopes, up to 12%

SOIL HEALTH PRACTICES: Conservation crop rotation (CCR) & cover crops

No-till corn planted green into a multi-species cover crop of crimson clover, tillage radish, and wheat

JIM HEBBE

American Farmland Trust

Michael Fields Agricultural Institute

USDA Natural Resources Conservation Service
U.S. Department of Agriculture

Soil Health Case Study

Hebbe Farms, WI

nitrogen (N) applications by 45 lb/ac/yr, a $28/ac/yr reduction in cost over those 150 acres. He finds this natural source of N to be more reliable and less subject to leaching versus commercial N.

The only decrease in income Jim experienced was due to his CCR of reduced corn acreage, leading to a $46/ac/yr decrease in net income over those 100 acres. While many costs to produce soybeans and wheat are lower than they are for corn, the revenue of corn is much higher. Jim notes that his CCR goes hand in hand with his cover crop use. By reducing the acreage of corn he needs to harvest in late fall, he gains more time to seed his cover crops before winter. While it costs more, this approach supports the overall functionality of his soil health system.

Cover crops account for the largest increase in cost. Seed, establishment, and fertilizer inputs for cover crops cost $44/ac/yr over 550 acres. Jim broadcasts rye after soybeans but uses a mix of broadcasting and no-till drilling rye into corn residue. He's less concerned about soil disturbance from the drill after corn, as the higher residue protects the soil. Jim drills the multi-species mix after wheat; he's experimented with broadcasting but found the tillage radish didn't germinate well. With the high seed cost for the mix, Jim wants to ensure good germination. N deficiency is a concern when planting corn into a green rye cover crop, so Jim adds 20 units of additional N on those 200 acres.

To offset costs, Jim usually applies for and receives a $5/ac crop insurance credit for planting cover crops, administered by the Wisconsin Department of Agriculture. Since funding is awarded on a first-come, first-served basis and is not guaranteed, it is not included in our analysis. The years Jim received this benefit, Jim's net income was higher than presented in this analysis.

Jim estimates he spends 130 hours annually on learning activities related to cover crops. He splits this time between reading and going to events.

Closing Thoughts

For Jim, the benefits of erosion control,[1] nutrient cycling, pollinator habitat, and improved soil structure are even more important than the $2/ac/yr he gets from implementing CCR and cover crops. Jim sees cover crops as insurance for weatherproofing his large investment in land and soil, and as a compliment to no-till by providing more residue. It helps him maintain peace of mind, as Jim notes, "I sleep excellently not worrying that I let soil wash off my farm. When mother nature throws a big curve ball, I'll know I did everything I could."

Jim is always trying new things, such as planting no-till peas, delaying cover crop termination, and collaborating with the University of Wisconsin on cover crop nitrogen rates. He encourages producers to start small and step outside their comfort zone, noting, "Nothing ever beats firsthand experience on your own farm."

—Jen Tillman

ECONOMIC EFFECTS OF SOIL HEALTH PRACTICES ON HEBBE FARMS, WI (2023 PRICES)[2]

Increases in Net Income

Increase in Income

ITEM	PER ACRE	ACRES	TOTAL
Yield increases due to cover crops (3% corn, 6% soybeans, 4% wheat)	$31	1,000	$30,760
Total Increased Income			**$30,760**

Decrease in Cost

ITEM	PER ACRE	ACRES	TOTAL
Corn fertilizer savings (45 lb N credit to corn following multi-species cover crop mix)	$28	150	$4,236
Total Decreased Cost			**$4,236**
Annual Total Increased Net Income			**$34,996**
Total Acres in this Study Area			**1,100**
Annual Per Acre Increased Net Income			**$32**

Decreases in Net Income

Decrease in Income

ITEM	PER ACRE	ACRES	TOTAL
Decrease in net income due to CCR (100 acres corn changed to soybeans & wheat)	$46	100	$4,627
Total Decreased Income			**$4,627**

Increase in Cost

ITEM	PER ACRE	ACRES	TOTAL
Cover crop costs (seed, planting machinery, fertilizer)	$44	550	$24,335
Cover crop learning activities (130 hrs/yr)			$3,800
Total Increased Cost			**$28,135**
Annual Total Decreased Net Income			**$32,762**
Total Acres in this Study Area			**1,100**
Annual Per Acre Decreased Net Income			**$30**

Annual Change in Total Net Income = $2,233

Annual Change in Per Acre Net Income = $2

Return on Investment = 7%

[1] These case studies often attribute an economic value to erosion control. However, RUSLE2 did not show a significant decrease in soil loss when adding cover crops to Jim's no-till system, as RUSLE2 only accounts for sheet and rill erosion which was already controlled by no-till. Because of this, we did not attribute an economic value to the ephemeral erosion control Jim observes from cover crops. [2] This table represents estimated average costs and benefits attributed to adopting conservation crop rotation and cover crops over the 1,110-acre study area, 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, Winter Wheat: $7.06/bu (USDA NASS, 2022-2024, Crop Values Summary, 2019-2023 averages); Nitrogen: $.63/lb, Potash: $.54/lb (Iowa State University, 2022-2024, Ag Decision Maker: Estimated Costs of Crop Production in Iowa, 2019-2023 averages); 2023 hourly labor rate: $29.23/hr (U.S. Bureau of Labor Statistics, 2023, Occupational Employment & Wage Statistics, First-Line Supervisors of Farming). • Machinery costs include the cost of equipment, custom hire, labor, depreciation, interest, insurance, housing, repairs, and fuel (Univ. of IL at Urbana-Champaign, Sept. 2023, Farm Business Management Machinery Cost Estimates: Field Operations & Forage Operations; Iowa State University, Nov. 2023, Ag Decision Maker: Iowa Farm Custom Rate Survey). • Return on investment is the ratio of Annual Total Change in Net Income to Annual Total Decreased Net Income, as a percent. • For information about study methodology, see farmland.org/soilhealthcasestudies. • This material is based on AFT's work supported by a USDA NRCS Cooperative Agreement #NR223A750010C003.

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