

Assessing on-farm economics of soil health

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A Michigan grower and his grandson standing in a field of mixed cover crop species, which provide numerous benefits, including the ability to have an advantage when bidding for rented land.

The following article is the fifth in a six-part series on assessing soil health. It focuses on the question of profitability as it relates to soil health. It is part of a larger Soil Science Society of America webinar series produced in partnership with The Soil Health Institute and sponsored by The Walton Family Foundation.

Producers often comment that economics drive farm management decisions. The adoption of soil health management systems is no different. Are cover cropping and no-till going to cost extra? Do I save in labor and fuel? How does the purchase of cover crop seed pay? For this reason, providing data relevant to the business case is central to the Soil Health Institute's comprehensive strategy to increase the adoption of soil health systems. Our goal is to effect positive change at scale, by increasing the acres of land managed with practices that enhance soil capacity to function as a vital living system. We recognize it is producers who manage the land and who will first recognize the benefits and the risk, which means that producers need relevant, location-specific information on not only how soil functioning changes, but also on how the business case changes with the adoption of soil health practices. Welcome to another edition of the "Assessing Soil Health" series where we focus on question of profitability.

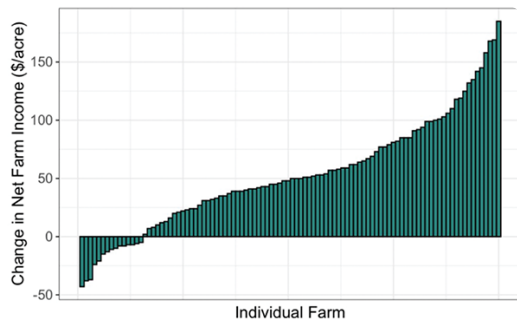


Figure 1, *Change in net farm income for 100 farms that have adopted no-till, reduced till, and/or cover cropping corn. Fifteen farms had a negative change while 85 had a positive change. Aggregated and averaged, the data show a positive net farm increase of \$51.60 per acre.*

Over the last two years, SHI with the support of Cargill and in collaboration with the USDA–NRCS, has conducted 100 interviews of corn and soybean farmers that have adopted no-till, reduced tillage, and/or cover cropping for at least five years as part of their management strategy. The interviews produced management and yield data that allowed us to calculate partial budgets for comparison of alternative production systems. This analysis quantifies differences in production expenses and revenue for each crop produced on farms in the study. The

expense categories considered were seed, fertilizer and amendments, pesticides, fuel and electricity, labor and services, post-harvest costs, and equipment ownership. Change in revenue was calculated using the yield change and long-term average price for each crop. Adopting soil health management systems includes additional expenses, as well as reduced expenses due to change in production methods. For each crop, average reduced expenses, additional expenses, and change in revenue were aggregated among farms. From these values, the change in net farm income was calculated (Figure 1).

During the interviews, the farmers were also asked about perceived changes with their adoption of soil health management practices. For example, more than 90% of the 100 respondents from the Cargill project said that their change in management, primarily adoption of no or reduced till and cover cropping, had improved field access and crop resilience and protected their social license to operate. Every farmer interviewed

reported an increase in water quality with some based on quantitative tests and others based on their own observations. Most producers, 67%, reported an increase in yield, and 83% said they had reduced the fertilizer they applied. The only question that most farmers did not answer “yes” to was whether their adoption of soil health management practices improved their crop loan terms, land rental arrangements, or crop insurance situation. However, regardless of this factor, farmers were confident that other observed benefits outweighed this consideration.

Average Change in Expenses, Revenue

The data from 100 farms producing corn and soybean were aggregated to calculate average reduced expenses, additional expenses, and change in revenue. For corn, expense reductions averaged \$67.06 per acre; added expenses averaged \$46.36 per acre; increased revenue averaged \$32.54 per acre; and decreased revenue averaged \$1.64 per acre. Together, these numbers tell an encouraging story for the business case of adopting no-till and cover cropping. The average change in net farm income with the adoption of soil health management practices in corn was \$51.60 per acre. The average change in net farm income with the adoption of soil health management practices in soybeans was \$44.89 per acre.

The partial budget difference describing additional revenue as a result of yield increase was particularly interesting. In controlled research experiments, the response of yield to adoption of soil health management practices is varied and inconclusive (Derpsch, [2014](#)). However, in these interviews, the producers reported a noticed improvement in yield resilience and stability. It is not that one should expect considerably higher yield as a result of implementing soil health management practices; rather, in the challenging years when the weather doesn’t cooperate, fields with soil health systems do considerably better than those in conventional

management. Over time, this stabilizes profits and decreases rates of crop failure.

For corn, the line item that saved the most money as a result of adopting the soil health management system was fertilizer and amendments with an average reduction of \$22.26 per acre. In our data, there was a greater amount of revenue gained from yield gain than from yield loss. Together, this demonstrates that yield was maintained with less additional nutrients. Likely, as soil health improves from reduced tillage and cover cropping, soil structure improves, allowing greater plant-available water storage, improved root exploration, improved cycling of organic matter, and improved timing/efficiency of plant-available nutrients. Not only does decreasing nutrient application reduce fertilizer bills, but it also reduces the risk of nutrients leaving the farm through surface water, ground water, and the atmosphere. Soil health practices are key to providing cleaner air and water.

Added expenses were primarily from the cost of cover crop seed. Using cover crops is a way to accomplish three of the soil health management principles. Cover cropping increases the amount of time live roots are actively working in the soil, provides protection from erosion to the soil surface, and increases diversity. The purchase of cover crop seed can be thought of as an investment in soil health for the long game (Myers et al., [2019](#)).

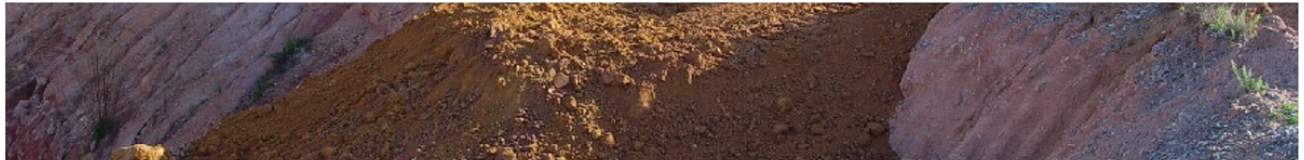
Data Show Increase in Net Farm Income

The data from these real-world operations are clear: farmers who have adopted no-till, reduced tillage, and/or cover crops have, on average, a positive change in net farm income. Changing management does require learning and developing a new system. Most cases require time for trial and error to figure out how to fine-tune the system for your local soil, climate, and market conditions. Many producers interviewed suggested starting small by converting half of one field to see the differences.

Nonetheless, producers who have made the switch demonstrated increased yield resilience in challenging years and an overall decrease in inputs costs. Over time and with technical support from neighbors and agronomists (Monaco Neto et al., 2021), soil health management systems can enhance the rural triple bottom line, not only increasing the social and environmental vitality of rural communities, but also the likelihood to increase farm income.

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