ECONOMICS of Soil Health Systems on 30 U.S. Farms

EXECUTIVE SUMMARY

Improving soil health can help farmers build drought resilience, increase nutrient availability, suppress diseases, reduce erosion, and reduce nutrient losses. Many soil health management systems (i.e., a suite of soil health practices) also benefit the environment by storing soil carbon, reducing greenhouse gas emissions, and improving water quality. However, investing in soil health management systems(SHMS) is also a business decision. This project was conducted by the Soil Health Institute (SHI) and the National Association of Conservation Districts (NACD) to provide farmers with the economics information they need when making that decision.

A total of 30 farmers from across the U.S. with an established history of successful implementation of SHMS in crop production were selected for this project. NACD interviewed those farmers to learn about their farms and experiences with adopting SHMS, and SHI interviewed them to acquire production information for evaluating their economics based on partial budget analysis. In using this approach, the costs and benefits of a soil health system are compared before and after adoption of that system. A detailed description of the partial budget methodology can be found on the SHI website: https:// soilhealthinstitute.org/economics/.

Crops for partial budget analysis included canola, chickpea, corn, cotton, dried bean, grain sorghum, millet, pea, peanut, soybean, sunflower, rye, walnut, and wheat. Cover crops were planted on 29 of the 30 farms, but not before every cash crop. Two farms produced organic crops in a soil health management system, while four farms gained additional revenue by grazing their cover crops.

Recognizing that each farm is unique, and the specific economic information on each farm is provided in the corresponding fact sheet, the following generalizations were found:

- **On average, after implementing a SHMS, it cost producers $14/acre less to grow corn, $7/acre less to grow soybean and $16/acre less to grow all other crops.**
- **Adopting a SHMS not only reduced expenses, but also increased net farm income.**
- **Across 29 farms, SHMS increased net farm income by an average of $65/acre (1 organic farm was excluded due to high revenue from price premiums that would skew the average results).**
- **Yield increases due to SHMS were reported for 42% of farms growing corn, 32% of farms growing soybean, and 35% of farms growing other crops.**
- **Cover crop seed costs averaged $21/acre for corn, $16/acre for soybean, and $25/acre when used with other crops.**
- **Four farms grazed cover crops, allowing them to increase revenue by an average of $26/acre.**
- **Additional reported benefits of adopting SHMS included decreased erosion and soil compaction, earlier access to fields in wet years, and increased resilience to extreme weather, among other benefits.**

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National Association of Conservation Districts

USDA United States Department of Agriculture
Natural Resources Conservation Service

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EXECUTIVE SUMMARY

While the primary goal of this project was to assess the economics of SHMS on farms, we also sought to assess economics of SHMS on long-term research sites to explore integrating research site information with that reported on working farms. However, we learned that a direct comparison of findings between a given farm and a nearby research site was not possible due to management differences between the two. Consequently, a subset of 87 long term U.S. research sites included in SHI's North American Project to Evaluate Soil Health Measurements were segregated into 4 geographic regions and their economics were analyzed based on cropping system and SHMS. Partial budget analysis of those long-term research sites revealed the following highlights:

- **Six research sites in IL, IN, OH, MO and SD showed that no-till reduced the average cost of growing corn by $21/acre and for soybean by $13/acre.**
- **A research site with colder, wetter soils in MN showed that no-till reduced net income for corn by $48/acre, but increased net income for soybean by $28/acre. Strip-tillage reduced the losses associated with no-till, such that the overall corn-soybean rotation was approximately $24/acre more profitable than the conventional tillage system.**
- **A research site growing winter wheat in NE showed that changing from a reduced tillage system with a sweep plow to a no-till system increased net income by $22/acre, while changing from a conventional tillage system with a moldboard plow to no-till increased net income by $48/acre.**
- **At a Nueces County, TX research site, converting from conventional tillage to no-till reduced production costs by $22/acre and increased net income by $30/acre for cotton. However, at a research site in Dawson, TX, adding a cover crop to a no-till system reduced cotton yield and net income by $56-60/acre.**
- **At a research site in OR, converting from conventional tillage to no-till reduced production expenses and increased net income by $8/acre for winter wheat and $3/acre for dried pea.**
- **Converting from conventional tillage to no-till at a Ritzville, WA research site reduced net income by $11/acre for spring wheat, mostly because of three additional herbicide applications that researchers used in their no-till system.**

Upon comparing the economic results from research sites with the on-farm realities experienced by farmers, it is clear that significant differences exist. The most consistent difference is that farmers generally reported neutral or higher yields and higher net farm income after converting to a SHMS from a conventional system. In contrast, reported economic and yield impacts were more variable across long-term research sites. This can be attributed to numerous reasons. For example, in a research study, management decisions are guided by the need to consistently follow pre-established experimental protocols, while a farmer is not only more experienced at understanding and managing the many nuances of soil and crop management (i.e., adjustments to seeding depth, seeding rate, weather, etc.), farmers also have more flexibility to implement management changes as needed.

In addition, scientists design experiments for many different objectives. A study designed to address one objective (e.g., compare different nitrogen fertilizers) is often very different than a study designed to optimize profit, making it inappropriate to extend interpretations of economic impacts when the study was not specifically designed to investigate profitability. By contrast, a farmer is operating a business, necessitating management decisions to be made through a lens of how changes in production practices will directly impact their net farm income.

This project has demonstrated the consistently positive economic benefits reported by farmers that have adopted soil health management systems. The wide range of farms, production systems and climates included in this project indicates that many more farmers may also benefit economically from adopting these systems, thereby expanding the associated environmental benefits for society and our natural resources.

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