

Economic Impacts of No-Till Adoption in Maryland



Summary

Researchers and agricultural producers believe that economic concerns are one of the largest barriers to adopting no-till management practices. A recent Mid-Atlantic study involving long-term data has found that over time, net returns (or profits) per acre can be greater for no-till compared to conventional tillage. The study identifies what inputs are affected by no-till adoption, providing more information about the sources of profit between long-term no-till use and conventional tillage. It also suggests that no-till profitability can increase under continued use over time.

The researchers used data from an Agricultural Research Service (ARS) Long-Term Agroecosystem Research (LTAR) field trial in Beltsville, Maryland (MD). Data were collected on crop yields and various categories of input costs (i.e., seeds, farm operations, fertilizers, and pesticides) from 1996 to 2019. It is among the few studies that focus specifically on analyzing the long-term economic performance of no-till, providing new insights on the impacts of no-till in the US Mid-Atlantic region over time.

Data and Methods

The analyses addressed two tillage systems: 1) no-till and 2) conventional tillage using a chisel plow and disk. The crop rotation used in both tillage systems was a corn/soybean/winter wheat/double crop soybean rotation. Both systems are part of the long-term Farming Systems Project illustrated in the photo at the bottom of the page. The team compared changes in income and costs of production between no-till and conventional tillage. Four input cost categories were used: seeds, farm operations, fertilizers, and pesticides.

A partial budgeting method was employed to calculate the expected net changes per acre (\$/acre) due to adoption of no-till over time. Here, partial budgets compare the changes in benefits and costs of production between no-till and conventional tillage.

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No-Till Benefits

No-till can aid in soil carbon sequestration and help mitigate the negative impacts of weather events. Building and maintaining soil organic matter helps ease drought impacts on crop yields. It also provides environmental benefits by reducing soil erosion. This prevents sediment runoff to water bodies, and conserves water and organic matter. The no-till adoption rate has continuously risen in the United States. The most recent US Department of Agriculture (USDA) survey estimates that no-till accounts for about 24.8% of the total cropland acres in 2012 and 26.4% in 2017.

Results from partial budgeting analysis reveal that continuous no-till adoption generates positive economic benefits by reducing overall input costs.

On average, no-till adoption increased long-term net returns by \$37.12 per acre (relative to conventional till). See Table 1.



Partial Budget Analysis

Partial budgets capture the change in net annual economic return from using a specific management practice. Here, they identify and quantify the differences in crop yields and input costs between no-till and conventional tillage. Potential sources of profit-increases for no-till are increased income (or increased crop production) and decreased input costs. Potential sources of profit-decreases in no-till include decreased income (or decreased crop production) and increased input costs.

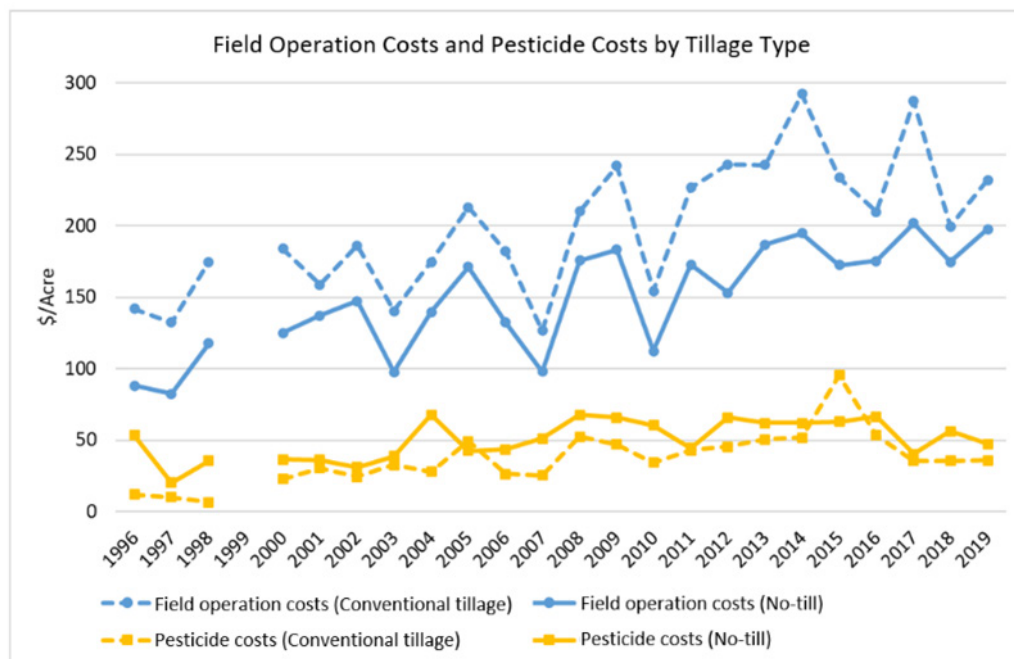
TABLE 1. PARTIAL BUDGET ANALYSIS FROM 1996-2019 (CORN, SOYBEANS, WHEAT)

INCREASE IN PROFIT (BENEFITS)		DECREASE IN PROFIT (COSTS)	
A. Increased Income: None identified		C. Decreased Income: None identified	
B. Decreased Cost:		D. Increased Cost:	
Reduced field operation cost (\$/ac)	\$49.93	Increased pesticide cost (\$/ac)	\$12.81
E. Total Increase in Profit (\$/ac)	\$49.93	F. Total Decrease in Profit (\$/ac)	\$12.81

TOTAL NET CHANGE IN PROFIT (E-F) = \$37.12/acre

Results

On average, crop yields were similar for both no-till and conventional till at the FSP. In addition, no-till management was associated with lower field operation costs but higher pesticide costs for all three crops. Average seed and fertilizer costs tended to be similar in both tillage systems. Overall, total input costs (i.e., total costs for all input categories) under no-till are much lower than under conventional tillage. Figure 1 illustrates the costs of field operations and pesticides from 1996-2019.



Conclusion

Many consider no-till as one of the more effective soil health conservation practices for both on-field and off-site benefits. Until now, very few studies have focused on the economic outcome of long-term adoption of conservation practices. This was due to a lack of long-term economic data. This field study, however, included 24 years of data. It reveals that over time, continuous no-till adoption generates positive economic benefits by reducing overall input costs. This is despite the possibility of little to no positive yield effect. The study can help encourage no-till adoption (especially in the Mid-Atlantic States) by providing farmers and agricultural stakeholders data-driven evidence of positive long-term economic benefits of the practice.

It may also have relevance to other agricultural practices where benefits are gradually realized over a longer period, yet adoption requires upfront (and recurring) costs to implement.

View the full article here for an in-depth look at the study: <https://doi.org/10.1016/j.soisec.2023.100103>

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