Long-term Soil Health Pays in Alabama



Improving soil health can increase drought resilience and nutrient availability, reduce erosion, and help fight disease. However, when considering soil health practices, farmers need information on the return on investment. That's why the Soil Health Institute conducts partial budget analysis of real farms and their practices, comparing the costs and savings of soil health management systems.

We analyzed partial budgets of five Alabama cotton farmers – each with at least five years of experience adopting soil health management systems. All farmers reported an increase in net cotton income.

The bottom-line benefits they saw include:

- Cotton net income rose an average of $108/acre
- Other crops in rotation with cotton saw net income rise an average of $94/acre for peanut and $36/acre for corn
- Average cotton yield increased 160 lb/acre

Before we break down the cost and revenue changes due to managing for soil health, let's take a look at the farms we interviewed.

ABOUT THE

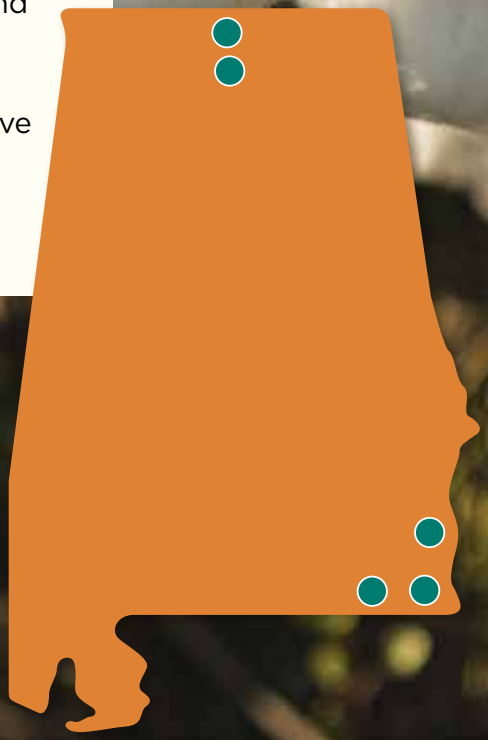
Farms

The five cotton farms ranged in size from 200 to 2,600 acres, with cotton, peanut, corn, soybean as cash crops and winter wheat and small grains used as cover crops. All soybean acreage was double cropped with wheat.

LAND USE	ACRES
Cotton	511
Peanut	303
Corn	185
Soybean	164
Winter wheat	164
Small grains for cover crop seed	80
Double crop	244
Total Crop Acres	1,163

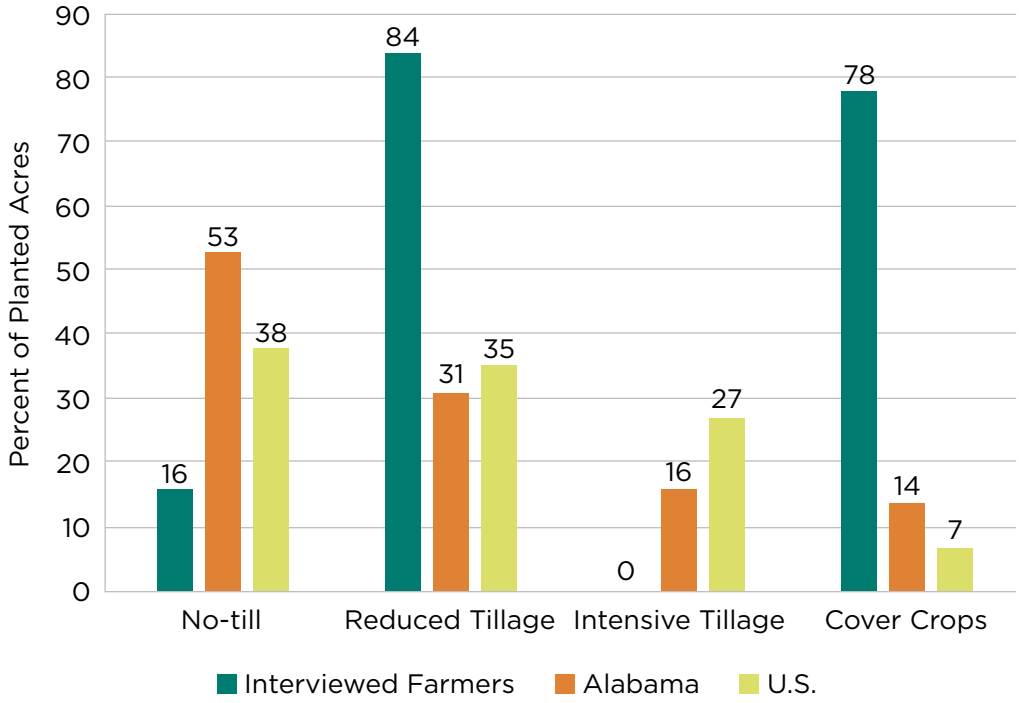
Mean annual precipitation was 50 to 60 inches, while mean temperature was from 57 to 68 degrees F. Prior to cotton production, all farms planted one to three species of cover crops. Three farms used some irrigation, and two farms were completely rainfed.

Soil types on these farms were representative of row crop fields in Alabama with soil textures from sands to silty clay loams.



Farm	Surface Soil Texture	Tillage Type	Cover Crop Species	Percent Irrigated
1	sandy loam	reduced tillage	winter/cereal rye	0
2	sand, sandy loam	reduced tillage	winter/cereal rye	50
3	sand to sandy clay loam	reduced tillage	wheat, triticale, oats	29
4	silt loam	no-till	crimson clover, triticale	16
5	silty clay loam and sandy clay loam	reduced tillage	wheat	0

One farmer adopted no-till on all acreage and four used reduced tillage, including three farms with strip tillage and one farm with vertical tillage. No-till averaged 16% of planted acreage, with reduced tillage averaging 84%. A smaller proportion of the interviewed farmers used no-till practices compared to the state average, primarily due to their crop rotation choices. The farmers interviewed also reported using cover crops on 78% of their cropland, considerably greater than state and national averages.



The farmer who used no-till has been doing so for 27 years, while those practicing reduced tillage have been doing so for an average of 19 years. The farmers planting cover crops have an average 14 years of experience with cover cropping.

VISIT US AT

https://soilhealthinstitute.org/economics
for a detailed description of our partial budget methodology

BOTTOM-LINE BENEFITS

for cotton production

Managing for soil health slightly increased per-acre expenses — primarily from cover crop seed and pesticides — however, those costs were offset by greater yields. On average, net income rose by $108 per acre for cotton.

Partial budget analysis of adopting a soil health management system, $/acre

	Benefits	Costs
Expense Category	**Reduced Expense**	**Additional Expense**
Seed	0.00	22.50
Fertilizer & Amendments	0.00	4.92
Pesticides	11.10	19.97
Round Module Covers	0.00	1.67
Fuel & Electricity	8.48	3.12
Labor & Services	23.35	12.33
Equipment Ownership	37.64	20.40
Total Expense Change	**80.57**	**84.91**

	Additional Revenue	Reduced Revenue
Yield, lb./acre	160.00	0.00
Price Received,[1] $/lb.	0.70	0.70
Revenue Change	**112.00**	**0.00**

	Total Benefits	Total Costs
Total Change	**192.57**	**84.91**
Change in Net Income	**107.66**	

[1] Commodity prices applied to yields based on long-term average prices.







Expenses

Seed, Fertilizer, and Amendments

All farmers reported planting cover crops prior to cotton production. Cover crop seed expenses ranged from $6/acre for wheat to $30/acre for a three-species mix of wheat, triticale, and oats. One farm broadcasted the three-species mix with a 22-11-11 fertilizer blend. No other farms reported additional fertilizer expenses for cotton production.

Pesticides

Reducing tillage and planting cover crops can suppress weeds, changing or eliminating the need for some herbicides. On the other hand, herbicide use may increase to terminate cover crops or for weeds previously controlled with tillage. All five farmers reported additional pesticide expenses, with four farms increasing herbicide expenses and one farm adding an insecticide application. Two farms reported reduced herbicide expenses. Averaged across all five farms, pesticide expenses increased $9/acre.

Equipment Ownership, Fuel, Labor and Services, and Other Expenses

Reduced expenses for equipment ownership and associated expenses totaled $69/acre. Additional expenses for equipment ownership and associated expenses totaled $36/acre. Additional expenses included planting and terminating cover crops, as well as strip tillage, vertical tillage, and light disking to incorporate cover crops.

Four farms reduced their expenses, ranging from $5 to $17/acre. One farm reported a total expense increase of $64/acre entailing additional expenses for cover crop seed with a fertilizer blend and incorporation into the soil by vertical tillage, as well as strip tillage that partially offset expense reductions associated with conventional tillage. On average, it cost $4/acre more to use soil health practices.

Revenue

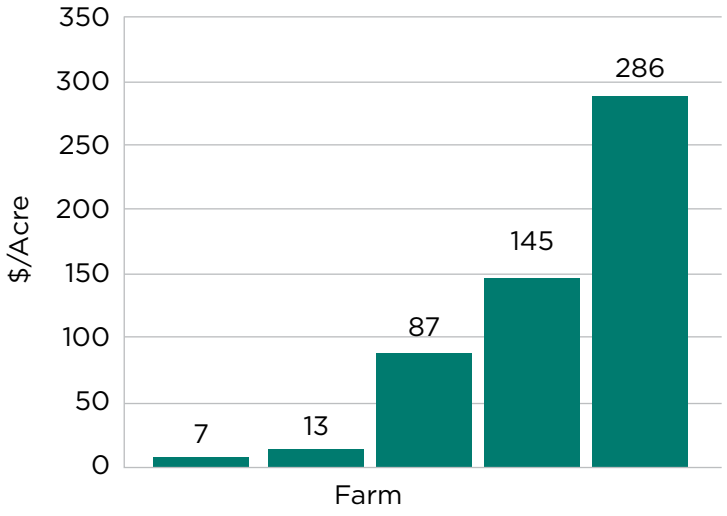
All farmers reported an increase in net cotton income. Three farms reported increased cotton yield with a five-farm average increase of 160 lb./acre. Because market prices for crops fluctuate, additional revenue was calculated by applying a long-term average cotton price of $0.70/lb. Using that price, crop revenue increased $112/acre. Combining the changes in expenses and revenue showed that managing for soil health increased net income by an average of $108/acre for cotton.

The farm with the greatest increase in net cotton income had the greatest yield increase, which compensated for the $64/acre increase in total expenses. The farms with the lowest net income increases did not have increased cotton yield.

Other crops

Three farmers grew peanut and reported net income to increase with a range of $57-$125/acre. Three farms growing corn increased net income with a range from $5-$72/acre. Two farms increased soybean net income by $15/acre and $77/acre increase. One farm increased net income $26/acre for wheat.

Change in net cotton income



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Long-term adoption of soil health practices is improving profitability for cotton farmers in Alabama. These findings underscore the importance of supporting growers who are interested in transitioning to these practices, where 53% of cropland is in no-till, 31% uses reduced tillage, and cover crops use represents just 14% of planted acres.

To learn more about soil health practice adoption, please visit

https://soilhealthinstitute.org/resources/







Additional benefits

In addition to benefits that directly impact profitability, all farmers reported increased crop resilience and more timely access to their fields. Four farmers reported improved water quality (based on observed differences in water clarity), and two farmers stated that adoption of soil health management systems improved public perception of agricultural production. These farmers visually monitored for observable changes in their soil organic matter levels, and three reported that those levels appeared to have increased.

The Soil Health Institute's Agricultural Economist, Dr. Archie Flanders, conducted this research and analysis. We thank the farmers who participated, as well as Soil Health Educators Jessica Kelton and Emily Ball for their input on the experimental design and for conducting the interviews. The supporters of the U.S. Regenerative Cotton Fund and funding from a USDA Advancing Markets for Producers grant (NR233A750004G040) made this work possible. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture. In addition, any reference to specific brands or types of products or services does not constitute or imply an endorsement by the U.S. Department of Agriculture for those products or services. USDA is an equal opportunity provider, employer, and lender.

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