ECONOMICS of Soil Health Systems

Lower Big Sioux River Watershed of Minnesota

FARM SIZE
700 crop acres
100 pasture acres

CROPS GROWN
Corn and soybean

SOIL TEXTURE
Silty clay loam

SOIL HEALTH MANAGEMENT SYSTEM
Cover crops
Corn-soybean rotation
Cattle grazing
Cattle manure for fertilizer
Reduced tillage production
Soil testing to monitor nutrient levels and for variable rate fertilizer application

NET INCOME INCREASE
Corn
$124.20
Soybean
$107.92

FARM #12

INTRODUCTION

The Ian and Richard Cunningham farm in the Lower Big Sioux River Watershed of Minnesota increased profitability by decreasing costs of production and increasing corn and soybean yields with a soil health management system (SHMS) of adding cover crops with cattle grazing to a system of reduced tillage production. Methods of reduced tillage have been applied for approximately 70 years with no-till soybean and strip-till corn production for 20 years. The farm has planted cover crops for 10 years.

Benefits of the SHMS reported by the farmer:

- → **IMPROVED SOIL STRUCTURE AND BIODIVERSITY**
- → **INCREASED WATER INFILTRATION**
- → **LESS EROSION AND COMPACTION**
- → **SUPPRESSION OF HERBICIDE-RESISTANT WEEDS**
- → **REDUCED FERTILIZER APPLICATION**
- → **INCREASED CROP RESILIENCE TO EXTREME WEATHER CONDITIONS**

ADDITIONAL INFORMATION ON THE FARM IS AVAILABLE IN A REPORT AND VIDEO PRESENTATION AT WWW.NACDNET.ORG/SOIL-HEALTH-ECONOMICS.

METHODS

The Soil Health Institute conducted an interview to obtain production information for evaluating economics of the soil health system based on partial budget analysis. In this approach, the benefits and costs of a soil health system are assessed by calculating changes in revenue and expenses before and after adoption of that system. The change in net farm income associated with adopting a SHMS is calculated as shown below and presented in Table 1.

Net change in farm income = Benefits – Costs, where:
Benefits = Reduced Expenses + Additional Revenue
Costs = Additional Expenses + Reduced Revenue

A DETAILED DESCRIPTION OF THE METHODOLOGY FOR PARTIAL BUDGET ANALYSIS CAN BE FOUND AT HTTPS://SOILHEALTHINSTITUTE.ORG/ECONOMICS.

FINDINGS

Initial Management System and Reduced Expenses

- → The initial management system included no-till and strip-till without cover crops.
- → Nitrogen for corn was reduced $22.28/acre; phosphorous and potassium reductions were equal for both crops.
- → One residual herbicide was eliminated in a post-plant tank mix for corn.
- → One herbicide in a pre-plant spray and one post-plant spray trip were eliminated for soybean.
- → Total reduced expenses were $55.94/acre for corn and $56.58/acre for soybean.

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ECONOMICS of Soil Health Systems: Lower Big Sioux River Watershed of Minnesota

Soil Health Management System and Additional Expenses

- The soil health management system adopted was no-till and strip-till production with cover crops.
- Cover crops on 500 acres included winter/cereal rye with brassicas, legumes, and peas.
- Cover crop seed cost was $20.00/acre before planting both corn and soybean.
- Cover crops were either broadcast or drilled in the fall for an $11.00/acre custom application cost, after harvest of the preceding rotation crop.
- Terminating the cover crop with herbicide was not an additional expense.
- Post-harvest expenses due to increased yields were hauling, check-off fees, and drying corn.
- Total additional expenses were $40.74/acre for corn and $33.66/acre for soybean.

Soil Health Management System Impact on Farm Income

- Reduced expenses were $15.20/acre greater than additional expenses for corn.
- Reduced expenses were $22.92/acre greater than additional expenses for soybean.
- Yield increased 20 bu./acre, and additional revenue was $84.00/acre for corn.
- Yield increased 6 bu./acre, and additional revenue was $60.00/acre for soybean.
- Grazing value of cover crops determined by grazing days available was $25.00/acre.
- **Net farm income increased $124.20/acre for corn and $107.92/acre for soybean.**

Table 1. Partial Budget[1] Analysis, 20 Years with a Soil Health Management System on a 700-Acre Farm, $ per Acre per Year (2019 Dollars).

	Corn		Soybean	
	BENEFITS	COSTS	BENEFITS	COSTS
Expense Category	REDUCED EXPENSE	ADDITIONAL EXPENSE	REDUCED EXPENSE	ADDITIONAL EXPENSE
Seed	0.00	20.00	0.00	20.00
Fertilizer & Amendments	47.11	0.00	24.83	0.00
Pesticides	7.52	0.00	26.92	0.00
Fuel & Electricity	0.00	0.00	0.31	0.00
Labor & Services	1.31	11.74	1.95	11.74
Post-harvest Expenses	0.00	9.00	0.00	1.92
Equipment Ownership	0.00	0.00	2.57	0.00
Total Expense Change	**55.94**	**40.74**	**56.58**	**33.66**
	ADDITIONAL REVENUE	REDUCED REVENUE	ADDITIONAL REVENUE	REDUCED REVENUE
Yield, bu./acre	20.00	0.00	6.00	0.00
Price Received,[2] $/bu.	4.20	4.20	10.00	10.00
Grazing Value	25.00	0.00	25.00	0.00
Revenue Change	**109.00**	**0.00**	**85.00**	**0.00**
	TOTAL BENEFITS	TOTAL COSTS	TOTAL BENEFITS	TOTAL COSTS
Total Change	**164.94**	**40.74**	**141.58**	**33.66**
Change in Net Farm Income	**124.20**		**107.92**	

1 Expenses and expected yields based on farmer reported production practices. (https://soilhealthinstitute.org/economics/)
2 Commodity prices applied to yields based on long-term average prices. Irwin, S. "IFES 2018: The New, New Era of Grain Prices?" Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 11, 2019.

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