

Soil Health Case Studies: Quantifying Economic, Water Quality, & Climate Outcomes

Michelle Perez, PhD – AFT Project Leader & Water Director

ACWA NUTRIENTS POLICY CMTE WEBINAR MARCH 23, 2020



OVERVIEW



Overview Outline



 Distribution of 8 AFT-NRCS Soil Health Case Studies via keyword on the web:

"FIC soil health case studies"

- Overview of AFT SH CIG Project
- Overarching Findings
- Uses of the Case Studies



Why quantify soil health outcomes?

- Evidence that no-till/strip-till, cover crops, nutrient management improve water quality & soil health
- Not much information about economic benefits linked with better soil health
- The agricultural community (farmers, retailers, landlords, bankers, etc.) want to know the "bottom line"





Project Goal



Drive adoption of soil health practices by:

- Quantifying the economic & environmental outcomes associated with these management changes
- ✓ Increasing awareness
- Developing a persuasive education tool to help convince farmers to adopt these practices on owned and rented land
- Improving landowner and operator communication and interaction



Meet the Team



Michelle Perez Project Leader Water Initiative Director



Florence Swartz Project Economist Retired NRCS NY Economist



Meet the AFT Authors







Justin Bodell CA Stewardship Manager Paul LumEmily Bruner, PhDCA Project ManagerMidwest Science Director, IL





Brian BrandtAaron RistowAg Innovations Director, OHNY Stewardship MgrAmerican Farmland Trust

External Reviewers

NRCS Economists

- Lynn Knight, Economist, East Region
- Bryon Kirwan, Illinois State Economist
- Lakeitha Ruffin, Oregon State Economist
- Richard Lovanna, FSA Economist
- Sophia Glenn, NRCS Economist
- Sarah Cline, NRCS Economist

NRCS Soil Health Specialists

- Kabir Zahangir West Regional Soil Health Specialist
- James Hoorman
 NE Regional Soil Health Specialist
- Candy Thomas, NRCS SH Specialist
- Justin Morris, NRCS SH Specialist
- Barry Fisher, NRCS SH Specialist

- University Economists
 - John Hanchar Cornell Cooperative Extension
 - Gary Schnitkey University of Illinois
 - Brent Sohngen
 Ohio State University
- NTT Reviewer
 •Mindy Selman, USDA
 Office of Ecosystem Markets
- COMET-Farm Reviewer
 •Matthew Stermer & Mark Easter
 Colorado State University



Front page - 8 Soil Health Case Studies

AULY 2019



Soil Health Case Study Ralf Sauter, Okuye Farms, CA

Soil Health, Economic, Water Quality, and Climate Benefits

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USDA inter Sure Barrent & Spinder



Soil Health Case Study

Tom and Dan Rogers, CA

Introduction

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Soil Health Case Study

Soil Health Case Study

lim, Julie, and Josh Ifft, Ifft Yorkshires, IL

Introduction

Larry, Adam, and Beth Thorndyke, Thorndyke Farms, IL

Soil Health, Economic, Water Quality, and Climate Benefits



Soil Health Case Study Eric Niemeyer, MadMax Farms, OH

Soil Health, Economic, Water Quality, and Climate Benefits eer cropping, no-till, and VIIT many benefits. Eric can see an





Dan Lane, Homewood Farms, OH Introduction

Soil Health, Econe Quality, and Clima



Soil Health Case Study

Jay Swede, Gary Swede Farm LLC, NY

Introduction Jay Hwede, his father his brother Ryan fare

In 2005, Jay tried strip-till to ad-

Soil Health, Economic, Water Quality, and Climate Benefits

liday Jay uses strip



Soil Health Case Study John and Jim Macauley, Macauley Farms LLC, NY

Introduction











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Ralf Sauter, Okuye Farms, CA

the cost of the micro-irrigation system and the added \$50 cost per acre of switching potainium forms from granular to injuid.	To estimate the water quality and climate benefits experienced on one of Ball's 11- acre fields, USDA's Nutrient, Tracking Tool	of his orchard acres by adopting the suit bealth practices.
Ralf allows native regetation to grow	(NTT) was used, which found that Balf's use of nutrient management, conservation	Closing Thoughts
an commerciation cover over writter and moves the overhead floor in spring and assummer. The over site provides habitat for beneficial insects, llines selepting this prestion, Rof Dae redand milicide aprepa from four times to one time every free years, sering him 800 per acro per year.	cover, mulching, and compost application reduced nitrogen leases by QMS. On the same m-actor field, UBDNA COMBT-Fierra Tool estimates that DaT's soil health prestions resulted in a soft reduction in total greenbcuse gas emissions, which corresponds to taking 'sy of a car off	Ball's experience in agriculture for 14 years has centered on implementing soil health practices in collaboration with his mether in law, data Okayo, Ball's early adoption and expansion of soil health practices including nutrient management, conservation revers modeling of praviase
Half also hires a brush standdor to chop	the road.	and use of compost resulted in reduced
and much the orchard pursings. This practice replaced hereign that required a instate to push perusings to the end of the contrast row where the server, This breach brender costs [20] op or areas weing here fitteded erosts [20] op or areas weing here have been been been been been been been have been been been been been been greater microhids activity, and improved weiter holding conserve.	Partial budgeting analysis was used to estimate the bush that and costs of adopting nutriant management, conservation enver- menting, and compost applications for the Okuya form. The study limited its faces in variations affected by the adoption of these soil handle parations. The table balows presents a nummary of illness reconstrict detects. Buff supposed has balonton line by	cost and higher yield. Its trictly bilinive that these previous here much finit been and using headbars, all the while protecting groundwater from rulning politation. Through many will headbar practices are more expressive to insplayment these conventional practices. But has found the increases in yield and other boundfile for extremely these conta.



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Farth per sevings due to compose (90 the loss 10)	#15.00		\$2,625	Increased Hugh Ing. cost	16.00		10.627
Petiticide strangt due to conspect Integrad Fanglicide)	\$100.00	175	11500	Compost apprication cost	\$156.00	175	\$25,650
Perticide savings due to conservation cover (SEN line hartiscide)	\$93.63	175	\$17,448	Contistent practice learning activities cost (22 hm/y/0	\$3,07	175	100
	\$35.00	18	\$8,805				
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For more information about this study or to discuss soil health practices, please centect Routuan, American Familiand Trans, Colfornia Project Manager plannistamisedoug, 207-455-1983 USA NRCE Materia Familia Conners, 225 N. Samway, 25, Samway, 26, Samway, 28, Samway, 28

Larry, Adam, and Beth Thorndyke, Thorndyke Farms, IL

ad ignore the yield benefits of R, and sufficient management, on in based off the last four your the 2006–17 National roys by CTICs ² . Thus, the sid bump from a reconstruct your the last three years last we che last in set income	respectively, by instituting strip-till and so-50, nutrient management, and cover emps on a 70-ares field selected for the NTT analysis, LBDMs COMET-Form Tool estimates that Larry's will bealth practices resulted in a 1995 reduction in total gravitocase gas emissions from this same field. This corresponds in thisful 14 certs of	The table below presents a summary of these economic effects showing Larry improved his bettom line by \$20 per every and by \$200H on the L000 across in this study by adopting the soil health practices Closing Thoughts
of 800 per sets increase for sense net homes increase of sense. Mara come in the form of sense in the sense of sense in the sense in the the sense in the sense in th	the read. Addining that will health parts have? more without mote. They report whose too however, and your encounty of part wave in increased one due to hearing within its and distribution for your parts (Jopger encore togram encore craps and have increased their set of hearing have and the internation of the top hearing have and heart increased their set of hearing have and the set hearing hearing wave and the analyzed to hearing wave and the analyzed to hearing wave and the hearing	Leary emprese solit to the human horly with the motiv, what you put it is in which paraget or 3. ⁴ By parting in particular to improve only holding that as notified management, conservation tilling, and the parate interaction of the worker holding equality, capation instare motion, suggraph making, and substance satisfy of the and meanraw. Though adapting over range presented owners holding cover range presented owners and the disparse and paraters. Though adapting over range presented owners to be assumediated in making their impacts while iterations in making their impacts while iterations in making their impacts while iterations

Economic Effects of Soil Health Practices on Thorndyke Farms (2018)

Increases in Net 1				Decreases in Net in	-		
Densate in Dille	-			Decrease to the pro-	11		
108	FER ACRE	ACRES.	121ML	128	FEI ACTE	ACRES	70746
laid Preparity days to Cover Draps	\$2.0	700	24267	Novidentified			30
the increased increase			\$3,067	Tutal Decreased Income			\$0
Decrease in Ca				Inchase In Cold			
100	108.4032	ACRES	1274	108	PEI 4/22	ACERS	101AL
Atriest Saving Oue to Nutriest Management	\$46.00	700	\$46,310	Nation Responses Lauranty Activities	\$187	1400	\$221
induced Machinery Cost-due to Reduced Tillega	\$17.62	1,400	\$24,945	Cover Crops Laureing Retailant	\$7,74	700	\$1,17
induced Wathinery Cost due to Nutrient Mgt.	\$2.75	1,400	\$1,85	Cover Ong Coda	\$78.00	100	\$21,300
			_	Increment Particips Cost that in Deduced Talege	\$5.00	3,400	\$2000
Har Decreased Cent		_	\$74,781	Total Increased Cold			\$34,762
new Total Increased Not Income			\$11,178	Areas' hear Decreased Ref Income			
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For more inform		-	turity or its	discuss soll health practices, please met			

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Jim, Julie, and Josh Ifft, Ifft Yorkshires, IL

in fact, USDA

this practice at the time of this report. Furthermore, the study oxcludes changes associated with no till on septemrs, since	Lower multient applications and use of cover evens translate to less sediment and multient loss as well."	upcharge of 50 cents an acre to impleme VRT nutrient application.
they were first implemented in 1990 and thus have become a part of the portroal	In fact, USDA's Nutrient Tracking Tool	Closing Thoughts
faming operation.	(NTT) estimates that the lifts reduced their N. P. and acciment leaves by 22	Jim and Josh host on farm demonstration
Increased soylecan yields account for the largest soil booth benefit on the fifth' firms. They attribute an average soybean yield increases of five basebale an avera to onever compains over the sity ware period since they started planting coreal ryo alsoid of soybeans. Their net increase has increased by 844 per avera per your as a	tions a 11% or supportingly per instituting multi-out management and cover crops on an 80 over field selected for NTT analysis USDAN COMET-Farm tool estimates that the HPC two soils leading accurates rescaled in a 23% reduction in total gravalizone gas emissions from this same field offsetting the amission from shift cars. For one year	to observate the success they've had with cover copy and to provide learning centermannent for other farmons. They has seen a dractic derivate in erosion on the form after planting orient pro, and there is noticeably isse stranding water in their fields compared to their neighbors. Jun attributes these improvements, namely increased inflations, summer matter
result, more than covering the 820 per acro annual cost of cover crop establishment and termination.	In order to achieve their soil health goals, the lifts spend a significant amount of time observation termschene to size current	content, and aggregate stability, to his up of covers. The lifts are now experiments with using cats after sorbeans. While
Jim and Josh were able to lower their P and K upplications by 20% as a result of alopting VITL leading to an annual cost awings of 810 an arcs. Additionally, the lifts are saving 815 per acro per year on	with new developments, particularly for cover crops. They spend about 550 hours such your, or about \$4 per acro, in learning costs annually. They also pay an annual	managing for soil health continues to require adaptive strategies, the lifts have successed in implementing a system of management charges over time that has proven to be successful in reducing their successful in reducing
reduced herbicide applications because of	 Setting: from -countor reflection was not included in the economic emploite because the 30% did not maintrivechanted. 	overall yields.

conomic Effects of Soil Health Practices on Ifft Yorkshires Farms (2018)

Annual in Annual				Decreases in Net Income				
House Hindune			_	Decrosse is inco				
104	PER ACRE	ACRED	TOTAL	1704	FERMINE	ACRES	79/7	
Increased any feel yield dee to sover or con- K tayled	\$43.00	125	\$35,922	Nove Identified				
fatal increased income	_		\$34,165	Tatal Decreased Income			1	
Decrease in Cost				Increased in Car	1			
704	PER ACRE	ACRES	10346	1704	FER MORE	ACRES	10.3	
Fact Elser surveys due to surrary eight (20% Aust P-& R)	30.02	1,860	00,300	Cover crist conta	\$100	/NID	11/2	
Arbickle savings due to weed control from to move onlys	\$4.00	625	\$12,210	Combined practice learning costs (100.2vm/yr)	\$2.00	1,250	\$10,55	
				Vacadaia rate lachyoitige spidsiege	103	3,250.	R.41	
Tetlal Decreased Cest \$28.5			\$28,570	Total Increased Cost			\$29,07	
Amount Turns Increased net income			\$64.764	Annual Time Decreased two income				
		_	1,880	Total Access to the Thirty Asia				
			112	Any allow Any Decement(in) Inume				
The table regression over a baseline studies of Commu- wer for 1000-ann study over an reported to the factors "Network Canon 1005 Table Appleane MACTion Canon Will Theorematic and The Table Apple The Technical St	Annu Annu Albertan Al	al Chan Reta	ge in Per m on Inve Cen Ca	Acre Net Income = \$22 Internet = \$2255 Destroyed Trad Destroyed the Incode expension of contracts. A Port path and to the Characteristic COMMO Foundation Tracking Tool on the Theory Physics COMMO COMMIT Press Track, and Heydown of the Annual on mark support 19 and ANTURE 2017 (2017) and 19 and Annual Physics I and ANTURE 2017 (2017) and 19 and Annual Physics I and ANTURE 2017 (2017) and 19 and Annual Physics I and ANTURE 2017 (2017) and 19 and Annual Physics I and ANTURE 2017 (2017) and 19 and Annual Physics I and ANTURE 2017 (2017) and 19 and 19	ni ar a parant niast og torib dag og toribu skota og toribu	(La., set p odd com r Sackiep This code 2009.	olli (hod talion, Ke tali ozt. Pe tali it batel	

ic Niemever.	MadMax	Farms, OH

Ingent Due to Soil Health Practices	\$697.00	1,25.0	545.750	Name identified					
108	PER ACRE	4(88)	10144	100		100 AC10	42883	31/8	
Increase in Acc					Concession in Fight				
Economic Eff	ects of	Soil H	iealth P	ractices on Mad	Max Farms	(2018)			
are the size of his planter. This is re timely planting and helped IO are his farming operation from p in 2013 to L2EO arms today, red to 0.00 expenses are offlat reasond routs for one additional isor pass and over resp planting reminalize costs. Nevertheless,	n The second sec	tial bud otimate pilog a e fertilia ma. The isbies a l bealth attrivety c impro	pring and the benefit of all, rower or applied study lim flected by 1 practices, of these as od has bet	lysia wana sand to and conta of remps, and variable time on MacMass ited the Roma to the adoption of these The table processing convenir officets. turn line by R26 per	chemistrice an negative impac- boolth. Eric als "conse emps a faciliting the soil forest noil boolt able to estiably marginal colle- always guarant	d other ing to on cover o reliabes i n like mine i in place," is practices raise a pro- where profi- and before.	ute to be crope at the fact if the works and he cr with no fitable re tability of	ern od avil hal erk relite a e being typ on mar turi	
no-till system has lowered labor authinery expenses by \$25 per ac- asings from eliminating his tills most allower Fric to contain an	14 AN	a specie active nate off	end health laction in t which com the road.	practices resulted in intal greenburges gas seponds to taking	Errick mutrixities for adopting soil health practices have hown to "taske dead soil alive again." He also enjoy the challenges of understanding metasymmetric transmos- mended to be microsofful. For example, Tark invest flast challing over engo project to achieve dusting over comp trajper fails, travelaging the planter sector, timing error crap termination to secremenfully mean errors." and autochromotome behavior				
edieves the use of biological desents have also contributed to roose by enhancing coil health at mi availability. He spends about 1 eve for the biologicals.	a la	e used a or crops taced bit 76, and al, USED	nd found 1 s, and varia s N. P. and HIN, rougo ta COMET	Pick use of no-till, die rate applications addiment losses by otherly. On the pame I-Parm Tool estimates					
orgicile costs have decreased ar- ing mybran ared treatment cost r acro.	W In	estimut softx on	the water perferred	r quality and climate on one of Tric's 110-	Closing Th	oughts			
nting "green" into growing cover terminating them with a roller set. This same him over \$10 per a		benefit etizee b disabilit	e of using a area increase y of the fac	all three soil health and the overall mi.	acts and by \$4 in the study are health practice	tolip on the raity adopt n	LIQU at	1	

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nise Shafer, Seriesee's County NBCS, Data in Concervention, 507 Surdary Boll A, Delaware, OH 42015, 740-552–40 Te read more case shafine, visit farmland.org.toithe adhrasee buffers

Dan Lane, Homewood Farms, OH

all, with the plouting pase, and then with Y drop slidedness nitrogen application in the growing even possible in more flictent use of matrients. As Darix corn lodds have increased, information from all burling and mattern transagement farming led him to apply more P. K, and increasitively mainter P. Tanàna costs be	Danis soil health transagement system has come with learning costs and challenges. He estimates he spends two works a year reading publications from soil testing labs and private agreesomic consultants. His higgest challenge is agrituge everything done. Dan prefers to make his strips in the fail but side use to finish harvestim and	by 35, 84, and the same field, Tool estimates practices resul- total greenhou corresponde to
12 pec acre annually.	planting cover crops, Furthermore, Dan's	Closing Th
The 400 across of cover crops planted every our buffers corn cost Dan Ritt per-acro- er-year in seed and planting costs. By lowly integrabing cover crops at a pace he on bondle. Dan balances he is averactiver	switch from cereal rye to a barley and hairy wetch mixture requires use of his twin row planter, which takes more time and must be done outlier in the fall to ensure establishment.	Dan is very for feels he has zer health practice started right as providing effici
nd building organic matter in his soils, eading to better infittation and more solstare estention. Though Dan strip- like and basels all his serves, he only plants over crops on across he owns, fearing loss fluis investments to the high development researe in his counts.	To estimate the wave quality and climate benefits correctioned on one of Dark's EO-arcs fields, USDA's Nutrient Thicking Tool was used and found that Dark use of strip till, cover crops, and handing of fertilizers reduced N. E and sodiment losses	throughout the same time, red integration of o the soil, reduce improved inflit the crop, all wit roturns on his

nomic Effects of Soil Health Practices on Homewood Farms, OH (2018



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Jay Swede, Gary Swede Farm LLC, NY

nervoared water infiltration, and savings in fiel, labor, and machinery maintenance.	attending conferences and field days and meeting with ag consultants.	improved his bottom line by \$35 per acre and by \$51,257 on the 1,200 acres in this			
When combined with roduced tillage for iis hay crop, Jay's savings average about 123 per acre. However, he spends about 10 more each rear setting up his core planter	To estimate the water quality and climate benefits especiesced on one of Jug's 22- acre fields, UEDA's Nutrient Tracking Tool	closing Thoughts			
o bardle residue from the provinus cosp.	was used and found that Jay's use of strip-	"In a recent wet year, the best corn was			
Negate similate upfluent costs for cover BSI per scen), Jay thinks It's worth II excuse II reduces compactine and absorbs uniforms from All applied massrs. Cover las increases noil organic matter. This set is offict by Jay's natrient management civitias that save him 651 per sore for	bit, Order Cryps, and motivate management reduced N, P, and assiltance linears by 40, pit, and p9% respectively. On the name field, USDA's COMBIT-Pars Tool estimates that Jap's will health practices resulted in a gIOR reduction in total green/hears gas emissions, which corresponds to taking three same off the read.	where the cover entry were," Jay sugs. While still inarning, Jay finite that he has ball hat extick with the odd built practices have adopted and its moving great results from relatively minor rhanges to his operations. The econd year we did still till, even through the over was only 8° tall.			
surthance of phosphorus and putamium, Geoplog the soil covered and minimizing illage has also reduced ortains by usedly we true per acre. The value of the surtherin in the soil arcord is over \$2 per sets (143025, 2005).	Pertial budgeting analysis was used to estimate the tessellin and costs of adopting no till and strip-till, cover emps, and sutrices management for the flweds Furm. The study immind the focus to variables effected by the adoption of them and	suph his ground is more "workable," and he has observed better infinition and decreased result and section in his fields following heavy mins. He also believes he has improved his bottom line by reducing his operating routs, tablening up his			
iny esthances his knowledge of soil health mathem by specifing about 16 loars a year	health practices. The table below presents a surrowary of these economic effects, Jay	management of nutrients, and producing higher yields.			

Economic Effects of Soil Health Practices on Gary Swede Farm, LLC (2018)

				Decreases in Net 1	-			
Burnane IN INCOM				Coursess in Southe				
104	PER ACIE	ACRED	10194	rtax	FEB ACRE	ACRES	TITA	
Yant Impact Due to Sol Imates Practices	\$7.81	600	\$43,358	None Marcifiel			1	
lutar increased income			\$43,968	Total Decreased Income				
Decrease in Car	£	_		Workson III Care				
754	PE8 4/20	ACREE	10164	rites	FEB ACRE	+CRE3	717A	
Induced Machiners Cost due to Reduced Villege	\$21.43	1300	18,252	Cost of Setting up Parties to Hands Residue	\$92.72	000	541	
Autrient Savings due to Nutrant Hingson,	\$40.61	800	\$24,780	Come Grap Canta	\$52,00	450	\$23,964	
Robus of Decreased Encours due to Soil Health Practices	\$2,25	1200	11,362	Residue and Tillage Pages Laaring Activities	\$0.07	1300	15	
				Cour Crops Laarning Activitian	\$1.22	45.0	TA	
				National Management Learning Activities	\$016	1500	\$244	
Total Decreased Cost			\$62,910	Tuta termined Ced			\$25,622	
Total Deparent Net Income		-	D16.079	Arread Total Decrement Net Income				
Total Actas in the Budy Area			1500	Name Arrise in 1918 Thirty Arris				
Par Acta Increased Nat Income		_	\$211	Annual Plat Acro Decisional Net Income			10	
	Annu	d Chan al Chan	ge in Tata ge in Per	i Net Income = \$82,257 Avro Net Income = \$55		_		

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Aaron Ristma, American Farmand Tout, New York Apriculture Streamship Program Manages, aristoxidifermia USDA NRCS Wayning County Office, 35 Canter Streat, Wasawa, NY 14556, USD 201-3118 Yo read reserv. case studies, yick Fanntand, cay, yudihadifecture studies

John and Jim Macauley, Macauley Farms LLC, NY

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Economic Effect	s of So	il Hea	ith Pra	ctices on Macau	ley Farms, M	Y (2018	0	-
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Non-Identified			- 50	None identified			1.1.1.1	1
Table Inclusioned Income		_	\$0	Table Decisional Income		-		
Barbarba in Con		-			Becken and An Co.	-	-	-
Digitize in Ca				1778				
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METHODS FOR ECONOMIC ANALYSIS

Economic Methods

- Partial budget analysis:
 - Estimates the economic effect (benefits and costs) of changes in a farming operation
 - Focuses only on variables affected by the change
 - Compares costs & benefits "before" & "after" soil health practice implementation

- Primary effects evaluated:
 - 1. Machinery
 - 2. Fertilizer
 - 3. Pesticide
 - 4. Yield
 - 5. Erosion repair
 - 6. Learning costs
 - 7. Other



Example of Partial Budget Analysis

Economic Effects of Soil Health Practices on Gary Swede Farm, LLC (2018)

Increases in Net Income Increase in Income				Decreases in Net Income Decrease in Income			
Yield Impact Due to Soil Health Practice	\$71.95	600	\$43,168	None Identified			
Total Increased Income			\$43,168	Total Decreased Income		\$0	
Decrease in Cost				Increase in Cost			
Item	Per Acre	Acres	Total	Item	Per Acre	Acres	Total
Reduced Machinery Cost due to Reduced Tillage	\$23.43	1,500	\$35,152	Cost of Setting up Planter to Handle Residue	\$0.72	600	\$432
Nutrient Savings due to Nutrient Mngmnt.	\$40.65	600	\$24,390	Cover Crop Costs	\$51.00	450	\$22,950
Value of Decreased Erosion due to Soil Health Practices	\$2.25	1,500	\$3,369	Residue and Tillage Management Learning Activities	\$0.07	1,500	\$98
			Ce Contraction	Cover Crops Learning Activities	\$0.22	450	\$98
				Nutrient Management Learning Activities	\$0.16	1,500	\$244
Total Decreased Cost \$62,911				Total Increased Cost			\$23,822
Total Increased Net Income \$106,079				Total Decreased Net Income			\$23,822
Total Acres in the Study Area 1,500			1,500	Total Acres in the Study Area			1,500
Per Acre Increased Net Income \$71			\$71	Per Acre Decreased Net Income			\$16

Total Net Returns = \$82,257
Per Acre Net Return = \$55
Return on Investment = 345%



METHODS FOR ENVIRONMENTAL ANALYSIS

Nutrient Tracking Tool – Water Quality



NTT is a free online tool for estimating N, P and sediment losses from crop and pasture

phosphorus and sediment losses from crop and pasture lands. With the most recent release of NTT, we now have a platform for the tool that can be used to estimate environmental improvement opportunities on farms across the country. NTT was developed by the Texas Institute of Applied Environmental Research at Tarleton State University with support from USDA's Office of Environmental Markets.



COMET-Farm – Greenhouse Gases



USDA United States Department of Agriculture Natural Resources Conservation Service

Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System.



Whole farm and ranch carbon and GHG accounting system









Why should I use USDA GHG **COMET-Farm?**



methods

What information do I need?



How are my results calculated?

Is my information safe?





COMET-Farm?



Overview video





FEATURED FARMER



Jay Swede, NY, diversified crop rotation



- Genesee County Genesee River Watershed;
- Sweet corn, alfalfa, corn silage, grain corn
- Study area: 1,500 / 4,500 acres
 - No-till, strip-till, cover crops, & nutrient management
 Cover crops: 450/ac/yr, oats, wheat, radishes or a mix in sweet corn after alfalfa, and corn silage

Annual SH Benefits: \$106,079 Annual SH Costs: \$23,822 Annual SH PROFITS: **\$82,257 or \$55/ac**

343% ROI

(2018 dollars)

NTT results: On a 25-acre field, N, P, & sediment reduced by 40, 92, & 96%

COMET results: Same field, total GHG reduced by 560%, taking 3 cars off road



Jay Swede, NY, diversified rotation

Increases in Net Income								
Increase in Income								
ITEM	PER ACRE	ACRES	TOTAL					
Yield Impact Due to Soil Health Practices	\$71.95	600	\$43,168					
Total Increased Income			\$43,168					
Decrease in Cost								
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Total Increased Net Income		\$106,079						
Total Acres in the Study Area		1,500						
Per Acre Increased Net Income	\$71							



Jay Swede, NY, diversified rotation

Decreases in Net Income								
Decrease in Income								
ITEM	PER ACRE	ACRES	TOTAL					
None Identified			\$ 0					
Total Decreased Income			\$ 0					
Increase in Cost								
ITEM	PER ACRE	ACRES	TOTAL					
Cost of Setting up Planter to Handle Residue	\$0.72	600	\$432					
Cover Crop Costs	\$51.00	450	\$22,950					
Residue and Tillage Mgmt. Learning Activities	\$0.07	1,500	\$98					
Cover Crops Learning Activities	\$0.22	450	\$ 98					
Nutrient Management Learning Activities	\$0.16	1,500	\$244					
Total Increased Cost								
Annual Total Decreased Net Income								
Total Acres in this Study Area								
Annual Per Acre Decreased Net Income								





OVERARCHING FINDINGS

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Yield & Income Benefits of Soil Health Practices Across Six Crop Farms



Improved Yield:

- 1 farm reported no yield change while
- > 5 reported yield increases
- Range: 2% to 22% for at least one of the crops grown
- Annual Change in Per Acre Net Income:
 - 6 farms reported increases
 - Average increase: \$41/ac/yr
 - Range: \$22 to \$56/ac/yr

Return on Investment:

- 6 farms reported positive ROI
- > Average was 151%
 - Range was 35% to 343%



Input Benefits & Costs of Soil Health Practices Across Six Farms

Changes to Fertilizer Costs:

- > 1 farm increased costs while
- 5 farms reduced costs
- > Average savings: \$36/ac/yr
- Range: \$18 & \$66/ac/yr
- Changes to Machinery, Fuel, and Labor Costs due to Change in Tillage:
 - I farm reported no change while
 - > 5 farms reduced costs
 - > Average savings: \$31/ac/yr
 - Range: \$20 to \$60/ac/yr





Input Benefits & Costs of Soil Health Practices Across Six Farms

Pesticide Usage: (Herbicide, Insecticide, and Fungicide)

- > 2 farms reported no change while
- 4 reported changes
 - 2 farms increased by an average of \$8/ac/yr; Range: \$5 & \$11/ac/yr
 - 2 farms decreased by average of \$17/ac/yr; Range: \$15 to \$19/ac/yr

Learning Costs:

- Average: \$3.12/ac/yr
- Ranged from \$440 to \$12,940/yr or
 44 cents to \$10.35/ac/yr





Environmental Benefits of Soil Health Practices Across all Six Farms

Water Quality Improvement:

All 6 row crop farmers *observed* reduced soil and water runoff On selected fields, NTT estimated:

- Average reduction in N losses was 61% (range was 23 to 72%);
- Average reduction in P losses was 74% (range was 33 to 92%); &
- Average reduction in sediment losses was 81% (range was 37 to 99%)

Climate Improvement:

On selected fields, COMET-Farm estimated total GHG emissions were reduced an average of 217% (range was 35 to 560%)

Uses of the Case Studies by the Conservation Community



We hope:

- Government partners NRCS, SWCD, & Extension
- Non-profits ACWA, Field-to-Market, ESMC
- Private sector Ag retailers, crop consultants, cover crop seed dealers, strip-till equipment providers, etc.

Use the case studies with their farm customers to help answer questions about the costs & benefits of adopting soil health practices.

Farmer Uses of the Case Studies



We hope farmers will:

Read the case studies & try one soil health practice w/ or w/o help AFT, 2 ag retailers, NRCS, & SWCD are at the ready to help

Say "yes" to a "Predictive Assessment"

AFT is offering 4 "soil health curious farmers" the service of running "what if" scenarios => potential, future economic, water quality, & climate benefits



Farmer Uses of the Case Studies

We hope farmers will share the case studies with:

- Existing landowners To discuss sharing the risks and rewards of the soil health investments
- New landowners To add new fields
- Bankers To secure additional financing for the farm expansion





Thank you & More Info

Michelle Perez, PhD Water Initiative Director mperez@farmland.org

Download the case studies at: farmland.org/soilhealthcasestudies

To sign-up for a training, email: <u>SHtraining@farmland.org</u>

Let us know if you use the case studies in your projects with farmers as an outreach & education material!

