

RULON ENTERPRISES LLC
"FARMING SINCE 1869"
6063 Acres in 2017
No-Till Since 1991
Cover Crops Since 2002

COVER CROP ECONOMICS

- 1. SUSTAINABILITY**
- 2. SOIL CARBON**
- 3. NUTRIENTS**
- 4. YIELD**
- 5. PROFIT**

National Conference on Cover Crops – 12/7/2017

What is
Sustainability?

MEET THE **NEEDS**
OF THE **PRESENT**
WITHOUT
DIMINISHING THE
ABILITY TO MEET
FUTURE NEEDS

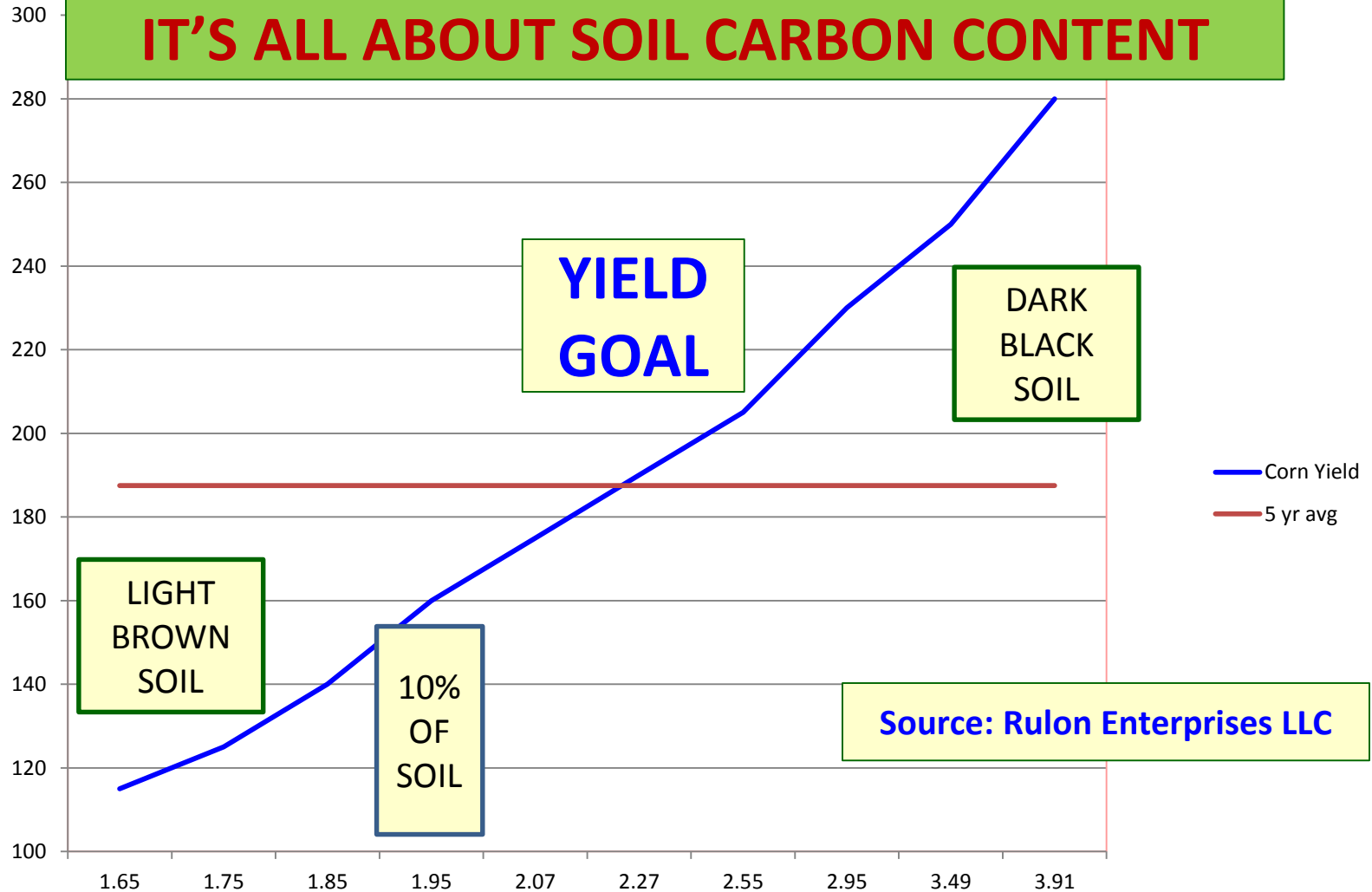
**BALANCE:
ECONOMIC
SOCIAL
ENVIRONMENT**

**SUSTAINABLE
IS DIFFERENT
FOR EVERY
TOWN
STATE
COUNTRY**



**WHAT ABOUT
OUR FARM ?**

IN CROP PRODUCTION IT'S ALL ABOUT SOIL CARBON CONTENT

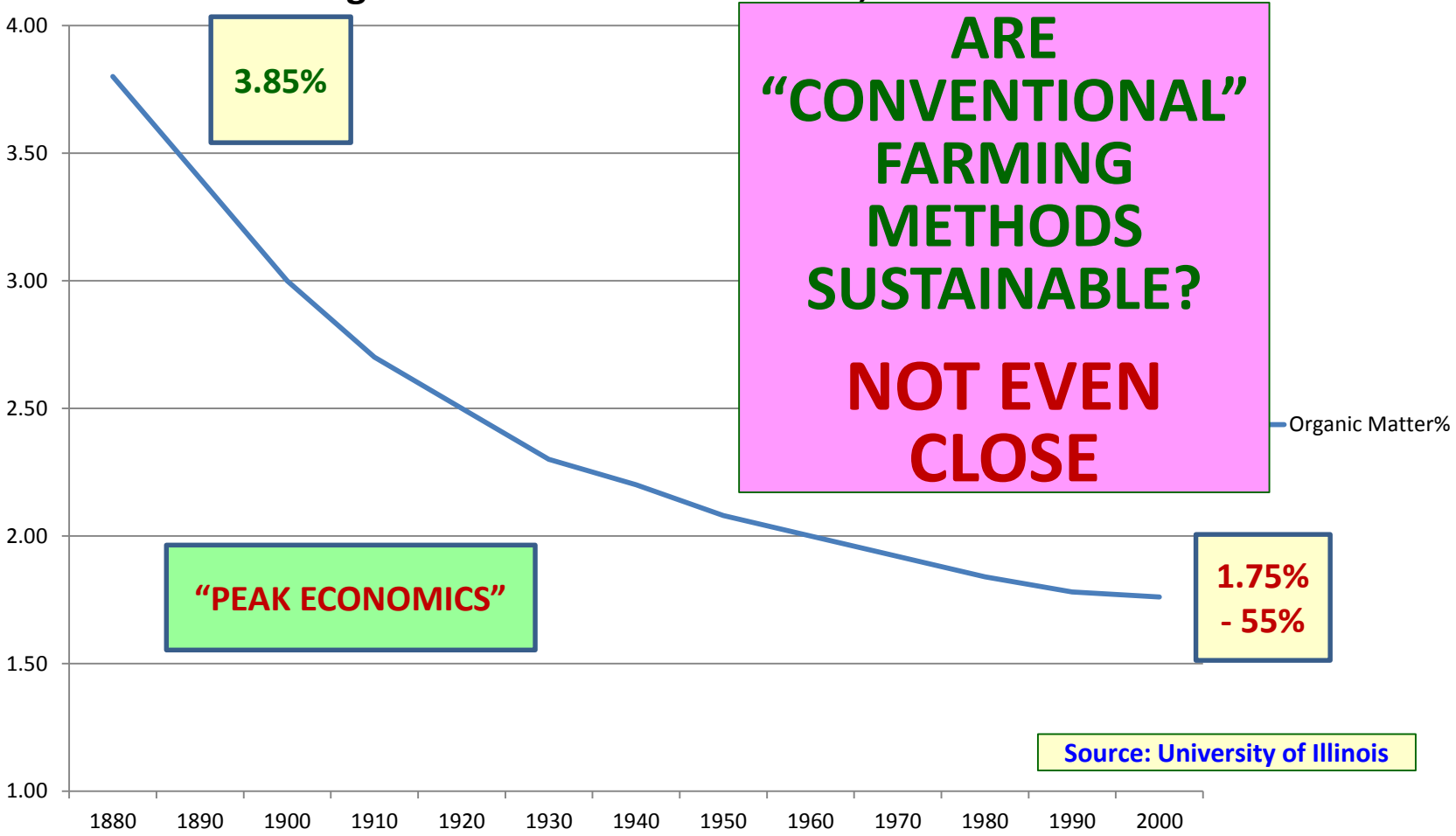


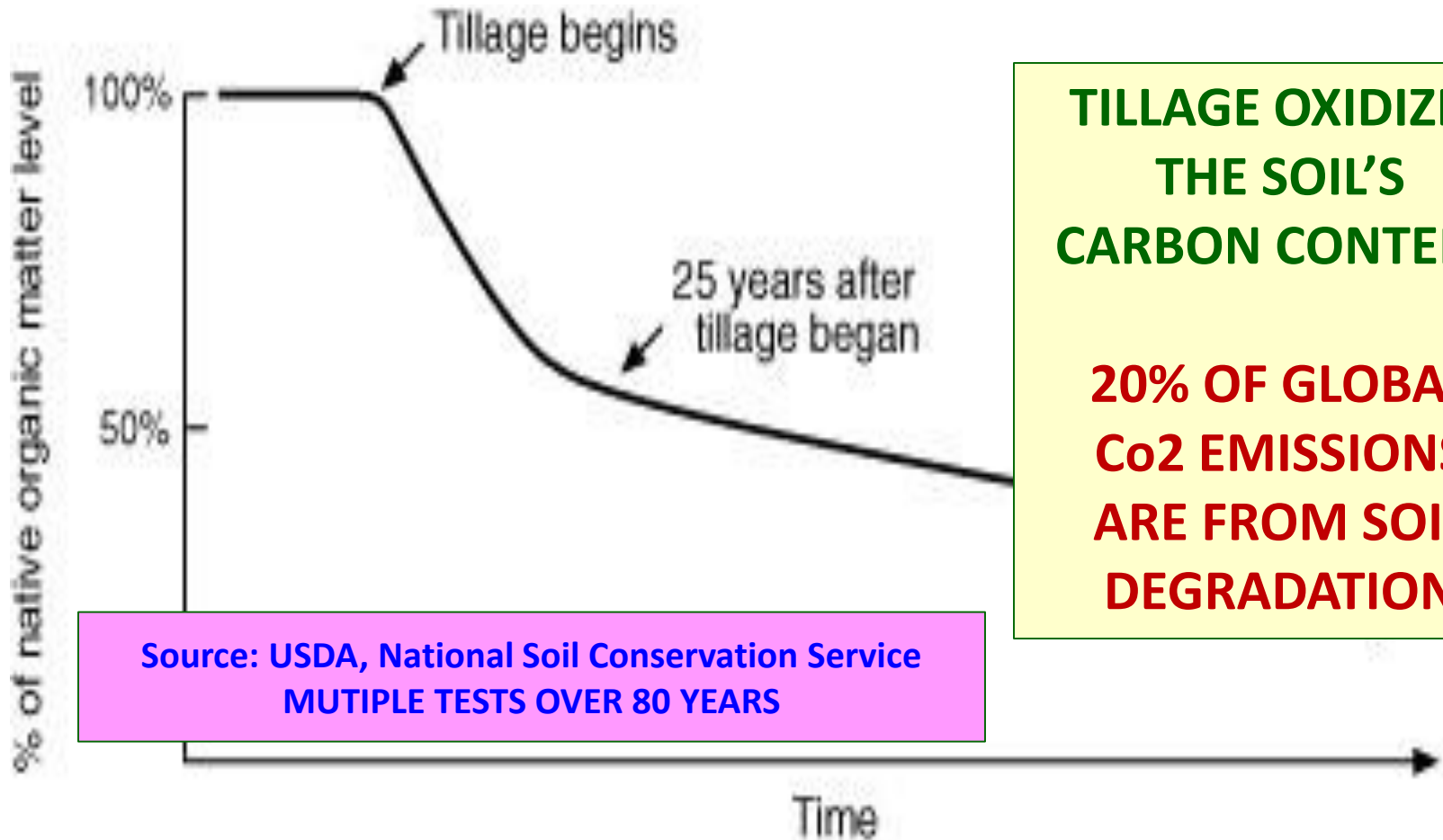
Source: Rulon Enterprises LLC

**SOIL % CARBON CONTENT : OUR INDIANA FARM
BY PERCENTILE**

MUST MAINTAIN % CARBON CONTENT TO BE SUSTAINABLE

Organic Matter %-Morrow Plots, C-IL





**TILLAGE OXIDIZES
THE SOIL'S
CARBON CONTENT**

**20% OF GLOBAL
Co2 EMISSIONS
ARE FROM SOIL
DEGRADATION**

**Source: USDA, National Soil Conservation Service
MUTIPLE TESTS OVER 80 YEARS**



**TILLAGE IS NOT SUSTAINABLE
EVERY PASS “MINES” THE SOIL
“OXIDIZING/BURNING CARBON”**

“PEAK ECONOMICS”

CAN WE PROFITABLY GROW CORN/SOY
AND **INCREASE SOIL CARBON?**



HARVESTING SOYBEANS and CAPTURING DATA
PLANT OATS/RADISHES/RAPESEED/CLOVER SAME DAY

CAN WE PROFITABLY GROW CORN/SOY AND **INCREASE SOIL CARBON?**

4 WEEKS AFTER PLANTING & BEAN HARVEST
OATS/RADISHES/RAPESEED/CLOVER

CAN WE INCREASE SOIL CARBON?



PLANTING CORN
INTO GREEN RAPESEED



PLANTING SOYBEANS
INTO GREEN RYEGRASS

CAN WE INCREASE SOIL CARBON?



CORN PLANTED IN TO GREEN RAPESEED: 4 WEEKS LATER
DARK GREEN w/ NO WEEDS

CAN WE INCREASE SOIL CARBON?

CORN PLANTED IN TO GREEN RAPESEED: 8 WEEKS LATER

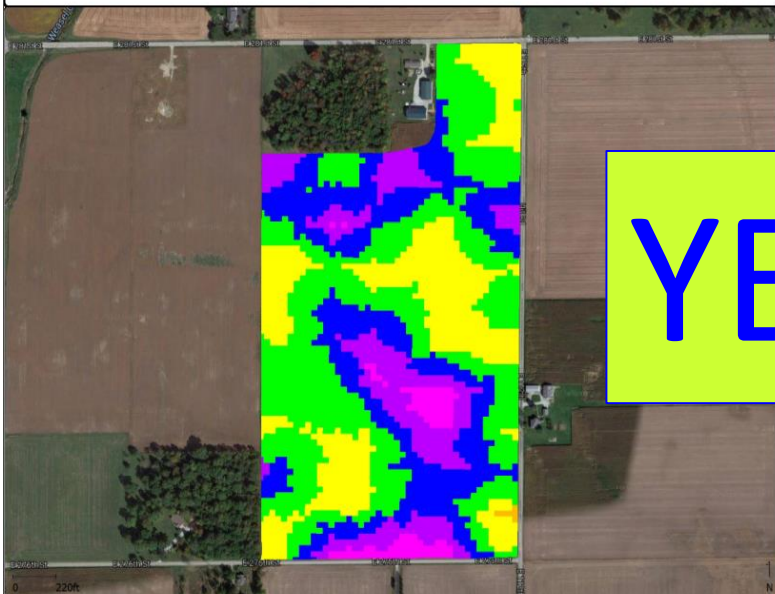
INCREASE SOIL CARBON CONTENT : .11%/YEAR

SOIL CARBON CONTENT 2002 vs. 2012 = + 1.1%

2.47 (1.4 to 4.0)

3.58 (1.8 to 6.1)

13Bendi-Hill - Soil Sampling (2002)



13Bendi-Hill - Soil Sampling (2012)



YES!!

Grower : Rulon Enterprises LLC

Farm : 13Bendi-Hill

Field : 13All

Operation : Soil Sampling

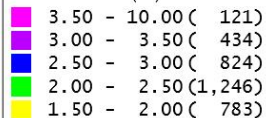
Average Soil OM : 2.478 %

Maximum Soil OM : 4.000 %

Minimum Soil OM : 1.400 %



Soil OM (%)



Grower : Rulon Enterprises LLC

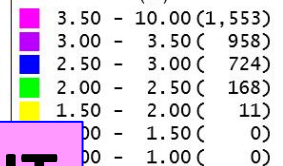
Farm : 13Bendi-Hill

Field : 13All

Operation : Soil Sampling



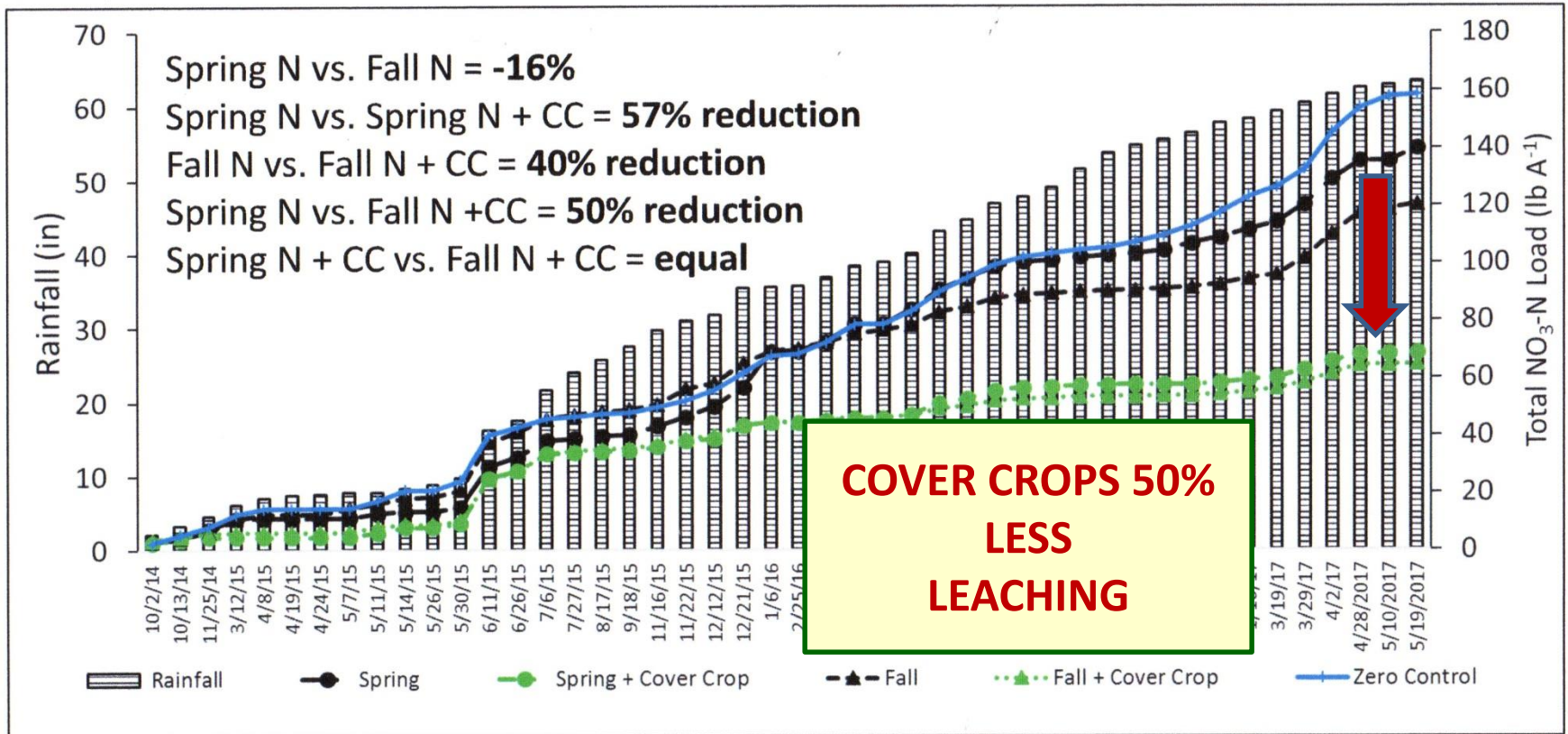
Soil OM (%)



SPACIAL DATA (x,y,z,time) PROVES IT

CAN WE REDUCE NUTRIENT LEACHING?

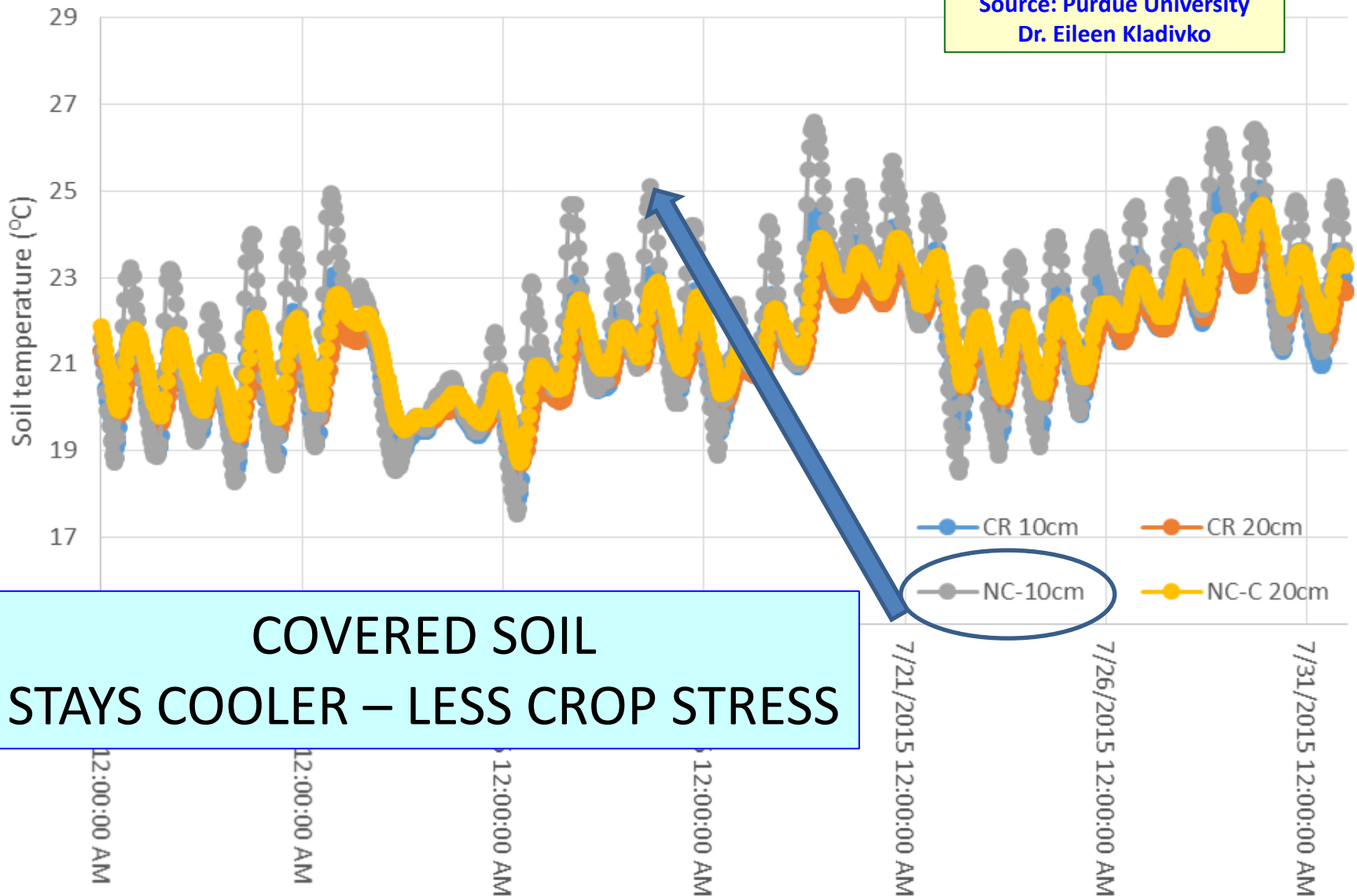
Cumulative Rainfall and Nitrate Loading



Source: Purdue University
Dr. Shalamar Armstrong

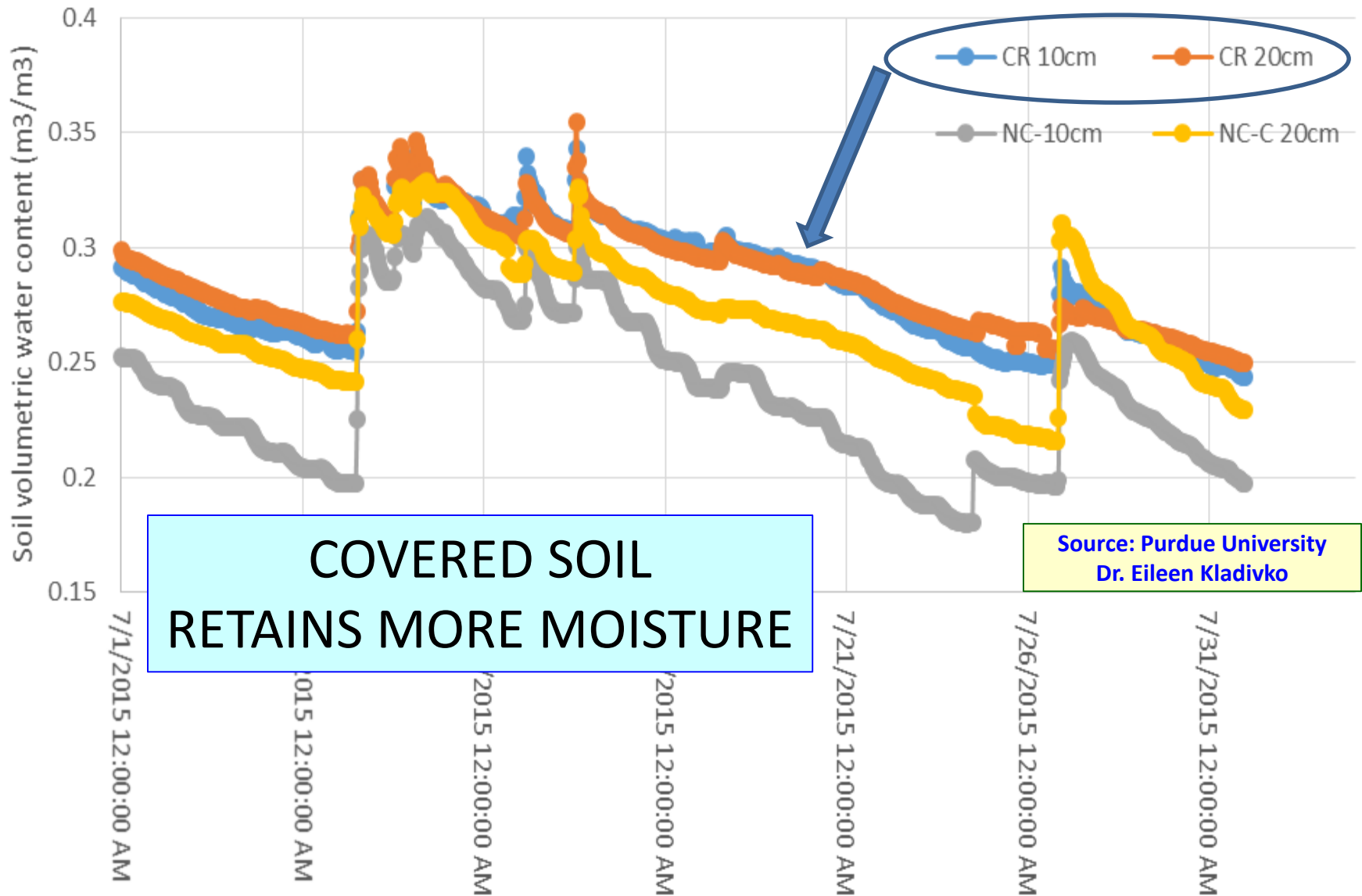
Rulon July Soil Temperature

Source: Purdue University
Dr. Eileen Kladvko



**COVERED SOIL
STAYS COOLER – LESS CROP STRESS**

Rulon July Soil Moisture



**COVERED SOIL
RETAINS MORE MOISTURE**

Source: Purdue University
Dr. Eileen Klavivko

Grower		Rulon Enterprises LLC										
Field		10LeeNorth; 12.8 gal 28% Starter dribbled; No insecticides or fungicides										
Year		2017: Planted 4/19; Harvested 10/14; Multiple 3 inch rain events										
Operation		Grain Harvest										
Product		Corn - Beck's 5140HR: Population 32,000 dropped; Emergence 20,000 to 32,000										
Dataset	Area	Avg. Yield (Dry)	Avg. Moisture	Est. Weight	Est. Volume	COVER CROP	N RATE	N RATE	N RATE	N RATE	N RATE	
03-12 along driveway junk-in "run"							AVG	95	115	135	175	
04 115 no c (2420012399)	1.204 ac	197.74 bu/ac	18.17%	14,015 lb	238.12 bu			197.74				
05 135 no covs (2420012399)	1.216 ac	217.33 bu/ac	18.99%	15,712 lb	264.31 bu	1441.35				217.33		
06 135 no c n (2420012399)	1.197 ac	213.20 bu/ac	18.76%	15,124 lb	255.14 bu	205.9				213.20		
07 95 no c n (2420012399)	1.196 ac	195.28 bu/ac	18.28%	13,766 lb	233.58 bu	7 Repts	195.28					
08 95 no c n (2420012399)	1.189 ac	187.19 bu/ac	17.79%	13,038 lb	222.56 bu		187.19					
09 175 no c s (2420012399)	1.206 ac	212.73 bu/ac	18.99%	15,255 lb	256.61 bu					212.73		
10 175 an rye/no c mix n (2420012399)	1.199 ac	217.88 bu/ac	19.12%	15,552 lb	261.19 bu					217.88		
11 175 an rye s (2420012399)	1.199 ac	208.44 bu/ac	19.07%	14,877 lb	249.99 bu							
12 175 an rye n (2420012399)	1.200 ac	219.40 bu/ac	19.12%	15,670 lb	263.17 bu	1395.79						
13 135 an rye s (2420012399)	1.199 ac	206.35 bu/ac	18.98%	14,711 lb	247.49 bu	199.4						
14 135 an rye n (2420012399)	1.180 ac	206.88 bu/ac	18.82%	14,487 lb	244.18 bu	7 Repts						
15 95 an rye s (2420012399)	1.206 ac	187.38 bu/ac	18.31%	13,327 lb	226.06 bu		187.38					
16 95 an rye n (2420012399)	1.191 ac	176.41 bu/ac	18.14%	12,357 lb	210.02 bu		176.41					
17 115 mix arc rs (2420012399)	1.205 ac	190.93 bu/ac	18.41%	13,581 lb	230.07 bu							
18 115 cer rye n (2420012399)	1.199 ac	183.37 bu/ac	18.31%	12,958 lb	219.78 bu							
19 135 cer rye s (2420012399)	1.199 ac	194.82 bu/ac	18.35%	13,781 lb	233.66 bu	1193.12						
JUNK 20 135 cr rye n Driveway Point Row	1.188 ac	186.05 bu/ac	18.47%	13,058 lb	221.05 bu	198.9						
21 175 cer rye s (2420012399)	1.187 ac	213.62 bu/ac	18.52%	14,987 lb	253.56 bu	6 Repts						
22 175 cer rye n (2420012399)	1.158 ac	221.43 bu/ac	19.20%	15,285 lb	256.45 bu							
23 95 cer rye s (2420012399)	1.195 ac	192.73 bu/ac	18.67%	13,639 lb	230.31 bu		192.73					
24 95 cer rye n (2420012399)	1.188 ac	187.15 bu/ac	18.43%	13,133 lb	222.42 bu		187.15					
25 175 oat rad s (2420012399)	1.192 ac	231.66 bu/ac	18.68%	16,356 lb	276.19 bu					231.66		
26 175 oat rad n (2420012399)	1.200 ac	228.05 bu/ac	18.74%	16,221 lb	273.69 bu	1504.86				228.05		
27 135 oat rad s (2420012399)	1.203 ac	226.64 bu/ac	18.56%	16,125 lb	272.67 bu	215.0						
28 135 oat rad n (2420012399)	1.216 ac	217.31 bu/ac	18.58%	15,631 lb	264.25 bu	7 Repts						
29 95 oat rad s (2420012399)	1.213 ac	193.38 bu/ac	17.97%	13,775 lb	234.61 bu		193.38					
30 95 oat rad n (2420012399)	1.214 ac	197.68 bu/ac	18.02%	14,096 lb	239.96 bu		197.68					
31 115 oat rad s (2420012399)	1.187 ac	210.14 bu/ac	18.29%	14,699 lb	249.37 bu							
32 115 no cov n (2420012399)	1.208 ac	214.99 bu/ac	18.37%	15,318 lb	259.64 bu							
33 95 no covs (2420012399)	1.189 ac	202.45 bu/ac	18.27%	14,184 lb	240.70 bu	1505.48	202.45					
34 95 no cov n (2420012399)	1.200 ac	212.14 bu/ac	18.36%	15,012 lb	254.48 bu	215.1	212.14					
35 135 no cov s (2420012399)	1.179 ac	220.89 bu/ac	18.53%	15,395 lb	260.43 bu	7 Repts						
36 135 no cov n (2420012399)	1.199 ac	223.04 bu/ac	18.81%	15,857 lb	267.34 bu			223.04				
37 175 no cov s (2420012399)	1.184 ac	221.56 bu/ac	18.46%	15,493 lb	262.32 bu					221.56		
38 175 no cov n (2420012399)	1.203 ac	210.41 bu/ac	18.95%	15,039 lb	253.09 bu					210.41		
39 95 an rye s (2420012399)	1.197 ac	188.58 bu/ac	18.58%	13,355 lb	225.78 bu		188.58					
40 95 an rye n (2420012399)	1.202 ac	192.06 bu/ac	18.52%	13,643 lb	230.82 bu	1463.65	192.06					
41 175 an rye s (2420012399)	1.184 ac	217.01 bu/ac	18.99%	15,276 lb	256.95 bu	209.1						
42 175 an rye n (2420012399)	1.199 ac	221.74 bu/ac	19.13%	15,835 lb	265.89 bu	7 Repts						
43 135 an rye s (2420012399)	1.188 ac	219.21 bu/ac	19.05%	15,488 lb	260.34 bu							
44 135 an rye n (2420012399)	1.185 ac	217.80 bu/ac	18.90%	15,330 lb	258.17 bu							
45 115 an rye s (2420012399)	1.177 ac	207.25 bu/ac	18.95%	14,488 lb	243.84 bu							
JUNK 46 115 an rye n (2420012399)	1.086 ac	207.50 bu/ac	18.69%	13,349 lb	225.39 bu							
47 95 cer rye s (2420012399)	1.047 ac	199.52 bu/ac	18.51%	12,352 lb	208.99 bu		199.52					
48 95 cer rye n (2420012399)	1.003 ac	197.28 bu/ac	18.35%	11,665 lb	197.78 bu	1478.41						
49 135 cer rye s (2420012399)	0.991 ac	215.21 bu/ac	18.71%	12,629 lb	213.17 bu	211.2						
50 135 cer rye n (2420012399)	0.999 ac	222.42 bu/ac	18.84%	13,191 lb	222.30 bu	7 Repts						
51 175 cer rye s (2420012399)	0.965 ac	221.63 bu/ac	18.86%	12,700 lb	213.97 bu					221.63		
52 175 cer rye n (2420012399)	1.011 ac	211.71 bu/ac	18.61%	12,667 lb	214.06 bu					211.71		
JUNK h2o 53 115 cer rye s (2420012399)	0.977 ac	183.73 bu/ac	17.97%	10,539 lb	179.52 bu							
54 115 cer rye n (2420012399)	1.004 ac	210.64 bu/ac	18.01%	12,419 lb	211.43 bu			210.64				
55 95 oat rad s (2420012399)	0.965 ac	209.55 bu/ac	18.01%	11,876 lb	202.18 bu		209.55					
56 95 oat rad n (2420012399)	1.011 ac	208.36 bu/ac	18.02%	12,371 lb	210.60 bu	1565.66	208.36					
57 135 oat rad s (2420012399)	0.957 ac	228.18 bu/ac	18.27%	12,870 lb	218.40 bu	223.7			228.18			
58 135 oat rad n (2420012399)	1.022 ac	229.38 bu/ac	18.41%	13,834 lb	234.37 bu	7 Repts			229.38			
59 175 oat rad s (2420012399)	1.000 ac	234.33 bu/ac	18.37%	13,827 lb	234.38 bu					234.33		
60 175 oat rad n (2420012399)	0.990 ac	232.98 bu/ac	18.35%	13,599 lb	230.55 bu					232.98		
61 115 oat rad s (2420012399)	0.986 ac	222.88 bu/ac	18.07%	12,920 lb	219.79 bu			222.88				
ix 62 w/ 63 115 oat rad n (2420012399)	0.959 ac	231.24 bu/ac	18.31%	13,076 lb	221.79 bu	201.4	195.45	204.74	217.24	220.29	209.97	
was #2 63 North 18th rd (2420012399)	0.963 ac	222.62 bu/ac	18.62%	12,662 lb	213.94 bu	South Rep Avg	AVG	AVG	AVG	AVG	ALL N RATES	
was #1 run (2420012399)	21.28 ac	190.62 bu/ac	18.27%	239,067 lb	4,057.1 bu	214.8	N RATE	N RATE	N RATE	N RATE	RATES	
(All)	89.44 ac	204.83 bu/ac	18.49%	1,082,537 lb	18,320 bu	North Rep Avg	95	115	135	175	AVG	

195.45	204.74	217.24	220.29	209.97
N RATE	N RATE	N RATE	N RATE	RATES
125	145	165	205	AVG

209.06	204.25	205.03	219.32	209.41
NoCover	An Rye	Cer Rye	Oat/Rad	ALL

IF WE EXCLUDE 95# N RATE					ALL
210.70	211.50	209.84	226.16	214.55	
NoCover	An Rye	Cer Rye	Oat/Rad	ALL	

207.2 Actual Weighed Avg/Acre

210.49	204.25	205.03	217.77	209.38
NoCover	An Rye	Cer Rye	Oat/Rad	ALL

Rulon Enterprises LLC - Cover Crop Cost Analysis Fall 2017

SEED COSTS	Cost/Acre	Acres	Seed Cost
Mix #1- Early After Soybeans	\$20.79	1,300	\$27,027
Mix #2- Late After Soybeans (Oct 10th)	\$15.12	1,300	\$19,656
Mix #3- Early After Corn	\$14.85	1,300	\$19,305
Mix #4- Late After Corn (Oct 15th)	\$7.25	1,300	\$9,425
	5,200	Seed Cost = \$75,413	
		Seed Cost/Acre = \$14.50	
Planting Costs for Season	Quantity	Rate	Total Cost
Tractor Hours	338	\$59.00	\$19,942
Labor (40 acres/hr@70%=28 acres/hr)	185.7	\$17.50	\$3,250
Fuel	1267.5	\$3.05	\$3,866
Planter Repairs/Wear	5,200	\$3.00	\$15,600
Total Other Costs	Acres = 5,200		\$42,658
		Planting Cost/Acre = \$8.20	
Total Cover Crop Cost =			\$118,071
Total Cost/Acre Planted = \$22.71			

Rulon Enterprises LLC Cover Crop Benefits Fall 2017

	Per acre	Acres	Total Benefit
Fertilizer Saved-P&K (20#P@\$.38 + 30#K@\$.225)	\$14.35	5,200	\$74,620
Fertilizer Saved-N (35#/Acre: 200 versus 165)	\$7.35	2,600	\$19,110
Corn Yield (4yearsx64strips:Plot Data: 7.1bu@\$4)	\$28.40	2,600	\$73,840
Soybean Yield Increase (1.95bu@\$10)	\$19.50	2,600	\$50,700

TOTAL ANNUAL BENEFIT= \$41.98 \$218,270

Drought Tolerance (2004-17: 30 bu every 5th=6 Bu@\$4)	\$24.00	2,600	\$62,400
Carbon Content (5.35bu/.1 of OM x 50% = 2.7bu@\$4)	\$10.80	5,200	\$56,160
Erosion Reduction (2 ton/acre @ \$4)	\$8.00	5,200	\$41,600
CSP Program Payment (\$40,000)	\$7.69	5,200	\$40,000

TOTAL LONG-TERM BENEFIT= \$50.49 \$200,160

Total Cover Crop Benefit = \$418,430

Net Economic Return = \$300,359

ROI = 254%

Net Profit/Acre Planted = \$57.76

Comparing the Systems in 2017

The "Real" Economics of No-Till

Activity or Input	Unit	Conventional		Long-Term NoTill+Cover Crops		
Soil Test	\$/Acre		2.50		2.50	(\$10.00 every 4th year)
Chisel Plow	\$/Acre		18.25		0.38	(Rip Flood 4% of acres every 4th year)
Plant Cover Crops	\$/Acre		0.00		8.20	
Cover Crop Seeds	\$/Acre		0.00		14.50	
Apply Dry Fertilizer	\$/Acre		4.00		4.00	
0-11-45 @ \$390	Lbs/Acre	200	39.00			(Standard Fertility Program)
11-52-0 @ \$400	Lbs/Acre			65	13.00	(Actual usage per year in LT No-Till)
0-0-60 @ \$280	Lbs/Acre			90	12.60	(Actual usage per year in LT No-Till)
Apply Anhydrous	\$/Acre		16.00		17.50	(\$1.50 to pay for Exactrix System)
82-0-0 @ \$450	Lbs/Acre	200	45.00	165	37.13	(50% Less Leaching, Purdue Data)
		<i>act N= 164</i>		<i>135</i>		
28-0-0 @ \$180	Lbs/Acre	130	11.70	130	11.70	
		<i>act N= 36</i>		<i>36</i>		
		<i>200</i>		<i>172</i>		
Apply Preplant Chemicals	\$/Acre		3.00		3.00	
Field Cultivate 1.5 times	\$/Acre		14.36		0.16	(Level Residue Floats)
Plant Corn	\$/Acre		15.00		17.00	(\$2.00 to pay for expensive no-till planter)
Corn Seed - \$240/unit	\$/Acre	32000seeds	97.50		91.20	(24k to 36k drop VRT - Avg=30400)
Replant Corn	\$/Acre		8.00		0.40	(2% Replant Required)
Apply Post Chemicals	\$/Acre		3.00		3.00	
Chemical Costs	\$/Acre		35.00		35.00	
Spray & Mow Fencerows	\$/Acre		1.75		1.75	
Insecticide/Fungicide	\$/Acre		16.00		0.00	Better
Harvest Corn	\$/Acre		36.00		36.00	
Hauling Corn	\$/Acre		15.60		16.16	(\$.08/bushel)
Drying Corn	\$/Acre		25.35		26.26	(\$.13/bushel)
Storing Corn	\$/Acre		23.40		24.24	(\$.12/bushel)
Overhead, etc.	\$/Acre		75.00		50.00	Rough estimate based upon 2017 actuals
Net Land Rent Cost	\$/Acre		220.00		200.00	Water Quality Incentives
TOTAL COST =			725.41		625.68	
AVERAGE YIELD =			195		202	
AVERAGE COST PER BUSHEL = \$			3.72		\$ 3.10	
			\$0.62			

2017 Actual Cost = \$3.10/bushel

Conventional Yield ADVANTAGE REQUIRED to have an EQUAL Cost per BUSHEL= 32

THE FIRST TIME IN HISTORY
TECHNOLOGY HAS MADE
FARMING SUSTAINABLE

BY ANY DEFINITION
ECONOMIC
SOCIAL
ENVIRONMENTAL

BUT ONLY 3% ARE ADOPTING

OUR WEBSITE:
www.rulonenterprises.com

**FOR A FREE TRIAL
SEND EMAIL TO:
"ken@rulonenterprises.com"**

National Conference on Cover Crops – 12/7/2017