Cover Crop Economics

Cost of Cover Crops

• Radish	2-3#/a	$2-5
• Cereal rye	30-50#/a	$7-15
• Hairy vetch	10-15#/a	$22+
• Annual ryegrass	8-15#/a	$8-15
• Crimson clover	8-20#/a	$13-30
• Rapeseed	2-6#/a	$.90-3
• Spring oats	10-20#/a	$4-12
• Application		

The Big Questions:

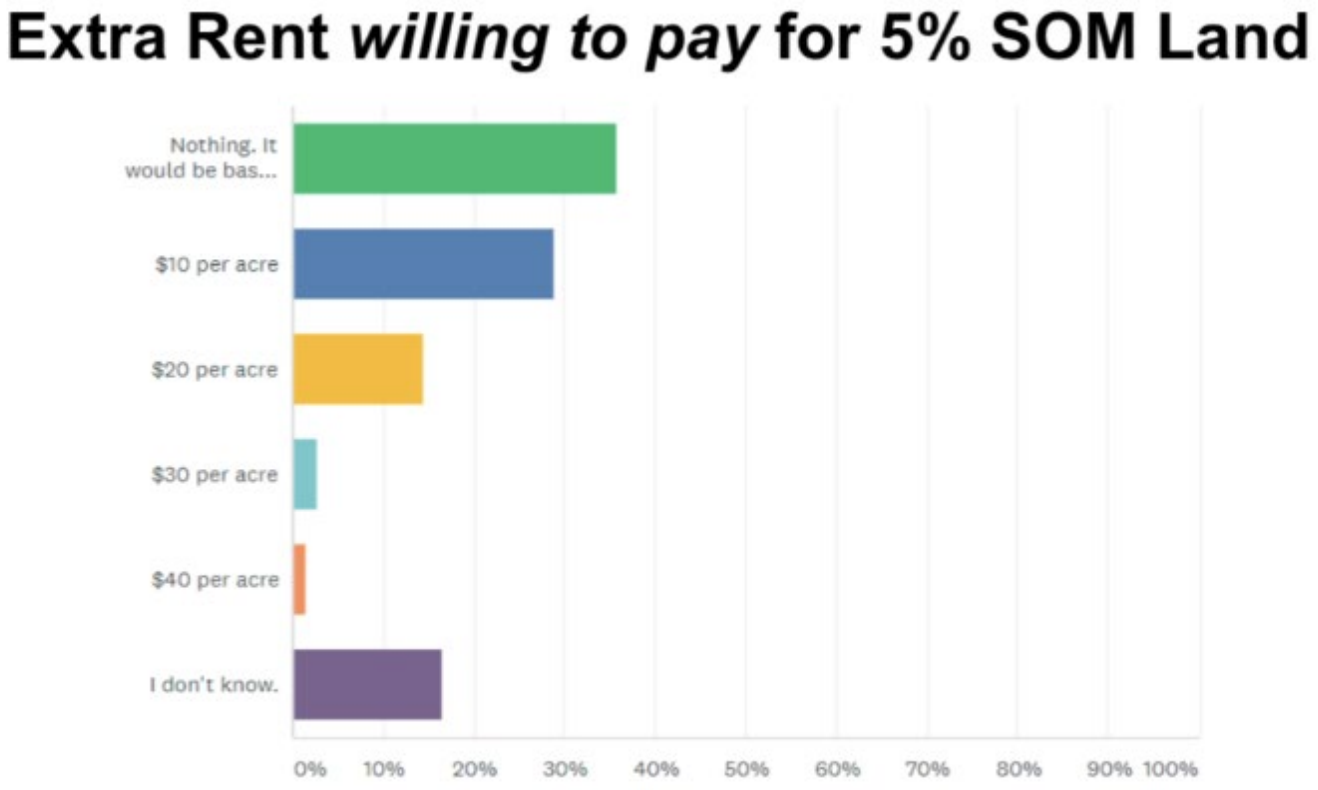
- How much longer can genetic improvements bridge the gap to mask losses in soil productivity?
- How much better could crop yields (and grain quality) be with attention to soil health?
- It is good to question the ROI of all inputs and operations.
  - Why are soil improvements (or at least preservations) not valued more?

How much will people pay?

Soil type and quality impacts production—but are people willing to pay more for better ground? Overby surveyed farmers in North Dakota to find where they placed the value of higher OM.

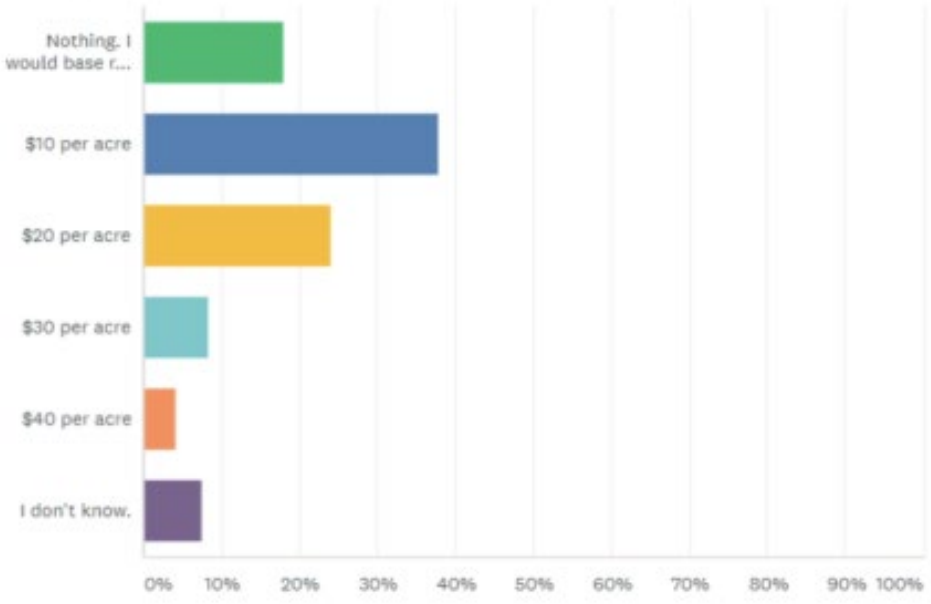
He asked this question: How much additional rent, per acre, are you willing to spend on ground with 5% OM versus 3% OM? However, he asked it twice, once before showing them the value additional OM brings and once after—there's obvious value in explaining the benefits.

Perception Before Explanations



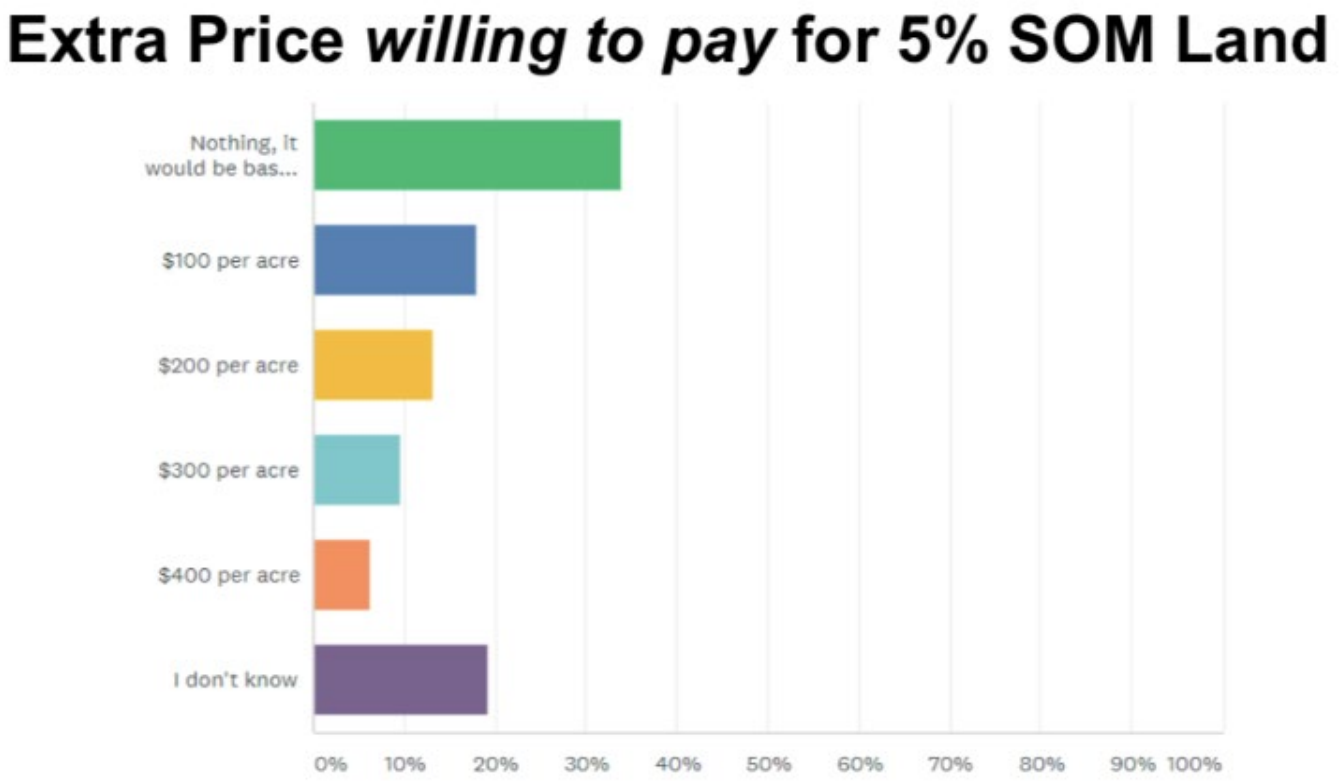
C: Paul Overby

Extra Rent *willing to pay after* the Value of SOM was explained



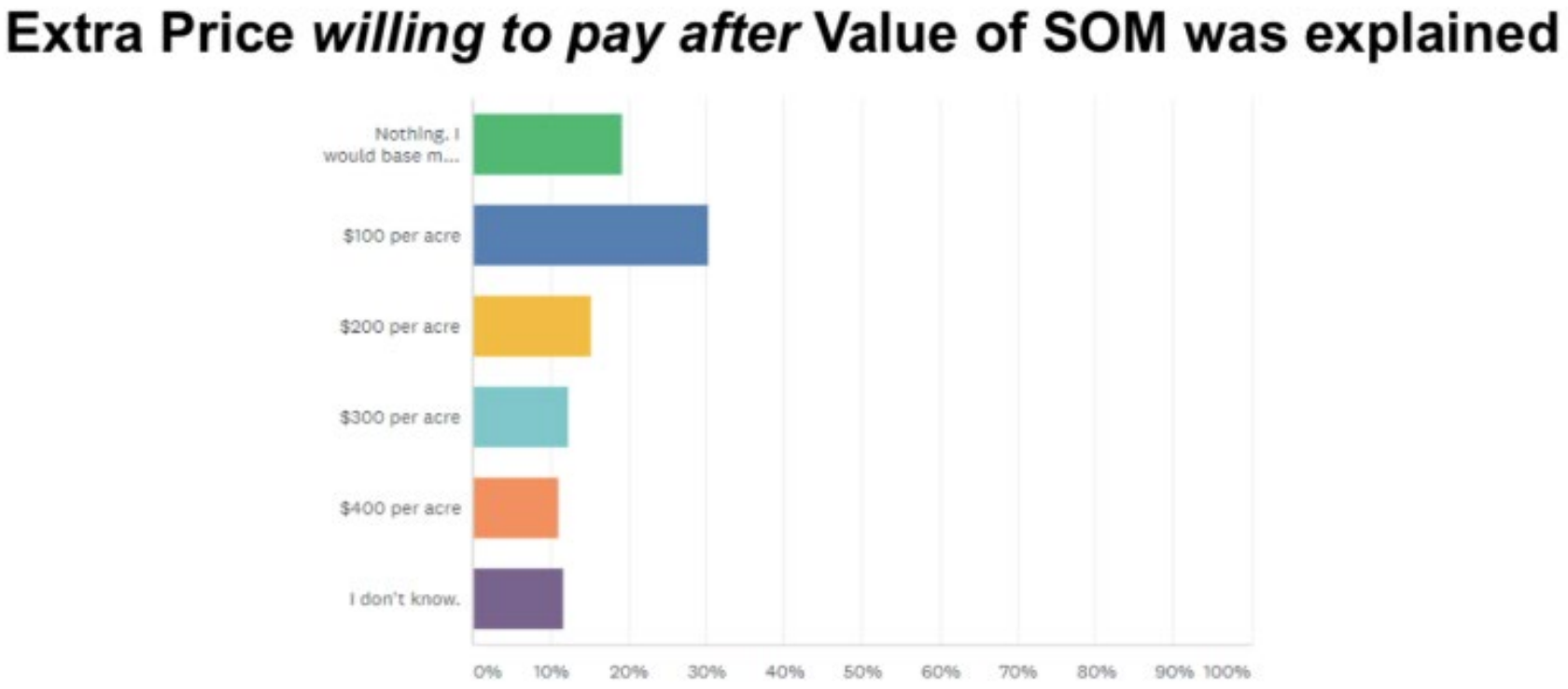
C: Paul Overby

When Land Purchase is Concerned



C: Paul Overby

After Explanation



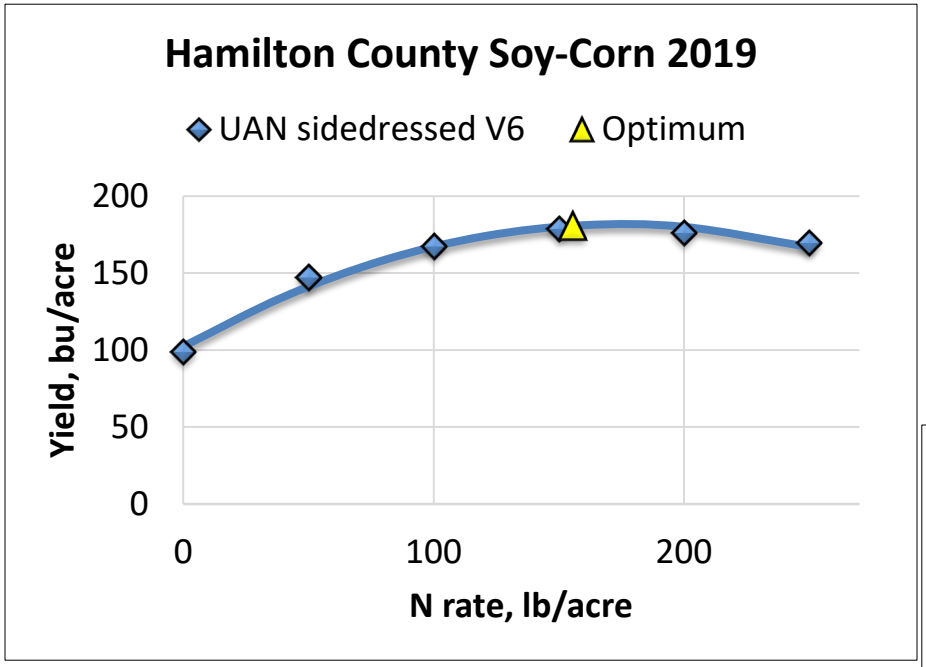
What Planting Mistake in 2019 Cost Farmers $250 Per Acre?

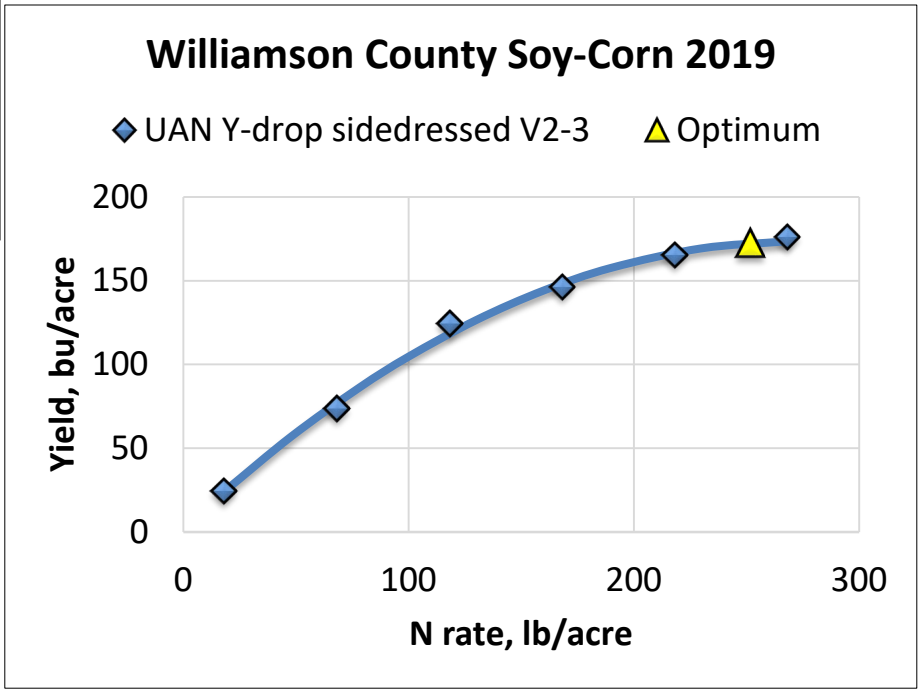
by Tyne Morgan 09:13AM Jan 22, 2020

"We have always done it that way." Precision Planting's lead agronomist Jason Webster thinks those are the seven costliest words in agriculture. During Precision Planting's Winter Conference this week in Tremont, Ill., discussions around prepping for planting 2020 were already under way.

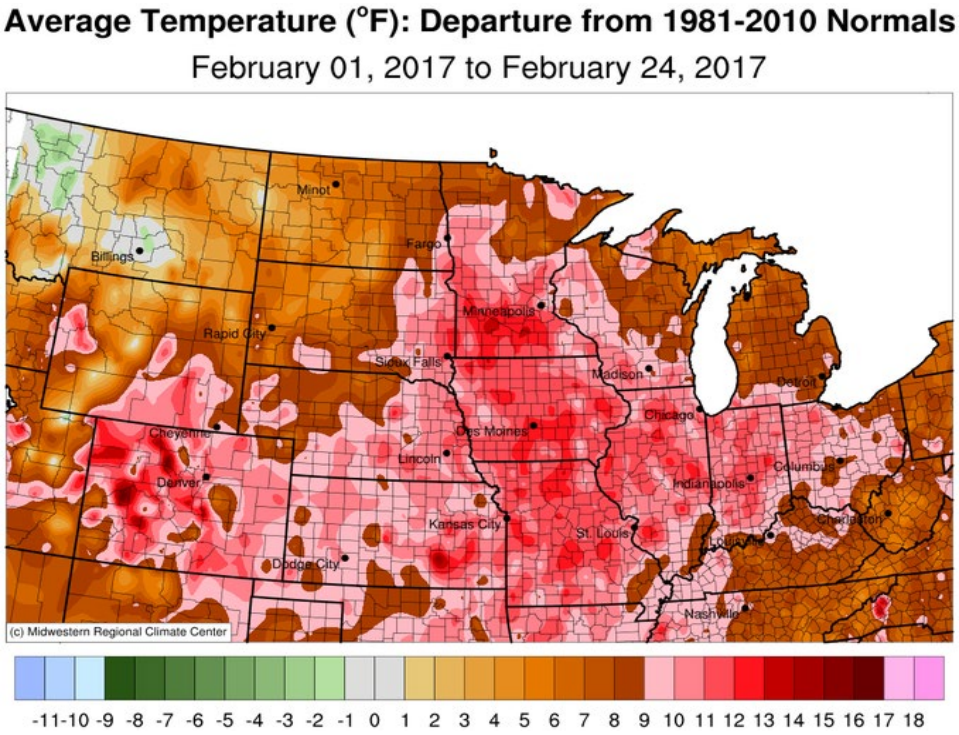
- What is the value of the rush to plant?
- If Water availability was not such a concern (SOM), what flexibility would that build into the production system
  - Heat at pollination isn't a problem as long as we have moisture available.

Nitrogen Supply from Cover Crop





Warm winters are slowly mining our soil organic matter.



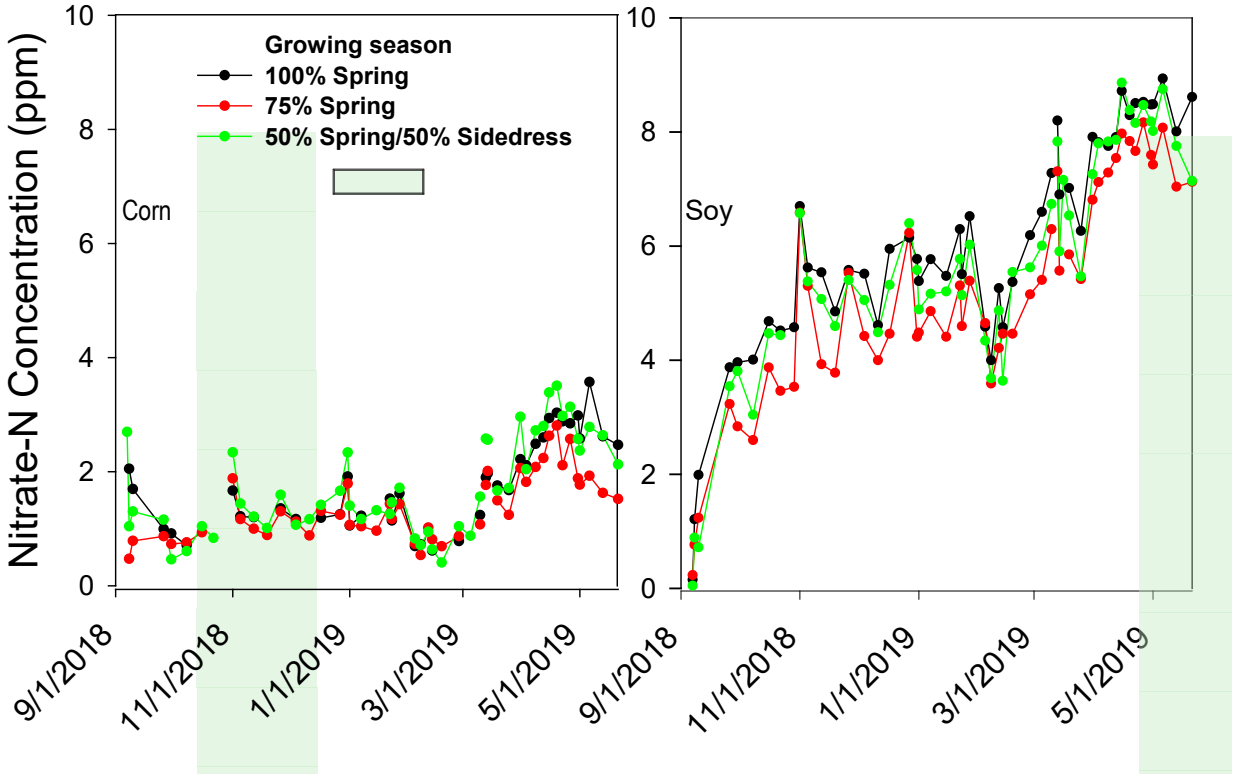
Warm winters enhanced mineralization before the row crop growing season.

Winter wheat will capture mineralized N and release it during the growing season.

"Soybean N credit" is more reliably available when wheat follows soybean than when corn follows soybean

Tile Nitrate Concentration

(Effect of previous crop)



Precision Planted Cover Crops 2018-19 Yield Summary

Junior Upton

John Pike

2018 Yields and Rank

Treatments	2018 Row Cover/	By Row/	Row Middle/	Yield	Rank
1	**CHECK**	**No cover Crop**		**147.57**	**12**
2	Radish	NO	Cereal Rye	**197.85**	**1**
3	Radish	Vetch	AR + CR + Vetch	**192.80**	**3**
4	Radish	NO	AR + CR + Vetch	**185.16**	**5**
5	E. Cabb (east)/Persian (west)	AR + CR + Vetch	AR + CR + Vetch	**169.13**	**9**
6	Oat	Crimson	AR + CR + Crimson	**171.47**	**8**
7	Crimson	Crimson	AR + CR + Crimson	**185.81**	**4**
8	NO	Balansa (L165-16-521)	AR + CR + Crimson	**193.64**	**2**
9	Crimson + Radish	Crimson + Radish	AR + CR + Crimson	**173.70**	**7**
10	Cereal Rye	Cereal Rye	Cereal Rye	**163.85**	**10**
11	NO	Annual Ryegrass	Annual Ryegrass	**179.17**	**6**
12	E. Cabb + Rape	Crimson	AR + CR + Crimson	**163.42**	**11**

2019 Yield and Rank

2019 Treatments	Row Cover/	By Row/	Row Middle/	2019 YIELDS	Rank
1	**No cover crop/ CHECK**			**184.85**	10
2	Radish/Oat	Crimson Clover	ARG/CR/Crimson	**191.77**	9 (Deer Damage)
3	None	Crimson Clover	ARG/CR/Crimson	**200.55**	7
4	Oats	Radish/Crimson	ARG/CR/Crimson	**160.75**	11 (Deer Damage)
5	Kale	Persian Clover	ARG/CR/Crimson	**200.25**	8
6	Oat/Chicory	Chicory/Oat	ARG/CR/Crimson	**237.56**	3
7	Beet/Oat/Crimson	Beet/Oat/Crimson	ARG/CR/Crimson	**232.56**	5
8	Radish/Oat	H. Vetch/Radish	ARG/CR/H. Vetch	**239.31**	2
9	None	H. Vetch	ARG/CR/H. Vetch	**231.97**	6
10	Oats	H. Vetch	ARG/CR/H. Vetch	**274.49**	1
11	ARG	H.Vetch	ARG/CR/H. Vetch	**236.66**	4

2019 Solid Drilled Grass Cover Crop with N Management

2019 Soild Grass Cover Crops			**Yields**
Cereal Rye Drilled	Cereal Rye	Cereal Rye	**272.26**
Bounty ARG	Bounty ARG	Bounty ARG	**236.79**
Lowboy ARG	Lowboy ARG	Lowboy ARG	**245.56**

- Early burndown
- In-furrow pop-up fertilizer
- Early sidedress
  - Injected UAN 180#
  - Applied V1-2 (7 days after planting)
  - 8” off row, not in middle of row

2 Year Averages

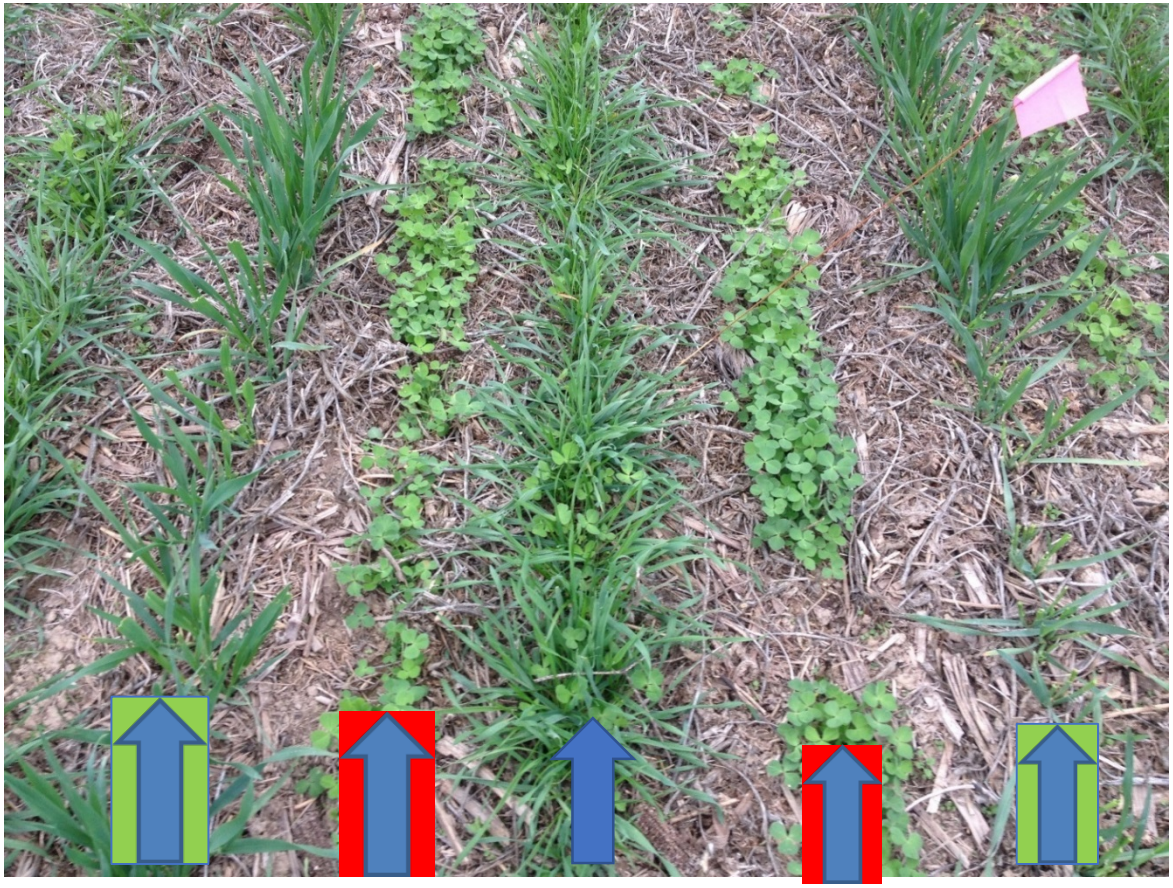
- Check (No Cover Crop soybean stubble)
  - **166.21** bu./ac.
  - Early standard burndown
  - Other treatments planted into green cover crop
- **Crimson Clover Treatments**
  - **190.76** bu./ac.
- **Hairy Vetch Treatments**
  - **213.98** bu./ac.

- Check
  - **166.21** bu./ac.
- **Winter Term. Cover on row**
  - **191.94** bu./ac.
  - Some advantage seen with winter terminated row cover in Vetch treatments
- **No cover on row**
  - **211.02** bu./ac.
- **Crimson Clover on row**
  - **179.31** bu./ac.

Annual ryegrass+ Cereal Rye+ Clover (Centered, middle of corn row)

Clover 7.5” from row

Corn will be planted on Oats (to winter kill) outside of clovers



Corn row to be planted in the “skip”

(Fall Picture)

Corn to be planted on Radish

- Accidental heavy seeding of radish produced smaller tubers that made better planting conditions than lighter rate and larger tubers might have.

Crimson Clover Plots

Hairy Vetch Plots

Green covers near row help to dry soil in planting “zones”

2019 Planting Corn
June 3

Planting 2020 Plot

- Replicated field length strip plots replace small plots

- Planted with commercial drill, instead of small plot drill.

Several Options for Skip/Strip Systems

Some of Mike Plumer's Findings

Radish row fertility-RTK

- One year data– 1.5#/a radish ($4.50/a)
  - Radish row vs row middles
    - P_1 test raised from 40 to 210
    - K test raised from 300 to 500+
- What is start fertilizer worth
  - No planter fill up time lost
  - No planter attachments
  - No fertilizer corrosion, replacement costs
- Cost savings ?

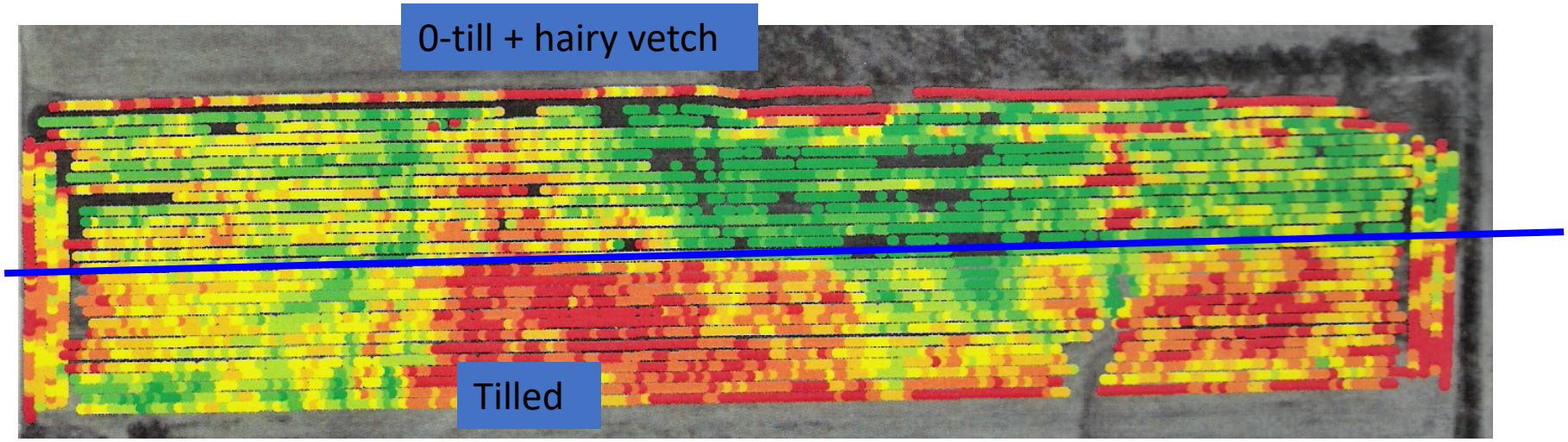
Some very interesting yield results !!

Treatment	Rep	Yield monitor (bu/acre)	Trt Average
clover/oats	1	160.3	160.8
clover/oats	2	164.3	
clover/oats	3	157.9	
clover/radish	1	170.6	174.6
clover/radish	2	178.4	
clover/radish	3	174.7	
clover/radish/oats	1	179.0	170.2
clover/radish/oats	2	191.4	
clover/radish/oats	3	140.4	
radish	1	187.0	183.5
radish	2	178.7	
radish	3	184.8	

Yield increases seen of 5- 20 bu/a at $5/bu corn == $25- 100/a

Gruver,WIU

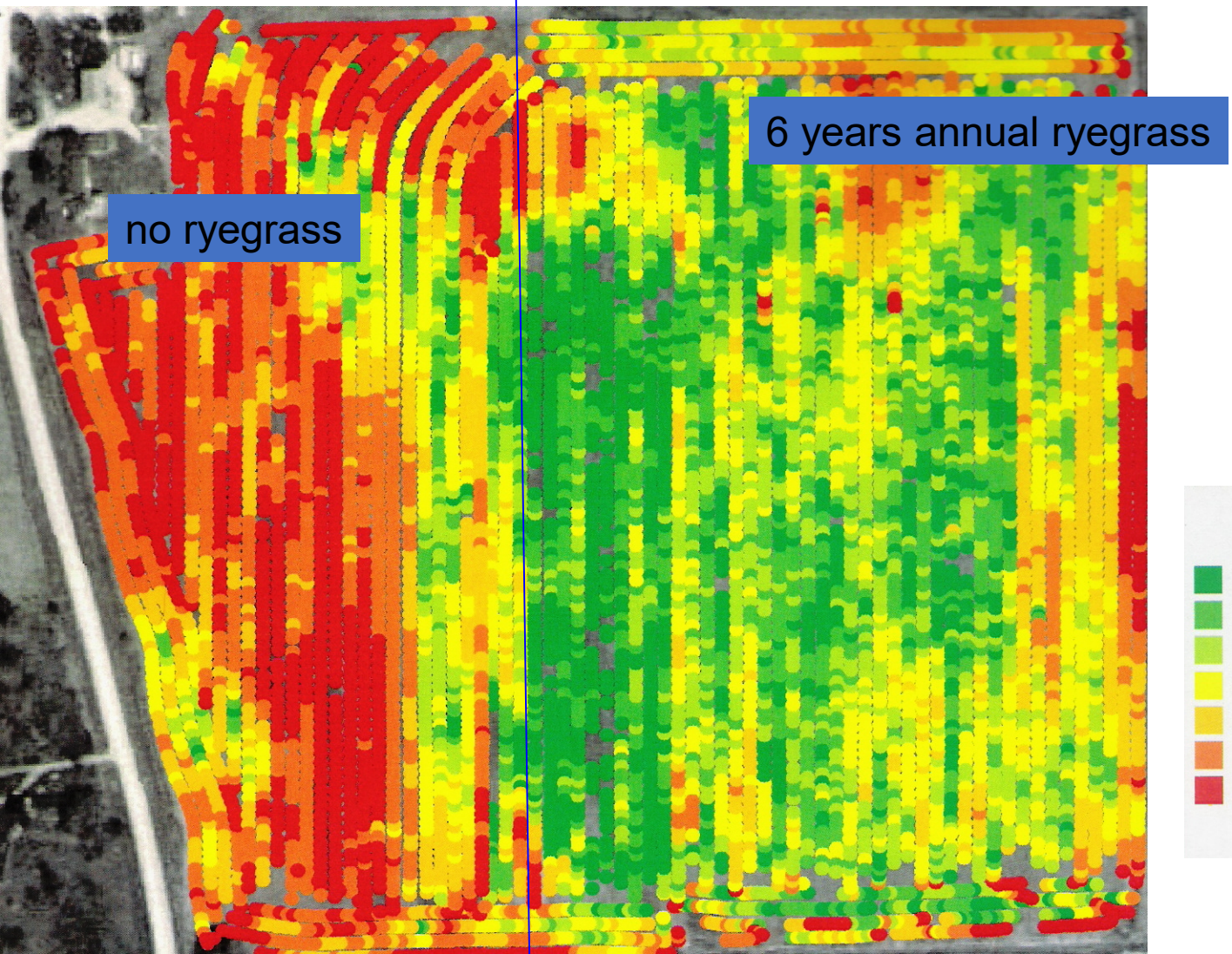
First year no-till + hairy vetch



Estimated Volume (Dry)
(bu/ac)

161.18	180.00	(3.35 ac)
148.18	161.18	(4.50 ac)
137.00	148.18	(4.57 ac)
127.28	137.00	(4.59 ac)
117.36	127.28	(4.61 ac)
107.12	117.36	(4.67 ac)
10.87	107.12	(4.60 ac)

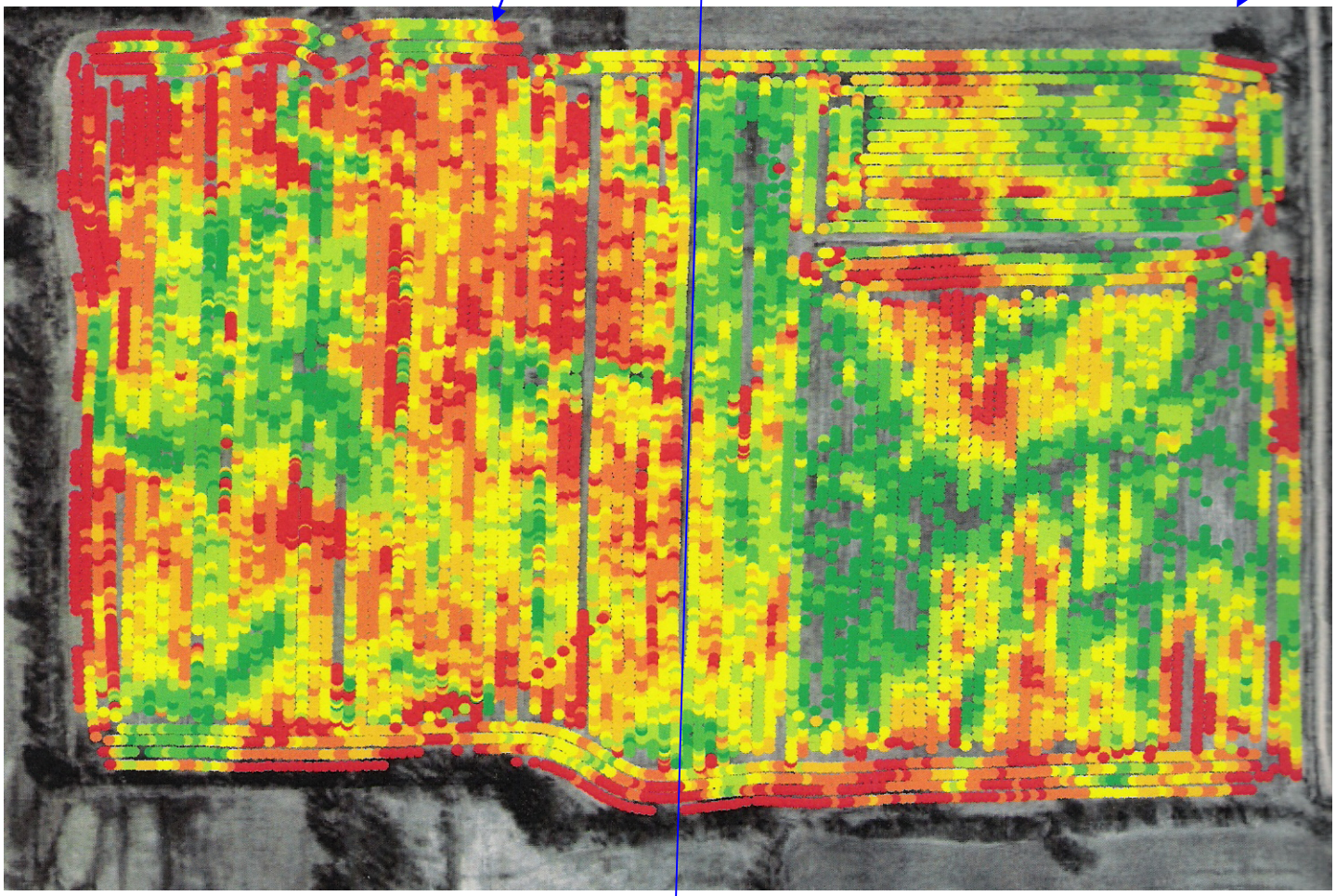
Cover crop effects



Estimated Volume (Dry)
(bu/ac)

175.40	-	205.00	(4.92 ac)
161.48	-	175.40	(5.85 ac)
148.63	-	161.48	(5.93 ac)
133.71	-	148.63	(6.01 ac)
111.64	-	133.71	(6.06 ac)
88.70	-	111.64	(6.13 ac)
12.08	-	88.70	(6.02 ac)

No cover crop vs cover crop



Estimated Volume (Dry)
(bu/ac)

156.25	- 175.00	(5.13	ac)
137.17	- 156.25	(8.08	ac)
123.86	- 137.17	(8.45	ac)
114.09	- 123.86	(8.63	ac)
104.70	- 114.09	(8.89	ac)
91.03	- 104.70	(9.00	ac)
10.11	- 91.03	(7.88	ac)

Annual Ryegrass Variety Plots

Ryegrass Planting Date

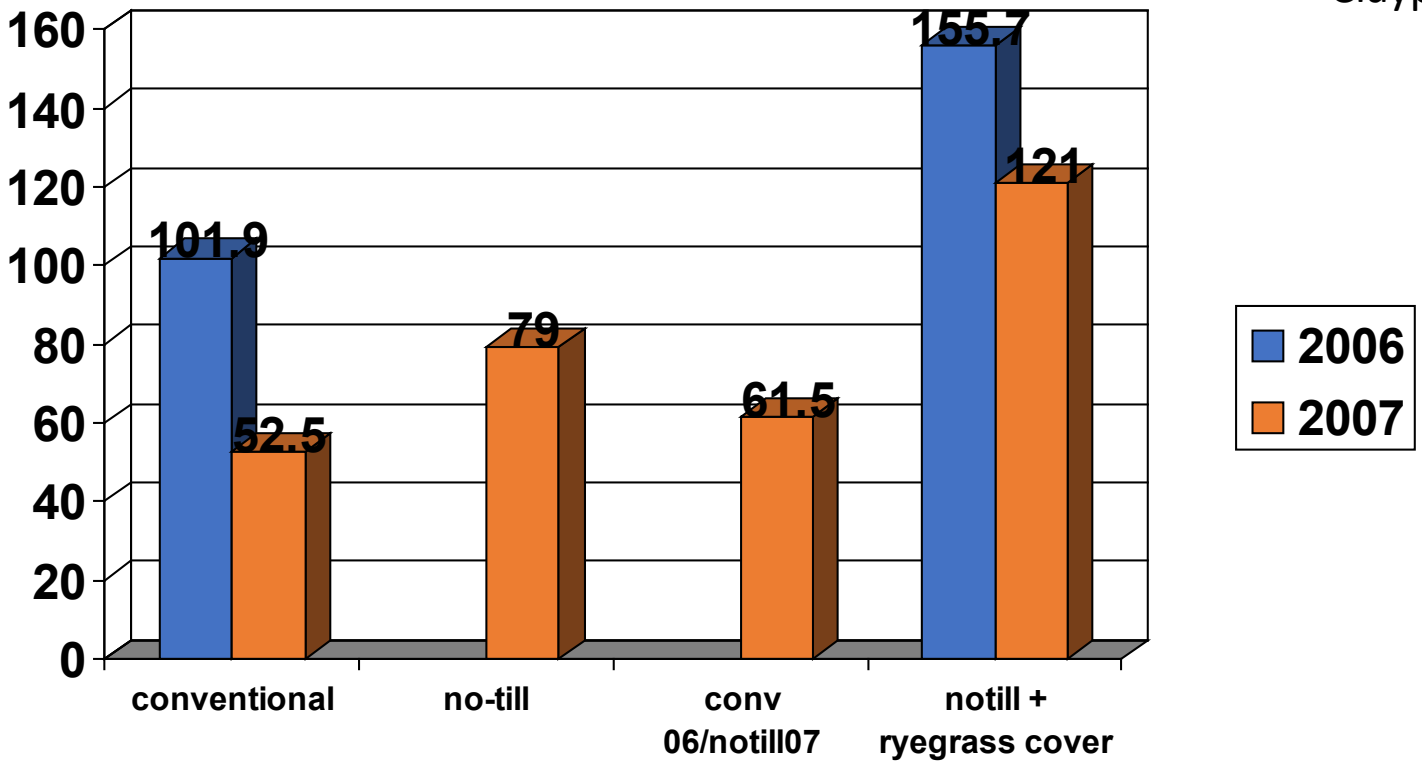
September 15 (11”)

vs

mid October (2”)

Yield advantage

2007 3” rain-April-Oct.
Claypan soil



9 replications 2006
8 replications 2007

Plumer U of Il.

Cost of Cover Crop for this 80 acres

- Seed 12#/a x $.70/# x 80 acres= $672
  - Drilling cost $14/a x 80 acres =$1120
  - Total cost =$1790

No-till + cover crop Yield advantage

- 45.8 bu over conventional tillage in 2006
  - At $4.50/bu corn=== $206.10
  - 68.5 bu/a over conventional tillage in 2007
  - at $4.50/bu corn=== $308,25

- On this 80 acre field : increased PROFIT
  - **$16488.00**
  - **$24660.00**

Weed Control

- Controlling resistant weeds
  - Glyphosate resistant marestail (horseweed)
    - Herbicide program: $40/a + not always effective
    - Cereal rye $16-24/a
  - Mulch and allelopathy effect from high residue cereal rye cover crop

WEED CONTROL

Replicated trial, rye residue removed (May 15)and control
Was not affected –June 15 2 years, 8 replications 2 varieties

How to Prove the Value of Healthy Soil

by Sonja Begemann 09:21AM Jan 10, 2020

- Just a 1% increase in soil organic matter (OM) can bring about $12 per acre in fertilizer savings to farmers, according to research at Ohio State University and Kansas State University. In addition, it’s putting carbon back into the soil.

Table 2: Value of Soil Organic Matter	
Assumptions: 2,000,000 pounds soil in top 6 inches	
Nutrients	1% organic matter = 20,000# 50% Carbon, C:N ratio = 10:1
Nitrogen:	1000# * $0.50/#N = $500
Phosphorus:	100# * $.70/#P = $70
Potassium:	100# * $0.40/#K = $40
Sulfur:	100# * $0.50/#S = $50
Carbon:	10,000# or 5 ton * $4/Ton = $20
Value of 1% SOM Nutrients/Acre	= $680
Relative Ratio of Nutrients:	100 Carbon/10 Nitrogen/ 1 Phosphorus/1 Potassium/1 Sulfur

C: Ohio State University, Hoorman and Islam

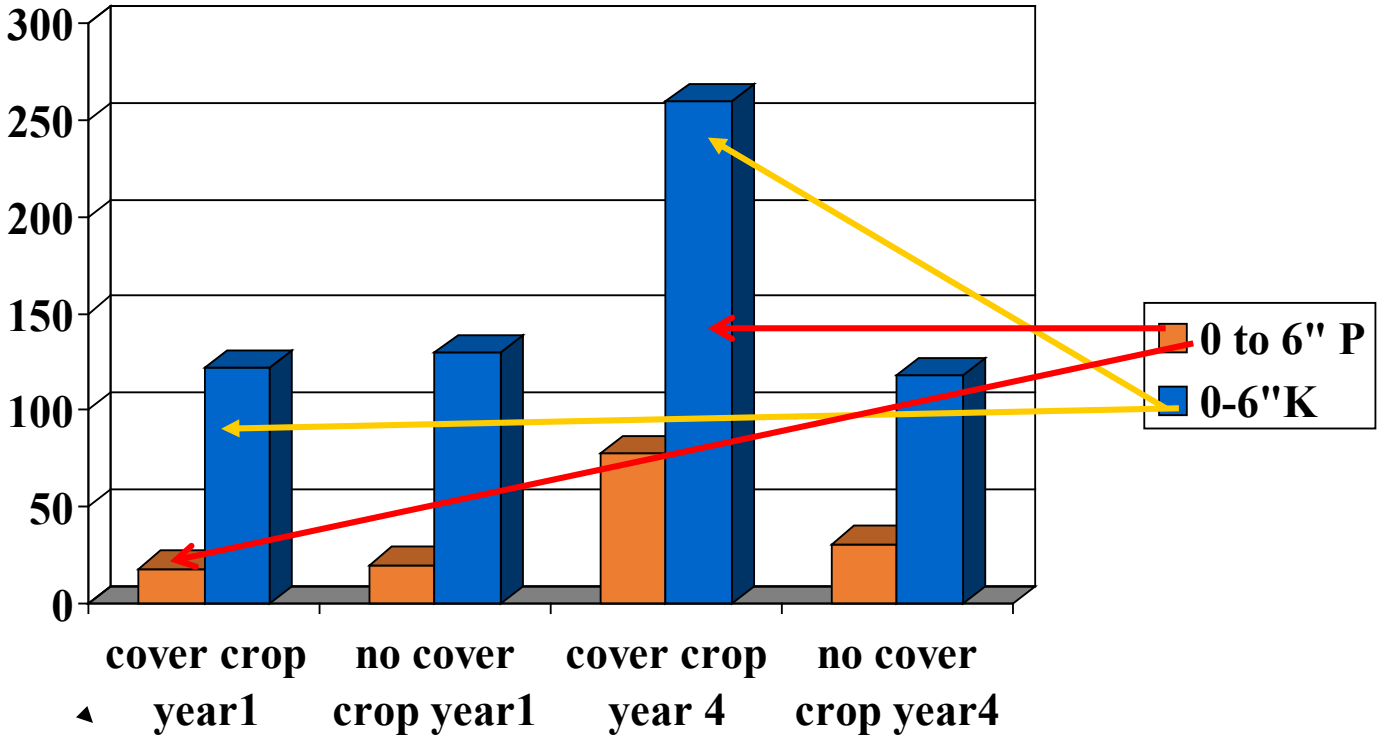
What about water holding capacity?

Putting an Annual Value to SOM

Nutrient Value per 1% SOM

Nutrients	Price/lb	Annual Release Calculation	Annual Value/Acre
Nitrogen	$ 0.40	1000 * 2.5% *.40	$ 10.00
Phosphorus	$ 0.40	100 * 4.5% * .40	$ 1.80
Sulfur	$ 0.08	100 * 2.5% * .084	$ 0.21
Total Annual Value			$ 12.01

Soil Tests in ryegrass Cover Crop



4 years,3 reps
C-S rotation

Plumer, U of Il

What is it worth?

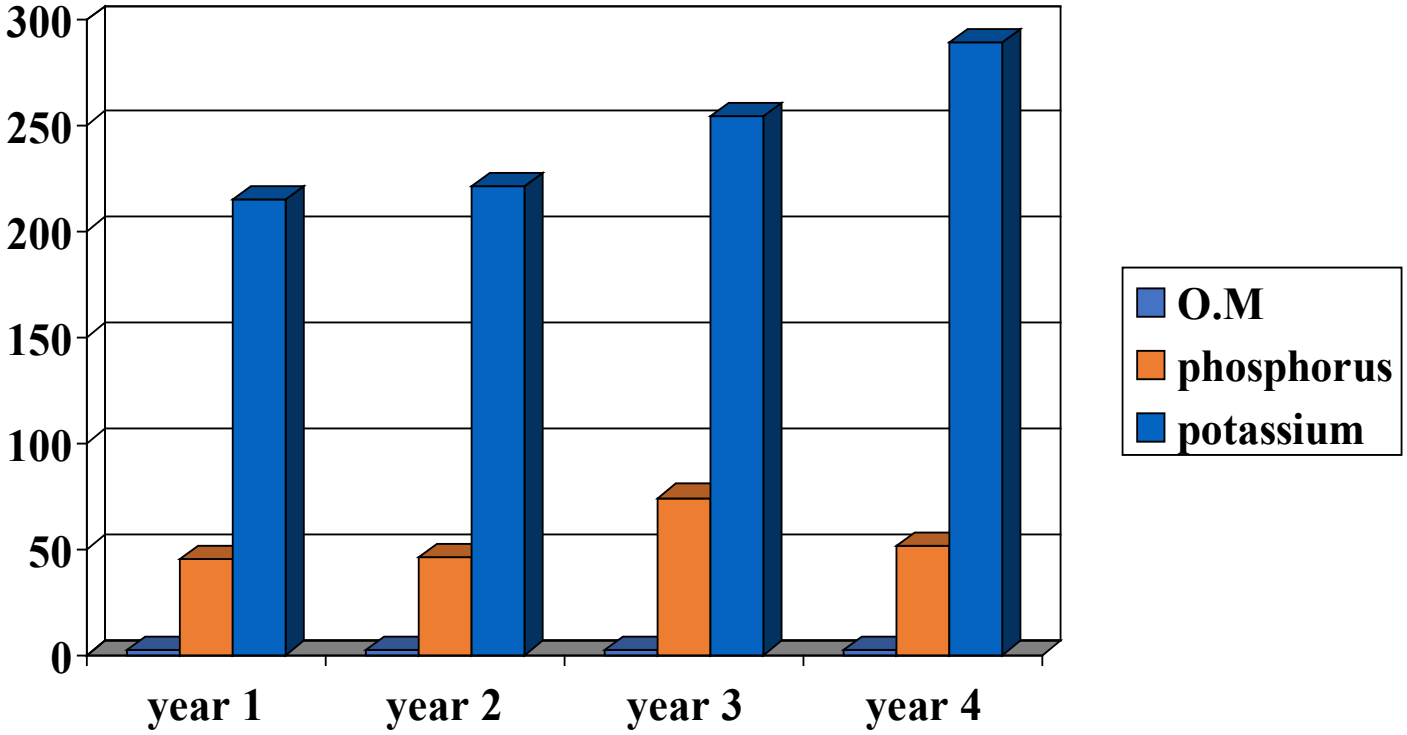
- P_1 test raised from 21 to 72
  - That is 51 pts. Which equals about 990#/acre of DAP
    - **At $700/ ton ==== $350/a in 4 years**

- K test raised from 122 to 261
  - That is 139 pts which equals 927# 0-0-60/a
    - **At $600/ton ====$287/a in 4 years**
- **Remember that does not include the 4 years removed by the crop how much is that each year**

Cost of Cover crop for $637/a fertility gain

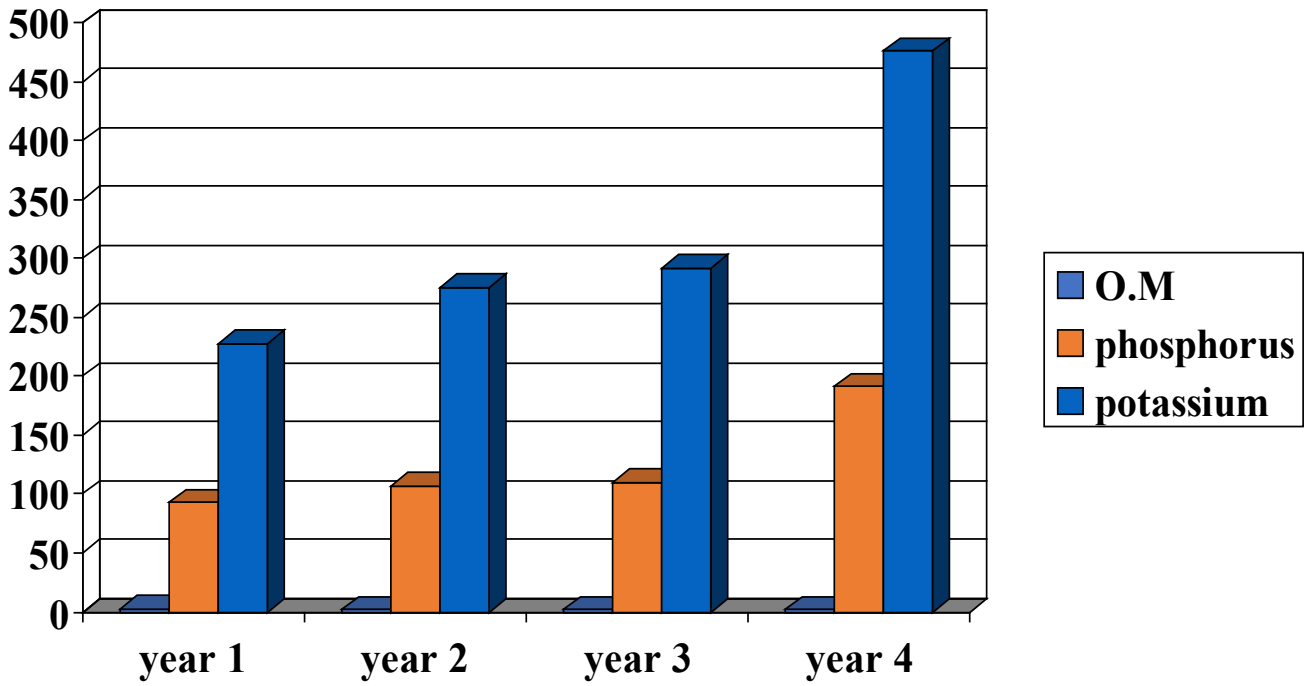
- Annual ryegrass 12#/a x $.70 = $ 8.40
  - Drilling $14/a = $14
    - Total cost = $22.40
    - Over 4 years = 89.60
    - $637-89.60==== $547.40/a

TA plot

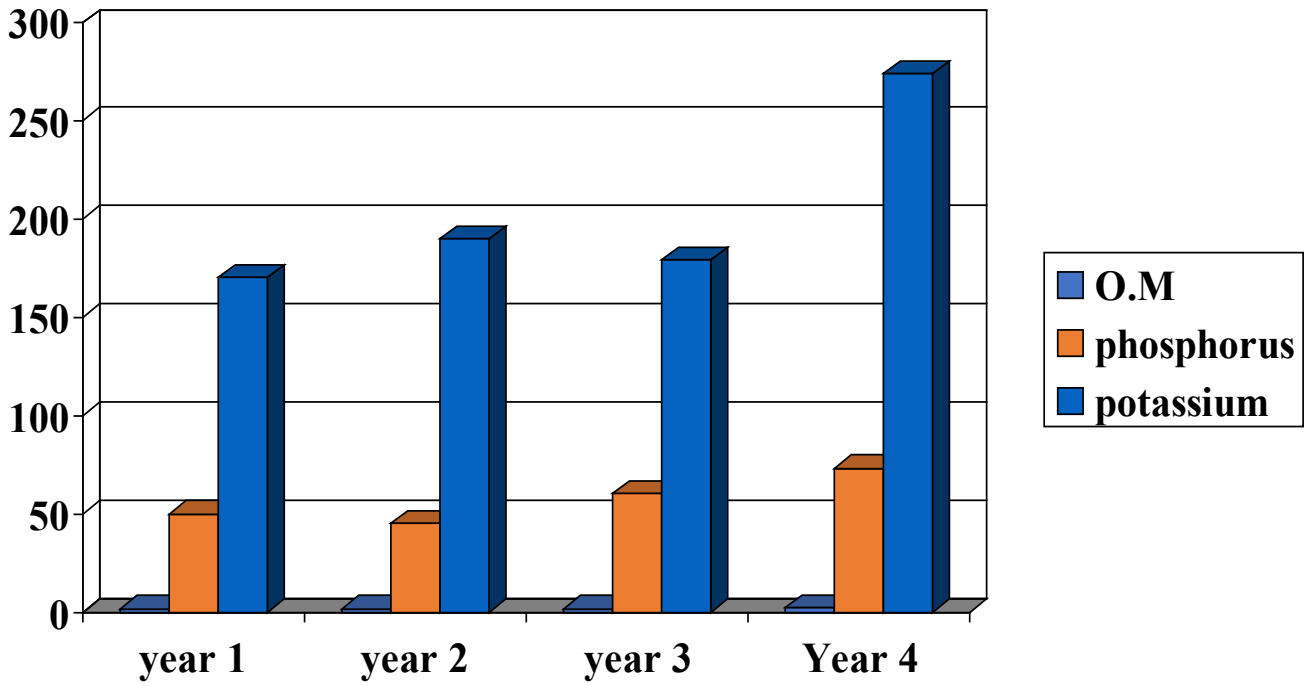


Annual ryegrass planted each year, fertility added only for crop removal

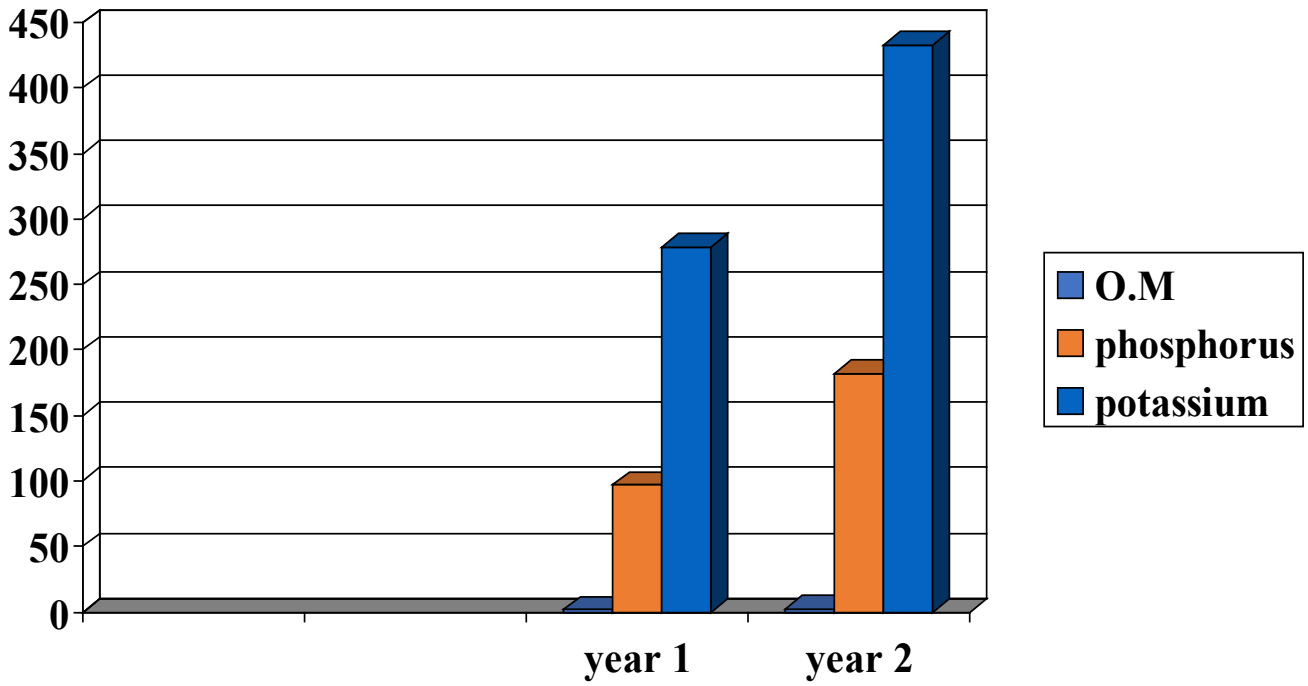
BI plot


500
450
400
350
300
250
200
150
100
50
0
year 1
year 2
year 3
year 4
O.M
phosphorus
potassium

MS plot

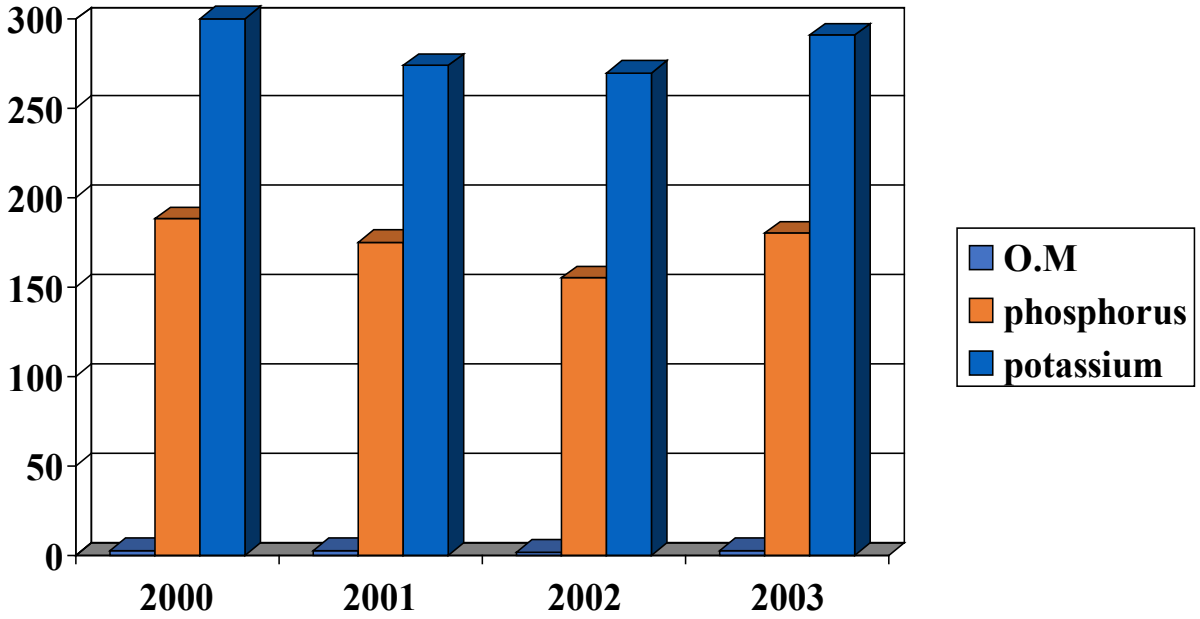

300
250
200
150
100
50
0
year 1
year 2
year 3
Year 4
O.M
phosphorus
potassium

HD plot


450
400
350
300
250
200
150
100
50
0
year 1
year 2
O.M
phosphorus
potassium

GR plot

Fall disked



How to stop nutrient movement