Increasing No-Till Soybean Productivity with Cover Crops and/or Gypsum

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Increasing Soybean Productivity while Improving Soil Quality and Mitigating Climate Change

Primary Researchers

Tara VanToia and Norman Fausey,
USDA-ARS, Columbus, Ohio

Warren Dick, Rafiq Islam, Marvin Batte and Randall Reeder,
Ohio State University

Dexter Watts, **USDA-ARS, Auburn, Alabama**

Darrell Norton, Dennis Flanagan, & Javier Gonzalez
USDA-ARS, West Lafayette, Indiana

Research sites:

Alabama, Indiana, and

two in Ohio (Piketon and Hoytville)

Farm Show sites (demonstration only):

Farm Progress Show (Iowa and Illinois)

Farm Science Review (Ohio)

Ag Progress Days (Pennsylvania)

Tom Kaspar, USDA-ARS Ames, Iowa

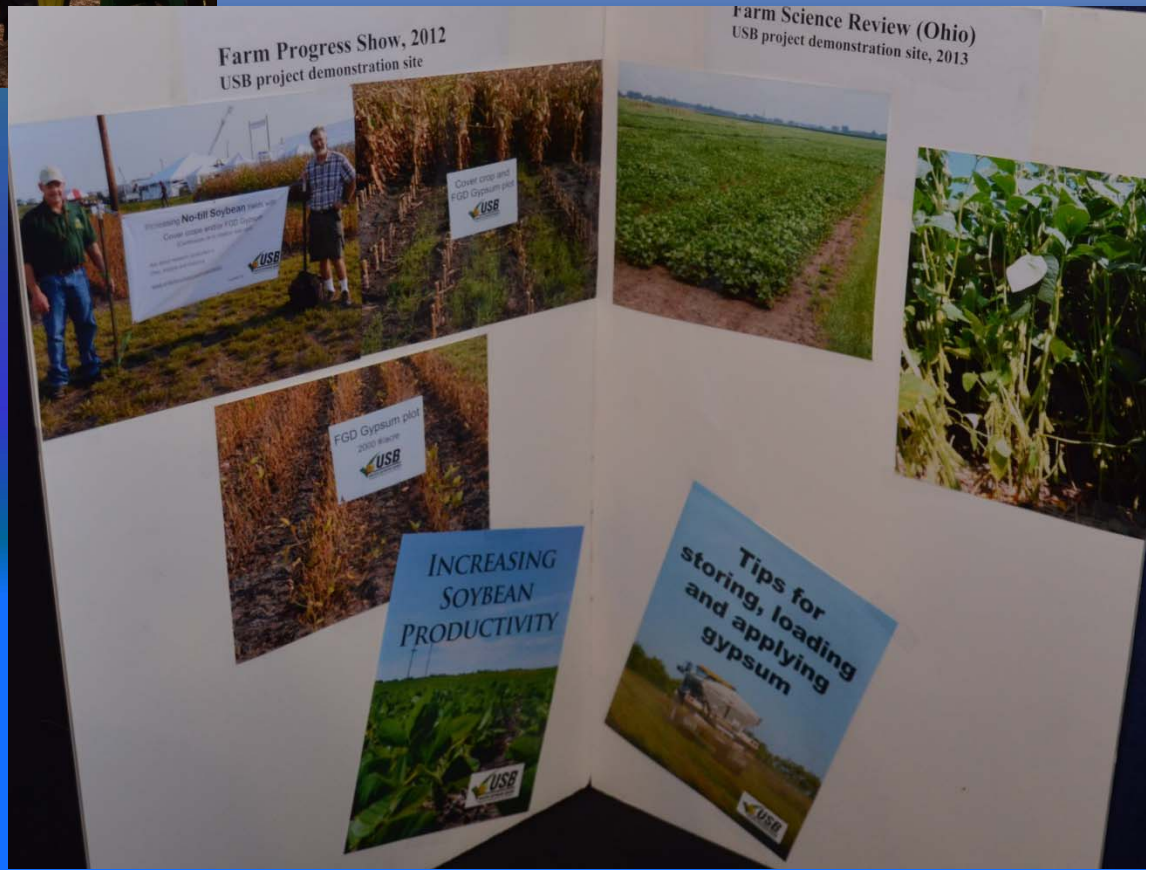
(Farm Progress Show)

Greg Roth,
Penn State U.

Farm Science Review (Ohio) Randall Reeder

Farm Science Review 2013

Farm Progress Show 2013



Cover crops (research sites)

Cereal rye (OH, IN)

Oilseed radish (Alabama)

FGD Gypsum, 2012-13

- In Ohio, Indiana and Alabama, gypsum was applied at:

  0, 1000, and 2000 lbs/acre.
- Repeated each year

Soybean Varieties, 2013

- Becks 325NR ~21% oil
- Asgrow A3231 ~17% oil

(Roundup Ready)

Key Observations

- For Soybean yield:
  - Gypsum did not impact yields in 2013.
  - Cover crops plots produced 3.6 bu/acre more.
  - High oil soybeans produced 4.6 bu/acre more.
  - Continuous soybeans produced 5.5 bu/acre less than soybeans after corn.
  - Yields in Ohio (Piketon and Hoytville) and Indiana were “statistically” equal.
  - Alabama yields were significantly lower: 19 bu/acre less.

Observations across sites and treatments

- Profits in Ohio (Piketon and Hoytville) were “statistically” equal, but Indiana and Alabama had significantly lower profits in 2013.
  - Indiana: $37/acre less, primarily due to higher cash rents than Ohio.
  - Alabama: $150/acre less, primarily due to lower yields than Ohio

Observations across sites and treatments

- High oleic soybean variety produced **$59/acre more** profit than the regular oil variety.

- Continuous soybeans produced **$70/acre less** profit that soybeans following corn.

Heavy metals

are not a problem in soybeans, with or without gypsum

.

Heavy metals concentration in soybeans did not vary significantly except for copper.

Gypsum application alone did not increase heavy metals content in soybean grains.

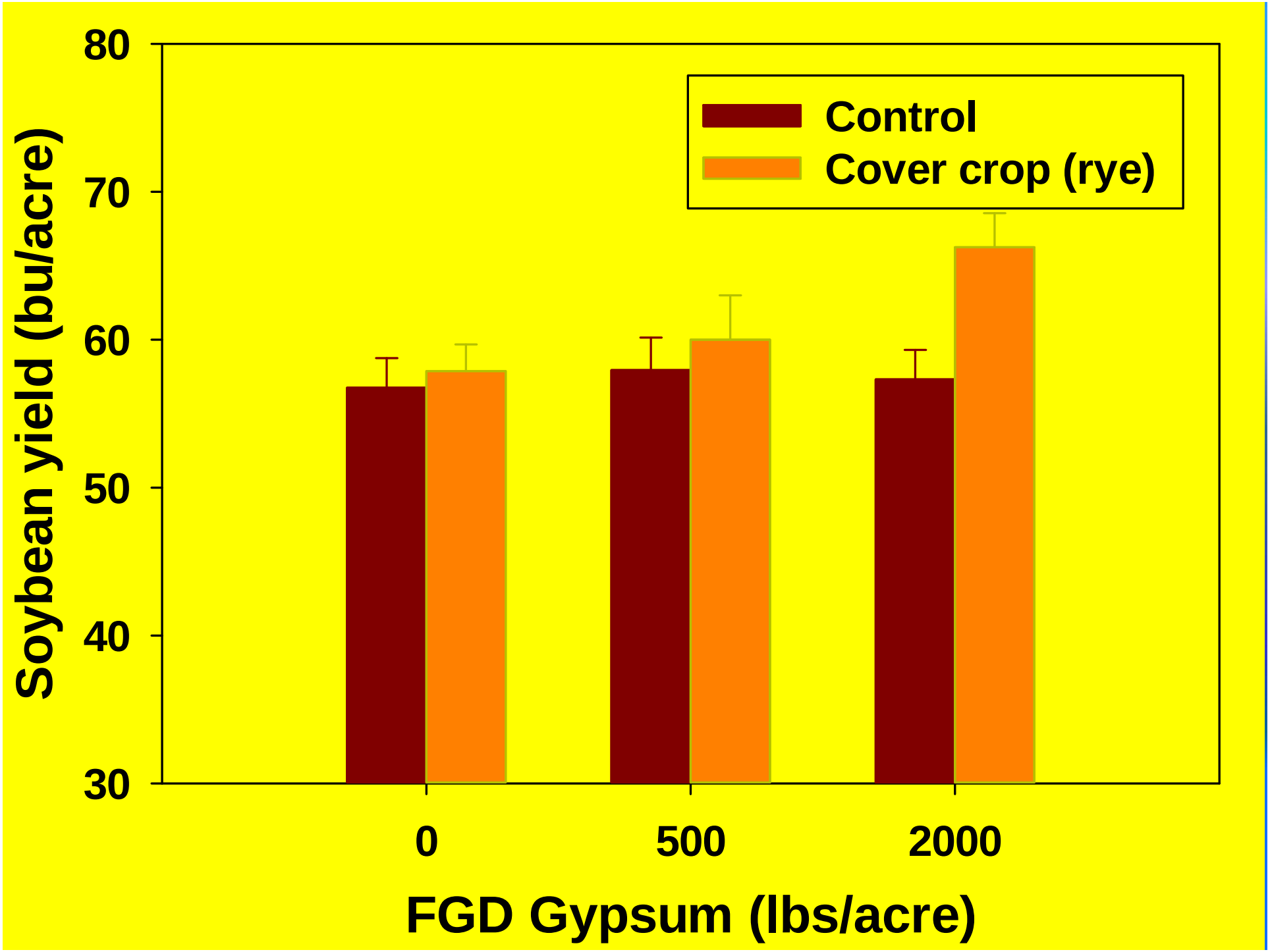
Cover crops decreased copper concentration with higher levels of gypsum.

Cover crop and gypsum interaction on heavy metal concentration in soybean grains, 2012

Cover Crop	Gypsum (lbs/ac)	Al	Cu	Fe	Mn	Zn	Cd
				(mg/kg)			
No		9.0a	3.5a	100.8[a]	35.8a	35.4a	0.08a
Yes		7.4a	1.6b	101.2[a]	37.4a	37.5a	0.08a
No	0	7.6	3.2	96.8	34.4	35.0	0.08
	2000	10.6	5.8	105.6	37.5	35.9	0.07
Yes	0	7.6	2.6	101.8	36.4	36.2	0.08
	2000	7.2	1.8	100.7	38.2	38.7	0.08
P≤0.05		ns	*	ns	ns	ns	ns

Cover crop and gypsum interaction on heavy metal concentrat soybean grains, 2012

Cover Crop	Gypsum (lbs/ac)	Co	Cr	Li	Ni	Pb	Si
				(mg/kg)			
No		0.27a	0.38a	3.78a	3.17a	1.23a	64.2a
Yes		0.26a	0.37a	4.44a	3.01a	1.13a	64.1a
No	0	0.28	0.39	3.66	3.22	1.15	60.5
	2000	0.25	0.38	3.92	3.11	1.33	68.6
Yes	0	0.26	0.35	4.48	3.46	1.07	64.6
	2000	0.27	0.38	4.4	2.62	1.17	63.6
P<0.05		ns	ns	ns	ns	ns	*

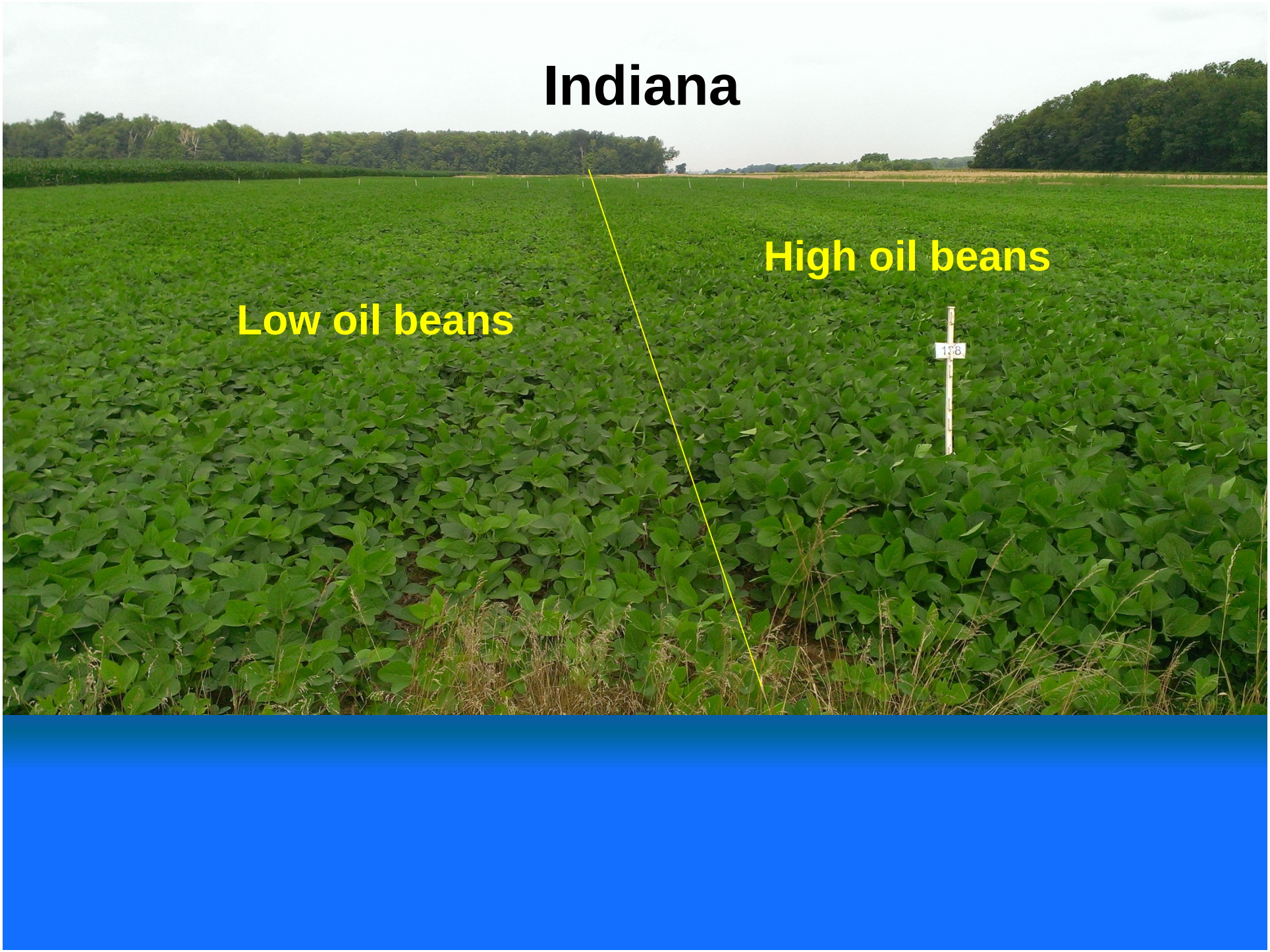

80
70
60
50
40
30
Soybean yield (bu/acre)
Control
Cover crop (rye)
0
500
2000
FGD Gypsum (lbs/acre)

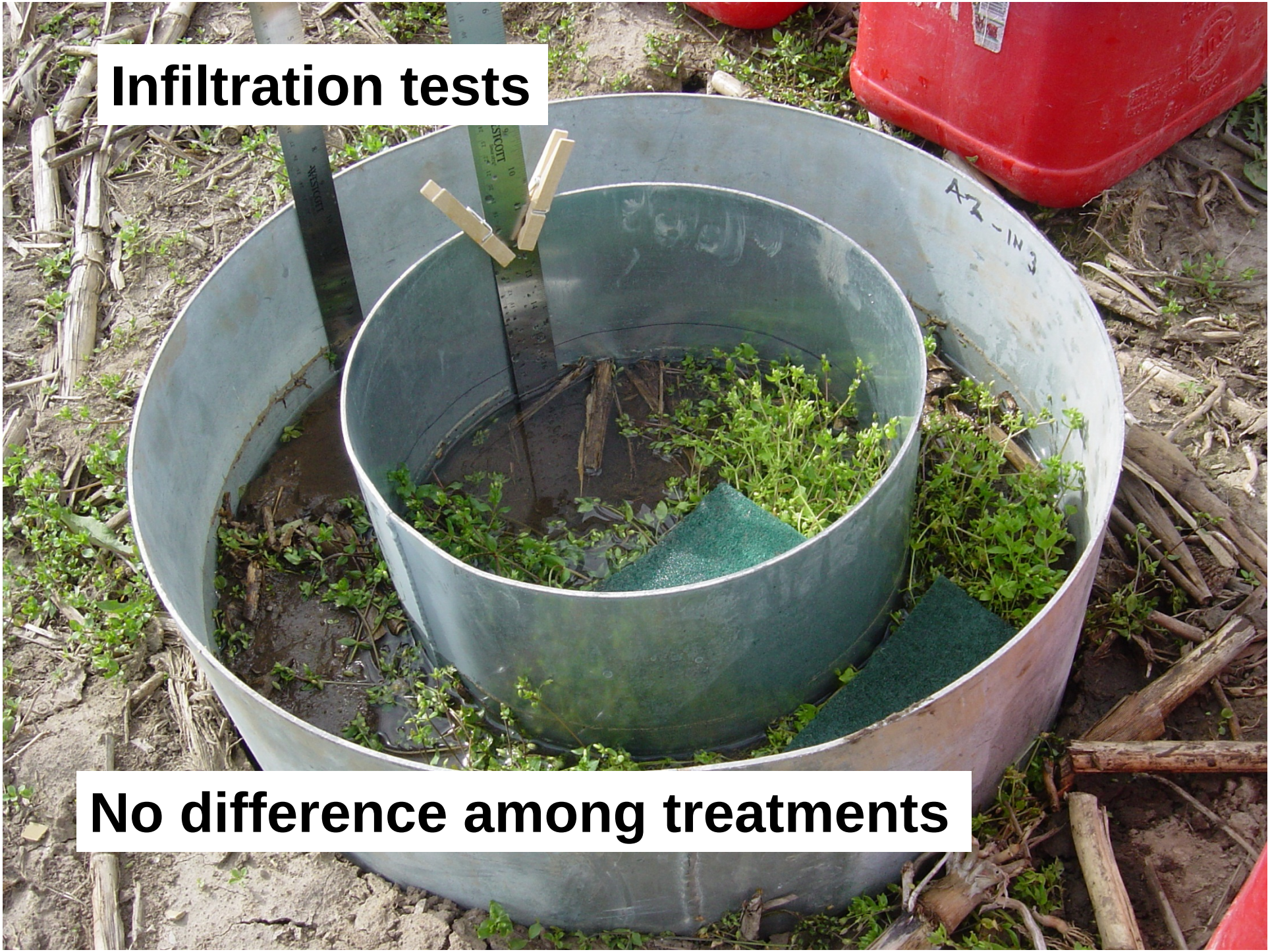
Extra Points: Cover crops

- Cover crops do much more than reduce erosion.
- Cover crops provide “living roots” for more months; improve biology in soil
- Cover crops: improved soil structure, deeper rooting, more available moisture to crop

Extra Points: Gypsum

- Gypsum does not help all soils.
- Grass benefits more than grains from the Ca in gypsum.
- Poor soils will show improvement more so than good soil.
- Low cost source of sulfate. (~200# gypsum/ac)
- Multiple years give better results


Indiana
High oil beans
Low oil beans


Infiltration tests
No difference among treatments