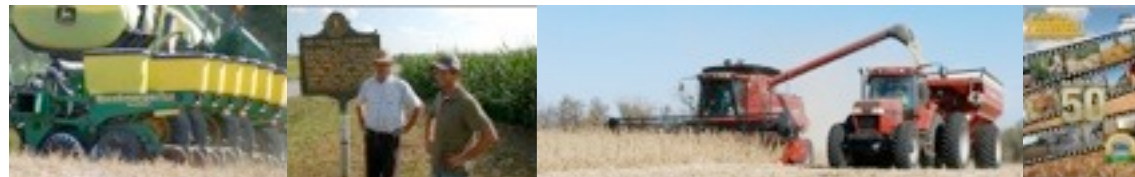


The Value Of Cover Crops In Drought Environments

Ryan Speer
Jacob Farms
January 9, 2013



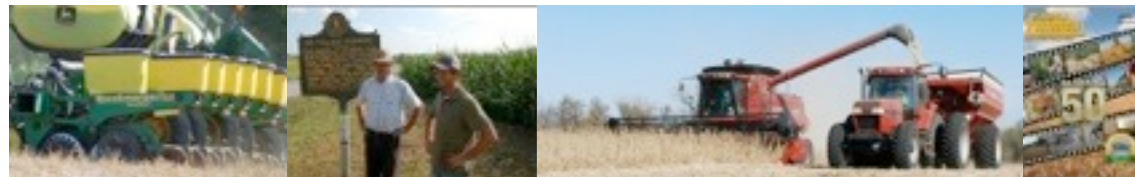
Jacob Farms

- Established 1896:
 - Continuously no-tilled since 2000
 - 30" annual rainfall 16 inches in 2011, 55 days over 100 degrees.
 - Sandy loam soils
 - O.M. 1-3 CEC's 8-25
 - ½ irrigated, ½ dryland, irrigation water salty (river)
 - Use variable rate applications fertilizer, seed, and lime



Outline for NNTC 2013

- **My goals of using cover crops**
- **Where do we fit covers into our rotations**
- **Rye and Radish program following corn**
- **Yield data**
- **Soil sample data: Fertility and Organic Matter changes**
- **How cutting back on cover crops cost us money even in the drought.**
- **Hidden successes after 6 years of cover crops.**



My Goals of Using Cover Crops

- **Build Organic Matter**
 - Higher O.M. holds more water and nutrients
 - 1.5% O.M. holds 35 lbs of water, 4% holds 165 lbs of water
- **Use excess moisture (normal rainfall years)**
 - Our sandy soils have low water holding capacity
 - Might as well be using the water to grow a cover instead of running off.
- **Scavenge nutrients**
 - Stop nitrogen from leaching
 - Pull P+K from deeper depths to feed cash crop
- **Feed soil microbes**
 - Keeping soil biology active all year speeds up residue breakdown and increases O.M. production.
- **Increase ground cover, weed suppression, input reductions**
 - Increased ground cover controls evaporation, controls weeds, and reduces chemical applications, and irrigation watering.



Our Rotations

- Irrigated: Corn-corn-soybean-wheat-d.c. soybean with rye and radish cover after 2nd year corn.
- Also have various cover crop mixes between 1st and 2nd year corn.
- Dryland: Corn-soybean-wheat-d.c. milo or d.c. soybeans
 - Rye and radish cover after dryland corn(all acres weather/ moisture permitting)
 - ***No ground is left bare during the summer, either double cropped after wheat or cover crops are used.***
 - ***90% acres planted to wheat or covers during in the winter. Balance is wheat /d.c. milo residues.***
 - ***100% ground cover is the goal. I don't want to see the soil.***



Cover Crops Used Past 5 Years

- Cereal Rye, Ryegrass, Radishes
- Sunn Hemp, Cowpeas, and Radishes Single Covers in 2008,2009.
- Blends: Sunn Hemp, Sorghum Sudan, Cowpeas, Radishes, Canola, Sterile Corn, Sunflowers, Forage Soybeans, Pearl and German Millet, Mung Beans, Lupins, Crimson Clover, Barley, Hairy Vetch, and Turnips.



How we got started with Cover Crops

- **2007 wheat freeze**
 - Sandy flood field planted to wheat.
 - Sprayed it with round-up after it was headed and planted soybeans into it mid-May.
 - Gravel field with 5 year average yield of 45 bushel per acre.
- **2007 yield was 67.5 bushel, used 35% less irrigation water, 1 round-up spraying vs. 3 in a typical year.**
- ***Got us thinking maybe we need to take a closer look at cover crops.***



Rye and Radish Program

- After corn is harvested we plant 50-70 lbs of rye and 2-3 lbs of radishes behind the combine in September.
- That will grow until mid-late April when the rye begins to head.
- We spray out rye with 32 oz round-up and 10 oz 2-4,d.





**NO-TILL
FARMER**





**NO-TILL
FARMER**





Rye and radishes October 15th, 30 days growth, 1265 acres planted this fall



Radish growth 48 days after planting with .65 inch of rainfall in 2010



Rye root mass in March 2011. Extremely dry spring



Rye residue after burndown and planting May 2012



Rye and radish residue



Soybeans 3 weeks after planting May 2012



Rye residue in late July 100% ground cover



**NO-TILL
FARMER**



Soybeans weathering drought of 2011 because of residue cover



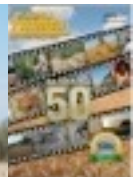
**NO-TILL
FARMER**



Still have 100% ground cover at harvest



**NO-TILL
FARMER**



Still have 100% ground cover after harvest



**NO-TILL
FARMER**



Wheat planted 5 days after harvest 2012



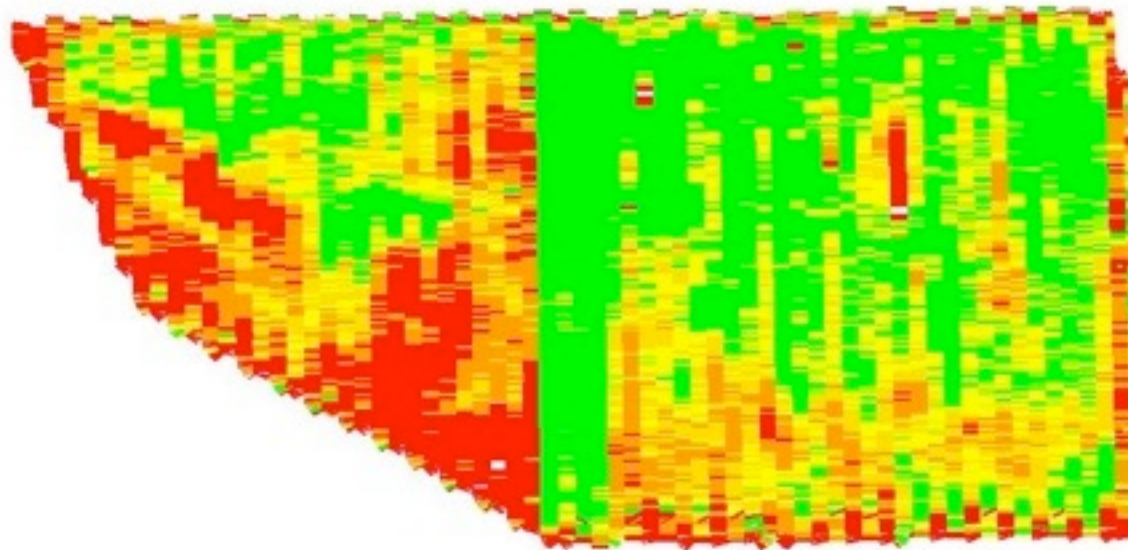
Wheat 2 weeks after planting (residue quickly disappearing due to high biological activity)



**NO-TILL
FARMER**



Jacob Farms Stamback 80 flood irrigation 2011



0 160ft

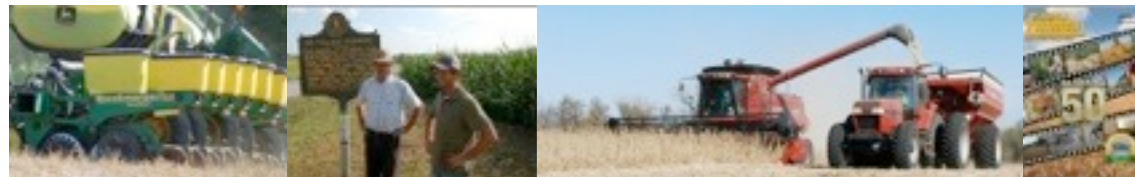
**NO-TILL
FARMER**



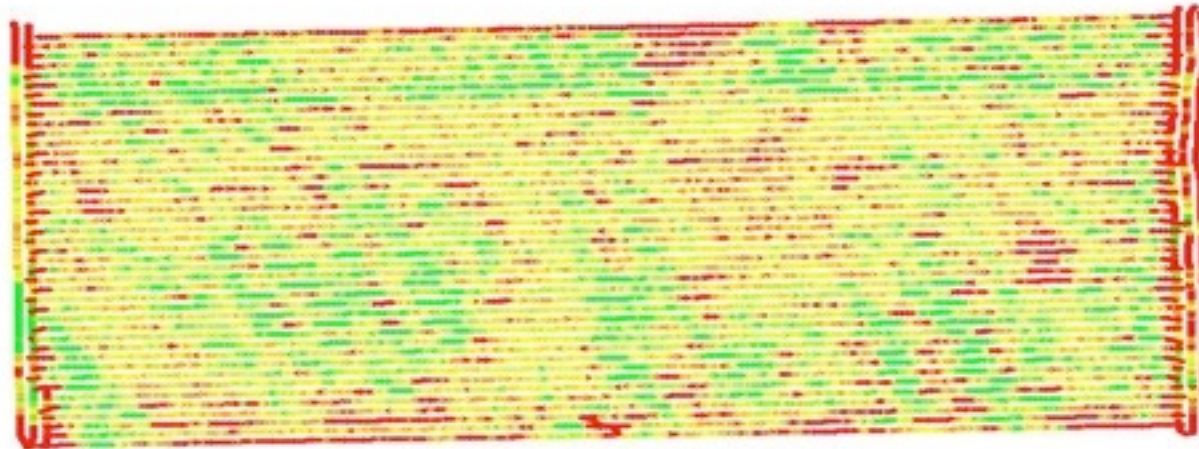
1
N

Soybean rye test 2011

- **Field Avg: 48.6 acres 46.79 bu/acre**
- **Rye strip: 3.48 acres 58.75 bu/acre**
- **No rye avg: 45.1 acres 45.87 bu/acre**
- ***Yield increase from rye: 12.88 bu/acre***



Soybeans in rye cover 2009 dryland



0 200ft

**NO-TILL
FARMER**



1
N

Dryland rye test 2009(wet year)

- **Field avg: 78.8 acres 70.2 bu/acre**
- **Rye strip: 11.6 acres 77.4 bu/acre**
- **No rye avg: 67.2 acres 68.7 bu/acre**
- ***Yield increase from rye: 8.7 bu/acre***



6 Years of Rye Results

- Economics:
 - 9 bushel increase @ \$13.50 = \$121.50 Average
 - 3 bushel increase @ \$13.50 = \$40.50 low
 - 18 bushel increase @ \$13.50 = \$243.00 high
 - Costs:
 - Drill cost = \$13.50/ acre
 - Seed cost = \$ 15.00/acre
 - Burndown on corn ground = \$ 9.75/ acre
 - **Total Cost** **\$38.25**
 - Net \$83.25 /acre average
 \$2.25/acre low
 \$204.75/acre high

This does not factor in chemical or irrigation savings!!!!

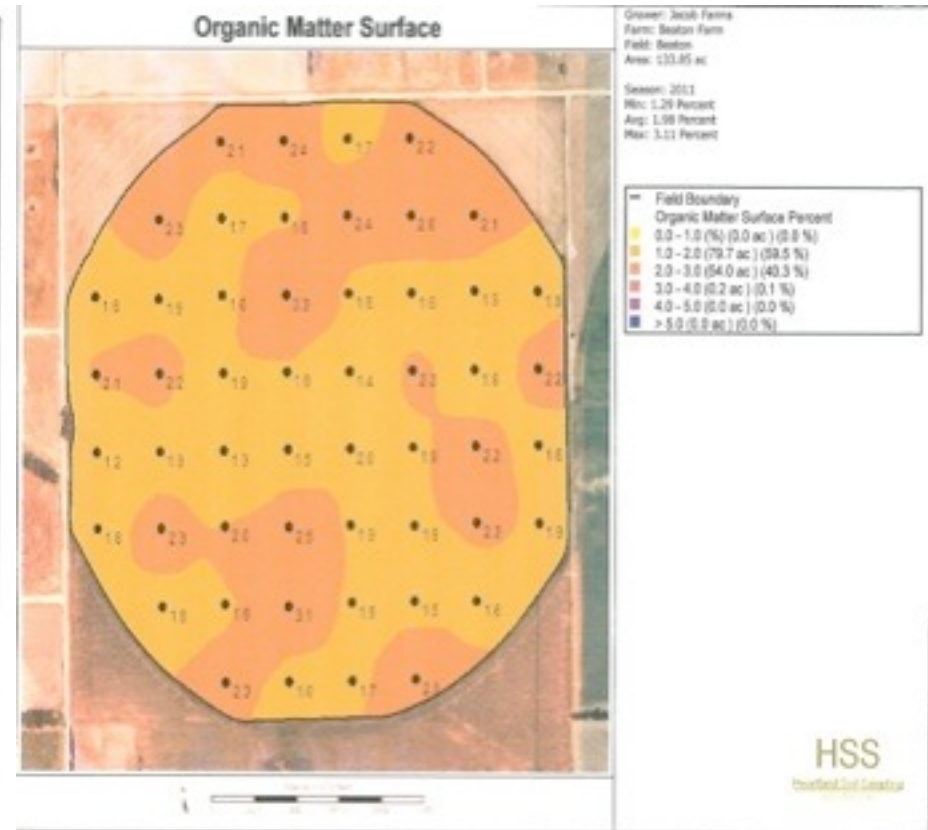
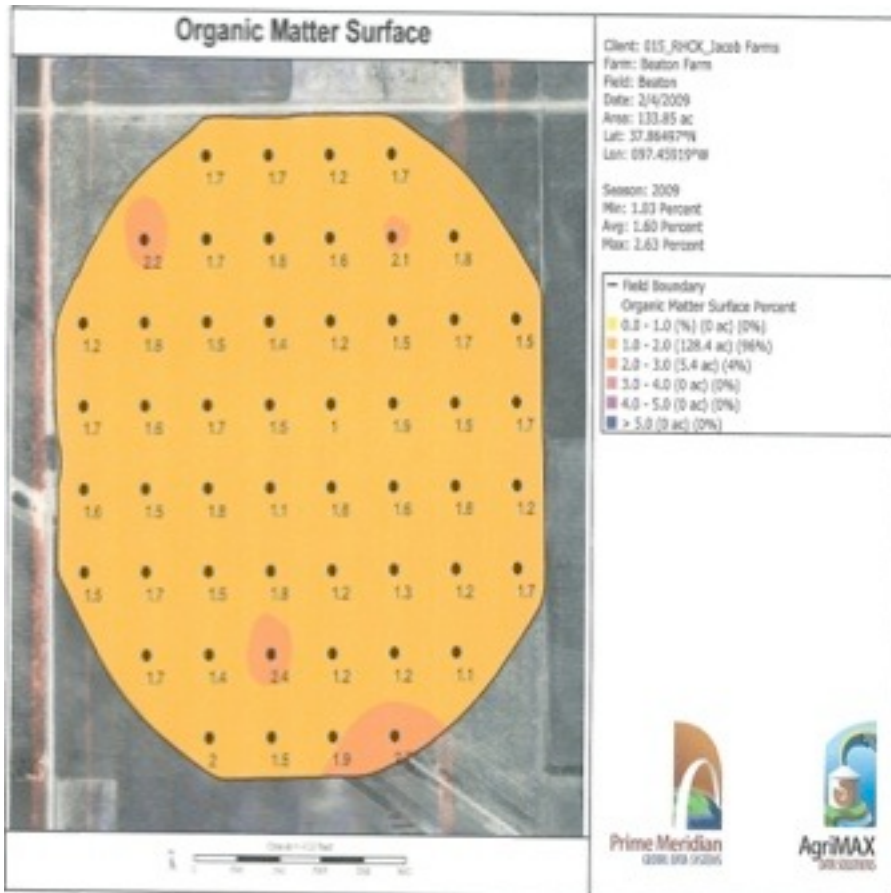


Benefits from Rye Cover Crop

- Good stands when planting into rye cover crop.
- Excellent weed suppression
- Cooler soil temps with help mitigate heat stress
- Quicker canopy, better plant health
- Cut irrigation by 30-35% on average over 6 years.
- Increasing organic matter rapidly on irrigated circles.
- Increased yields:
 - Tested for 6 years now on replicated side by side trials. Average yield increase has been 9 bushels with a range from 3-18 bushels over 6 years. 2008,2009 were wet years and 2010, 2011,2012, were very dry years. Have had yield increases in wet and dry years.



24% increase in Organic Matter in 4 Years with Intensive Cropping and Cover Crops.



Sunn Hemp rolled at 52 days 2009



**NO-TILL
FARMER**

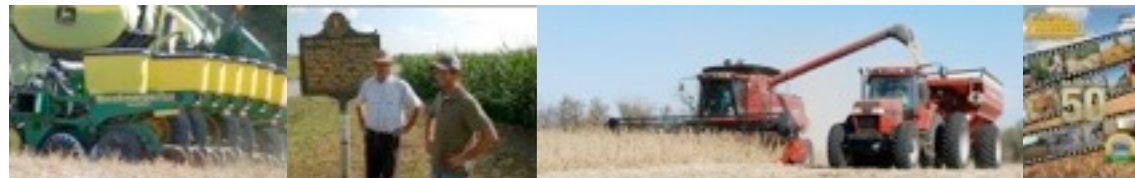


2010 summer mix after wheat of sterile corn, sunn hemp, sunflowers, radishes, and pearl millet



Can Rye Distribute Lime and Raise Available Phosphorus Levels?

- We apply lime every 4 years in small amounts if needed
 - Usually 1-2 ton
 - All fields applied variable rate
 - Usually less than 50% of field needs lime
- We apply lime when rye is next in rotation if possible
 - Rye's massive root system helps lime move deeper in the soil than it would with straight no-till.
- We have increased Phosphorus levels since rye was added to rotation
 - Rye is speeding up the downward movement of the lime which is balancing the pH of the soil at deeper depths which is releasing phosphorus that was previously tied up due to our unbalanced pH levels.
- We lime when soils get down to 6.0 pH. Goal of 6.5 pH.
 - Our old goal used to be to lime at 5.5 pH.
 - Took too much lime, top 4 inches pH was too high, 4-24 inch was too low.
 - Has saved us over \$40,000 a year on phosphorus fertilizer on our dryland acres alone.

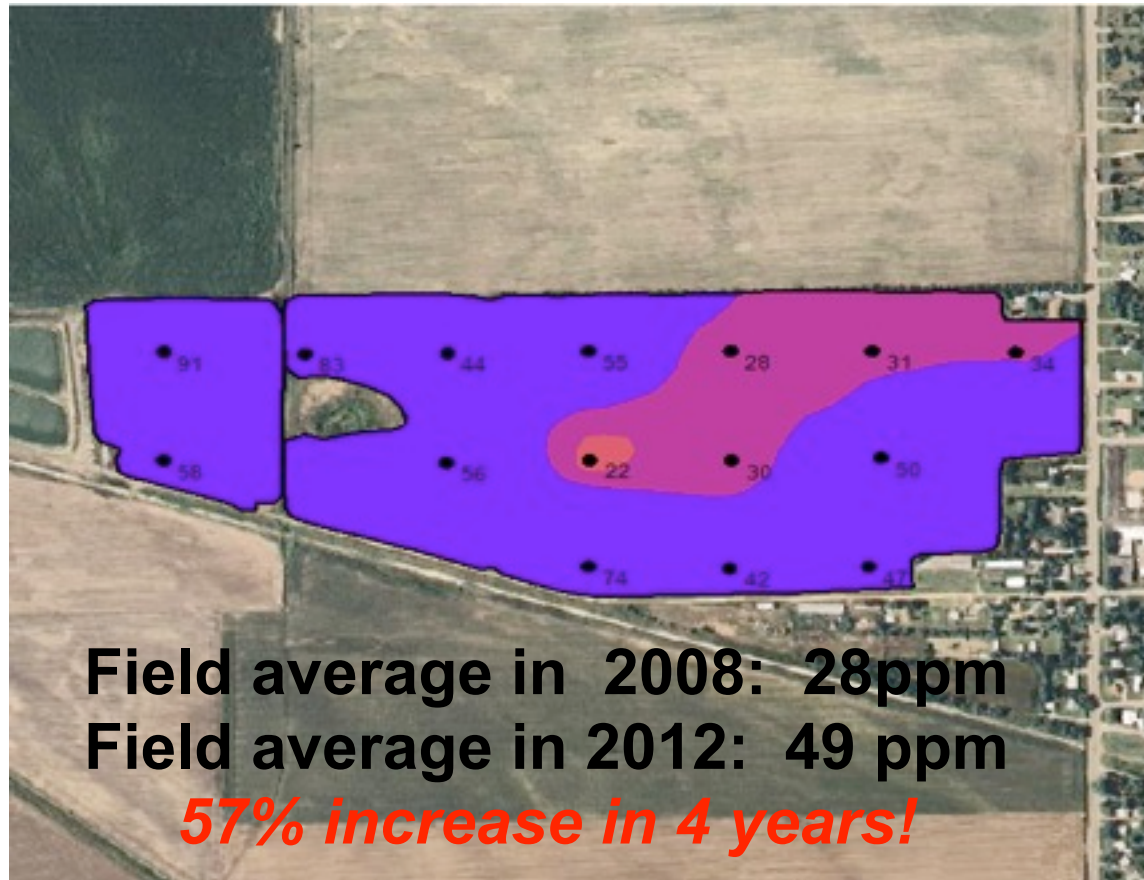


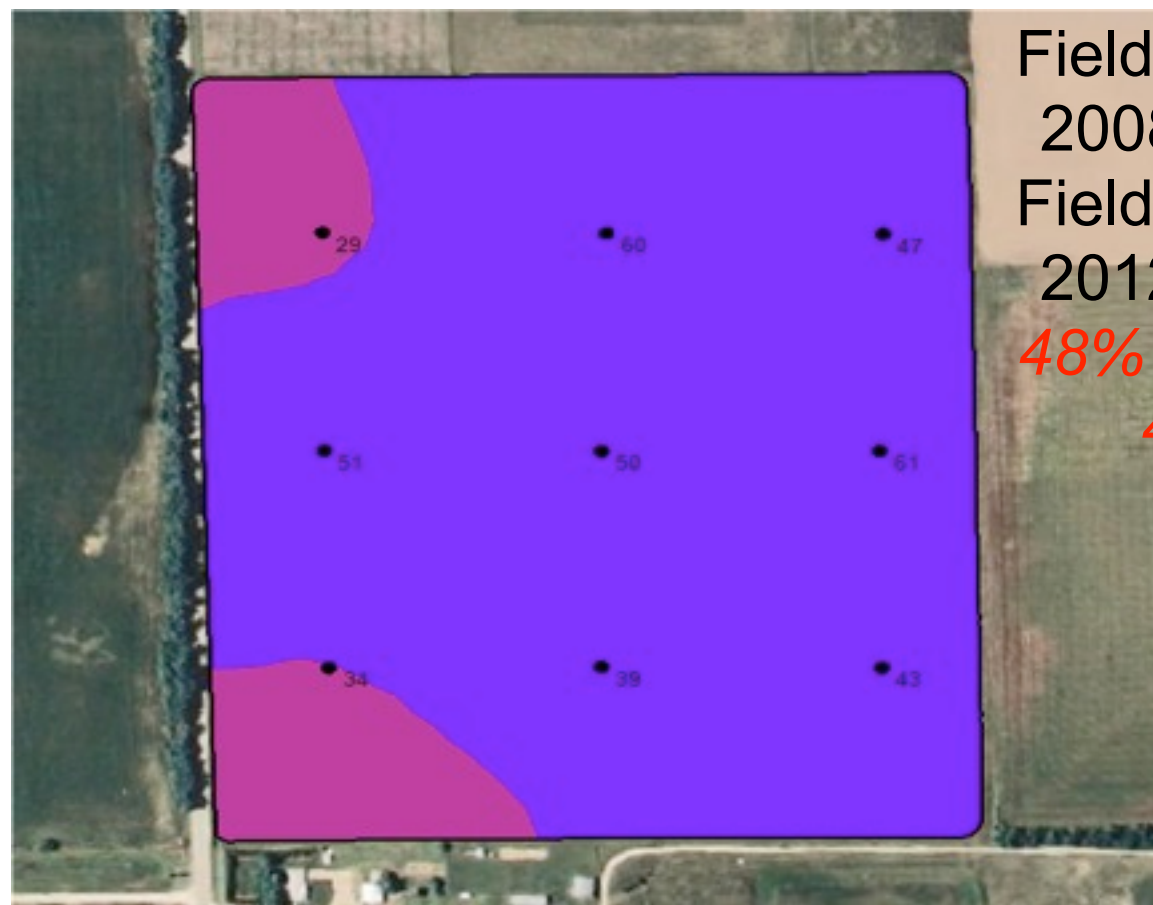
Can Rye distribute lime and Raise Phosphorus Levels?

- Total soil cover provides a living mulch so that roots can grow at the soil surface and pick up fertilizer at the top 2 inches of soil. Total soil cover keeps the surface wet allowing access to surface applied fertilizer and lime.
- Phosphorus, potassium, and lime move faster in the soil with cover crops than in a no-till system without covers because of the constant supply of roots that allow movement of the nutrients.

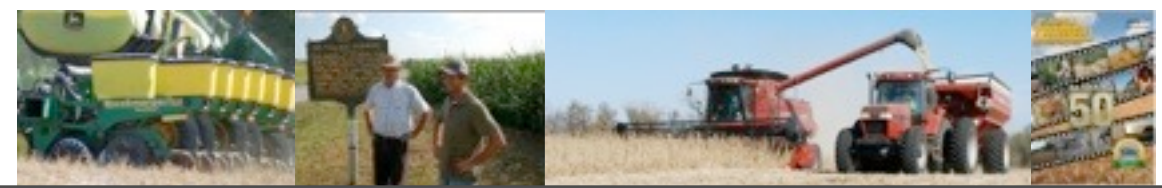


P levels in soil sample





Field Average in
2008: 22 ppm
Field Average in
2012: 45 ppm
*48% increase in
4 years*



Why not to give up on a cover crop planted August 1st 2011



Same cover crop after 1.6 inches of rain in October



**NO-TILL
FARMER**



How not planting rye cover crop on dryland acres in fall of 2011 hurt us.

- Reduced yields because lack of cover. (high evaporation)
- Increased chemical applications to control pigweeds.
 - Spent \$30/acre more on soybean fields without cover crops than with covers to control weeds chemically and still had more weeds than where we used the cover crops!!!
- More evaporation during summer due to poor cover.
- Dry conditions created very “tolerant pigweeds” which required hand pulling in spots on a few fields.
- Very bare soils after soybean harvest without cover crops compared to where we used cover crops.





Spring 2012, very warm. no cover crop = early weeds on no-till ground. sprayed fall 2011 with authority XI.



Pigweeds going to seed in April. Nicked up by chemical and confused by short day length in spring made seed.



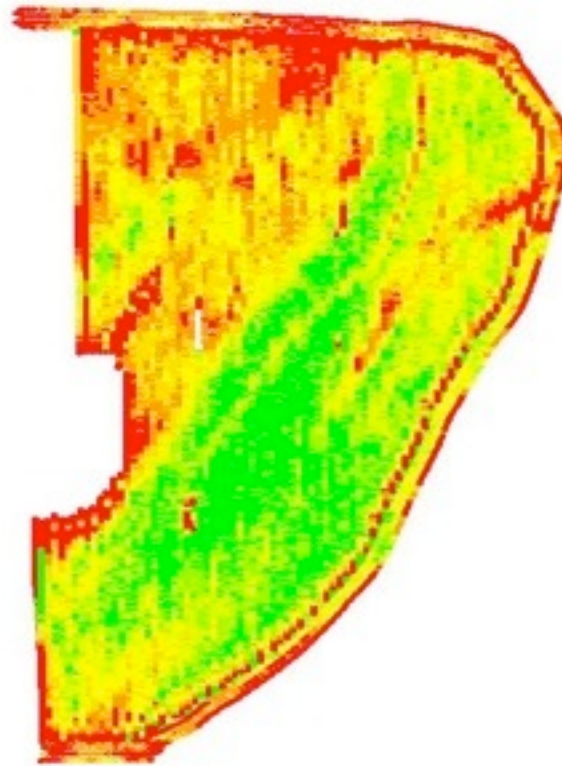
Rye cover crop spring 2012 = no pigweeds



12 acres of full tillage beans no residue= no yield

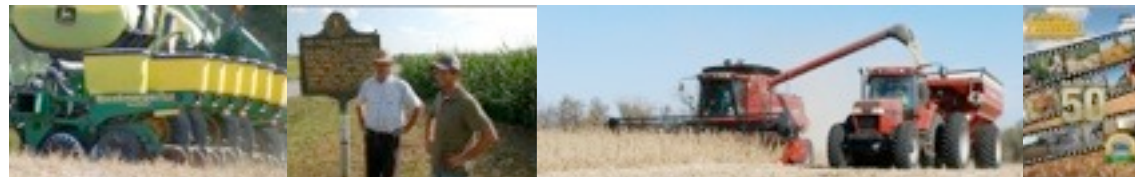


Hidden Successes with Cover Crops



Dryland corn planted into cowpeas

- Field Average: 76 acres 161 bu/acre
 - No cowpea: 11 acres 160 bu/acre
 - Cowpea: 65 acres 182 bu/acre
 - Difference: **+22 bu/acre**
-
- 5 acres 0 yield drowned out
 - 10.23 acres over 200 bushel
 - 18.7 acres over 188 bushel
 - 120 lbs total N applied
 - 8 ppm in soil in top 2 foot sample





This is why we use cover crops and no-till. Neighbors full tillage field blowing onto ours.



2.5 inches of soil blew in one day in November. 40 mph sustained winds all day.



**NO-TILL
FARMER**



Fall cover of crimson clover, ryegrass, and radish taken
same day as blowing pictures.



**NO-TILL
FARMER**



Rye and radish planted right beside field that was blowing.



**NO-TILL
FARMER**



What have we learned?

- Cover crops continue to improve our soil while adding money to the bottom line.
- If I can breakeven on the cost vs. initial benefit, (yield increase, reduced chemical costs and fertilizer costs), I think the long-term benefits will pay for many years to come.





Questions?

ryan@jacobfarms.com

jacobfarms.com

