

Economic Benefits of a Precision Ag Based 4-R System

By Grant Strom

Co-Owner/Operator Strom Farms

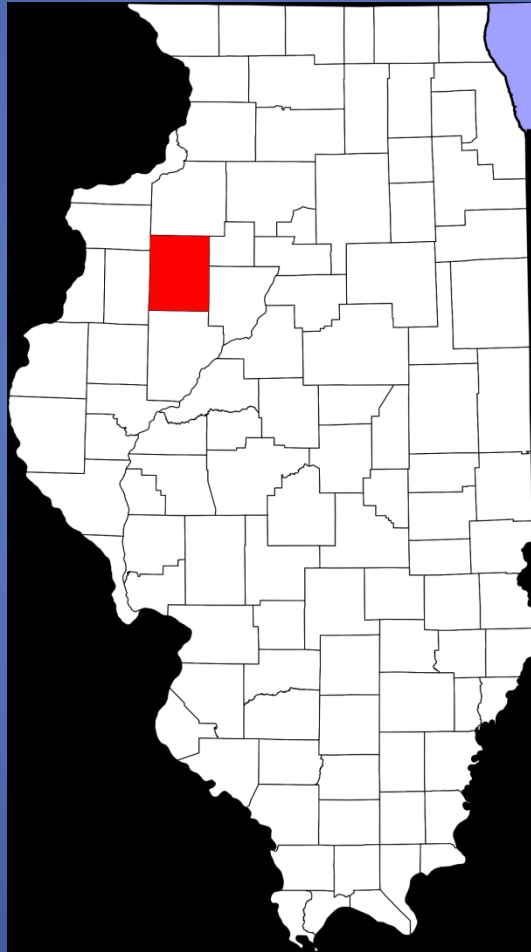
Dahinda, Illinois

Strom Farms

- 5,500 acres of Corn & Soybeans
 - 3,200 acres of Corn
 - 2,300 acres of Soybeans
- 80% of fields rotated and are no-till/conservation till
- Farms are highly variable in soil type, slope, and size
- Creates need for efficiency=adoption of technology

Strom Farms

Knox
County
Illinois



4R Nutrient Strategy

- Right Source
 - Match fertilizer to crop type needs
- Right Rate
 - Matches amount of fertilizer type crop needs
- Right Time
 - Make nutrients available when crops need them.
- Right Place
 - Keep nutrients where crops can use them

Why 4R's for Storm Farms

- Diverse production needs
 - High variability in field conditions
 - Sensitive soils
 - Floodable and high risk acres
- Needed to increase fertilizer efficiency—create a sustainable system for future generations.
- Talk of increased regulations:
 - Gulf Hypoxia
 - Lake Erie
 - Chesapeake Bay

Changes with the 4R's

- Have used VRT for P and K needs for many years
 - Traditionally 2 year applications
 - Changed to 1 year applications
- Have increased focus on Nitrogen in recent years
 - All Spring or in-season applications now
 - 2019—1st year with N on planter
 - Experimenting with Variable Rate N
- **Economics:** Increased fertilizer efficiency with less lbs/bushel produced=savings\$\$\$.

Building a 4R Blueprint

- Know your fields AND know your soil
 - Every field needs a different recipe
 - Can't change field in one year
- Start with accurate soil sampling
 - P, K, Ph, Organic Matter, CEC are the basics
 - Incorporate micronutrients when the macros are addressed.
 - Test frequently and consistently
- Field topography
- Drainage system?

How to analyze P.A. Investment

Grain Farming is unique...we buy finished/value added products and technology to produce a raw consumer product. We have to spend a lot of time deciding value that is often difficult to quantify.

- Tangibles vs Intangibles
 - Fuel consumption, fertilizer efficiency, yield response, equipment cost
 - Yield variability, price fluctuation, fatigue, family time, personal accomplishment

How to analyze P.A. Investment

- Case study
 - Worked with Dr. Sally Flis, Director of Agronomy with The Fertilizer Institute
 - Analyzed our farm's 4R practice evolution from 2014-2017
 - Showed a cost per acre decrease range of \$16.49 to \$25.31 per acre while reducing GHG emissions by 34.7%

Dry Fertilizer Example

Pat's North—258 bu/A Corn 2018

Removal rate: 90 lbs P, 65 lbs K

200 lbs of 0-46-0 @
\$427/ton=\$42.70/A

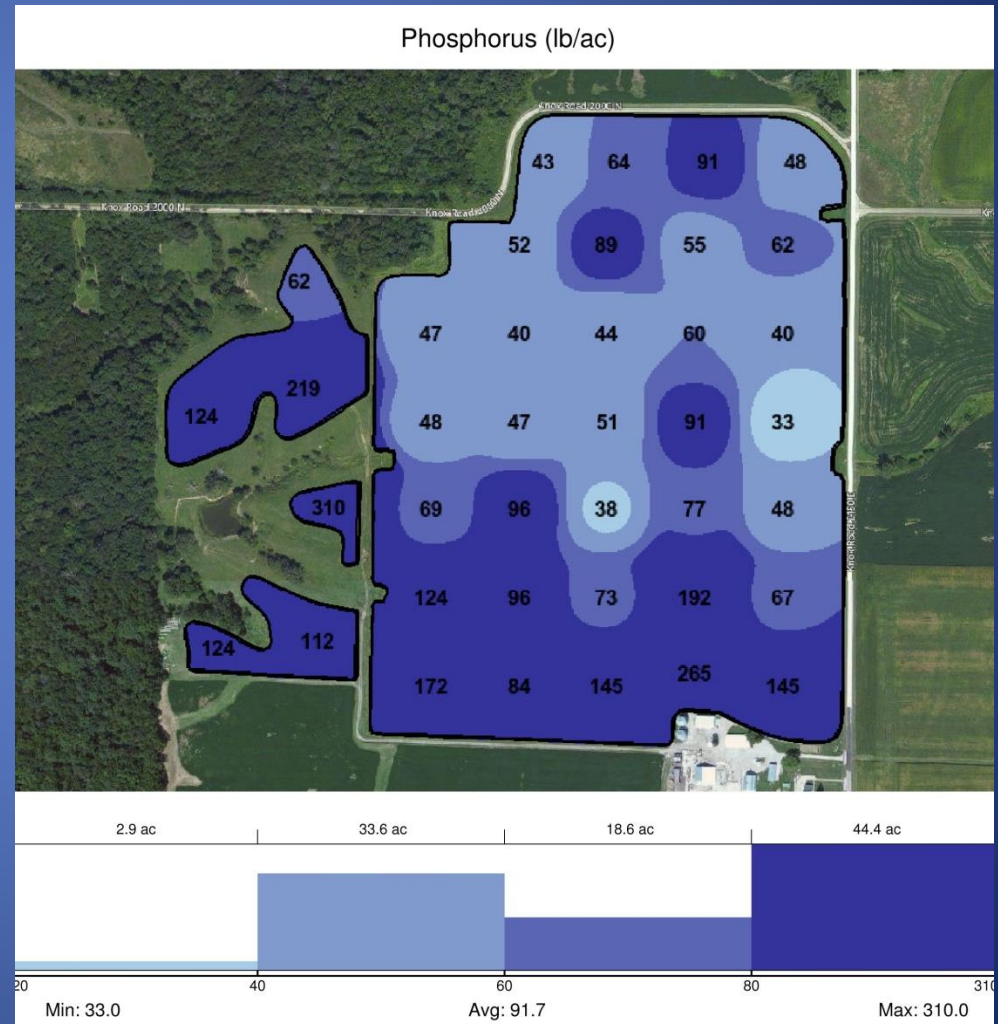
Total on 100 acres=\$4,270 plus app

VS.

Variable Rate application of 0-46-0
@ average rate of 61 lbs per acre

61 lbs of 0-46-0 @
\$427/ton=\$1,303/A

Decrease of \$2,967.00



Dry Fertilizer Example

Pat's North—258 bu/A Corn
2018

Removal rate: 65 lbs K

100 lbs of 0-0-60 @
\$336/ton=\$16.80/A

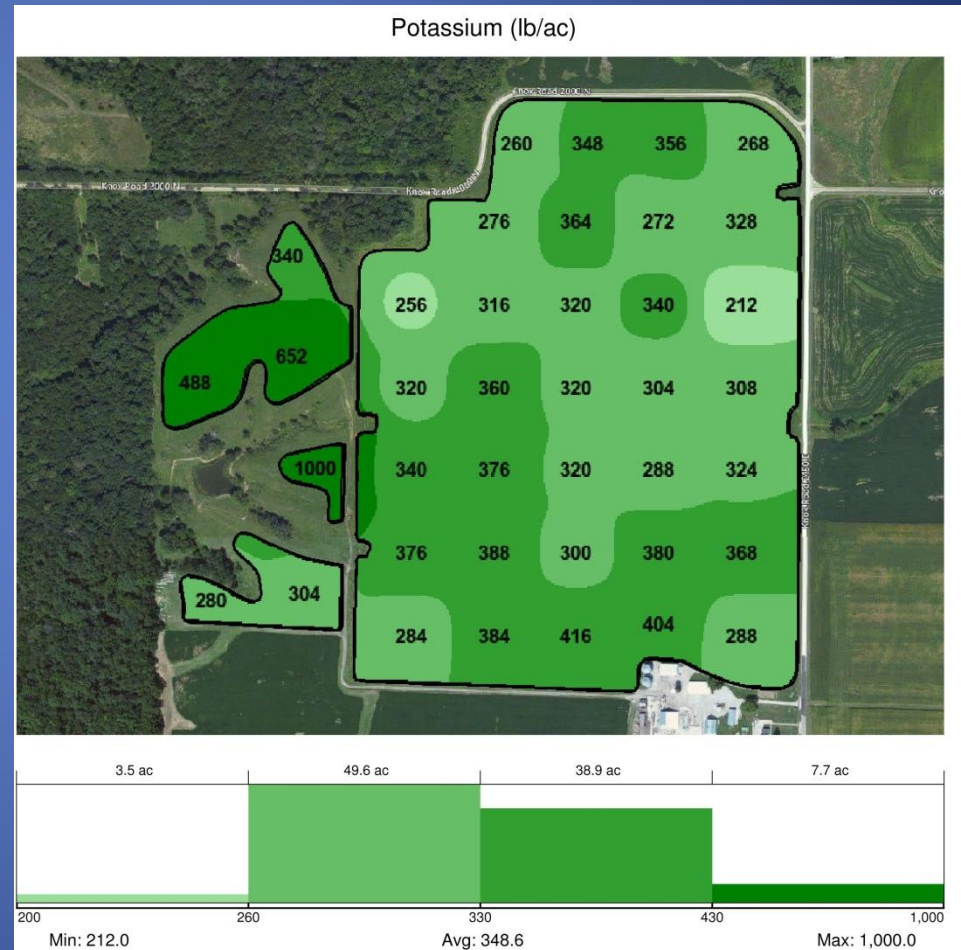
Total on 100 acres=\$1,680 plus
app

VS.

180 lbs of 0-0-60 @
\$336/ton=\$30.24/A

Total on 100 acres=\$3,024

Increase of \$1,344.00



Dry Fertilizer Example

- Decrease expense on Phosphorus--\$2,967
- Increase expense on Potash--\$1,344
- Fertilizer savings of \$1,623
 - But...also put fertilizer where it was needed to build this field
 - Increased yield opportunity on lower fertility areas

Nitrogen Example

- 100 Percent Spring pre-plant, at plant or post-plant nitrogen on our farm.
 - Spring anhydrous
 - UAN with planter
 - UAN with Sprayer
 - Sidedress anhydrous
 - Topdress Urea
 - Y-Drop or aerial urea if needed
- 2019 has presented multiple challenges

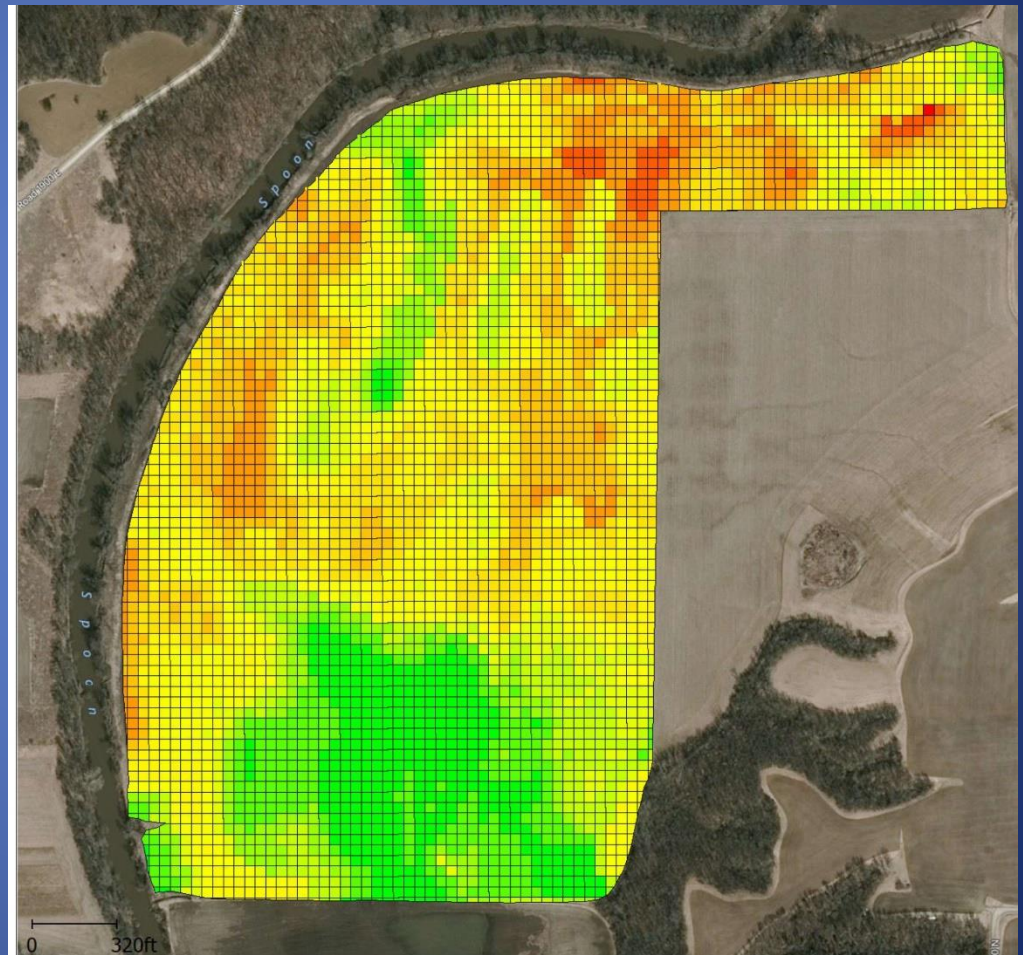
Nitrogen Example

Nitrogen soil testing was indicating between 15-62% of available nitrogen was lost

A 4R nitrogen program gives you flexibility to adjust with little added cost

Extreme example:

- River bottom flooded twice after weed & feed application (20 gal 32% UAN)
- Non-flood areas less loss
- Variable-rate side-dress application of anhydrous ammonia at average rate of 135 lbs of N
- Original plan of 120 lbs of N.



Utilizing your network

- Have at least 2 crop advisors
 - One needs to be an independent
 - Make sure they share the producer's goals
- Use a peer group
 - Find people that strengthen your weaknesses
 - Find out what others have tried
 - You will find much more success in building friends than adversaries

Lessons From 4R's

- You will spend more on equipment and application technology
- You will use less fertilizer per bushel produced
 - Systems approach
 - Must have proper equipment technology
 - Strong genetic selections
 - Healthy and balanced soils
 - Place fertilizer using the 4R strategy

What are the barriers?

- Equipment costs—very difficult for smaller or lower capital operations
- Time consumption—I spend DAYS with my agronomists figuring out products and strategies.
- Farming/fertilizer industry are not yet equipped for a full scale implementation
 - Example Anhydrous Ammonia

How do we convince others?

- What speaks to farmers?
 - Big Yields
 - Saving/Making Money
- These are both achievable with the 4R Nutrient Strategy
- Farmers are business owners: They care about the environment—but they have to be economically viable.
- If you do what is best environmentally with soil and fertility, that has a direct impact on positive long-term economic benefit.

Next Steps for Improvement

- Sampling
 - More soil analysis/better zones
 - Tissue Sampling
- More advanced monitoring systems
 - Field level weather data collection
 - Instant imagery
- More individualization of field characteristic
 - Soil health vs soil type
- Field specific algos & predictability
- Advancement in fertilizer technology

Why 4R for Me

- Economics
 - Much less expense per bushel produced
 - Less product on un-needed areas
- Environment
 - Right thing to do
 - Lead to less regulations?
- Need a sustainable system
 - Public appeal
 - Strong business model

Final Thoughts

- The 4R Nutrient Management system is an economic system not just environmental stewardship
- Every field is different and must be treated as such
 - It takes different precision agriculture tools for every different situation
- Analyze the “Tangible” and “Intangible” benefits of your decisions