Economic Benefits of a Precision Ag Based 4-R System

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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

Source: The Fertilizer Institute, www.nutrientstewardship.com
Why 4R’s for Strom 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%

Research by Sally Flis, Ph.D., The Fertilizer Institute
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 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 & predictibility

• 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