UPDATING TRI-STATE FERTILIZER RECOMMENDATIONS

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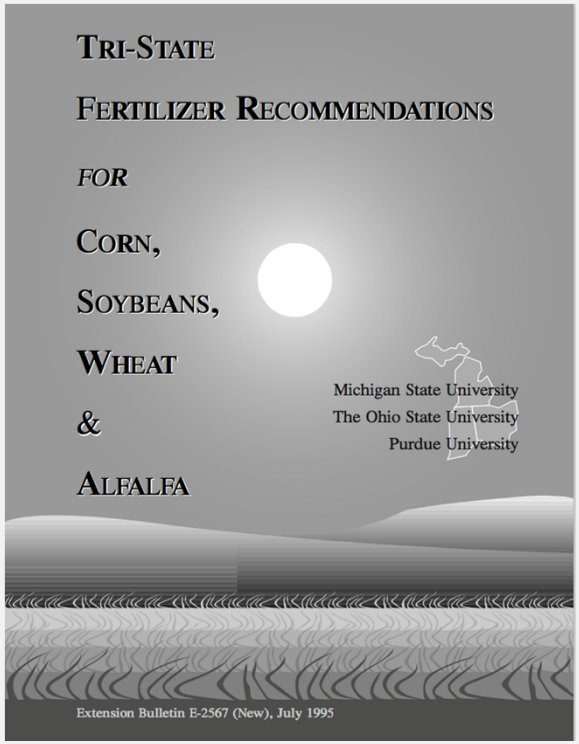
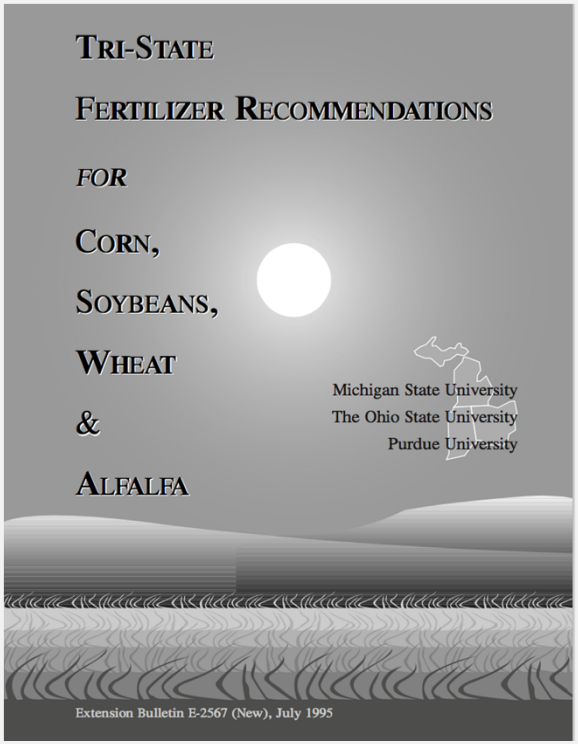
Tri-State Recommendations

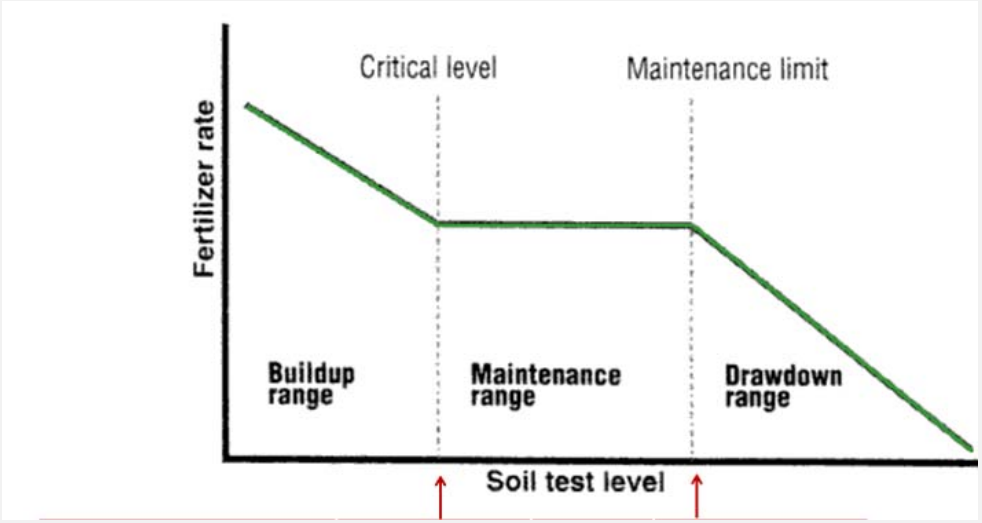
- Originally Published in 1995
- Unified N, P, K recommendations for corn, soybean, wheat and alfalfa across Ohio, Michigan and Indiana
- Served as a cornerstone of fertilizer management in this region



Tri-State Recommendations

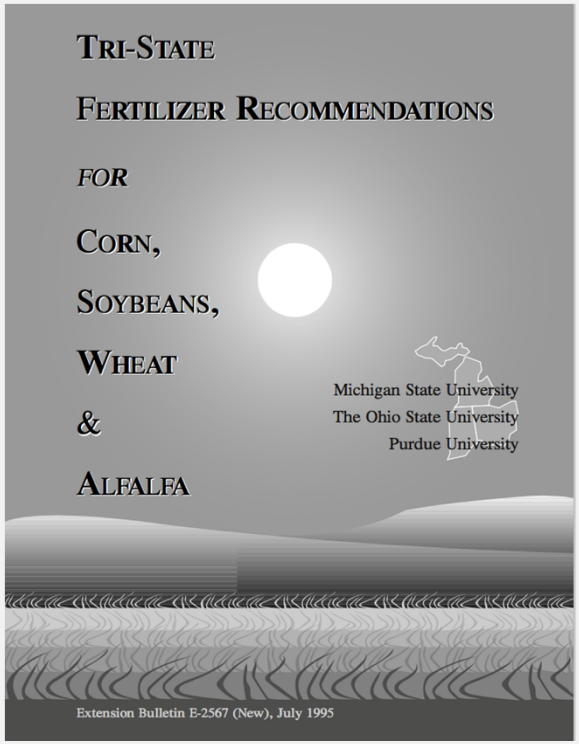
- Phosphorus and Potassium based on build up and maintenance philosophy





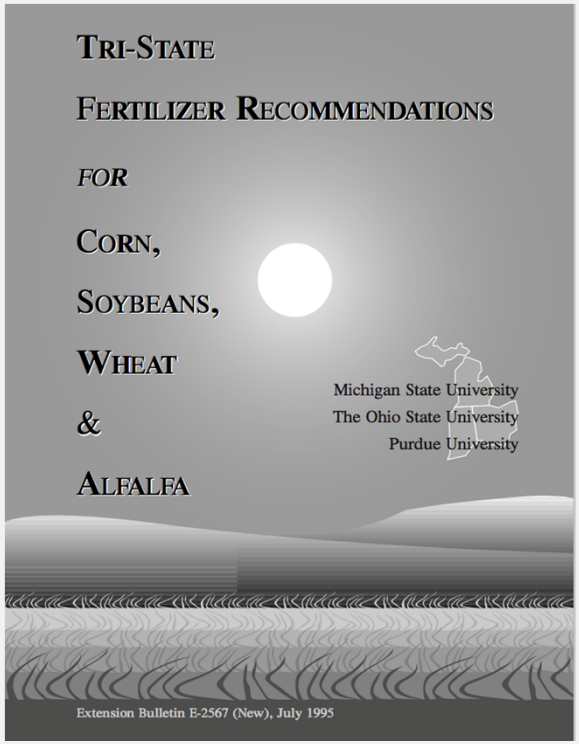
Tri-State Recommendations

- Farming has changed in 20 years
  - Increased yields
  - Increased conservation tillage
  - Adoption of round-up and Bt genetics
  - Reduced rotations
  - New pests and diseases
- In OH-IN-MI, majority of farmland is rented
  - Implications for management?
- Water quality issues has put a spotlight on nutrient management and agriculture



Tri-State Recommendations

- Call to revise fertilizer recommendations
  - *Do Tri-State recs still apply to my highly productive fields?*
  - *I'm renting and don't know how long I will farm this ground. What's the minimum amount of fertilizer I can apply to get a good yield?*
  - *I am concerned about water quality and want to show that I'm doing an even better job managing nutrients on my farm.*
  - *We've moved to variable rate technology and want to dial in multiple rates within a field.*

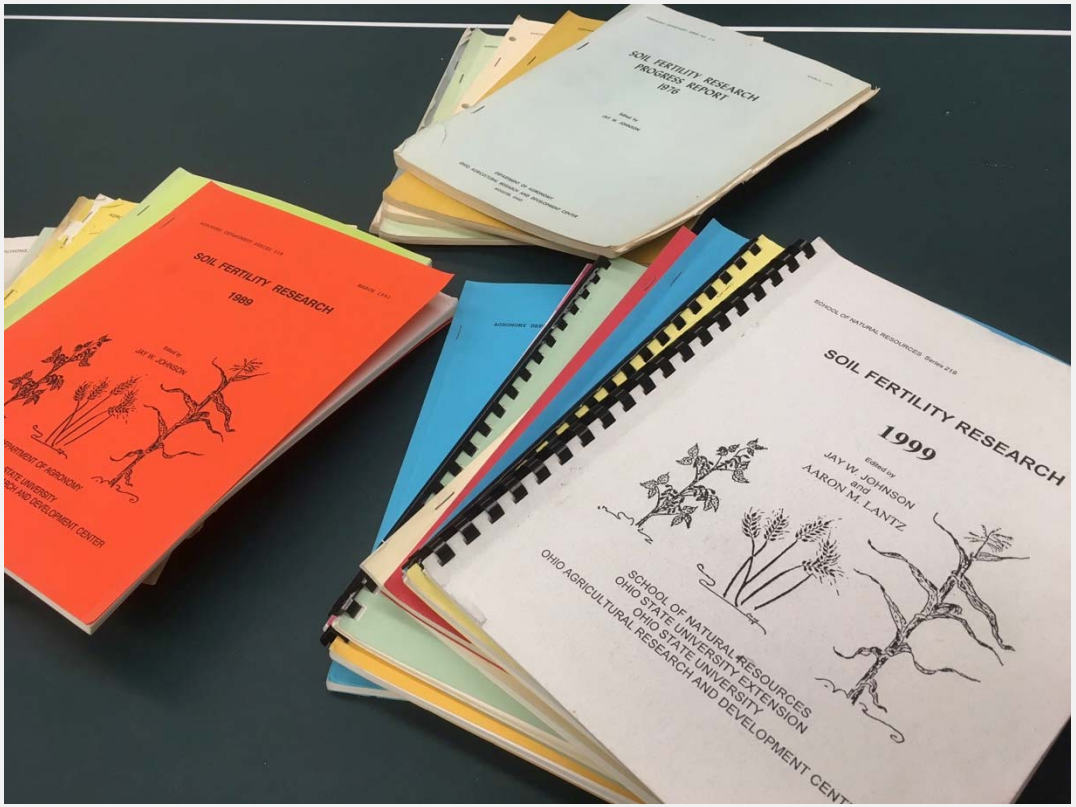


Before we know where we are going, we should probably know where we have been…

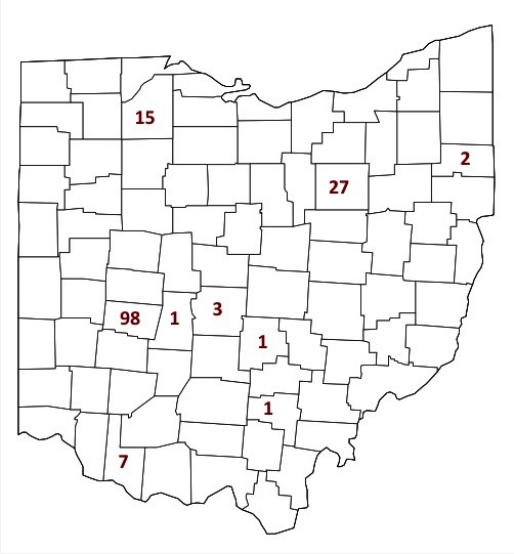
Jay Johnson – OSU Fertility Specialist

Annual Soil Fertility Reports: 1976 – 1999

- 68 P trials (site-years) conducted
- 92 K trials conducted



Ohio Data from Tri-State

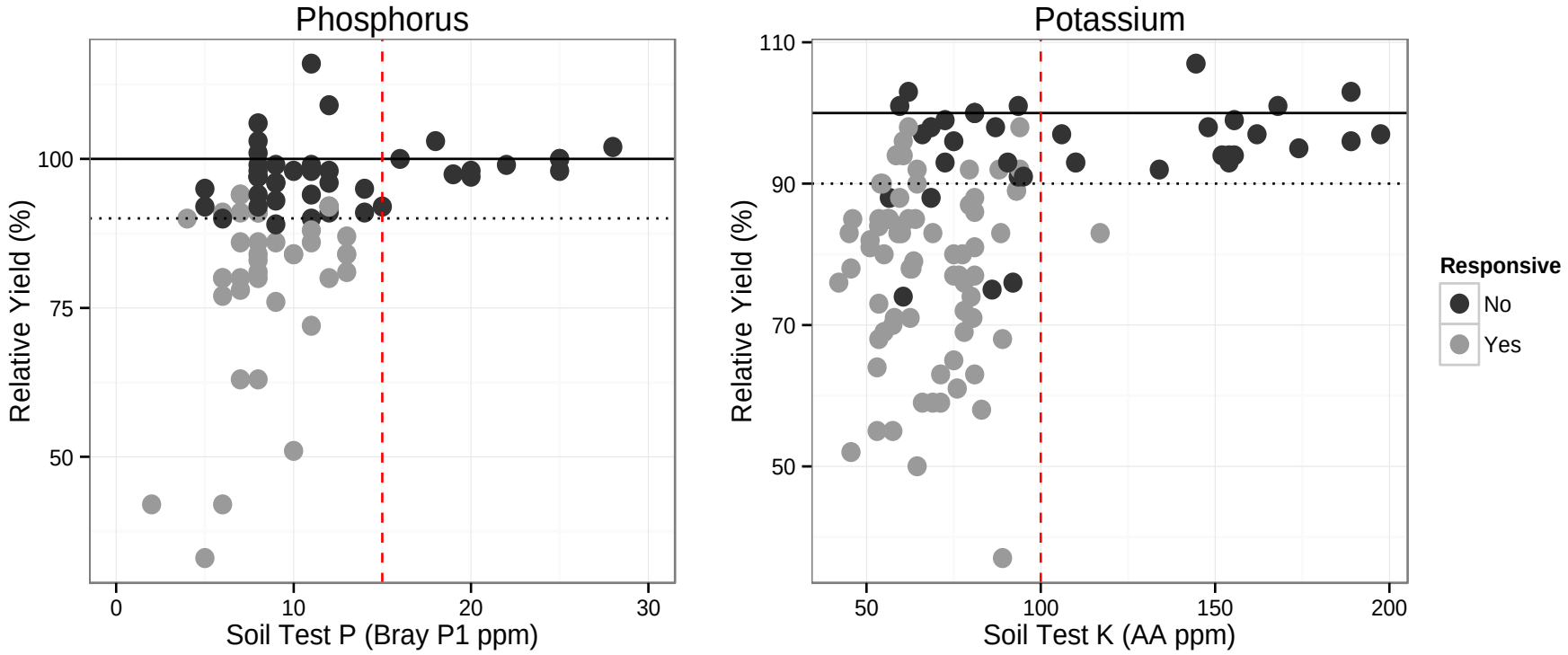


P & K trials were conducted at 9 total sites

Table 1. Number of Phosphorus and Potassium Trials Conducted

	Phosphorus			Potassium		
	Corn	**Soybean**	**Wheat**	**Corn**	**Soybean**	**Wheat**
Responsive	20	6	4	45	16	1
Non-responsive	18	20	0	20	9	1
Total	**38**	**26**	**4**	**65**	**25**	**2**

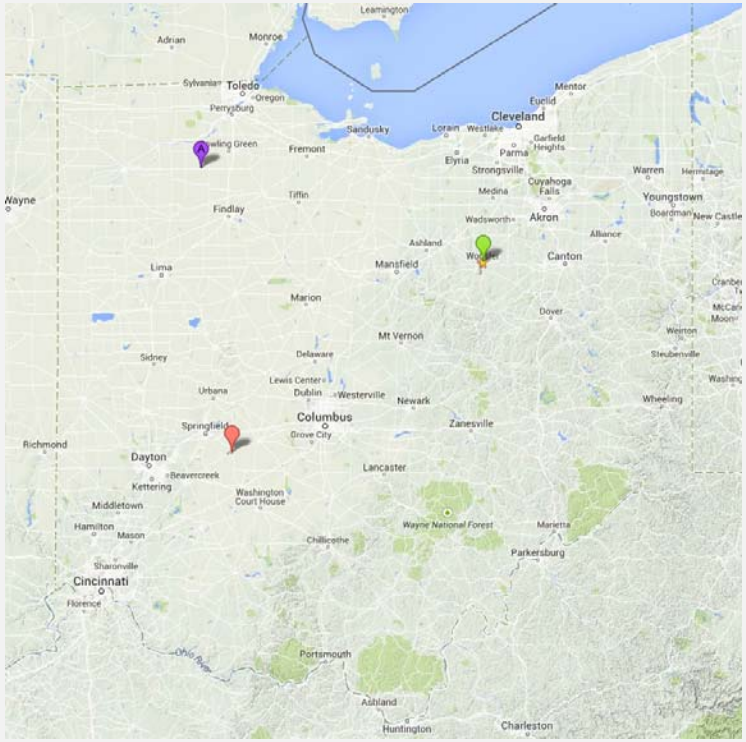
At what soil test level should fertilizer be applied to see a yield response?



More recently from Ohio…

Long-term P & K Plots

- Clark County
- Wayne County
- Wood County



- 2006 – 2014

  (9 years of corn-soybean)

- Fertilizer rate
  - P: 3 rates (0, 1x, 2x estimated removal rates)
  - K: 3 rates (0, 1x, 2x estimated removal rates)

Baseline Soil Data

Soil Property	Clark	Wayne	Wood
pH	6.8	5.9	6.1
CEC (meq/100g)	13	11	22
OM (%)	1.7	1.5	2.9
Bray P (ppm)	29	28	22
K (ppm)	113	113	198

Tri-State Rec Corn and Soybean Maintenance Range

- Phosphorous: 15-30 ppm Bray P
- Potassium: 100-155 ppm AA

Grain Yields (2006-2014)

42 total comparisons of fertilized vs. unfertilized

How many comparisons responded to fertilization?

Yield Responses to Fertilizer

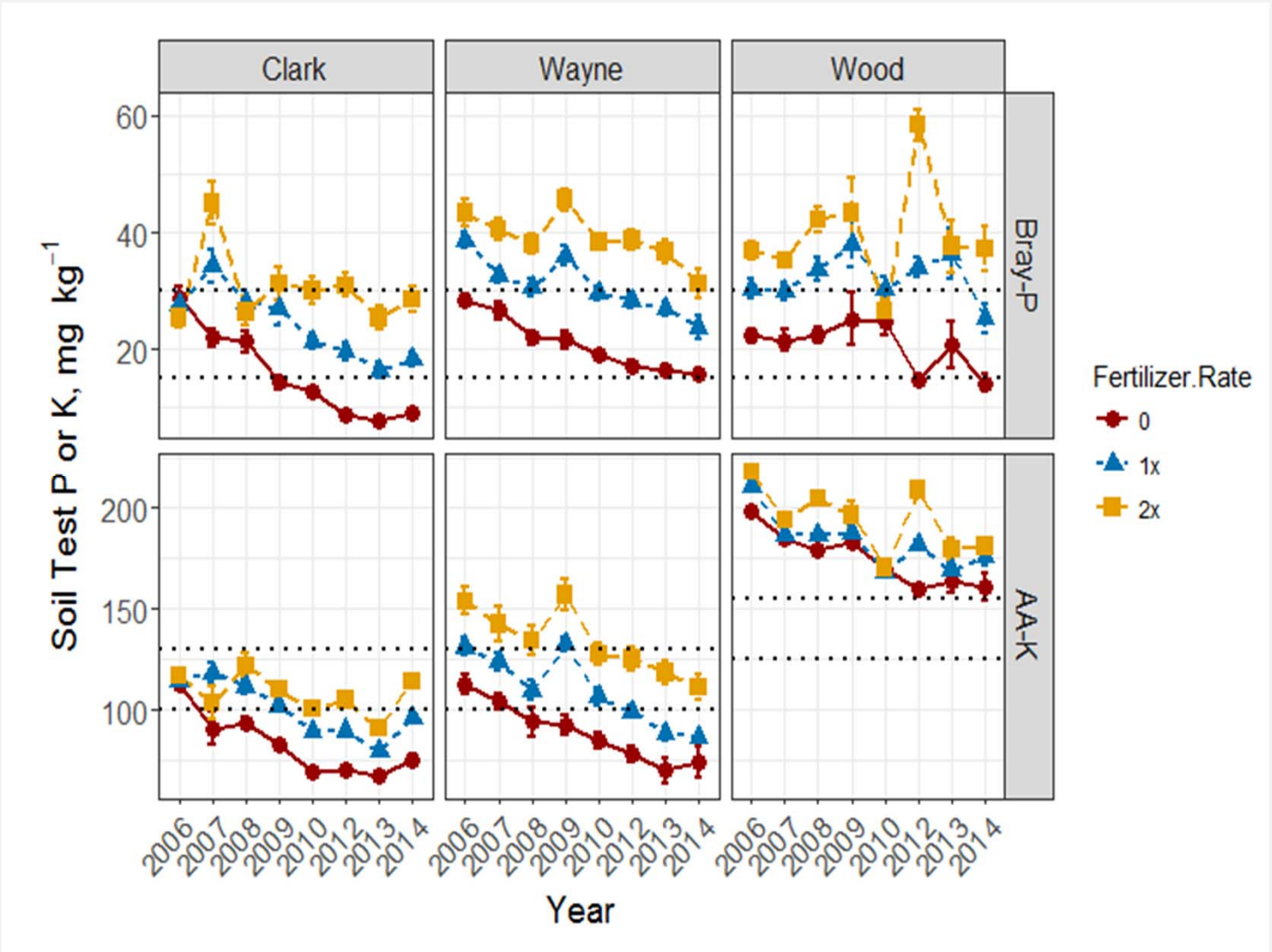
- 10 out of 42 responded to fertilization

Responses greater over time?

Nutrient	Early (2006-2008)	Mid (2009-2011)	Late (2012-2014)	Total (2006-2014)
Phosphorus	0	1	5	6 out of 42
Potassium	2	1	1	4 out of 42

Fulford et al., 2016, Better Crops

Soil Test P & K Trends

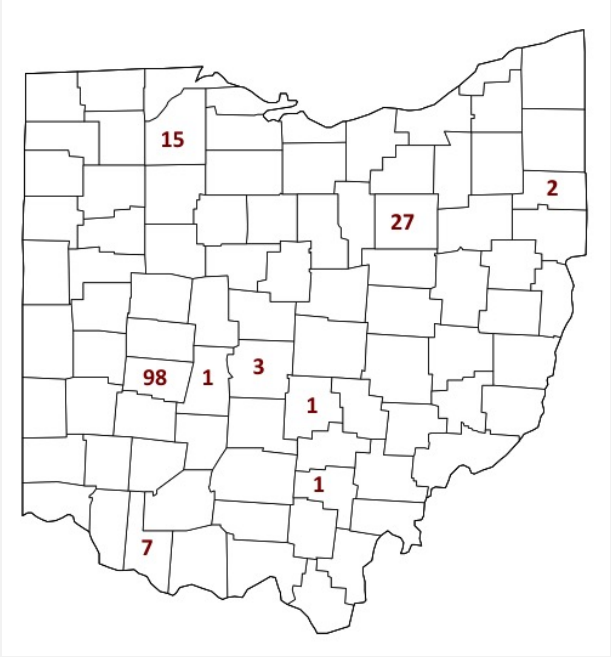


What about current on-farm work?

Overview – Fertilizer Trials

- Funding from Ohio Corn and Small Grain Marketing Programs, Ohio Soybean Council & USDA
- Majority are on-farm trials, some OSU-farms
- Many sites over diversity of soil types and regions in Ohio
- Working directly with growers, but also with crop consultants, agronomists to help facilitate strip trials
- Corn, Soybean, Wheat
  - N, P, K, S

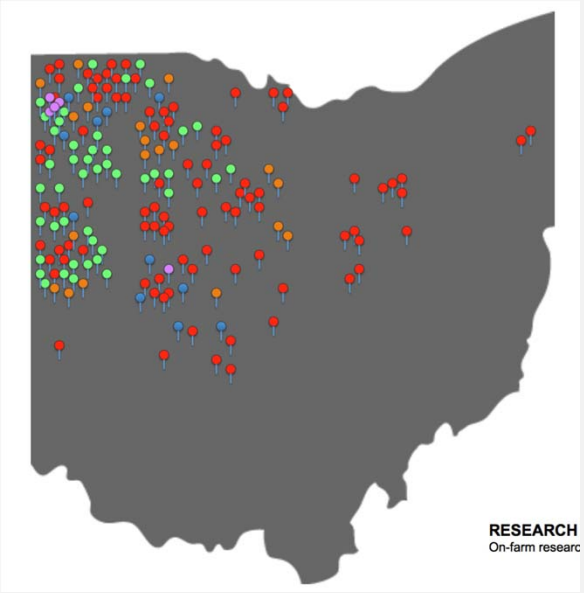
Ohio Data in Tri-State Fertilizer Recommendations Old Model vs. New Model



P & K trials were conducted at 9 total sites

N trials were conducted at 15 total sites

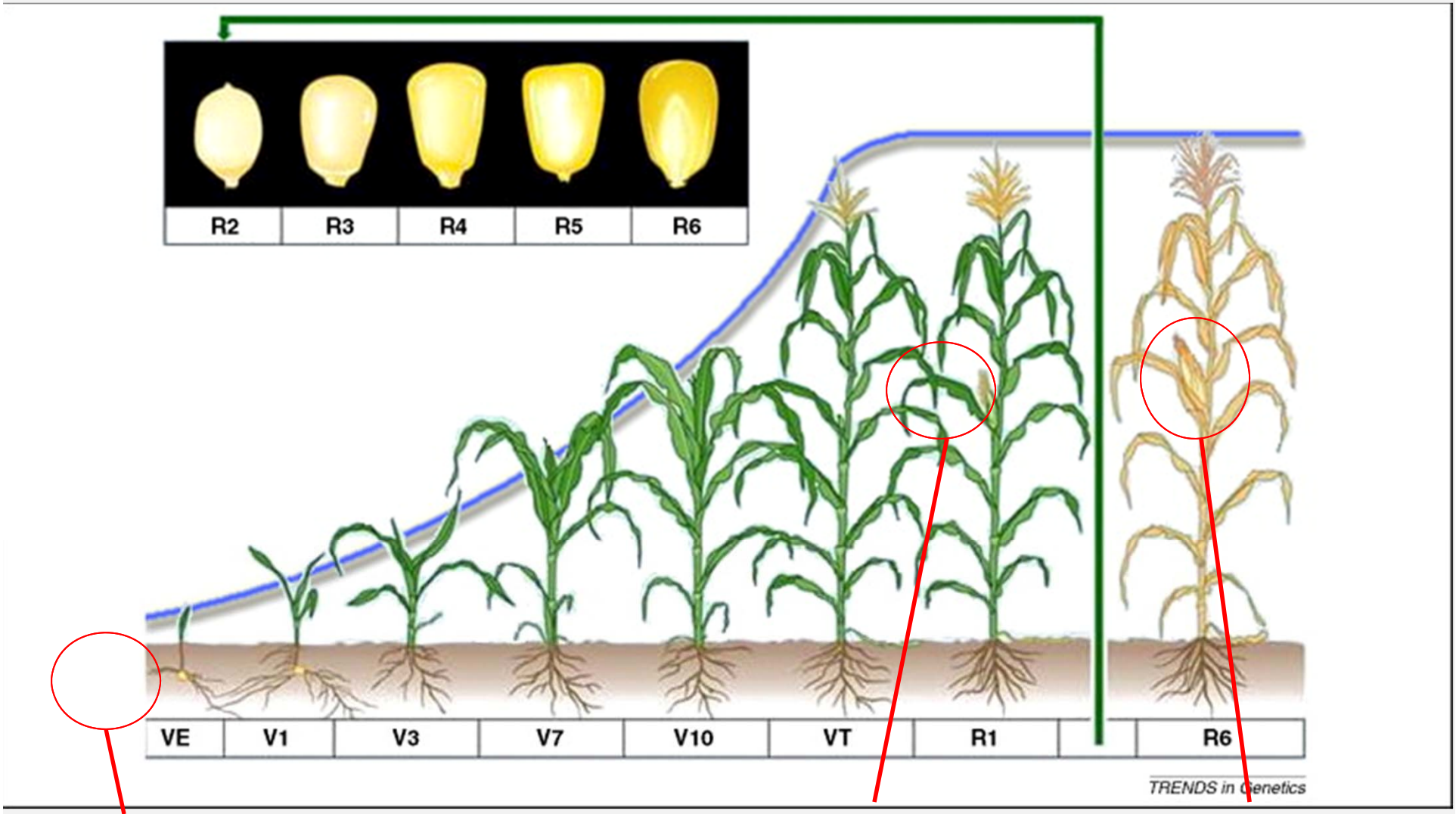
25 years of data



Distribution of on-farm fertilizer trials (2014-2016)

Red and blue points = fert trials
3 years of data

Approach



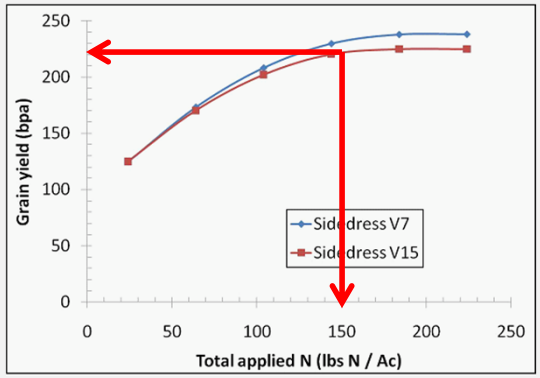
1) Soil sampling

2) R1 Tissue Nutrient Analysis

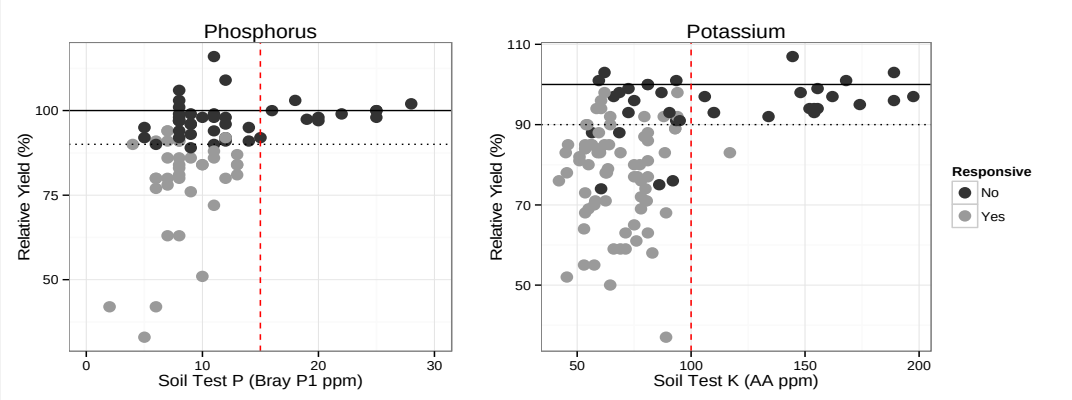
3) Yield & Grain Nutrient Analysis

Two Trial Types

1) N trials for corn and wheat:
   - Multiple rates to develop yield response curve
   - MRTN (economic model)



2) P, K , S trials for corn, soybean, wheat
   - Single rate of +/- fertilizer
   - Relate to soil test levels and tissue test levels (P, K, S)



Where are we now?

2014 – 2016 Field Seasons – 151 total trials

2014

	Nitrogen	Phosphorus	Potassium	Total Sites
Soybean		14	15	17

2015

	Nitrogen	Phosphorus	Potassium	Total Sites
Corn	19	12	9	29
Soybean		13	13	13

2016

	Nitrogen	Phosphorus	Potassium	Sulfur	Total Sites
Corn	38	22	16	3	65
Soybean		22	22		22
Wheat	2	5	5	2	5

2017…?

Where are we headed?

- IN-MI-OH State Specialists met in Fort Wayne and discussed issues with revising Tri-State Recommendations
- Intention to continue to maintain as 3-state document
- Hope to have more dynamic, living document, than a static work revisited every 20 years
- More questions than answers at this point
- Hopefully first chapters will emerge in 2018

Thank You

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