THE MORE-ON PRINCIPLE:

WHY FARMER USE INPUTS LIKE THEY DO

AAE 320

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Common Paradox in Farm Management

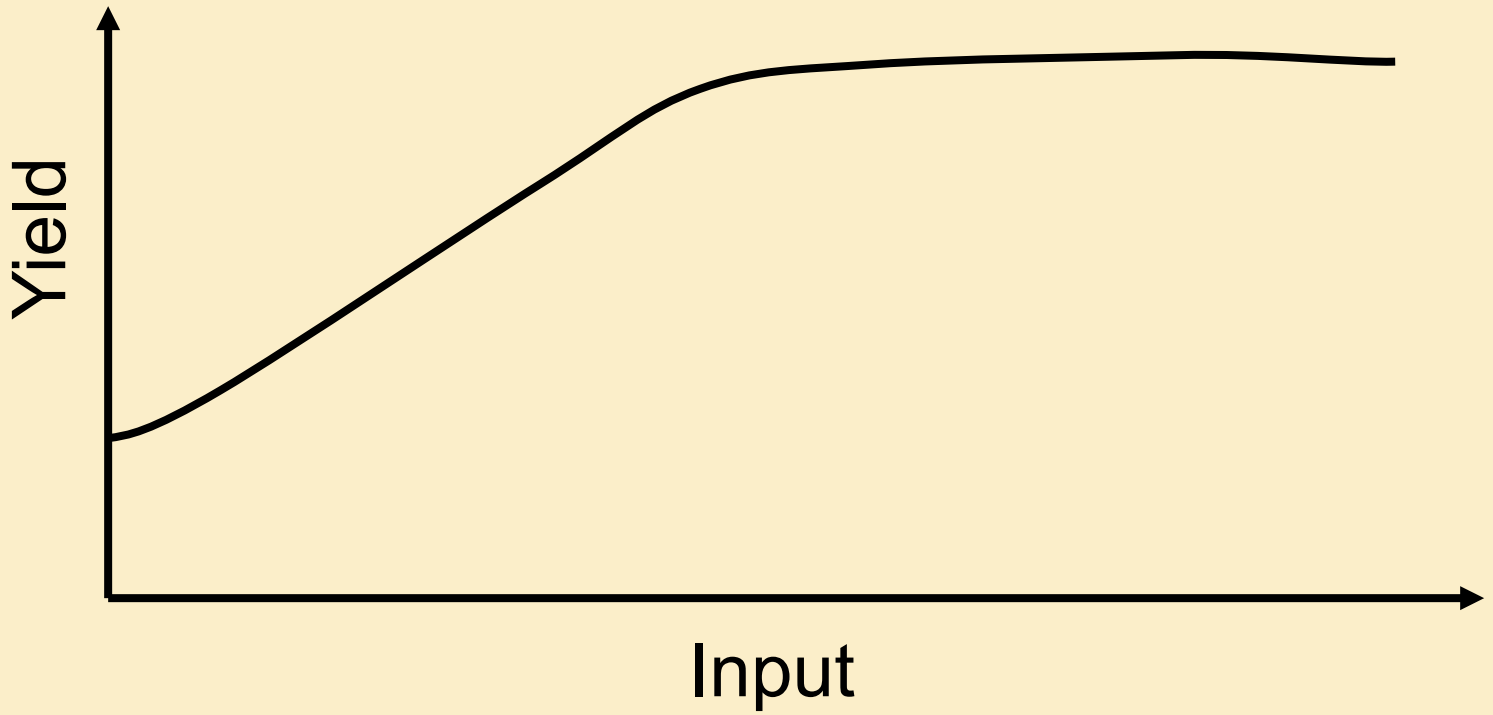
- See many claims that farmers “over use” some inputs that cause environmental pollution: fertilizer, pesticides
- Why would farmers waste money on inputs that they do not need?
- Information deficit problem: Need more education and extension
- Risk: They are using inputs for risk management, so insurance
- Trust: Do not trust the test, technology, science: Demonstrations
- Use subsidies to pay them or Regulations to force them
- Social science response: We do not understand farmer rationality
- My Theory: The More-On Principle

Summary of the Main Point

- 1) Production function becomes inelastic (flat) at or near optimal levels for many inputs, so small profit changes occur over a wide range of input levels
  - **Wide range of input levels will seem consistent with maximizing profit**
- 2) Impact of inputs on yield and profit is hard to clearly identify with all the variability from other factors
  - **Even science has a hard time identifying what's economically optimal**
- 3) Underuse of key inputs is obvious, but overuse is invisible, and inputs are relatively low cost
  - **A common human response in situations like these is to put a little more on, hence the name "The More-On Principle"**
- **This is part of the farmer rationale driving "over use" of some inputs**

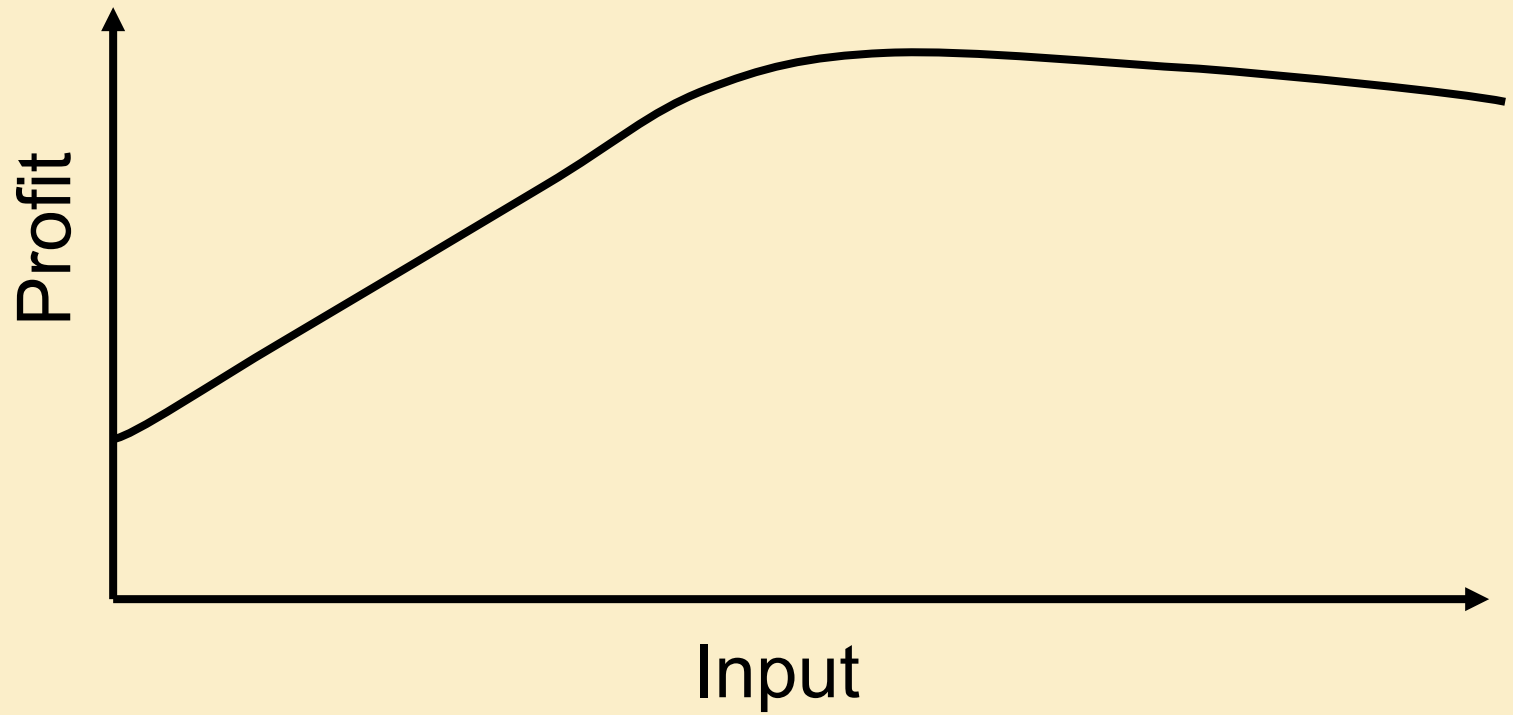
Farming a Flat Function

- For many crop production processes, yield becomes relatively unresponsive to inputs when they are used at near optimal levels

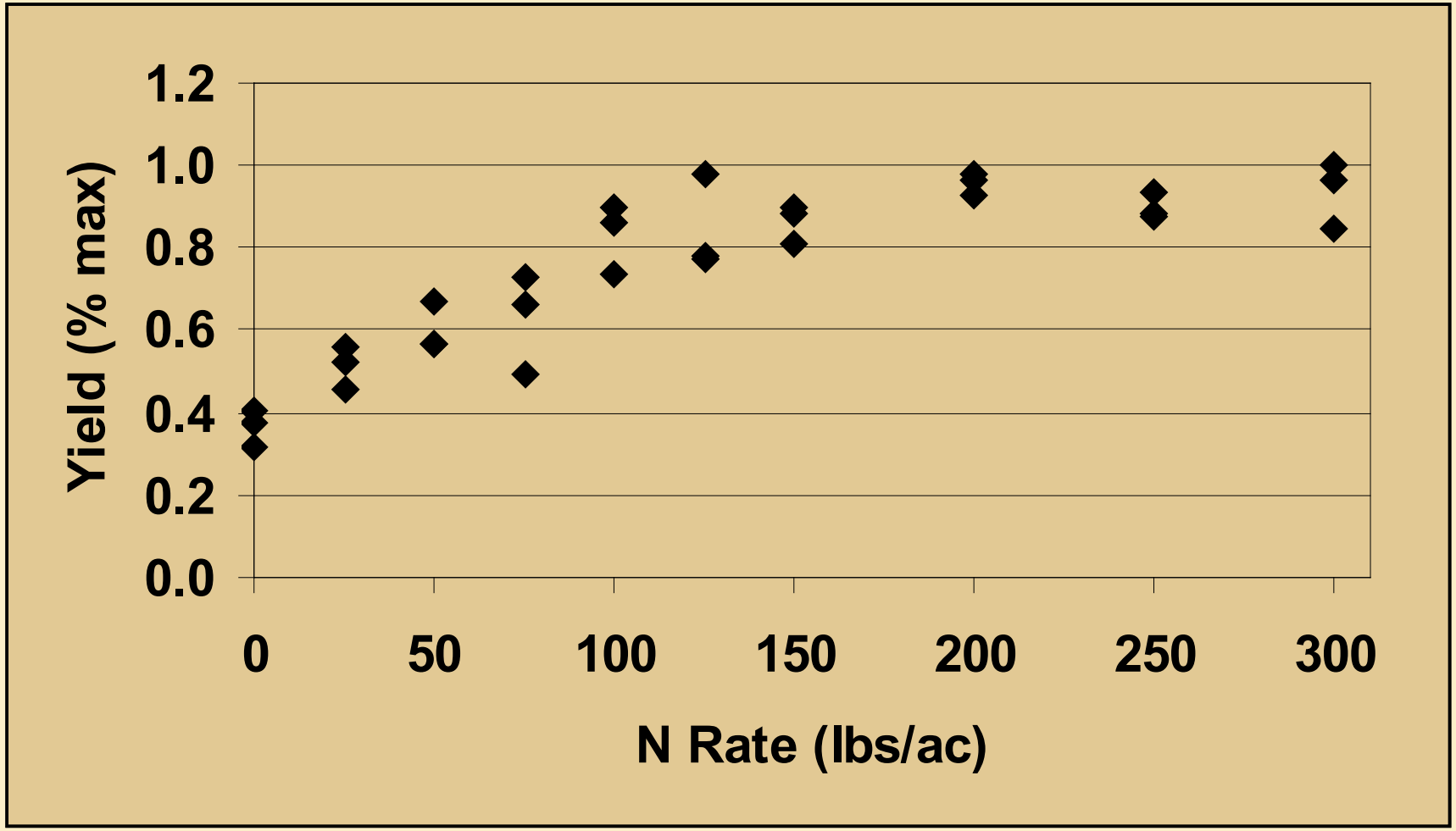


Profit becomes Inelastic to Input Levels

- As a result, profit also has a “flat” response to the input with a long slow decline for the relatively low-cost input

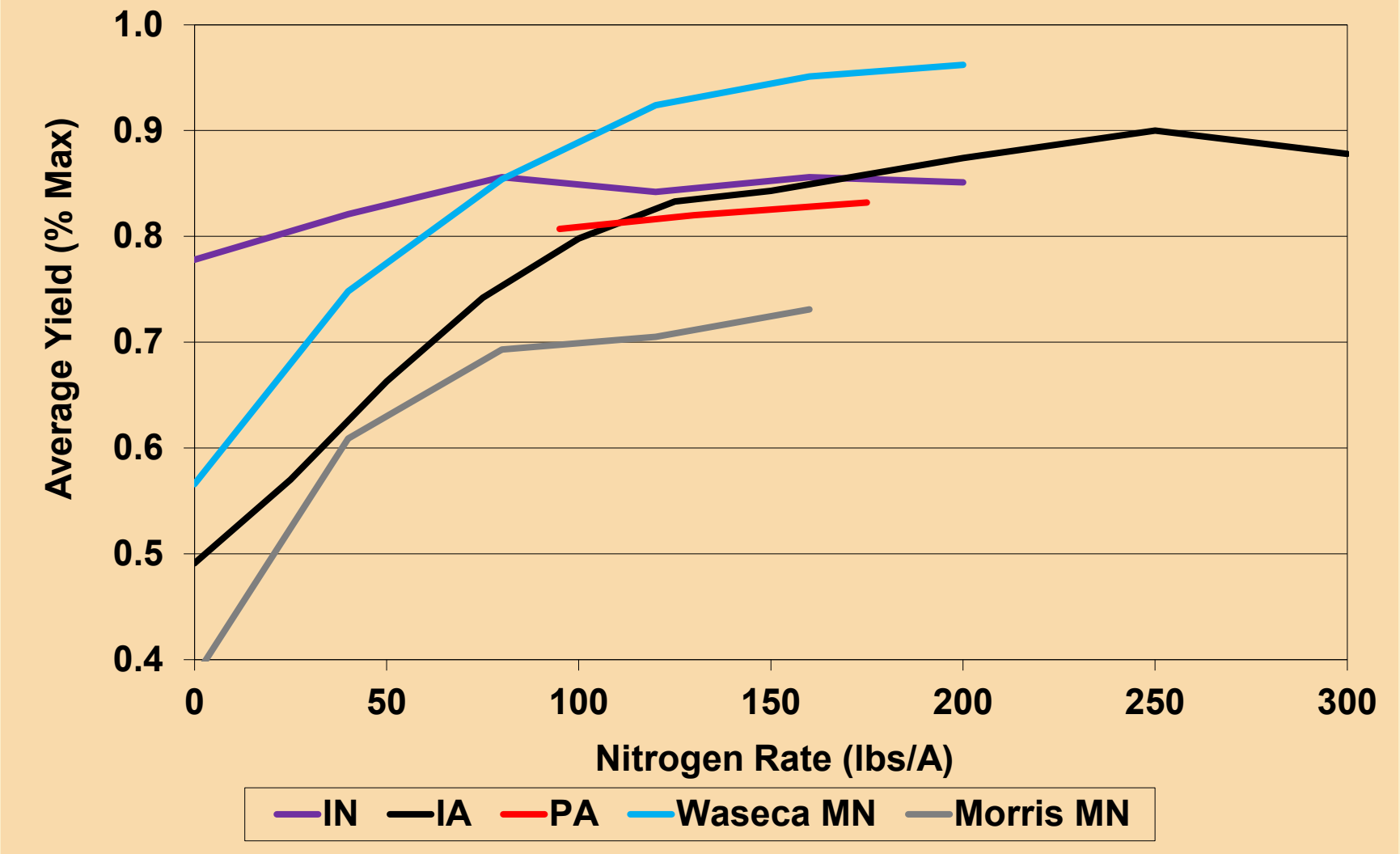


One Site-Year from Iowa (Mitchell 2004)



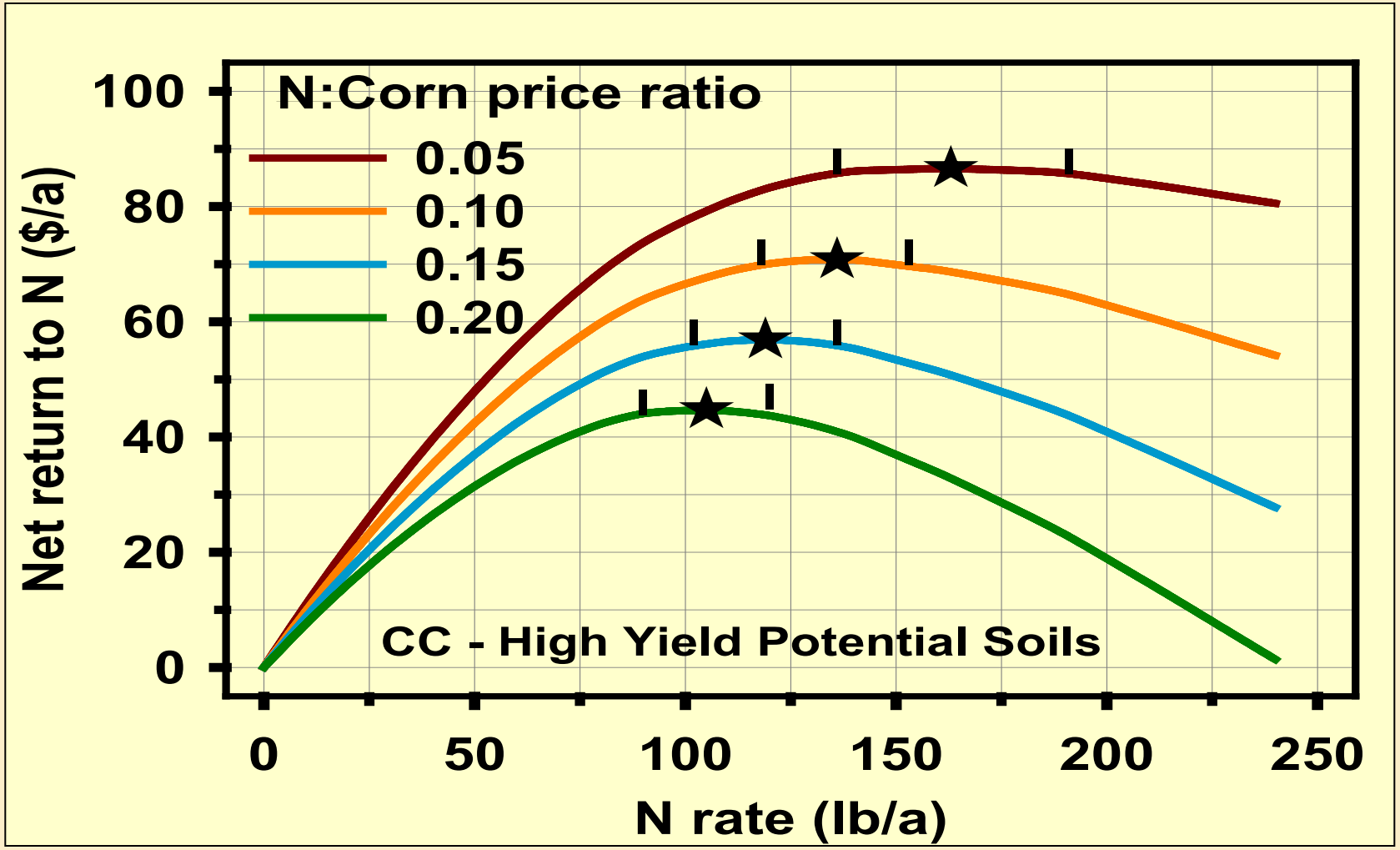
- Yield response flattens out
- See the yield variability

Average Corn Yield by N Rate (Mitchell 2004)



Yield response flattens out

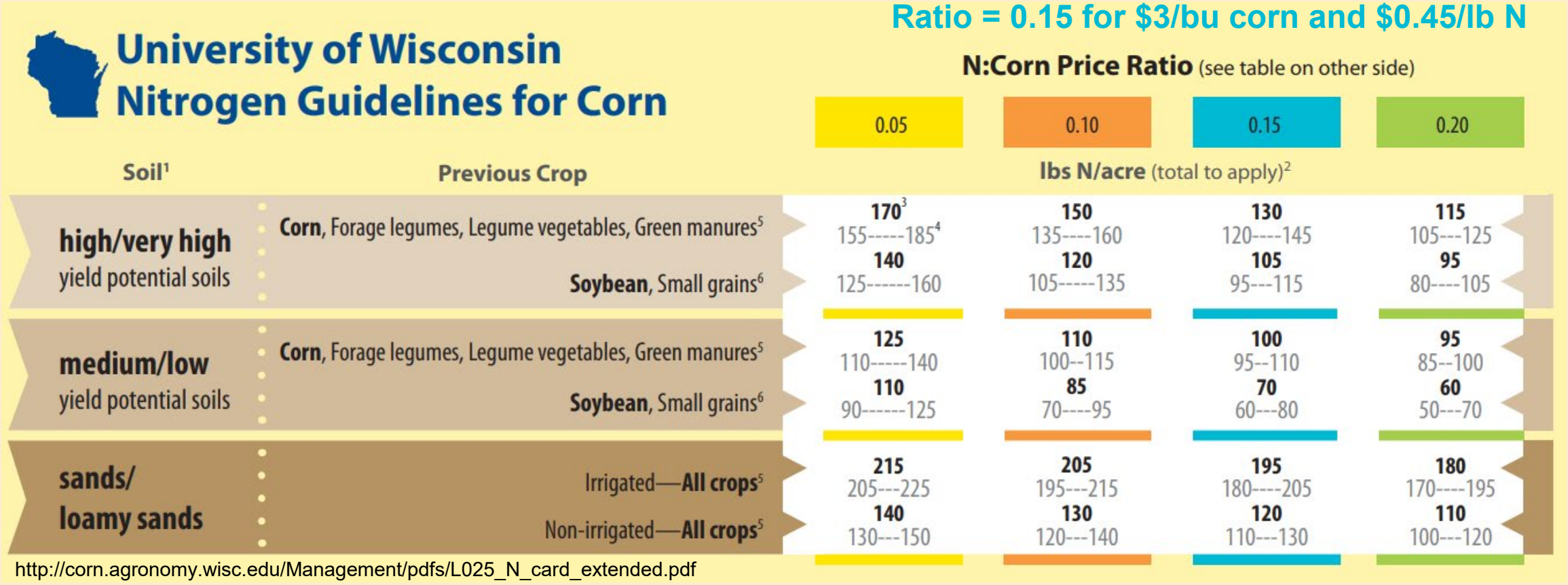
Current WI N Recommendations



- Effect of flat yield response curve on optimal N rate
- Wide range of N rates within $1/ac of optimum

Source: C. Laboski, UW Soil Science

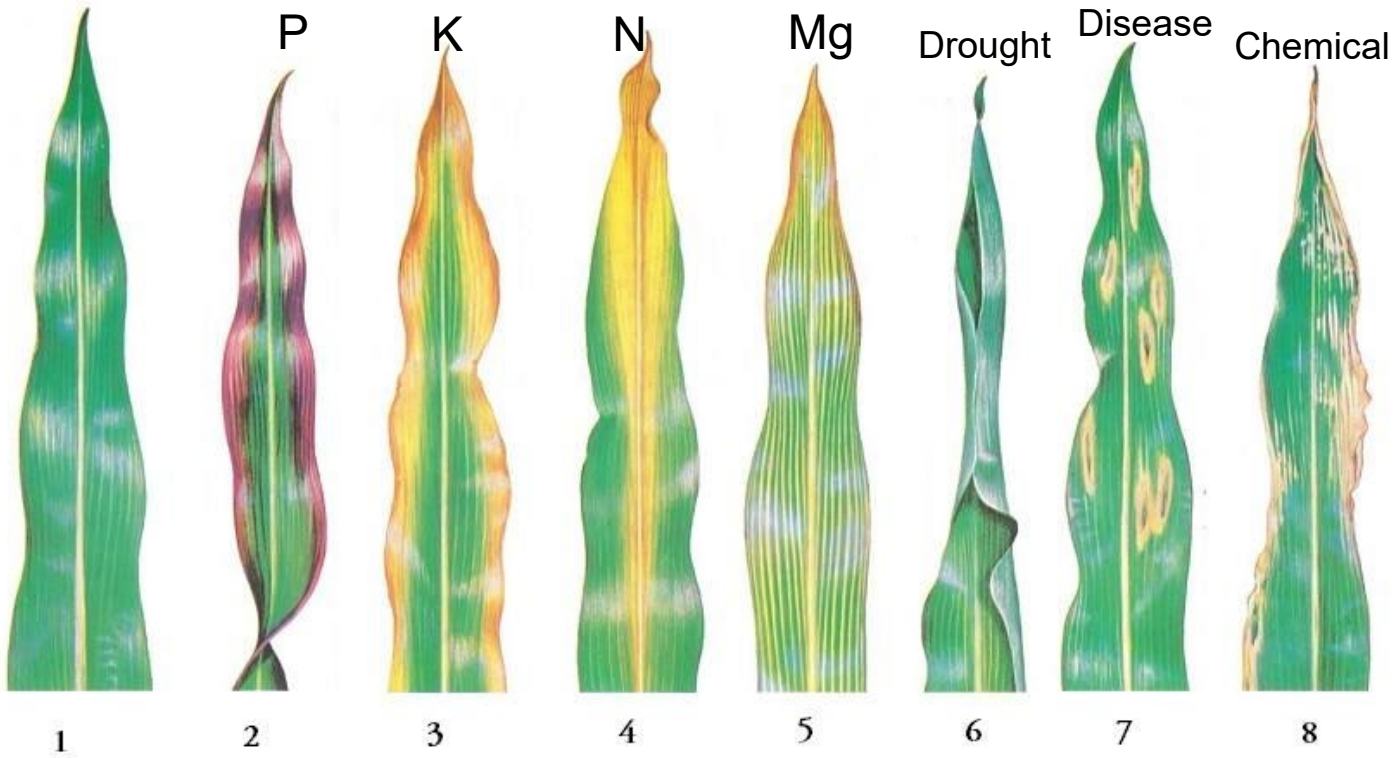
Effect of Flat Yield Response Curve on Optimal N Rate



http://corn.agronomy.wisc.edu/Management/pdfs/L025_N_card_extended.pdf

Corn following Corn: 120-145 lbs/ac, $54 to $65.25/ac in costs, **$11.25/ac range**

Corn following Soybeans: 95-115 lbs/ac, $42.75 to $51.75/ac in costs, **$9/ac range**



What's wrong with my plant?

1. Healthy leaves shine with a rich dark green color when adequately fed.
2. Phosphate shortage marks leaves with reddish-purple, particularly on young plants.
3. Potash deficiency appears as a firing or drying along the tips and edges of lowest leaves.
4. Nitrogen hunger sign is yellowing that starts at the tip and moves along middle of leaf.
5. Magnesium deficiency causes whitish strips along the veins and often a purplish color on the underside of the lower leaves.
6. Drought causes the corn to have a grayish-green color and the leaves roll up nearly to the size of a pencil.
7. Disease, helminthosporium blight, starts in small spots, gradually spreads across leaf.
8. Chemicals may sometimes burn tips, edges of leaves and at other contacts. Tissue dies, leaf becomes whitecap.

Nutrient Deficiencies Obvious

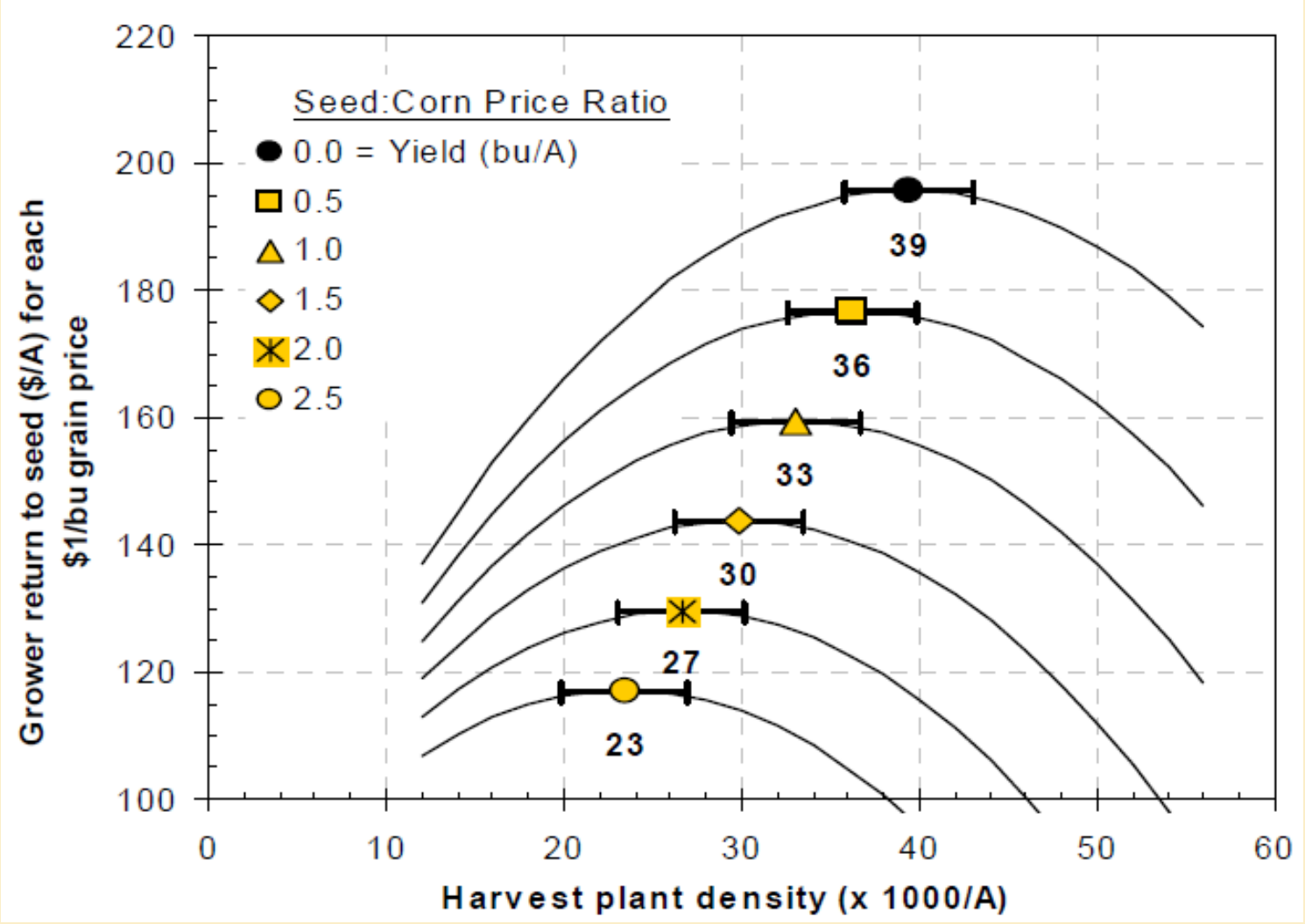
Source: https://crops.extension.iastate.edu/files/article/nutrientdeficiency.pdf

What does corn look like if it has Too much Nitrogen?

Too much Phosphorus? Too much Pesticide?

Corn Returns to Seeding Density

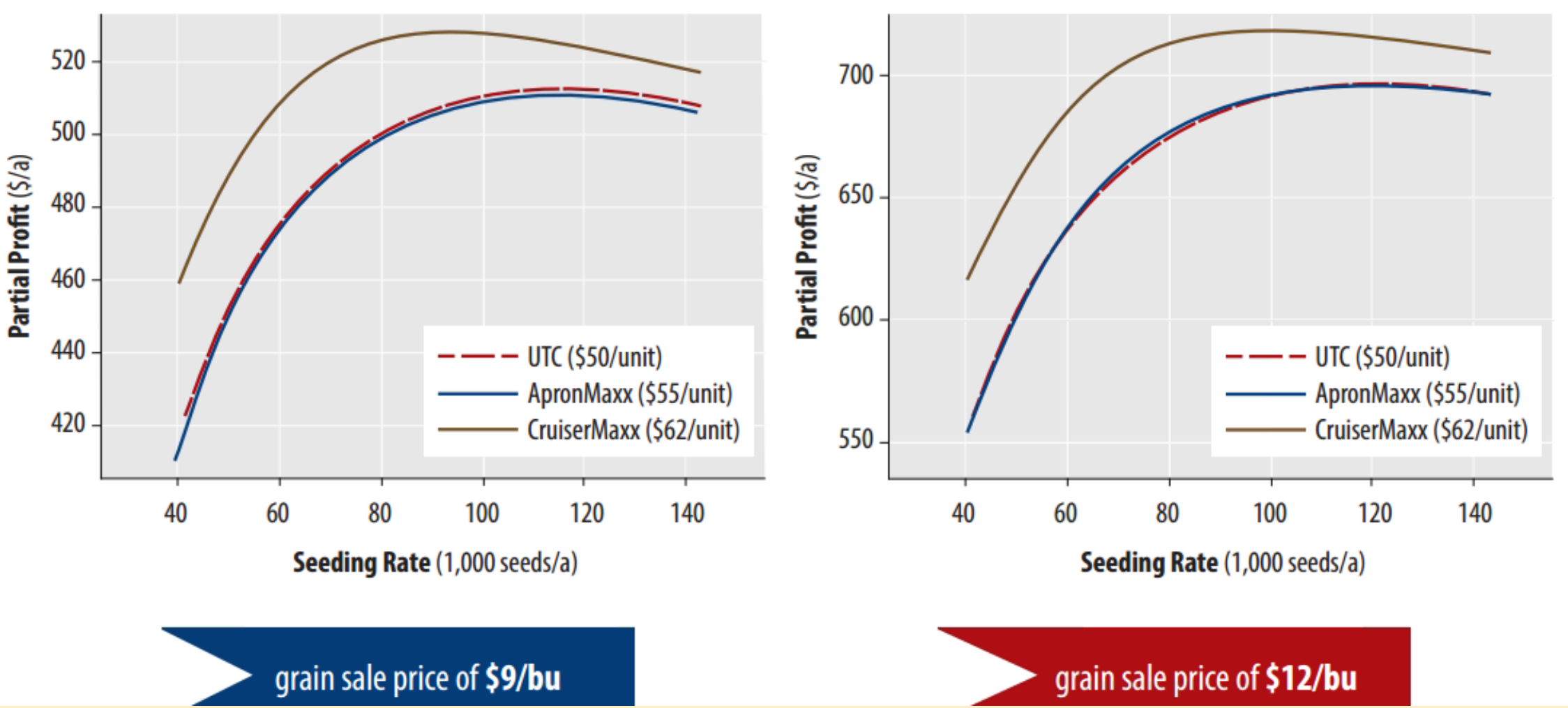
(Lauer and Stanger 2006)



- Effect of flat yield response curve on optimal seeding rate
- Wide range of seeding rates within $1/ac of optimum

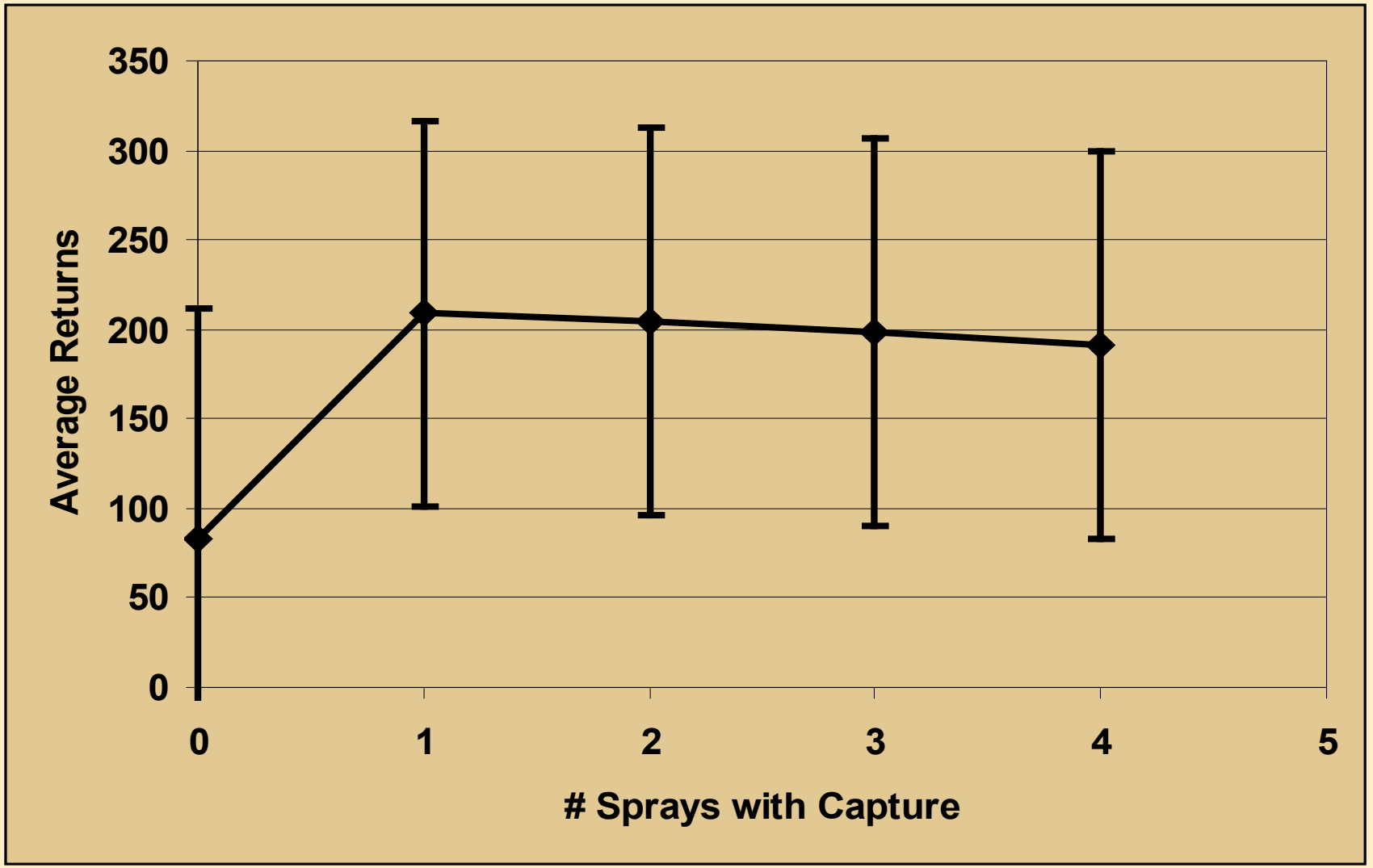
Source: http://corn.agronomy.wisc.edu/AA/pdfs/A044.pdf

Soybean Returns for Seeding Density and Seed Treatments (Gaspar et al. 2014)



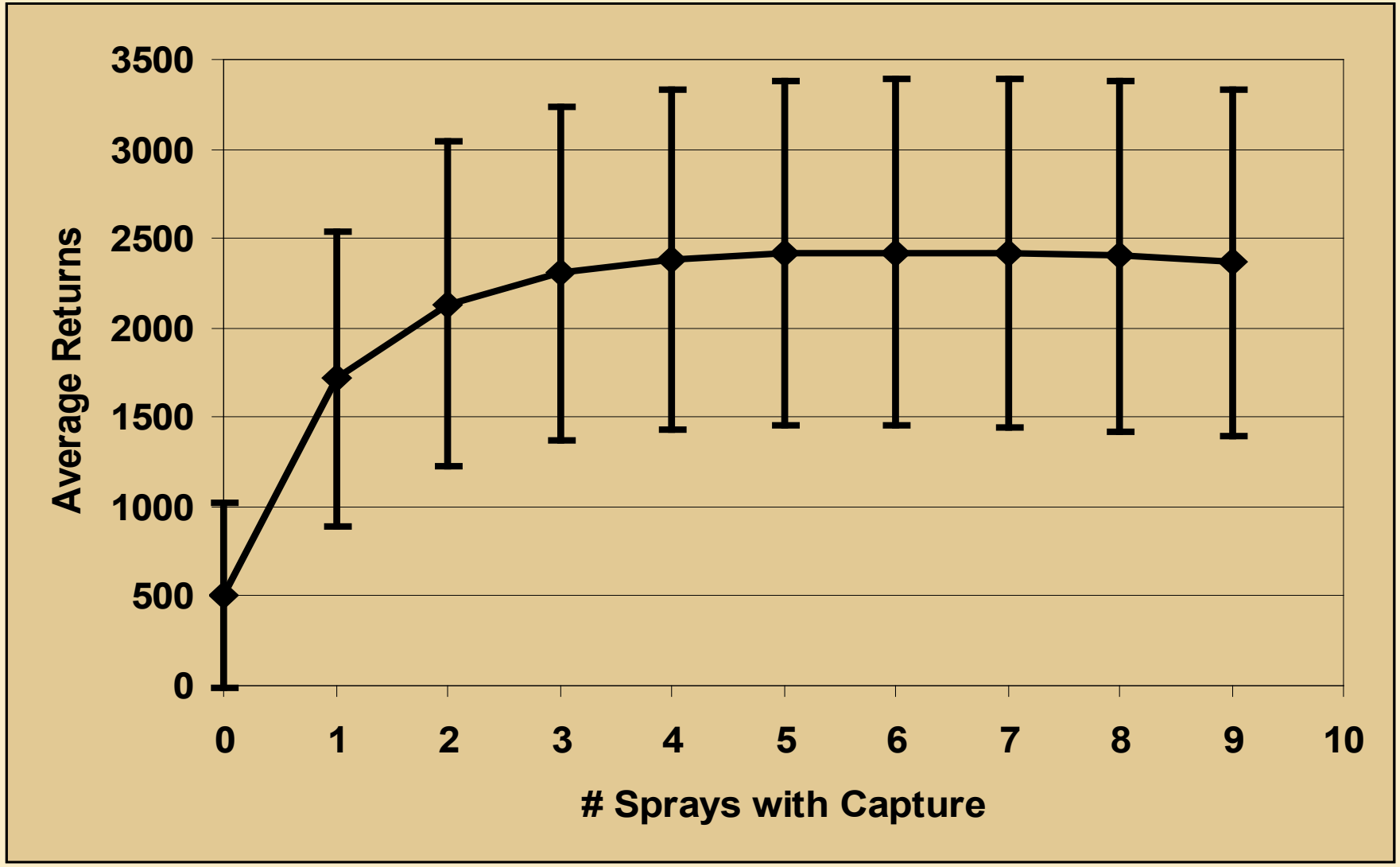
http://www.coolbean.info/library/documents/SoybeanTreatmentRisk_2014_FINAL.pdf

Capture (bifenthrin) on Processing Sweet Corn (mean with 95% error bars)



- Yield response flattens out
- See the yield variability

Capture (bifenthrin) on Fresh Market Sweet Corn (mean with 95% error bars)



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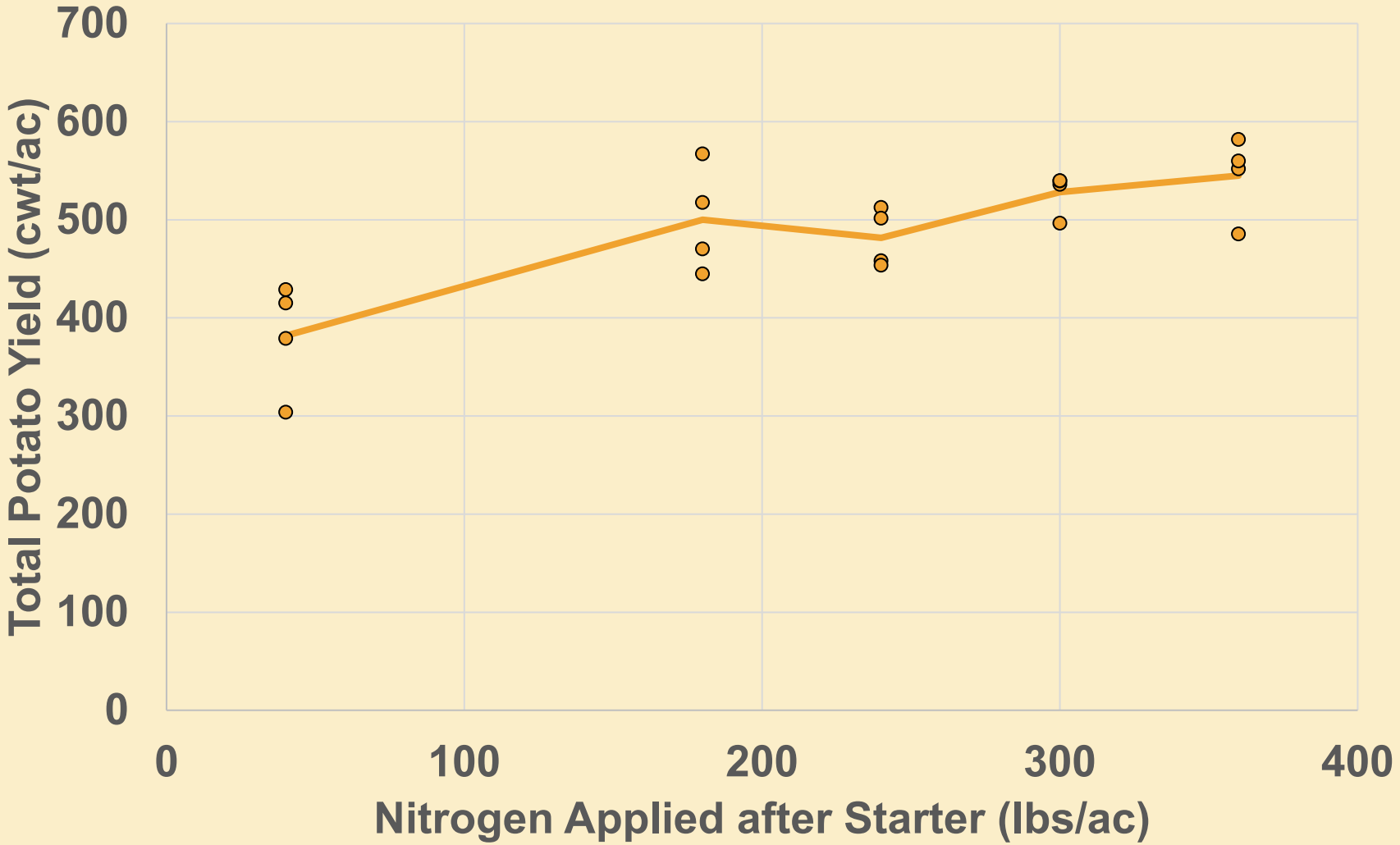
- See the yield variability
- How many sprays would you use?

Yield Response to Applied N (Fresh Russets in 2018 at Hancock)



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Data Courtesy of Yi Wang, UW-Horticulture

Summary: Why do farmers use inputs like they do?

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