

# Soybean Trait Needs for the Midwest: The Musings of an Agronomist

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THE UNIVERSITY  
*of*  
**WISCONSIN**  
MADISON



**UW**  
**EXTENSION**

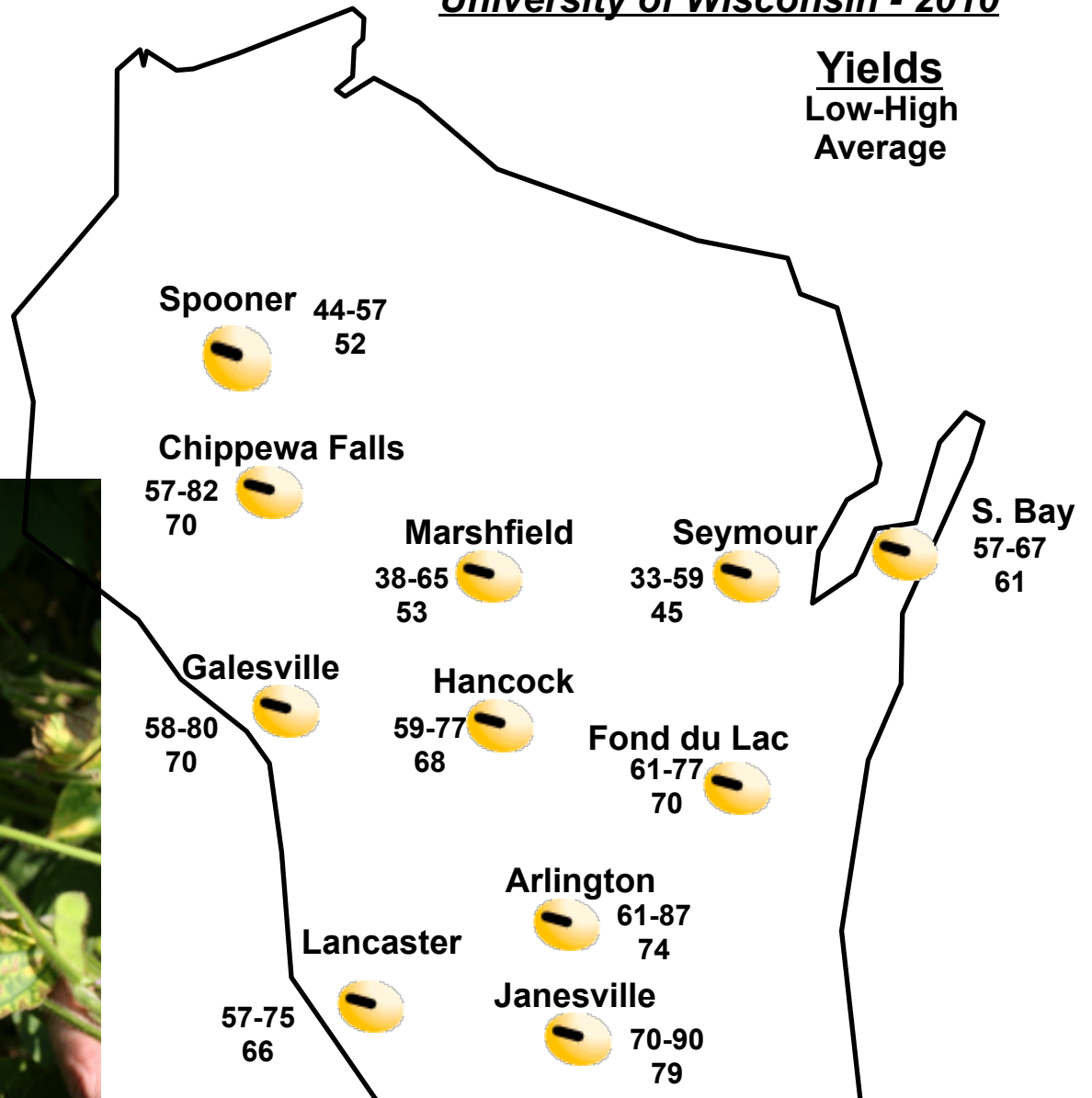
# 2010

- **State record yield (50.5 bu a<sup>-1</sup>)**
- 938 M
- + 300 GDU's
- $\geq H_2O$
- Beans where dry
- Lodging
- Soybean aphid
- SDS

## Soybean Variety Test Locations

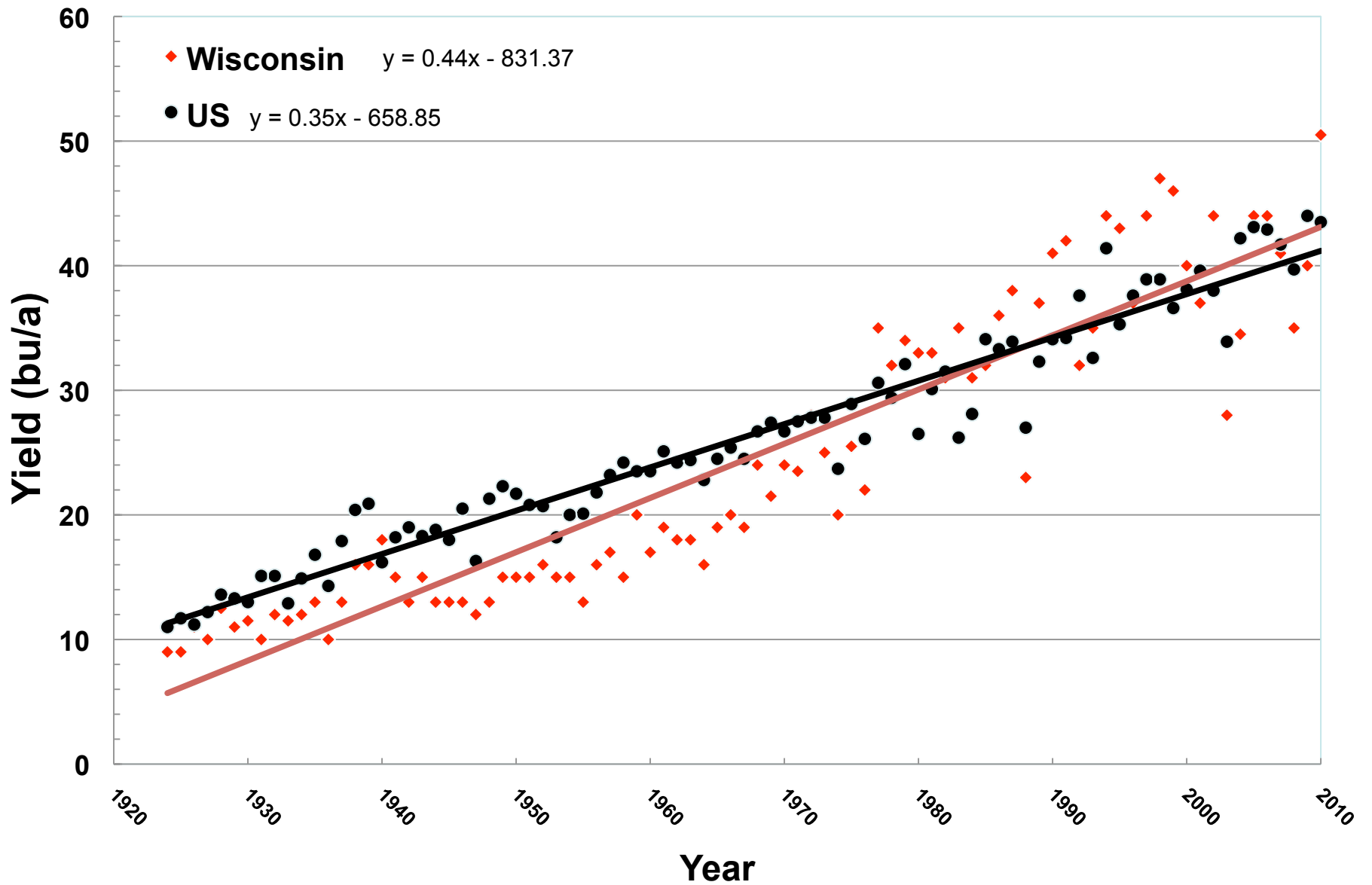
University of Wisconsin - 2010

Yields  
Low-High  
Average

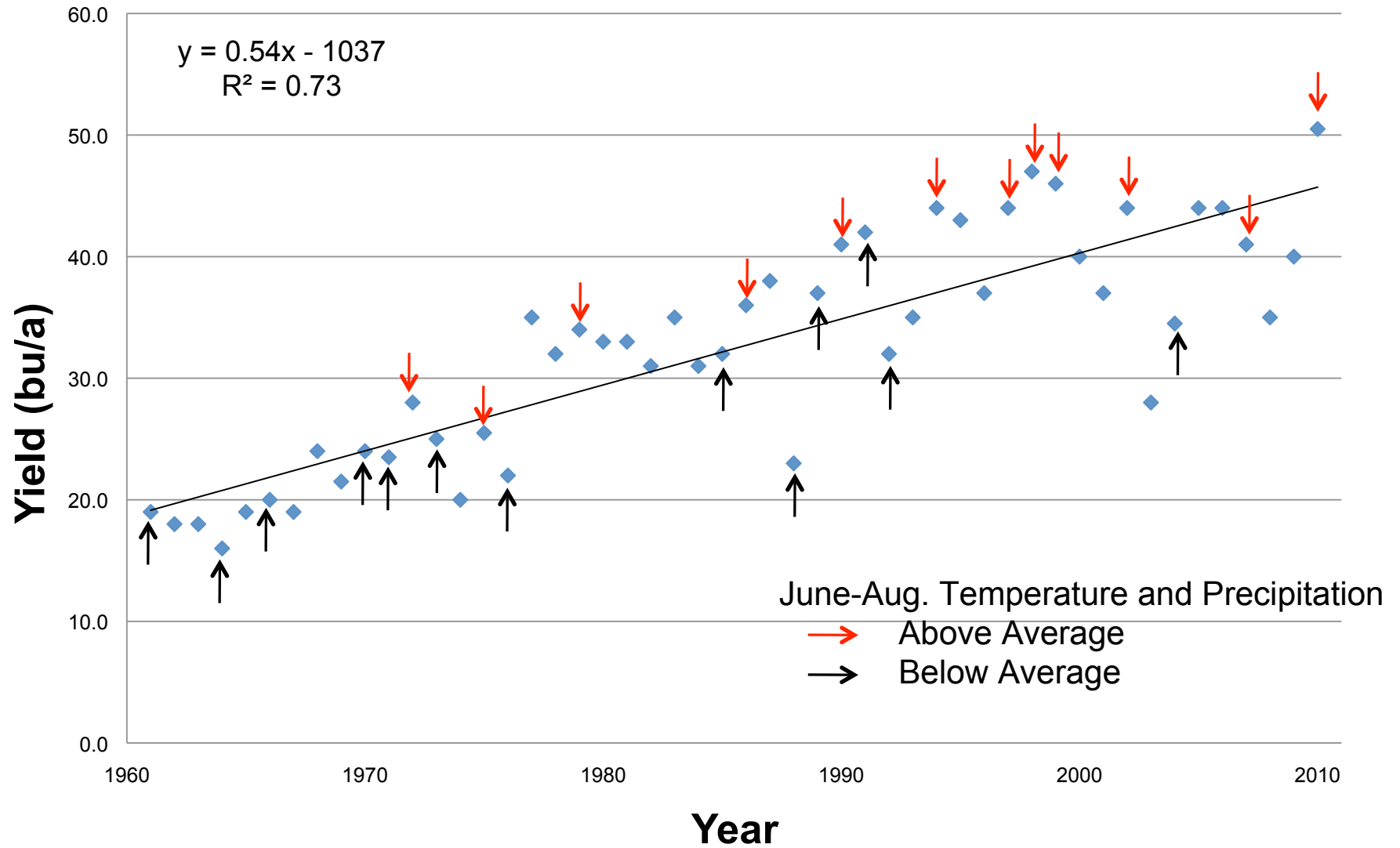


# US and WI Historical Soybean Yields

## 1924 to 2010

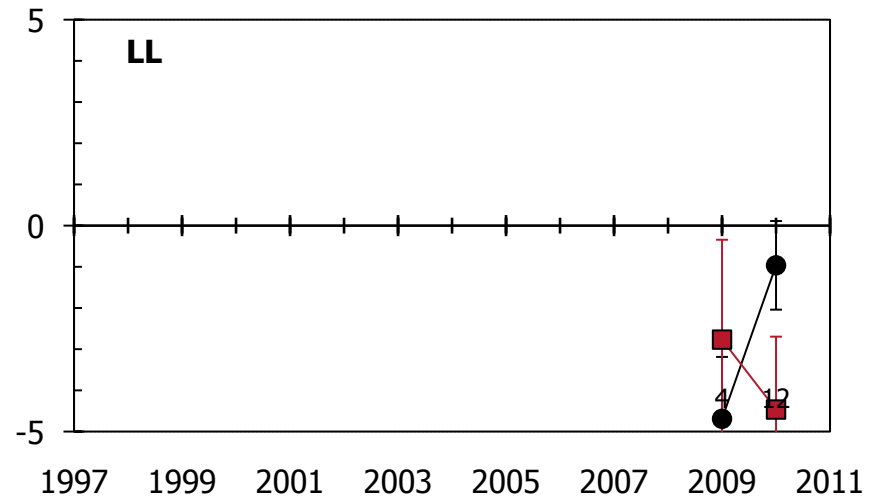
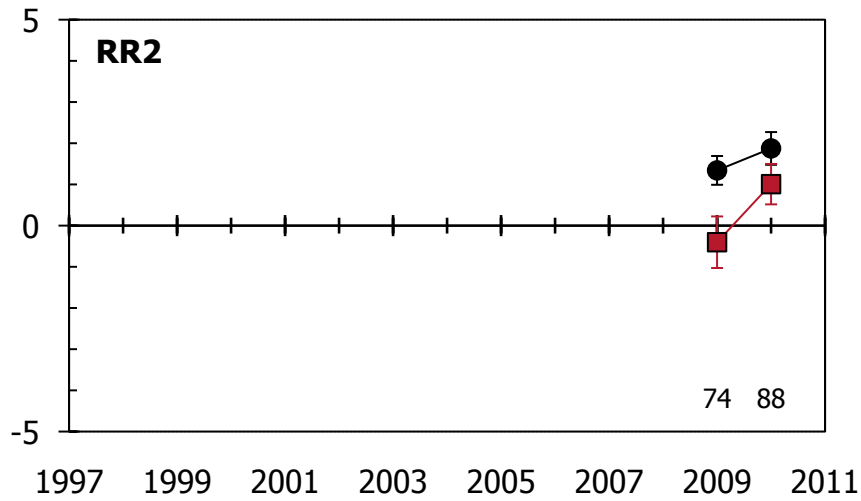
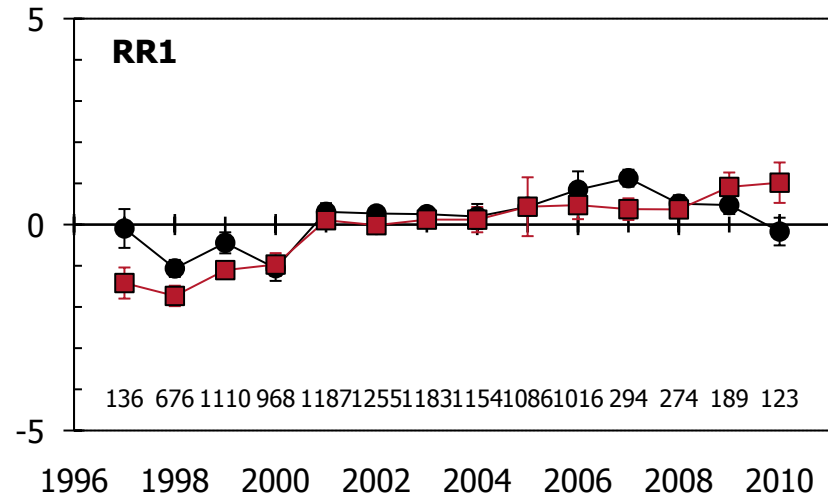
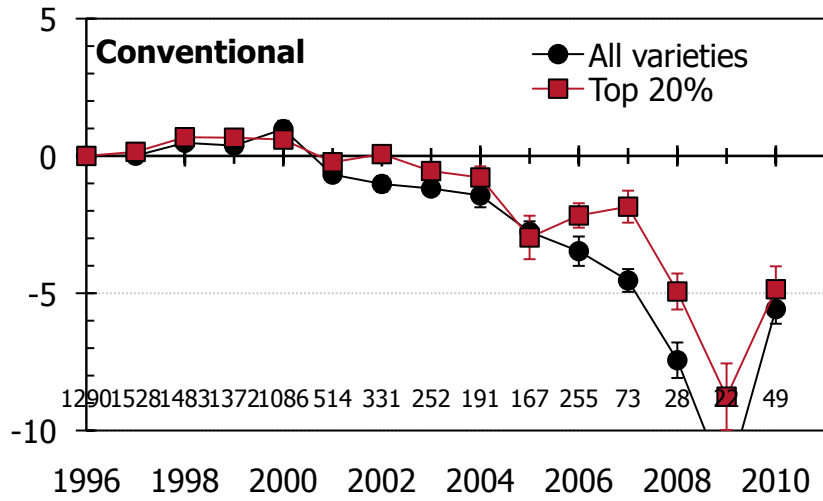


# Wisconsin State Average Soybean Yield 1961-2010



# Relative performance of transgenic soybean varieties

Grain yield difference (bu/A) = variety average – trial average



# How do we define “Trait”

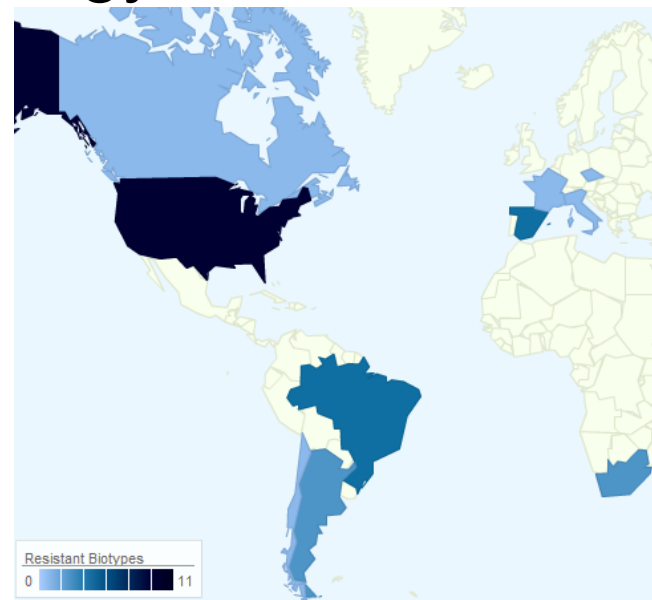
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- *An inherited characteristic: (Merriam-Webster)*
- *A characteristic that is refined, enhanced or developed by researchers, and then expressed by a plant to convey an agronomic or value-added benefit to the farmer, processor or consumer. (Monsanto via Susan Curvy)*

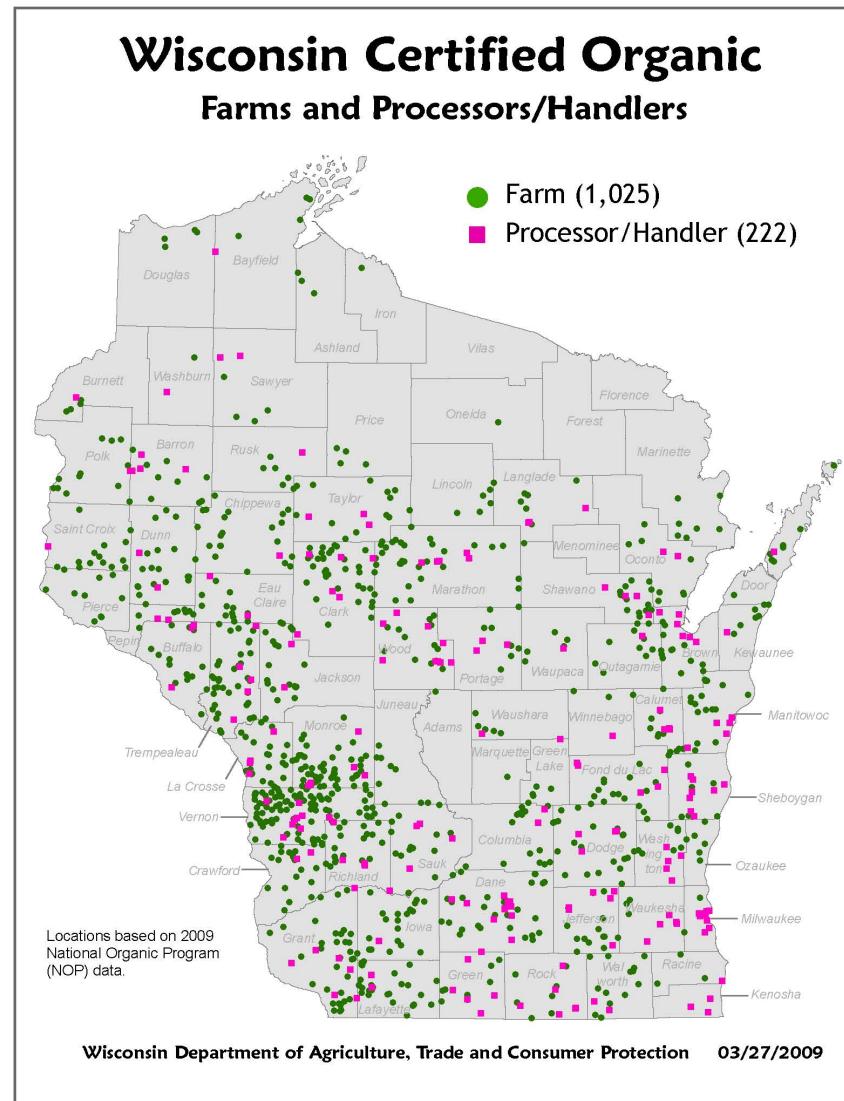
# Herbicide Traits and Resistance

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- RR1 will shortly be off-patent (2014/15)
  - What will happen to this technology
  - PVP and patent laws
  - Education & Enforcement
- Glyphosate resistant weeds are an increasing fact of life
- DHT and Dicamba soybean will have a place, but not everywhere



# WI organic production



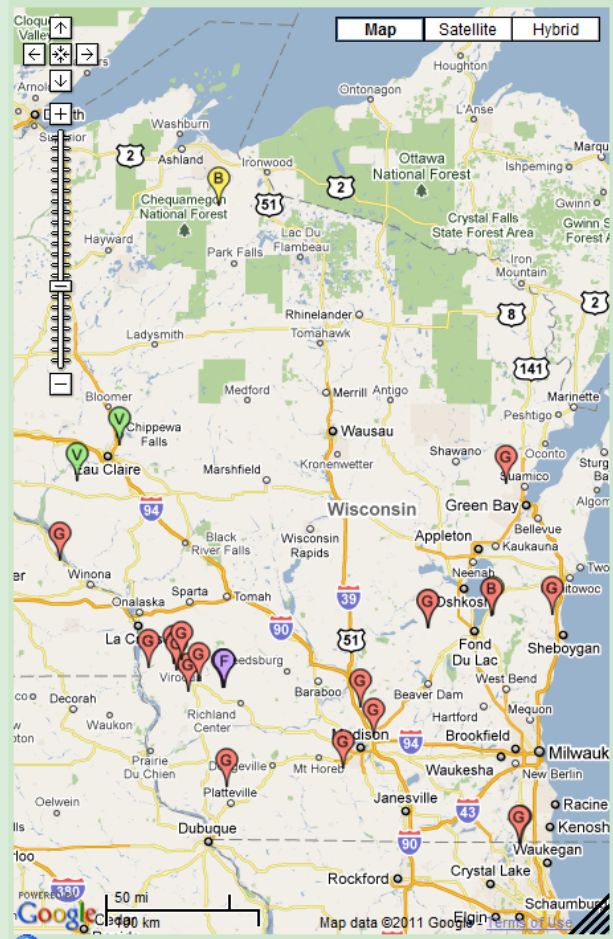




**Locate Field by address, town, or zipcode**  
 53708

**Map Layers Legend**  
 Click to display

- Atrazine Prohibition Areas
- Commercial Wind Turbines
- Outstanding / Exceptional Streams
- Outstanding / Exceptional Lakes
- DNR Trout Streams
- DNR Trout Springs
- Tribal Lands
- County lines



**Sensitive areas Legend:**  
 Click to expand

**-Organics:**

- Certified Organic
- Organically Raised

**-Vegetables and Fruits:**

- Grapes - Vineyards
- Market Vegetables
- Berries: Strawberries, Blueberries, Blackberries, Raspberries
- Cranberries
- Fruit Trees
- Fruits

**+Others:**

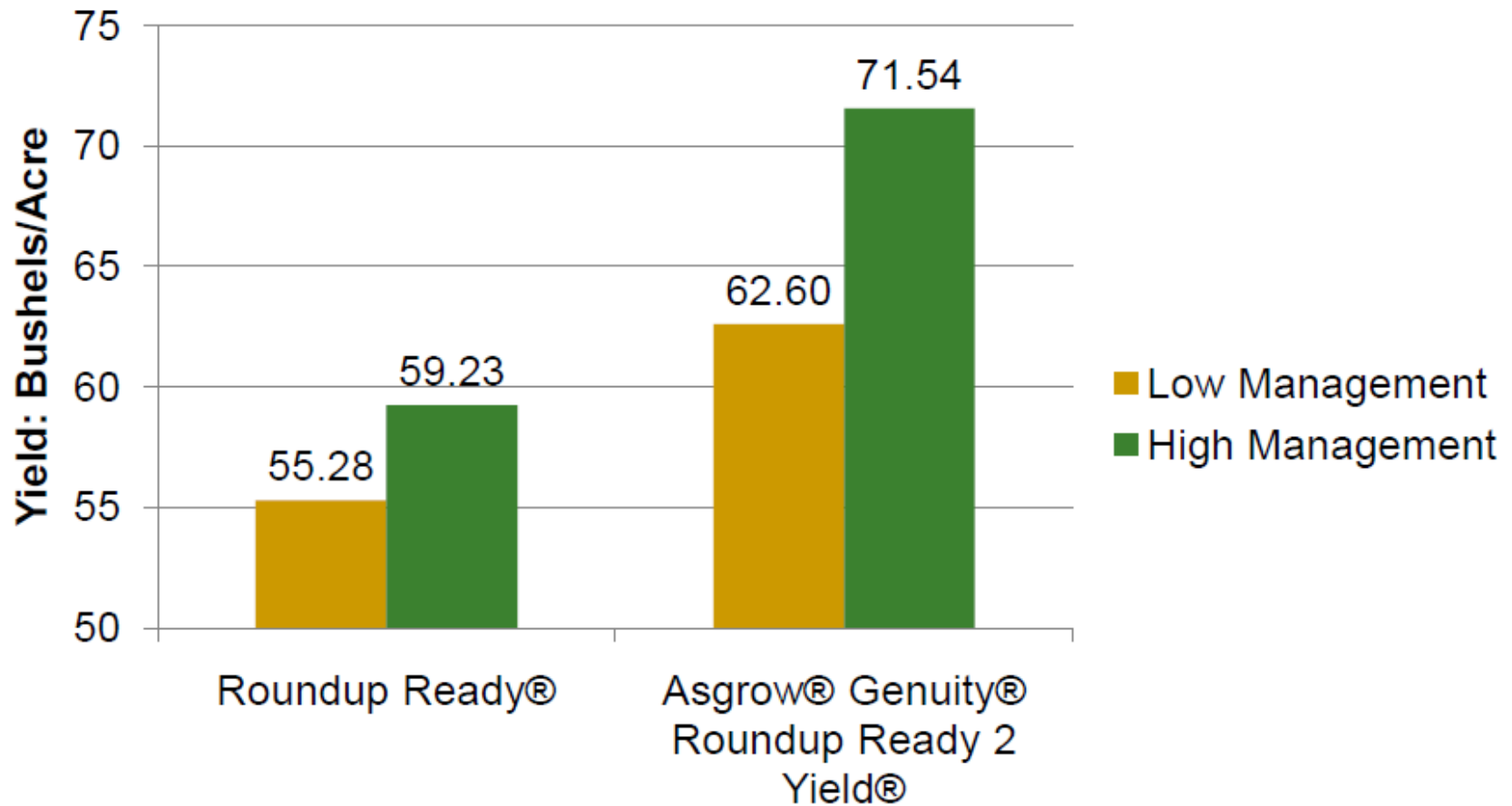
- All

These data are meant to facilitate communication between applicators and growers.

Note: bounding lines indicate approximate positions of sensitive lands submitted to the site, not property lines.

**Zoom in and click on a sensitive area for information**

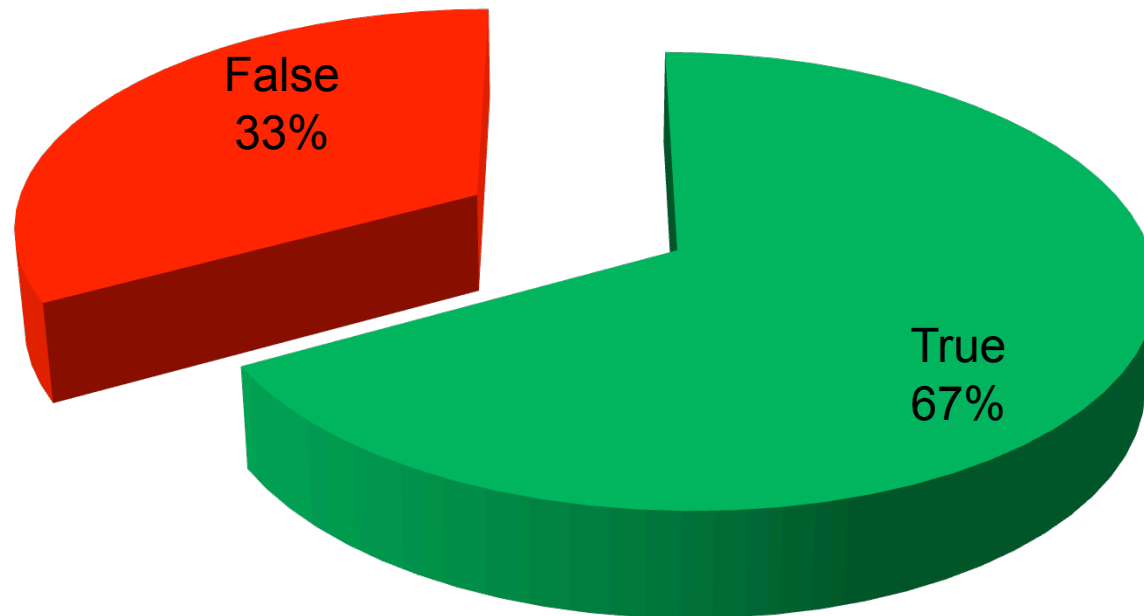
# Yield Response to Increased Management



# Do trait by management interactions exist?

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- “New” Soybean Traits are/will be More Responsive to High Input Management?



**Facts according to me  
a.k.a. Things an Agronomist  
may say because we are an  
expert in everything...just  
ask us**

# Soybean Cyst Nematode (*Heterodera glycines*) Facts

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- Strong evidence to support the fact that PI 88788 is either breaking down or HG shifts are occurring
- To date no compelling data to support efficacy of labeled nematicides for control of SCN

# Sudden Death Syndrome (*Fusarium virguliforme*) Facts

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- Soybean planting dates are being pushed earlier every year to increase yield
- SDS incidence and severity is increasing
- Independent causal link has been identified
  - Planting date and SDS
  - SDS and SCN
- No complete genetic SDS resistance has been identified
- No efficacy of labeled fungicides for SDS

# White Mold (*Sclerotinia sclerotiorum*) Facts

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- Every 5-8 years we get reminded about the impact of white mold
- No complete genetic resistance has been identified
- Variable efficacy of labeled fungicides
- Cobra usage to control this pathogen is high risk high reward

## **Brown Stem Rot (*Phialophora gregata*) Facts**

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- Historically, our strategic breeding efforts for BSR resistance have significantly increased soybean yield
- Have we forgot about this pathogen or have our breeding efforts selected for BSR genotype A and are we missing genotype B?



# Soybean Aphid (*Aphis glycines*)

## Resistant Trait Facts

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- Are we wasting our time introgressing soybean aphid resistance into high yielding germplasm?
  - Resistant biotypes are already present, though other Rag genes are being presented
  - Aphids are relatively easy to kill, though resistance can occur quickly to synthetic pyrethroids

A photograph of a rural landscape. A dirt road winds through a field of green and yellow crops, likely soybeans. In the background, there are rolling hills, a line of trees, and a cloudy sky. The text is overlaid on the image.

# Characterizing Soybean Yield Advancements: The Decades Study

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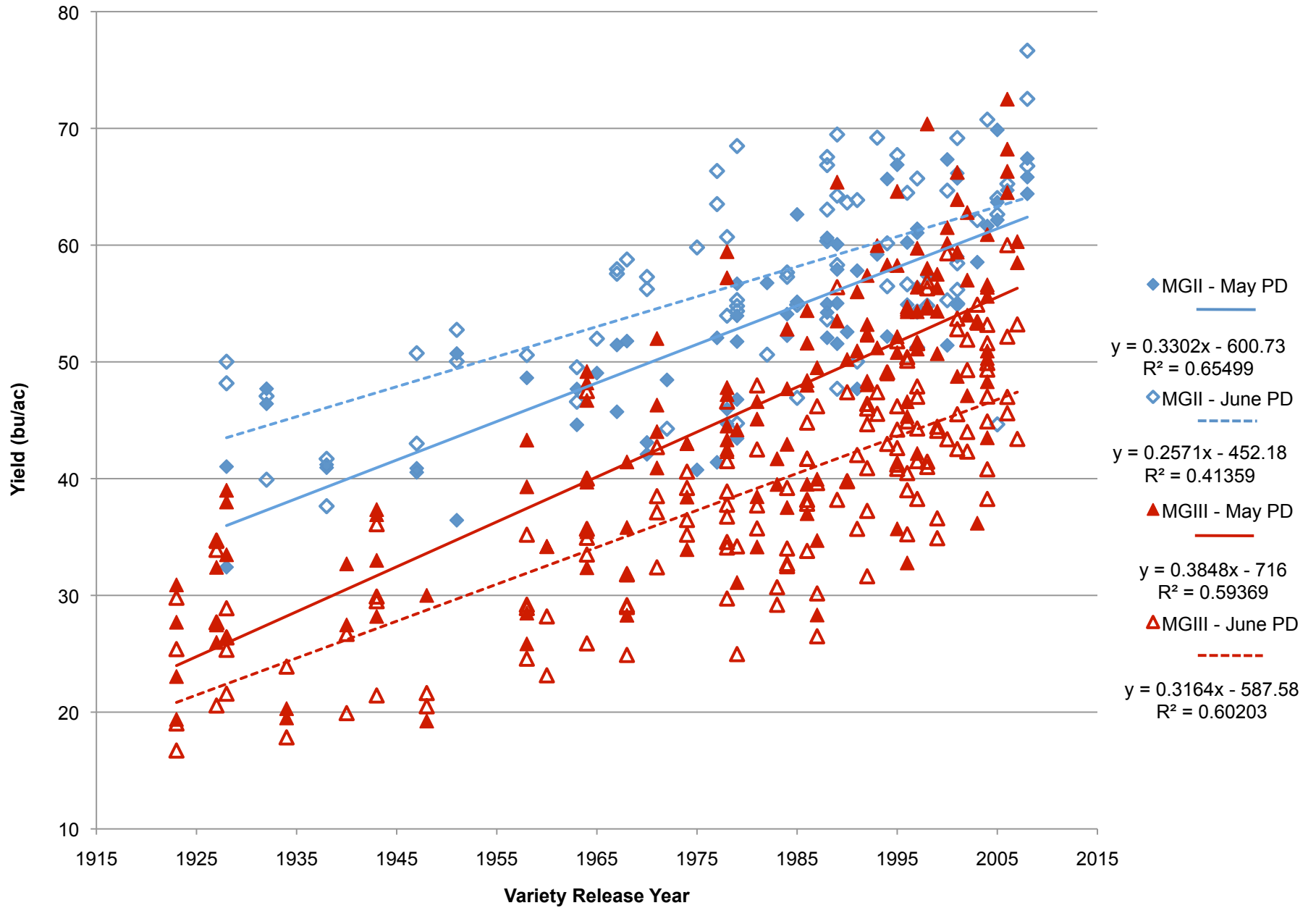
- Are there interactions between genetic improvements and/or environment and management over time
- Have we experienced any intended or unintended consequences of our soybean breeding efforts over the past 80 years?

# Characterizing Soybean Yield Advancements: The Decades Study

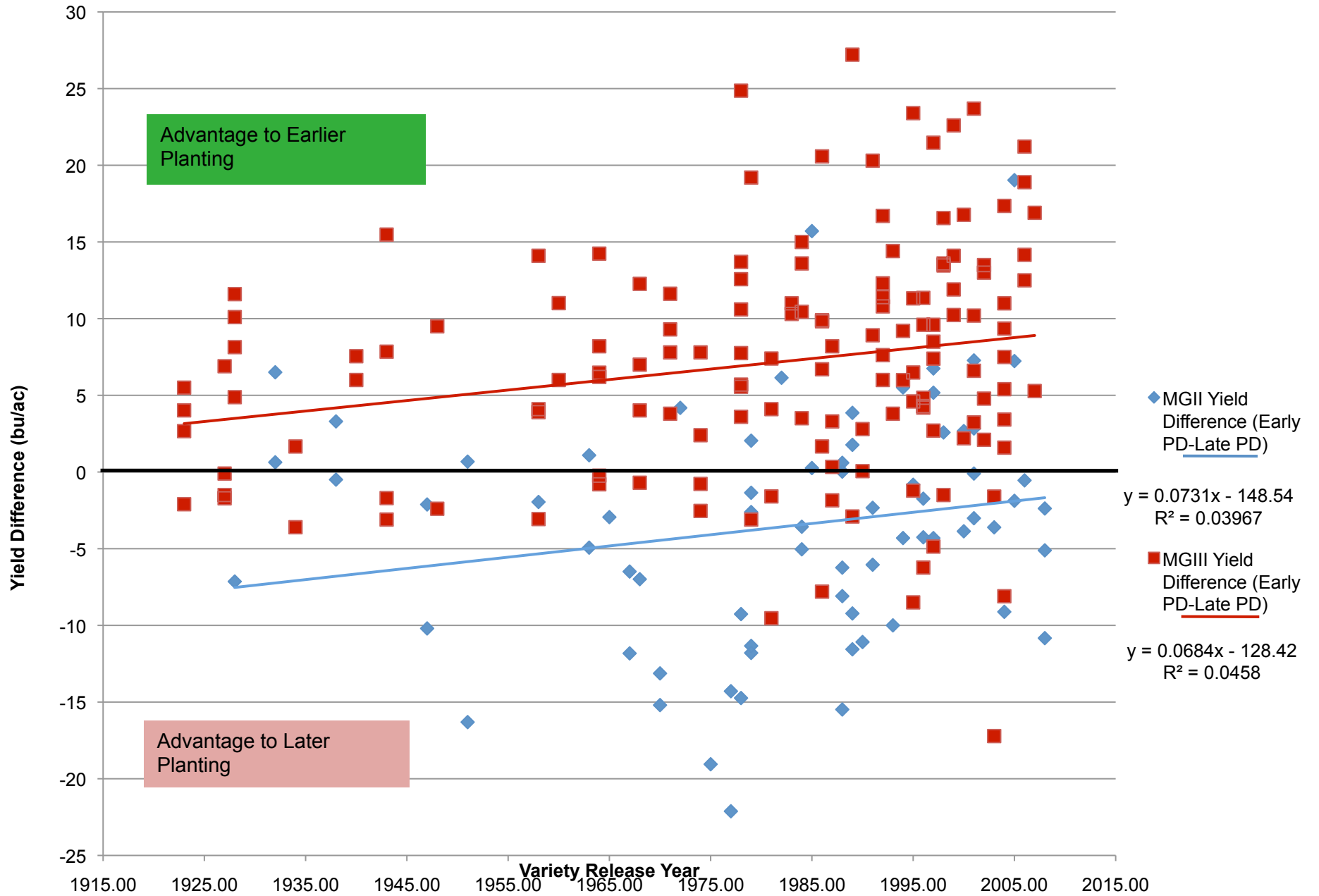
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- Given the interaction between genetics and crop environment we propose a set of experiments with the underlying **goal** to characterize and quantify the effect of both genetic and agronomic yield gain in soybean.
- This will be completed by comparing 59 historical soybean cultivars against four agronomic variables including:
  - Planting date effect on relative CGR, HI, seed yield and quality
  - Compare yield gain in newer cultivars attributed to breeding for greater seedling and foliar disease tolerance
  - Compare yield gain due to nitrogen fixation and utilization
  - Compare plant morphology, branching ability, and overall seeding rate impact on yield gain
- University of Wisconsin, Illinois, Minnesota and Purdue

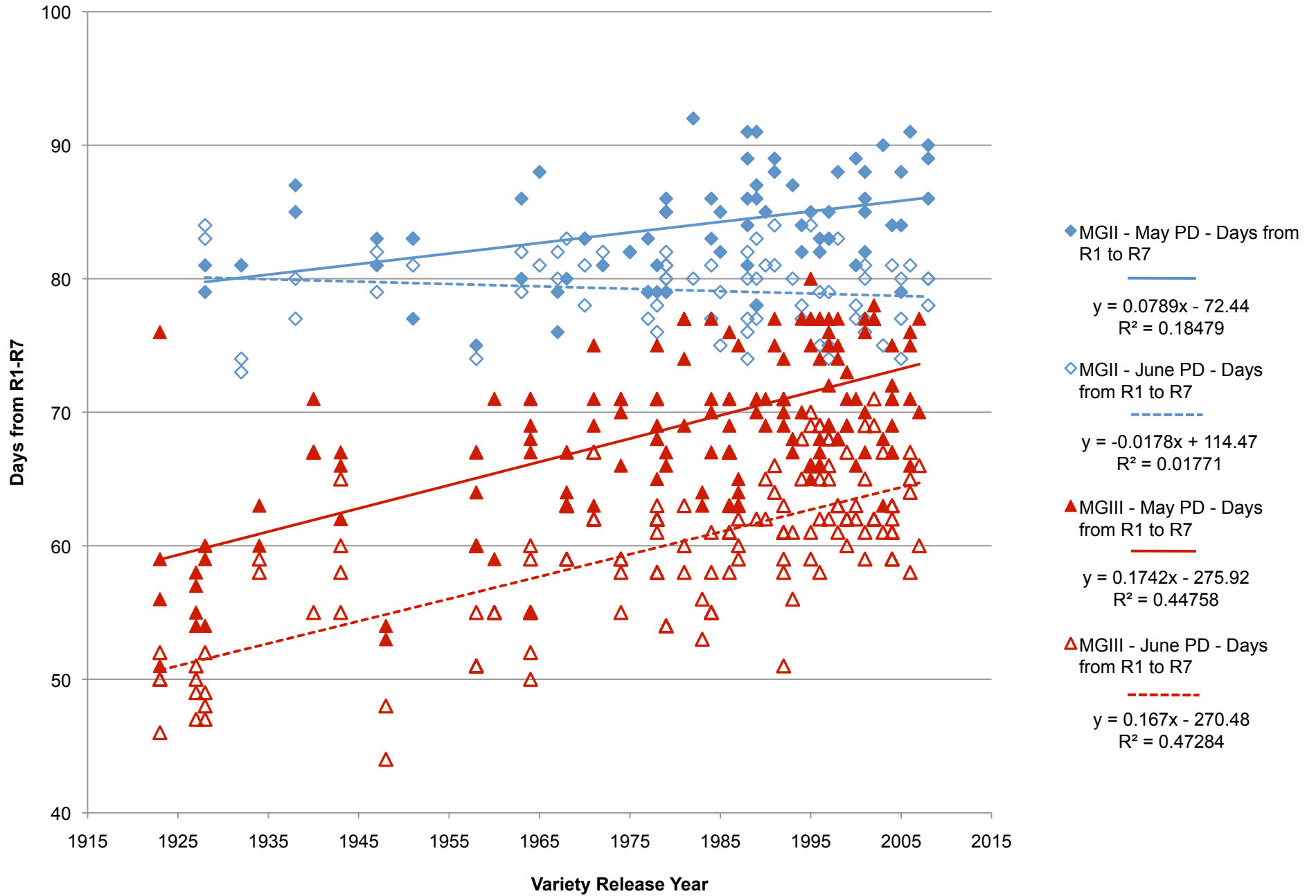
# Planting Date



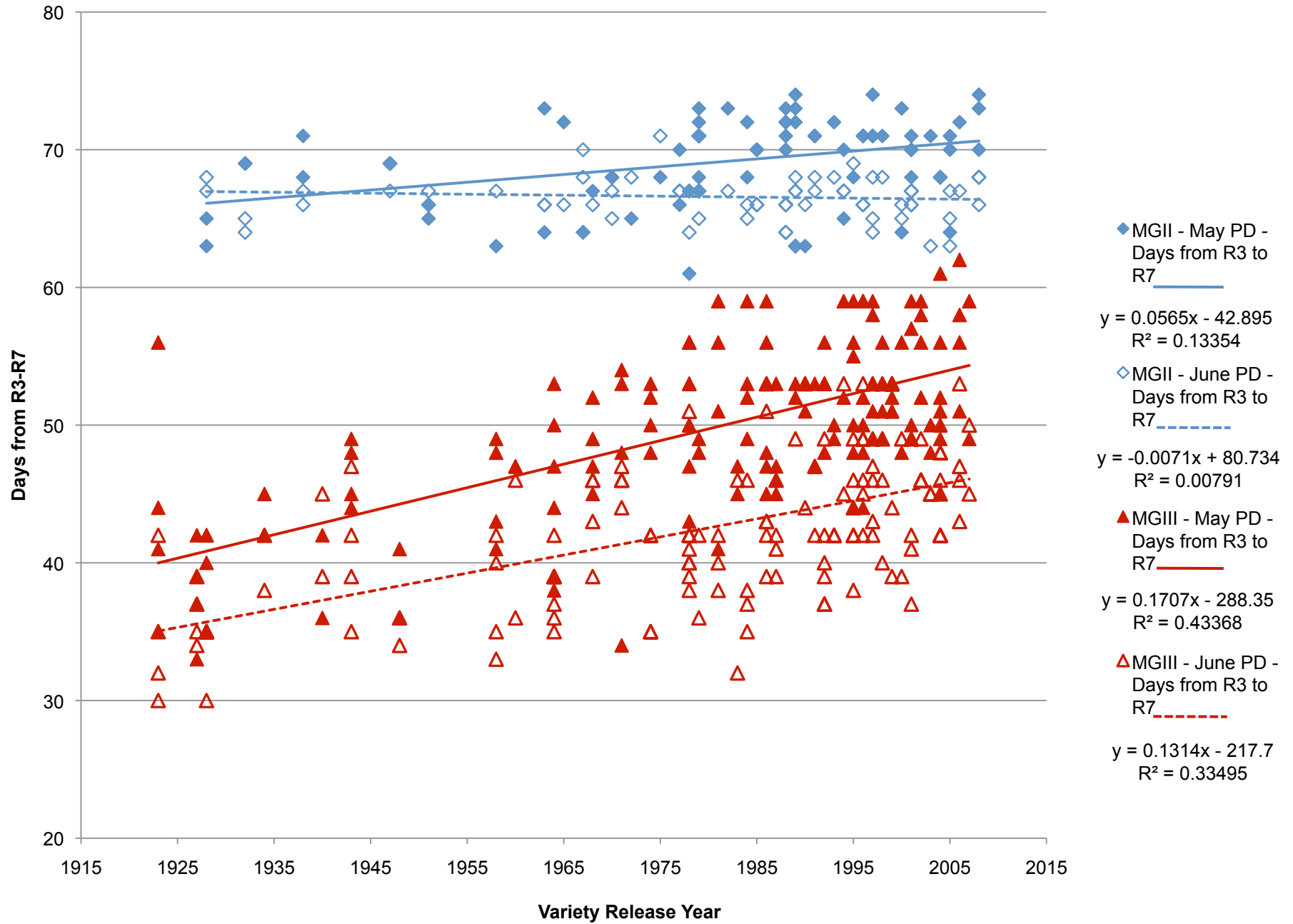
# Yield Difference (May PD-June PD)



# Days From R1 to R7

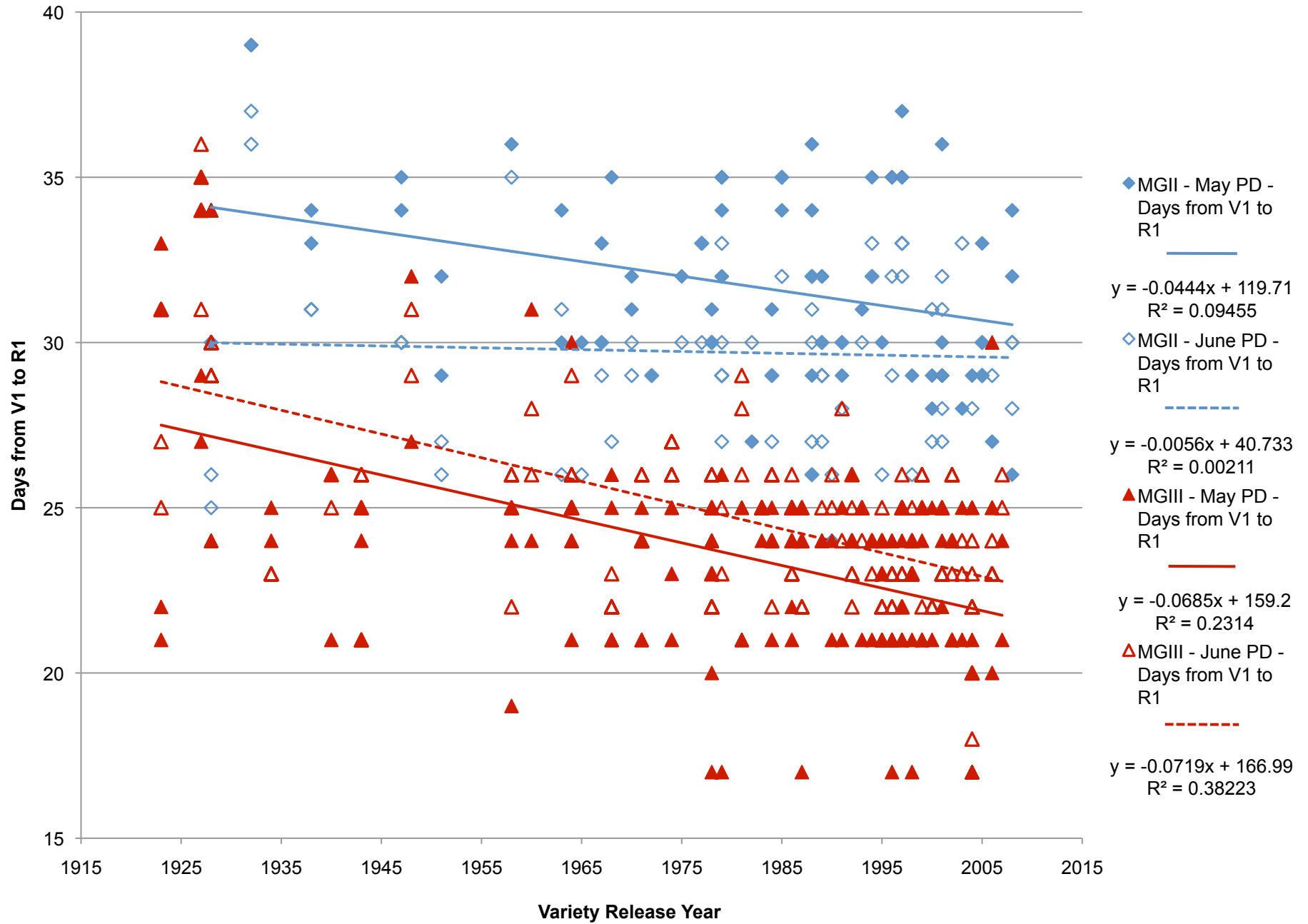


# Days From R3 to R7

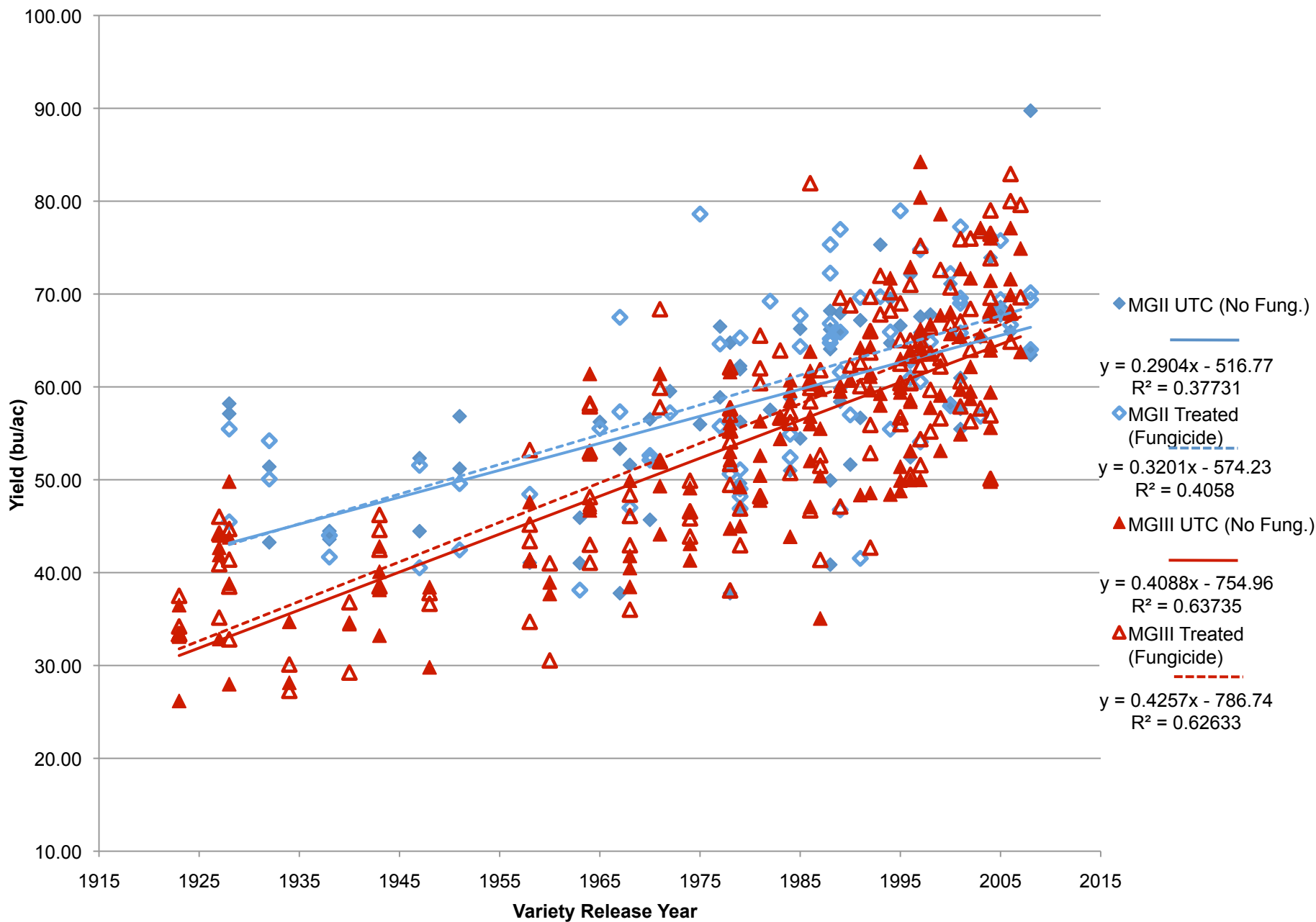




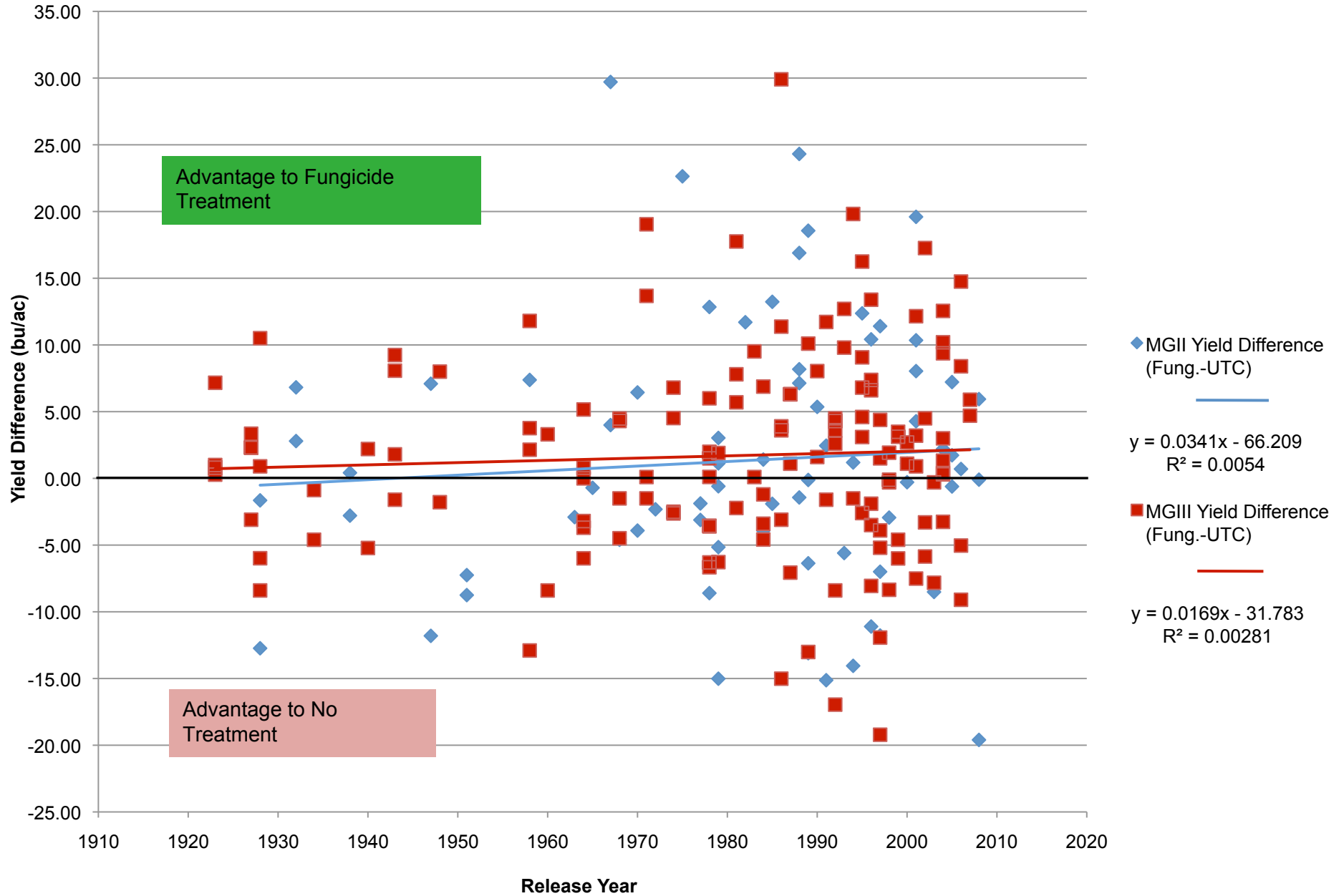
# Days From V1 to R1



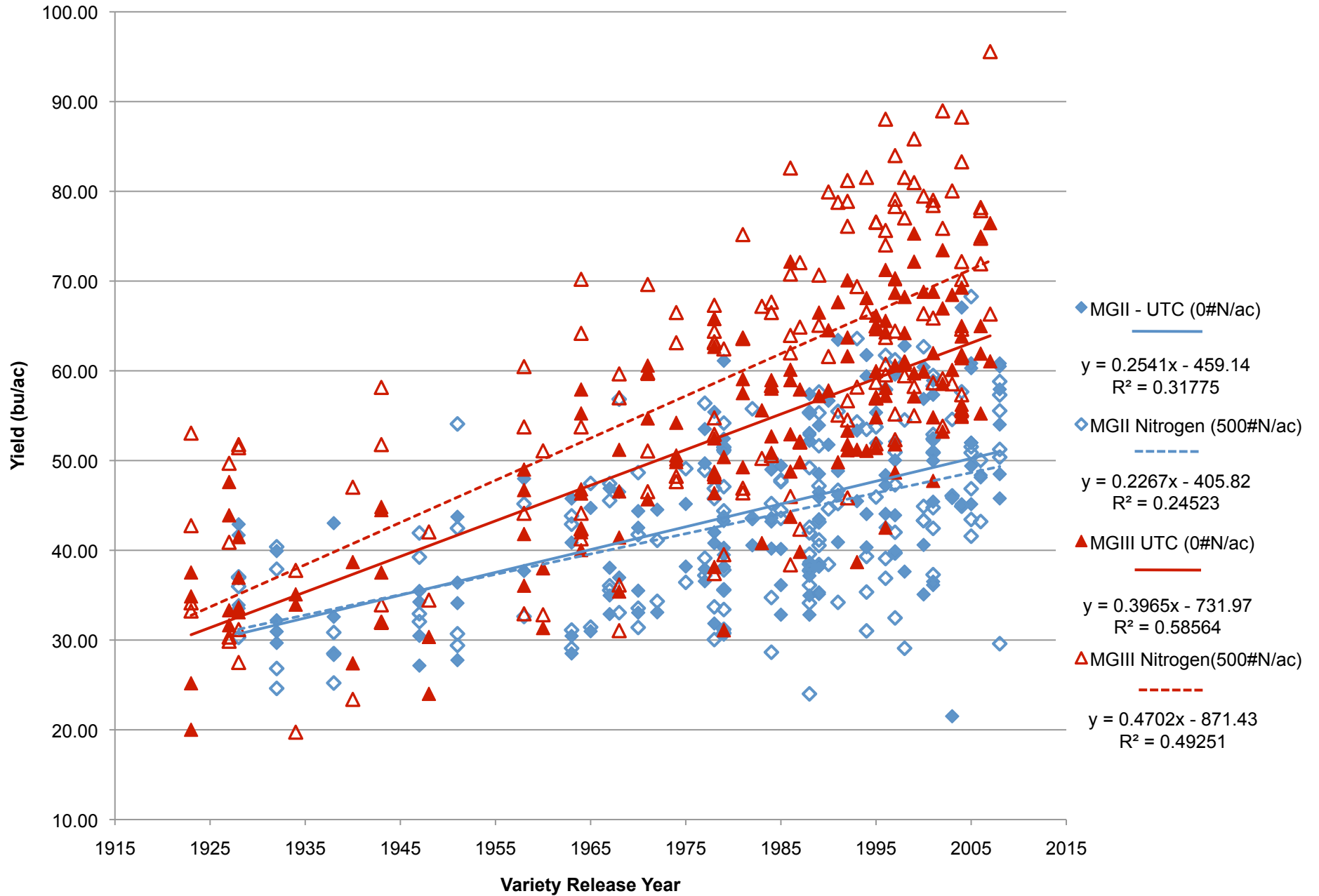
# Fungicide Use



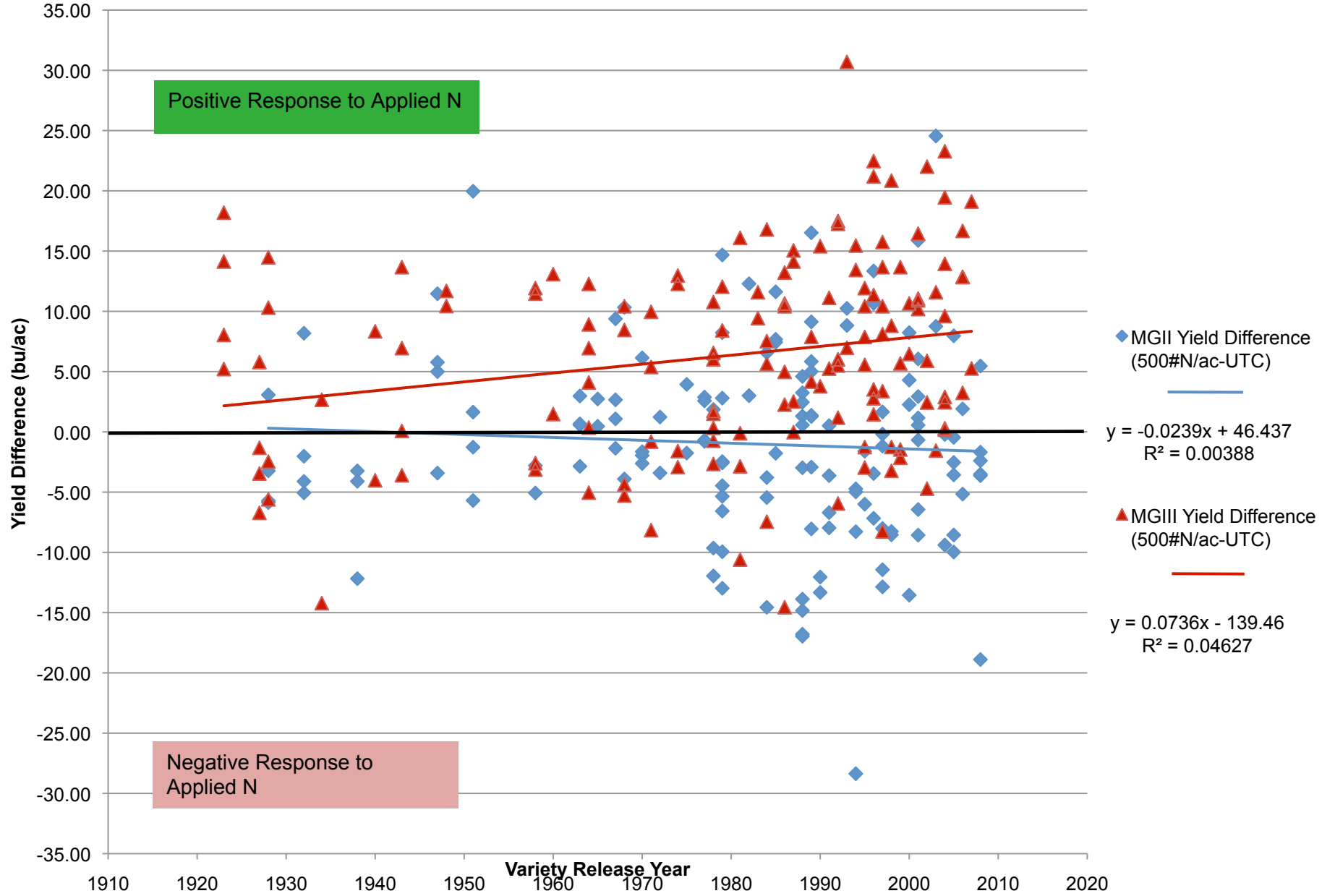
# Yield Difference (Fungicide - UTC)



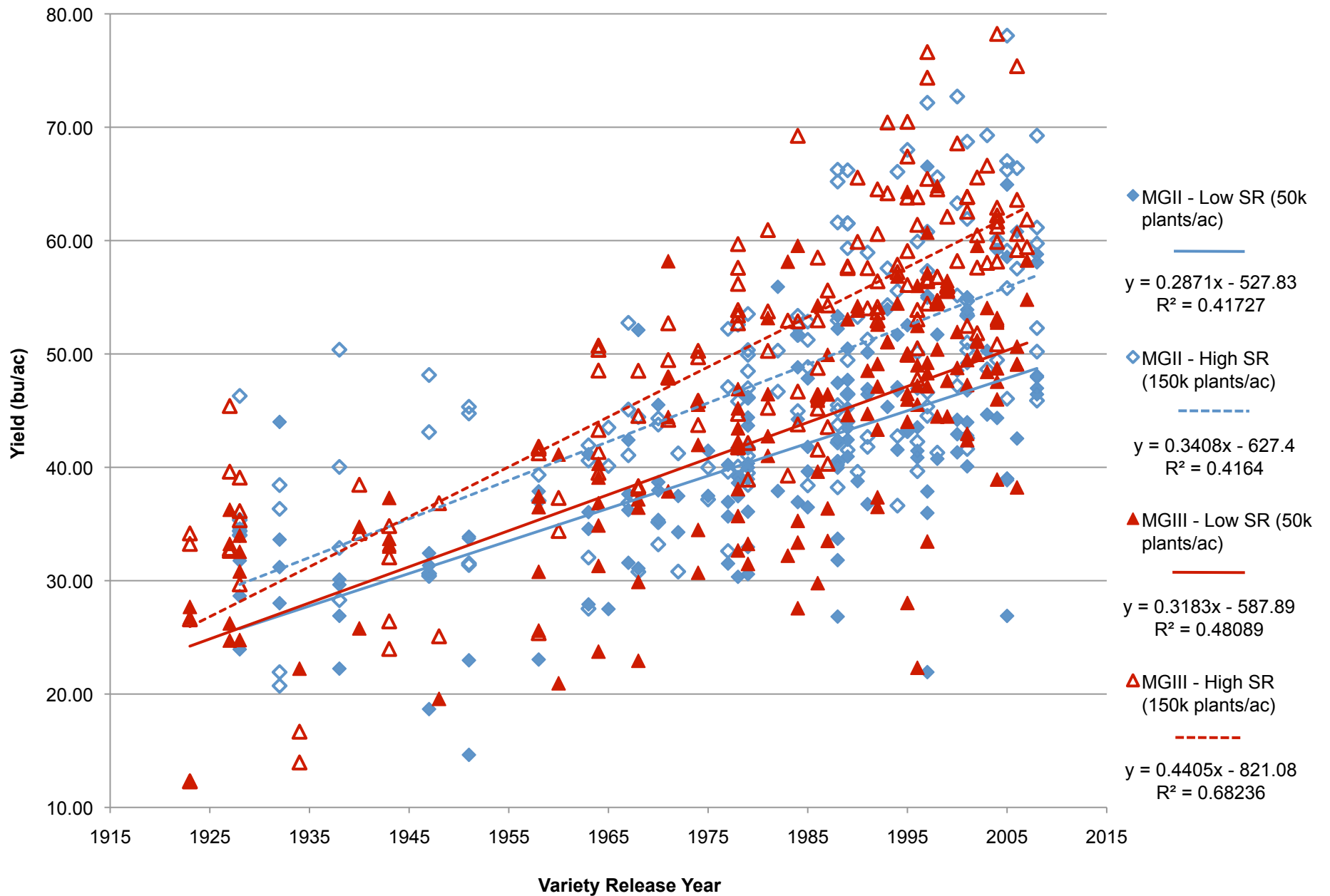
# Nitrogen Utilization



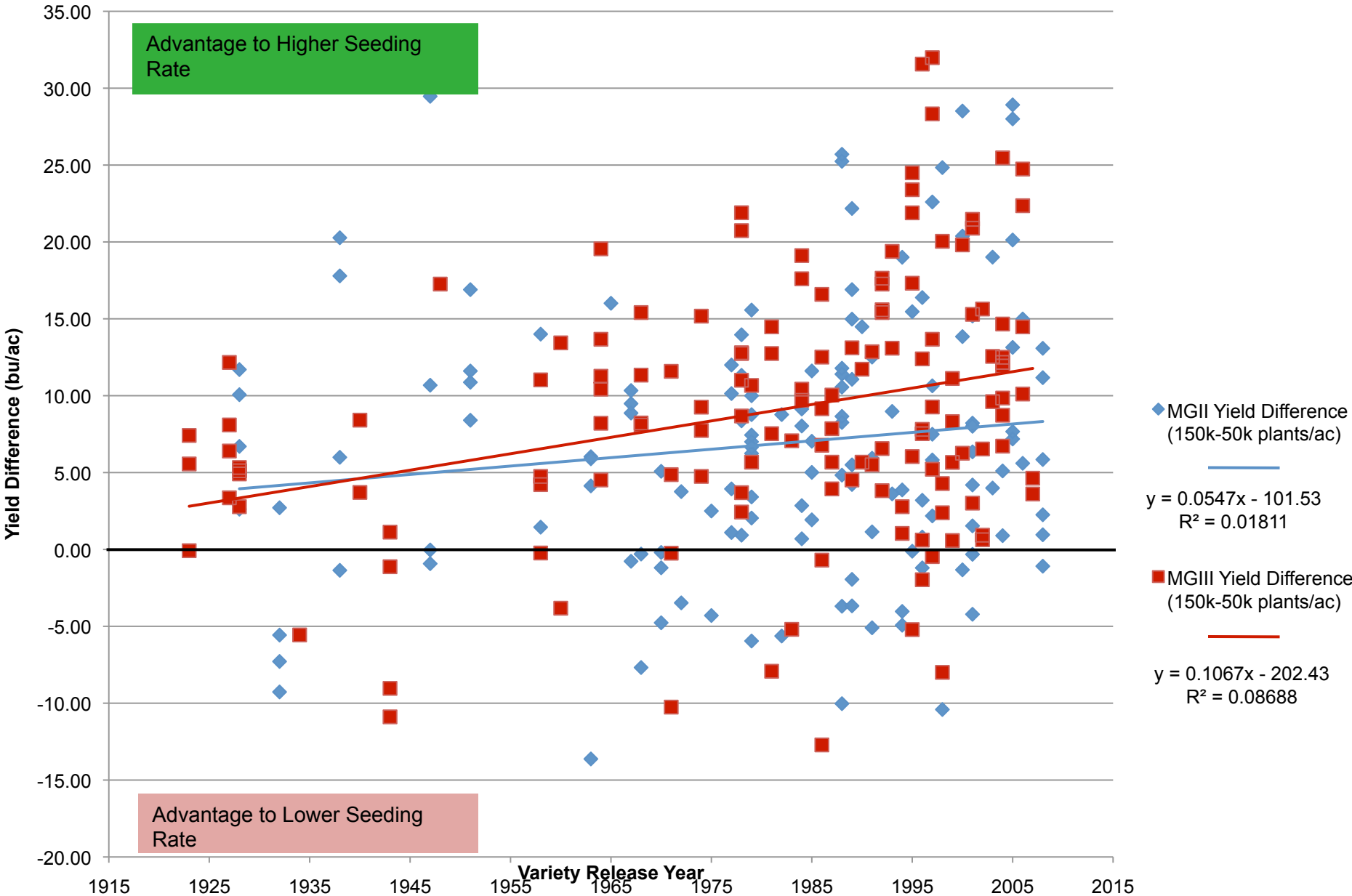
# Nitrogen Yield Difference (500# N/ac - UTC)



# Seeding Rate



# Yield Difference (150k-50k plants/acre)



Advantage to Higher Seeding Rate

Advantage to Lower Seeding Rate

◆ MGII Yield Difference (150k-50k plants/ac)  
 $y = 0.0547x - 101.53$   
 $R^2 = 0.01811$

■ MGIII Yield Difference (150k-50k plants/ac)  
 $y = 0.1067x - 202.43$   
 $R^2 = 0.08688$

# Very Preliminary Thoughts on the Decades Study

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- Newer cultivars are 'longer' and are penalized more by late planting
- Breeders are doing a good job with breeding for the disease controlled by fungicides
- In the MG III's new cultivars are better able to use applied N
  - Poor N fixers or higher N demand not met by BNF
- We are selecting for cultivars that may require higher planting populations



A photograph of a rural landscape. In the foreground, a dirt path runs through a field of green and yellow crops. The path is flanked by rows of plants, some of which are taller and more yellow, possibly indicating maturity or a different variety. The background shows a rolling green hillside under a cloudy sky. A line of trees is visible on the horizon. The overall scene is a typical agricultural setting.

**Coolbeans!!!**



Sept. 16 2010



June 23, 2010



Sept. 9 2010

# Days From V1 to R7

