Comparison of Soybean Yields in On-Farm Trials vs Small Plot Experiments

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Iowa Soybean Association On-Farm Network®

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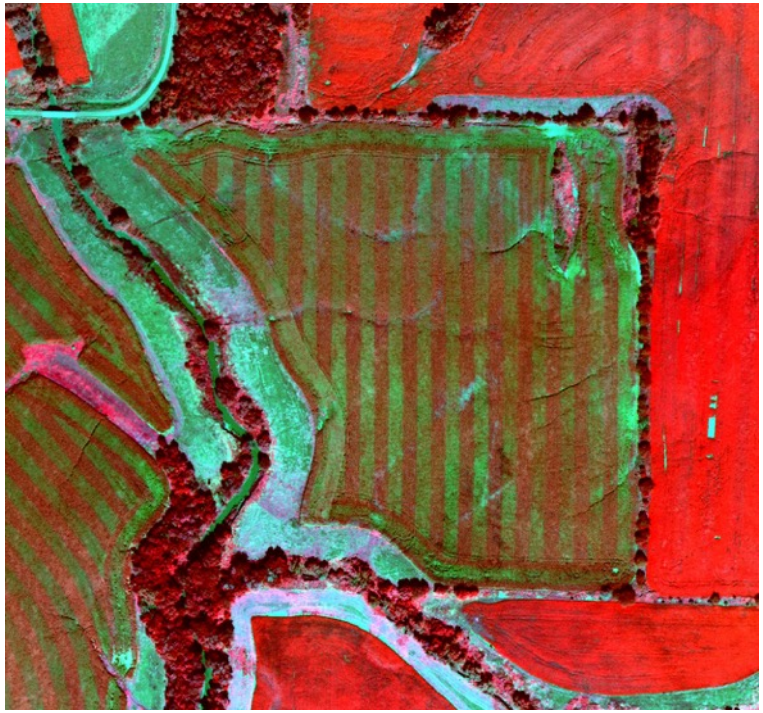
Funded in part by the soybean checkoff

Overview

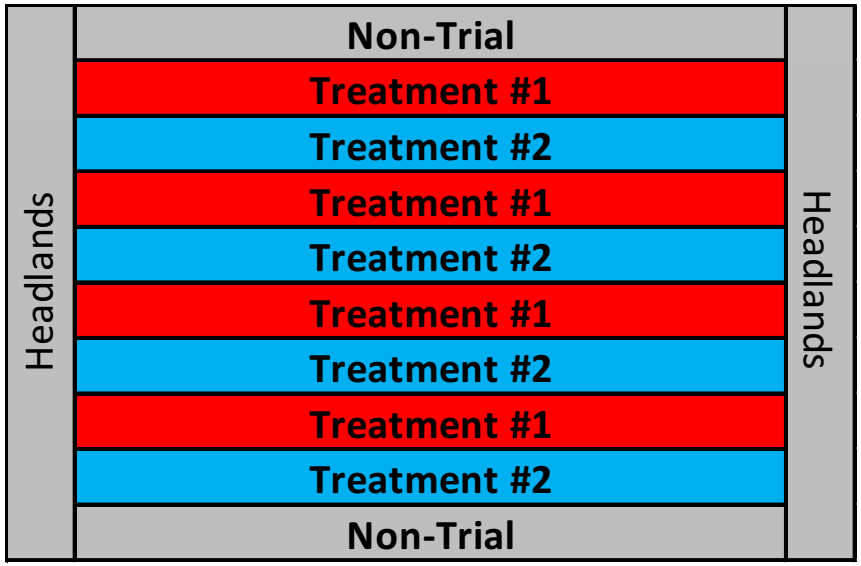
- Small-plot experiments vs On-farm replicated strip trials
    1. Clariva seed treatment
    2. Fungicide on corn
    3. Fungicide on soybeans
- Variance component analyses of random yield variation on soybean fungicide trials
- Power analysis to determine the optimal number of locations, replications and years in future studies

Replicated Strip Trials

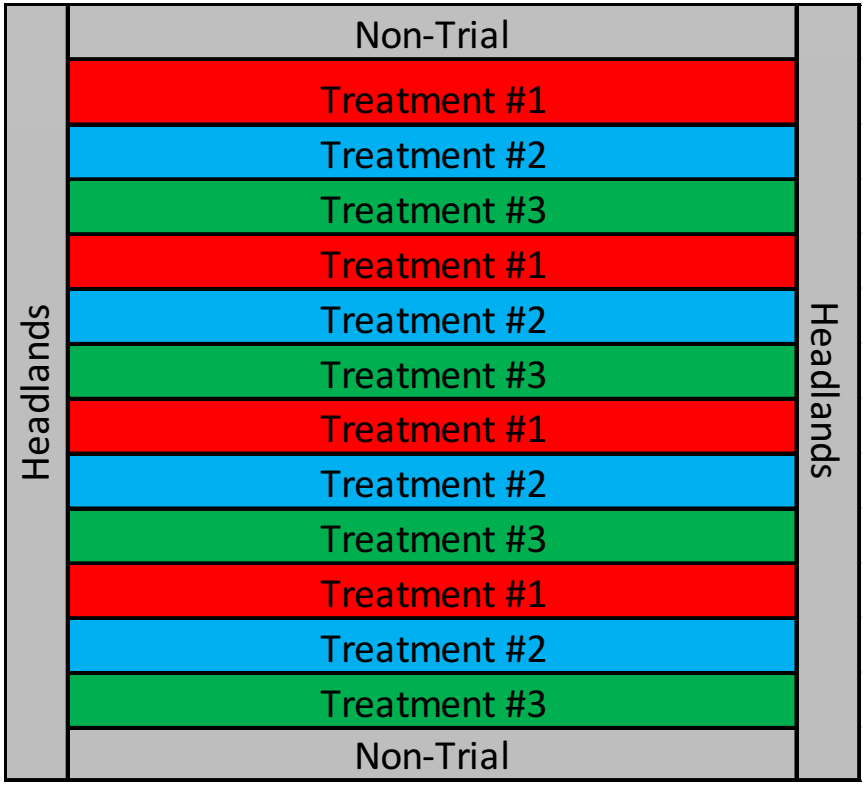
- Sort out true effects of treatments
- Background “Noise” – Experimental error
- Statistical analysis
  - Individual trials
  - With multiple trials



Basic Trial Setup

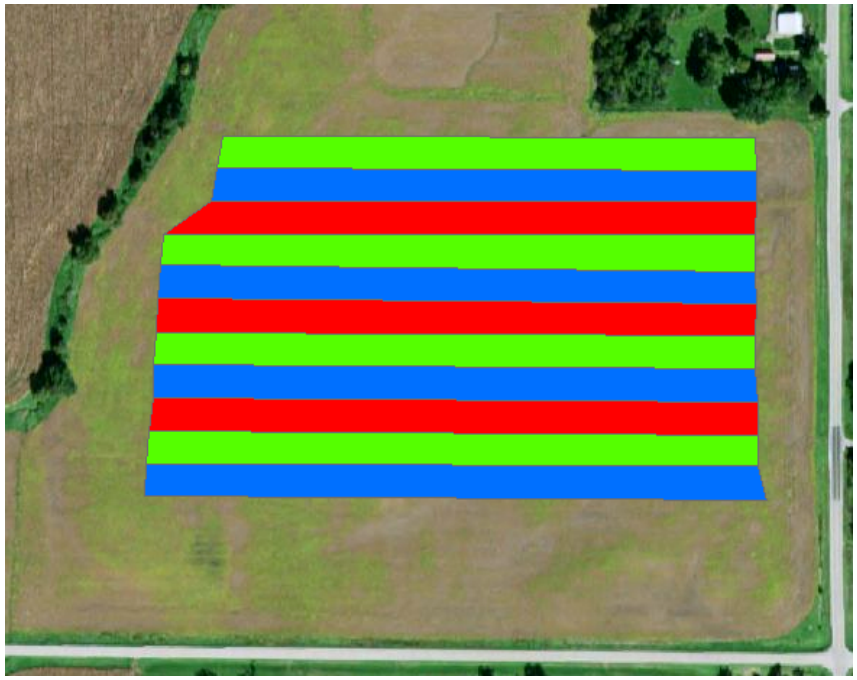


- We do not use headlands or field edges
- For almost all of our trials, we limit to 2 or 3 treatments



Trial Setup - Layout

- 2 and 3 treatment trials are typical
- Most trials follow the rows
- Plot plans (below) can be created for farmer guides or in cases where monitor issues hinder data collection

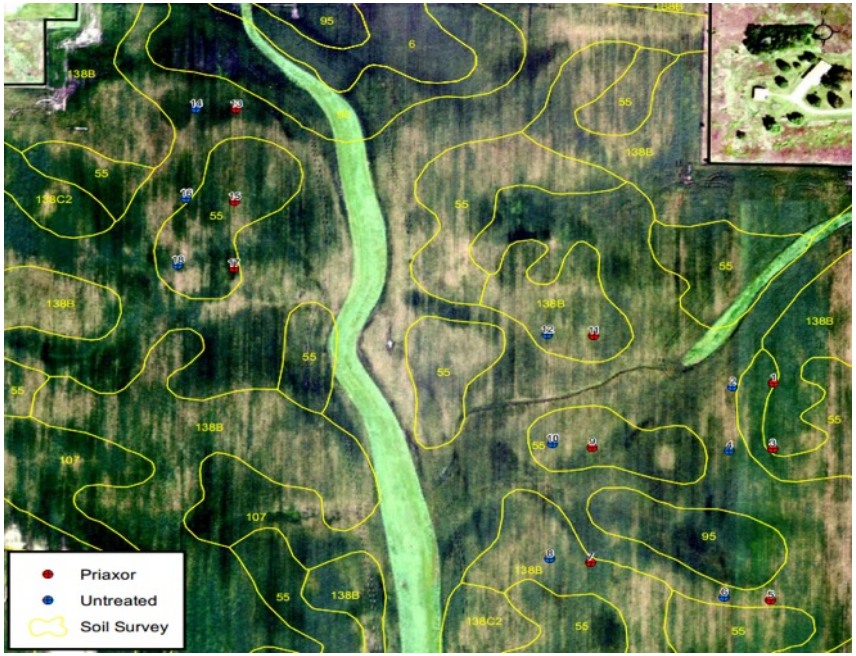


Tools

- New technology makes trials much easier
  - Recording application and harvest
  - Equipment sensors, shut-offs, and VRT
  - Computer Programs (i.e. SMS, ArcMap, AgStudio)

Aerial Imagery

- Quality control
- Identify problem areas
- Treatment effects
- Targeted sampling



Online Database

On-Farm Network® Replicated Strip Trial Database

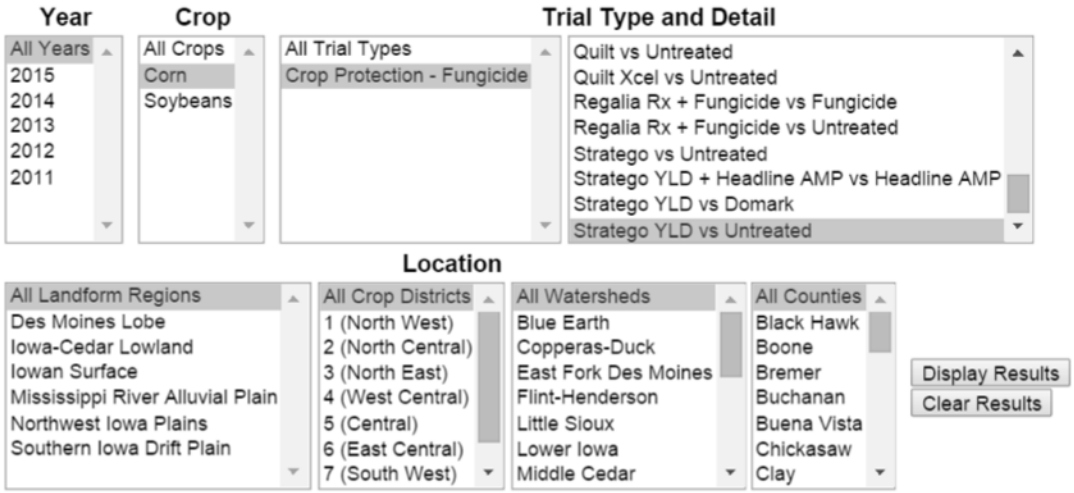
Description

This database contains summaries of individual replicated strip trials following On-Farm Network protocols. The summaries include essential management information, spatial yield data, and imagery. Scouting, soil and tissue sampling reports are included if available. The interface allows users to query by year, crop, trial type/detail and location.

Instructions

Watch the Video Tutorial

Limit trial results as desired by selecting one or more values for Year, Crop, Trial Type, Trial Detail, Crop District, Watershed, Landform Region, and County.
Hold the CTRL key and click to select multiple items.
After making all of your selections click Display Results.
If you choose just one crop you will see the average yield difference and also have the option to calculate ROI on the trials.
To reset your selections click Clear Results.



www.isafarmnet.com

Google: On-Farm Network database

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Basic Steps for Trials

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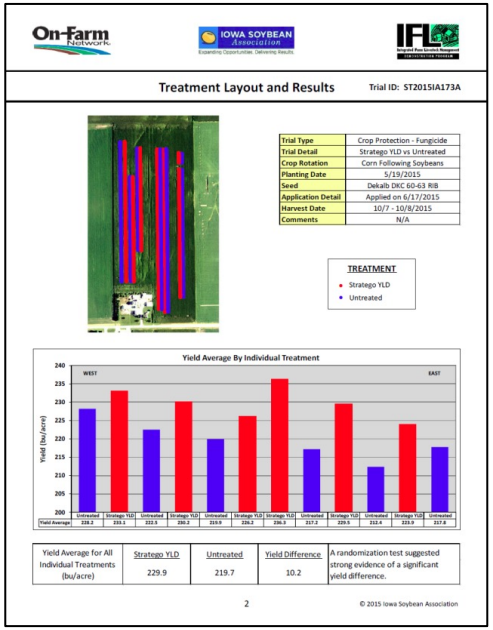
Replicated Strip Trial Report for ST2015IA173A

This is a Crop Protection - Fungicide trial comparing Stratego YLD vs. Untreated on a corn following soybeans rotation, located in Keokuk County, Iowa.

Aerial Imagery Flown September 2, 2015

1 © 2015 Iowa Soybean Association



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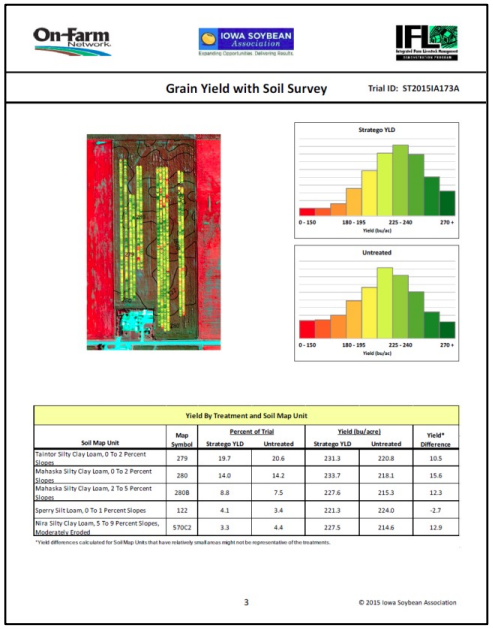
Treatment Layout and Results Trial ID: ST2015IA173A

Trial Type	Crop Protection - Fungicide
Trial Detail	Stratego YLD vs Untreated
Crop Rotation	Corn Following Soybeans
Planting Date	5/19/2015
Seed	Dekalb DKC 60-63 RIB
Application Detail	Applied on 6/17/2015
Harvest Date	10/7 - 10/8/2015
Comments	N/A

TREATMENT
- Stratego YLD
- Untreated

Yield Average for All Individual Treatments (bu/acre)	Stratego YLD	Untreated	Yield Difference	A randomization test suggested strong evidence of a significant yield difference.
	229.9	219.7	10.2	

2 © 2015 Iowa Soybean Association



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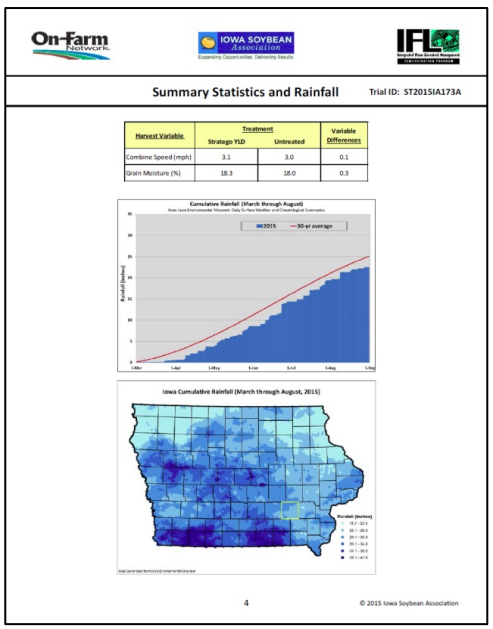
Grain Yield with Soil Survey Trial ID: ST2015IA173A

Yield By Treatment and Soil Map Unit

Soil Map Unit	Map Symbol	Percent of Trial		Yield (bu/acre)		Yield* Difference
		Stratego YLD	Untreated	Stratego YLD	Untreated	
Tainter Silty Clay Loam, 0 To 2 Percent Slopes	279	19.7	20.6	231.3	220.8	10.5
Mahaska Silty Clay Loam, 0 To 2 Percent Slopes	280	14.0	14.2	233.7	218.1	15.6
Mahaska Silty Clay Loam, 2 To 5 Percent Slopes	280B	8.8	7.5	227.6	215.3	12.3
Sperry Silt Loam, 0 To 1 Percent Slopes	122	4.1	3.4	221.3	224.0	-2.7
Nira Silty Clay Loam, 5 To 9 Percent Slopes, Moderately Eroded	570C2	3.3	4.4	227.5	214.6	12.9

*Yield differences calculated for Soil Map Units that have relatively small areas might not be representative of the treatments.

3 © 2015 Iowa Soybean Association



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Summary Statistics and Rainfall Trial ID: ST2015IA173A

Harvest Variable	Treatment		Variable Differences
	Stratego YLD	Untreated	
Combine Speed (mph)	3.1	3.0	0.1
Grain Moisture (%)	18.3	18.0	0.3

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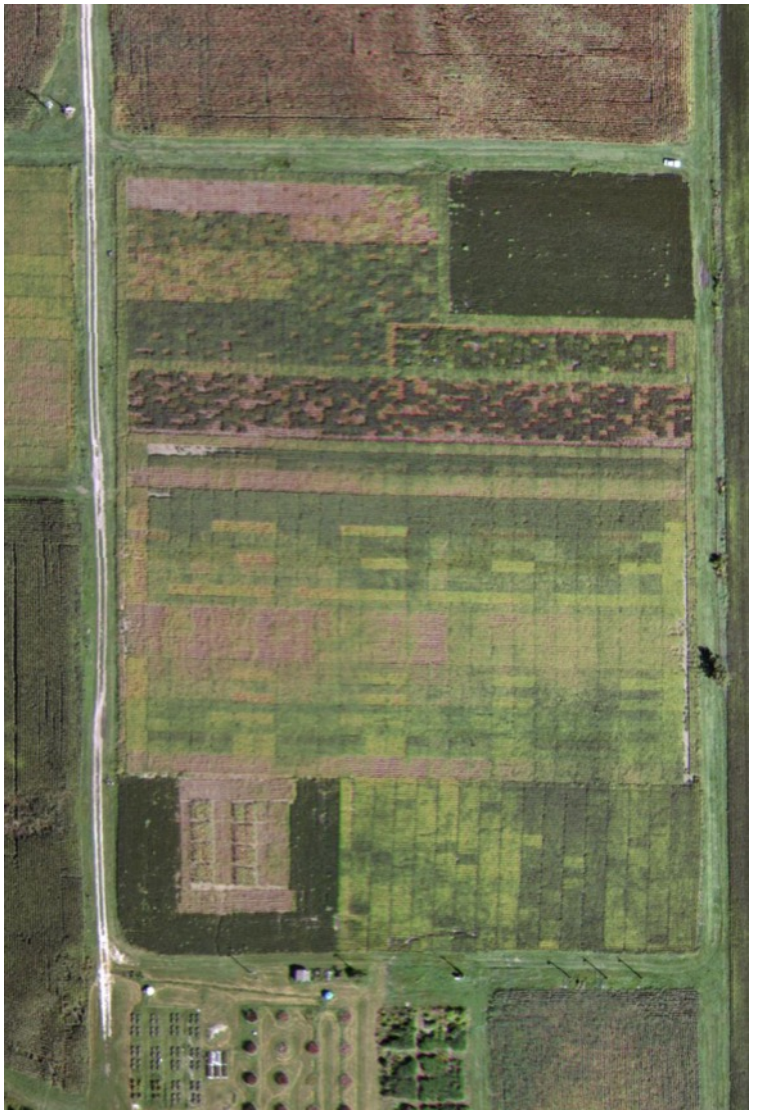
On-Farm vs small-plot research



On-Farm vs small-plot research

Clariva Summary

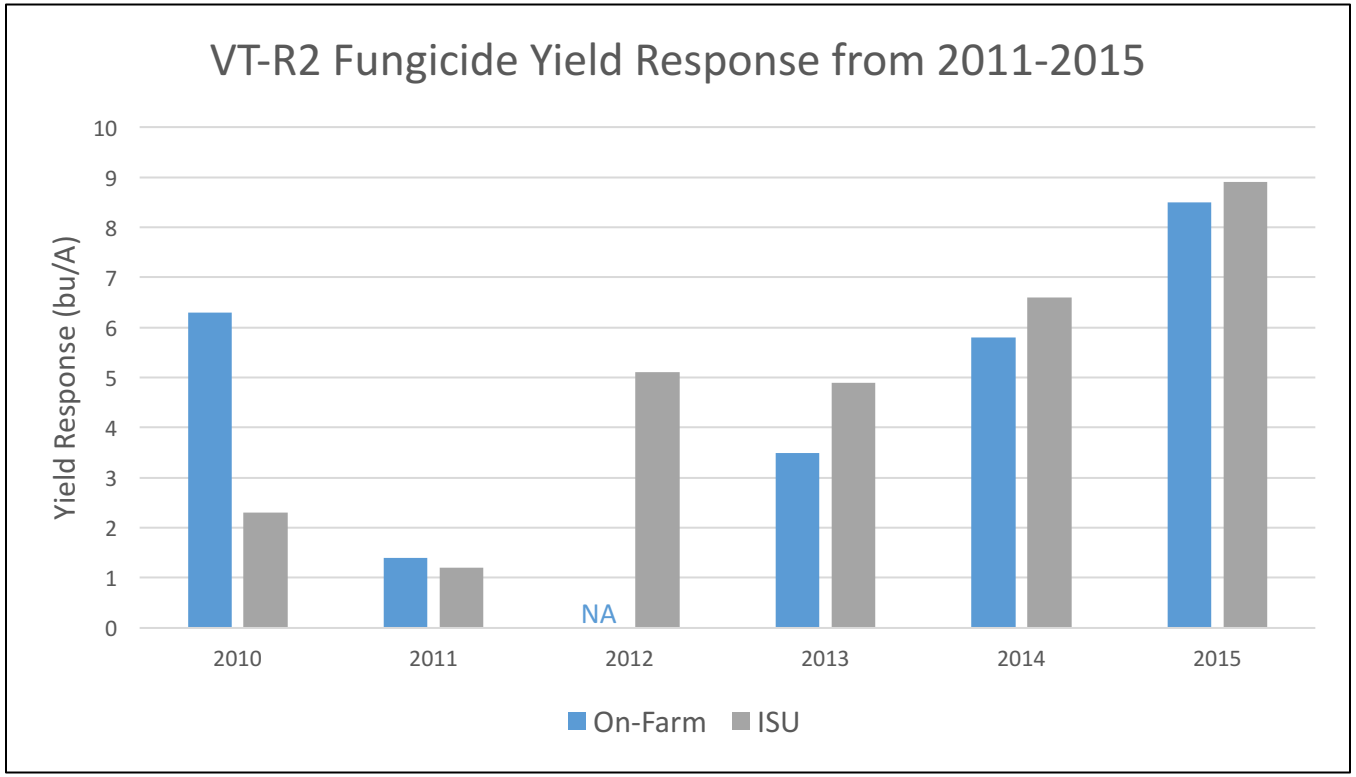
- Across 49 ISU and ISA locations there was on average a **0.1 bu/A** yield response from Clariva
- In 2014-15 there was a significant reduction in SCN reproduction compared to the base seed treatment in both the ISU and ISA trials

Year	Organization	# of Locations	Yield Response (bu/A)	SCN Reduction
2014	ISA	15	0.8*	43%*
2014	ISU	9	0.3	49%*
2015	ISA	16	-0.1	39%*
2015	ISU	9	-0.7	40%
		49	0.1 bu/A	

* Designates significant differences with 10% confidence

Fungicides on Corn (Vt-R2)

- Yield response by year for VT-R2 GS fungicide applications for ISA On-Farm Network and Iowa State University
- Yearly average yield responses were very similar for on-farm trials compared to small-plot trials

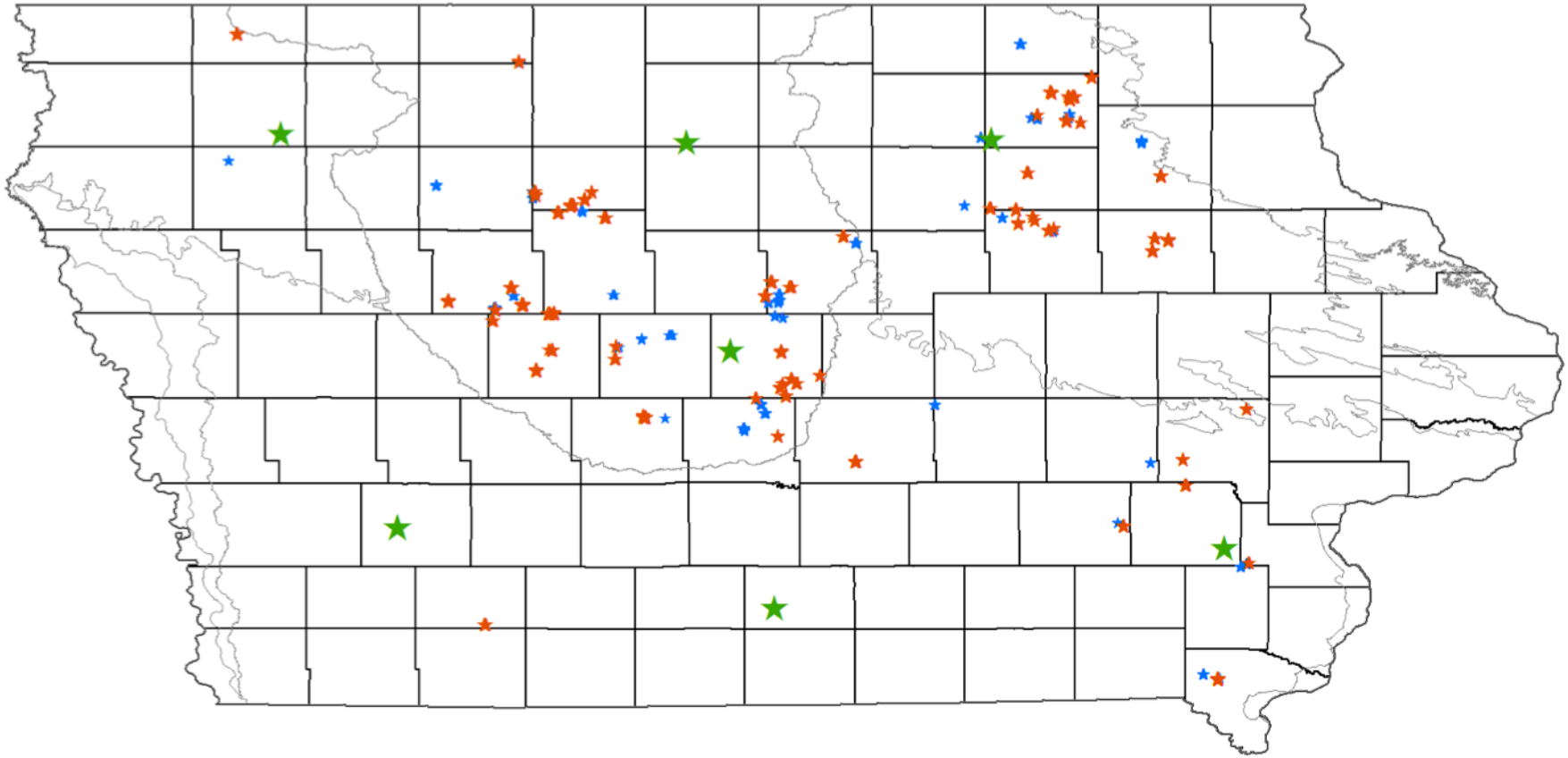


Fungicide on Soybean

- Yearly average yield responses match very closely for strobilurin or strobilurin mix fungicides at the R3 growth stage for Iowa State University small-plot and on-farm strip trials

Year(s)	ISU (bu/A)	On-Farm (bu/A)	Yield Difference
2008-2011	3.1	2.5	**0.6**
2012	0.8	0.2	**0.6**
2013	1.0	0.6	**0.4**
2014	0.1	1.2	**-1.1**
2015	2.2	1.9	**0.3**
2016	2.0	1.6	**0.4**

ISA and ISU Headline Trials



Steps

1) **Statewide analyses**
2) **Regional analyses: separate ISA trials for central, southeast, and northeast Iowa**

ISU Research Stations

ISA 2008 trials

ISA 2009 trials

ISA On-Farm Trials

- Variance component analysis for ISA on-farm Headline fungicide trials in 2008-2009
- Average yield response was **2.8 bu/acre** (90% CI [2.5, 3.3])

Component	Standard deviation bu/acre [90% CI]	Total Variance (%)
Year	**1.1** [0.6; 1.9]	2
Trial (Year)	**6.9** [5.5; 86]	84
Rep (Year*Trial)	**1.6** [1.3; 2.0]	5
Residual noise	**2.3**[2.2; 2.5]	**10**

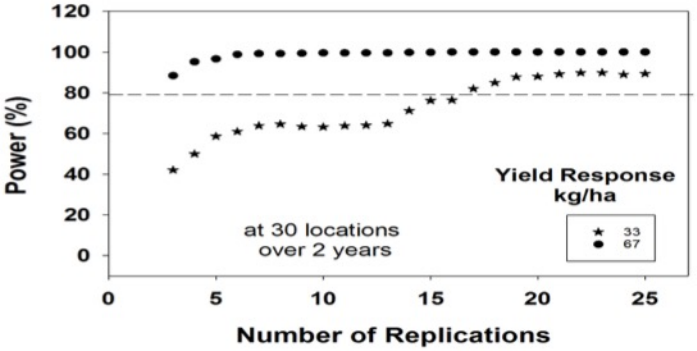
Iowa State University small-plot trials

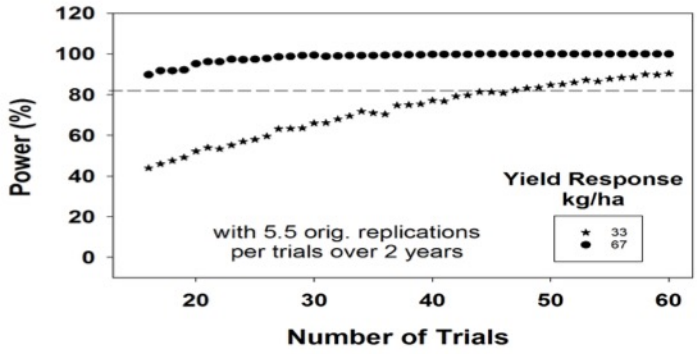
- Variance component analysis for ISU small plot Headline fungicide trials in 2008-2009
- Average yield response was **3.4 bu/acre** (90% CI [2.0, 4.9])

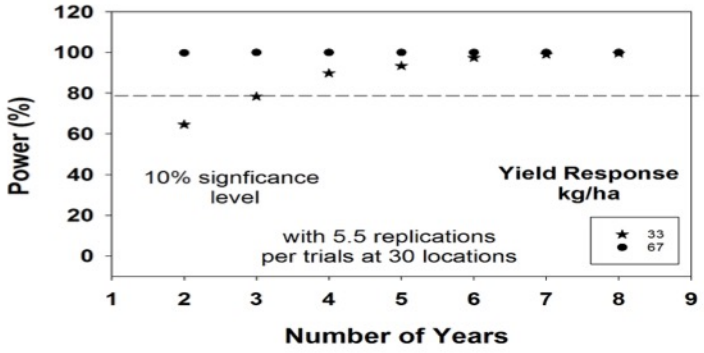
Component	Standard deviation bu/acre [90% CI]	Total Variance (%)
Year	**5.8** [1.0; 33.0]	5
Location (Year)	**9.4** [6.5; 13.9]	57
Rep (Year*Trial)	**2.8** [1.8; 4.5]	22
Residual noise	**5.1** [4.4; 5.8]	**16**

Power Curves: On-Farm vs Small Plots

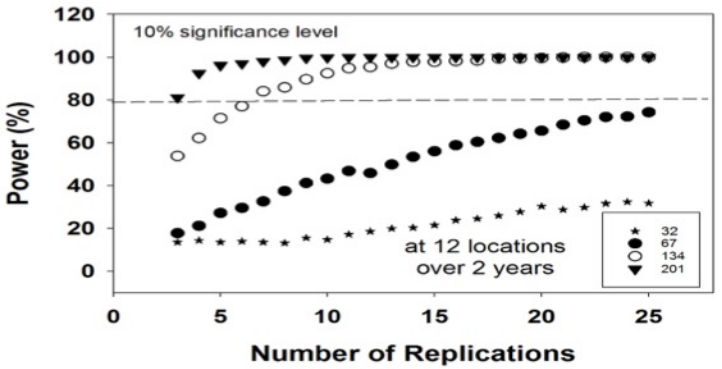
On-Farm Trials based on 2008-2009

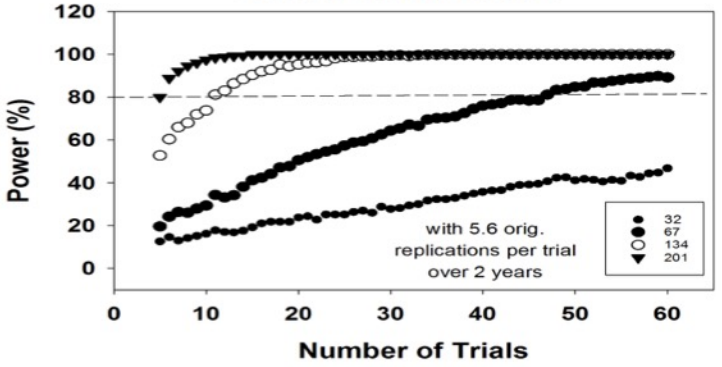


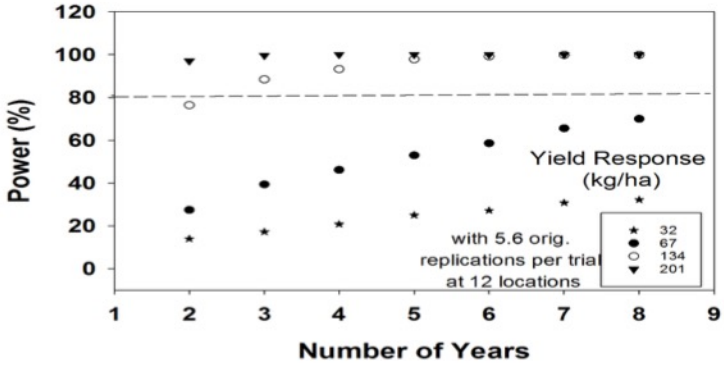




Small-Plot Exp. based on 2008-2009







On-Farm Strip Trial Advantages

- Farmers learn whether technologies or products work first hand on their fields
- Spatial analyses can be done to identify effects of soil properties and topography
- Easier to establish more locations to quantify potential interactions between yield response with environmental and management factors
- Less variability within trials
- Fewer trials, years and replications needed draw conclusions on product performance

Small-Plot Advantages

- Easier to test many treatments in the same location
- Cost per treatment is typically much lower
- Easier to collect in-field/scouting data from trials (i.e. SCN soil sampling, or disease ratings)
- Better control when, where and how trials are implemented
- Less risk of losing trials

QUESTIONS?

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