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# Continuous improvement in the areas of crop, nutrient, pest and soil and water management

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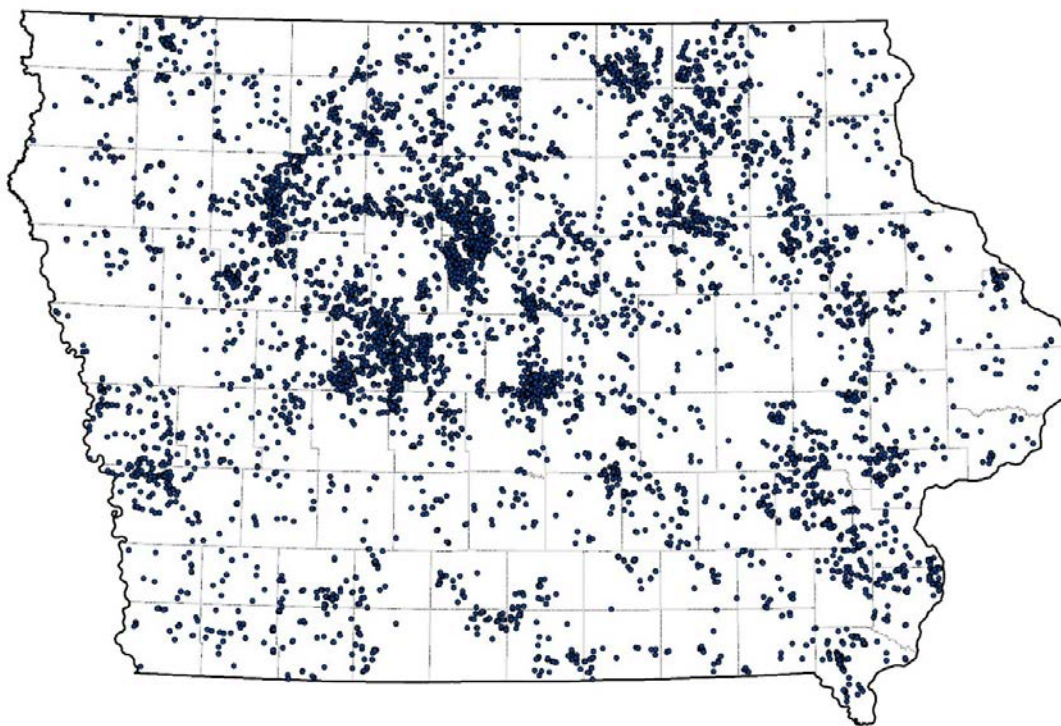
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## Continuous improvement in the areas of crop, nutrient, pest and soil and water management

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### Introduction

During the last 15 years, the Iowa Soybean Association On-Farm Network<sup>®</sup> has developed and adopted a variety of tools to conduct on-farm studies to improve efficiency and profitability in crop production by engaging farmers in participatory learning. The information collected enables farmers to make informed decisions by examining results of on-farm studies evaluating different products and management practices.



**Figure 1.** The locations of On-Farm Network studies conducted from 2005 through 2014 across Iowa.

### Research topics and methodologies

Participants of on-farm studies test a variety of products and management practices in replicated strip trials. Some of the most common research topics are below:

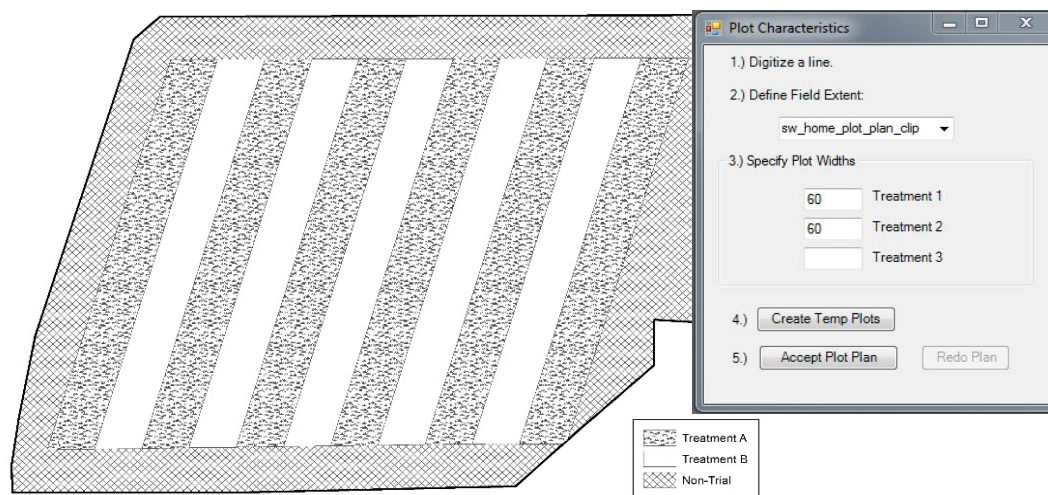
- Crop management - seeding rates, row widths, planting date, plant growth regulators and plant stimulants.
- Nutrient management - rate, form, time, placement and stabilizers.
- Pest management - fungicides, insecticides, herbicides and nematicides.
- Soil and water management - cover crops, soil amendments and tillage types.
- Technology evaluation-crop canopy sensors, planter systems, tillage and fertilizer equipment and data transfer (industry telematics).

Precision agriculture tools and technologies allow growers to turn their farms into research plots. Strip trials compare alternating treatments across farmers' fields replicated a minimum of three times. The simplicity of the design allows farmers to use their own equipment to complete a trial. Treatments are set up to align with the width of the combine header and span the field length. Treatment locations and crop yields are recorded using monitors equipped with GPS.

Analyses are done to identify whether topography, soil drainage, organic matter, soil conductivity and other factors affect yield differences within and across fields.

## Tools and technologies

In addition to precision agriculture monitors equipped with GPS, a geographic information system (GIS) is used to process, analyze and summarize data as well as execute trials. For example, a plot planner tool is used to help in treatment design and treatment layout and ensures that farmers follow trial protocols (Fig. 2). These plans can also be used to prescribe treatments automatically by changing fertilizer or seed rates as farmers conduct field operations.



**Figure 2.** An example of using the plot planner tool to design a strip trial plan.

## Data quality control and summary

A variety of quality control procedures are used to ensure the reliability of trial results. Spatial attributes such as harvest date, grain moisture, combine speed and swath width help eliminate errors and remove areas affected by flood or other problems. Spatial data from precision agriculture monitors are also utilized when assigning treatments to yield observations in GIS.

Late-season aerial imagery of crop canopy is used to identify equipment application errors, changes in crop varieties or hybrids within fields or to verify the treatment effect.



**Figure 3.** The treatments, 15 inch vs 30 inch row spacing in soybeans, are visible on the aerial imagery collected on September 14, 2014. The imagery helped to remove the flooded areas from the yield data.

Year	Crop	Trial Type and Detail	
All Years ▲	All Crops ▲	All Trial Types ▲	30" rows vs. 15" rows ▲
2014	Corn	Cover Crop	80-200-240 vs 39-100-120
2013	Soybeans	Crop Management	Acceleron vs Untreated
2012		Crop Management - Planting Date	Accomplish LM vs Untreated
2011		Crop Management - Population	Accomplish vs Untreated
2010		Crop Management - Roller	Actuate vs Untreated
2009		Crop Management - Row Spacing	Advanced Biologicals N-TEK vs Untreated
2008		Crop Management - Tillage	Aerial Applied vs. Ground Applied
<b>Location</b>			
All Landform Regions ▲	All Crop Districts ▲	All Watersheds ▲	All Counties ▲
Des Moines Lobe	1 (North West)	Apple-Plum	Adams
Iowa-Cedar Lowland	2 (North Central)	Big Papillion-Mosquito	Audubon
Iowan Surface	3 (North East)	Blackbird-Soldier	Black Hawk
Mississippi River Alluvial Plain	4 (West Central)	Blue Earth	Boone
Missouri River Alluvial Plain	5 (Central)	Boone	Bremer
NA	6 (East Central)	Boyer	Buchanan
Northwest Iowa Plains	7 (South West)	Copperas-Duck	Buena Vista
<input type="button" value="Display Results"/> <input type="button" value="Clear Results"/>			

**Figure 4.** A screen capture of the On-Farm Network database of replicated strip trials. Results can be queried by a variety of factors.

Summary of individual trials are posted online at [www.isafarmnet.com/onlinedb/index.php](http://www.isafarmnet.com/onlinedb/index.php). Farmers' name and locations remain anonymous, but users can query, sort by research topic, geographic area or year.

In addition to the summaries of individual trials, the online database can be used to calculate a return on investment for products and practices based on the aggregated results. These summaries are useful for making data driven decisions.

## **Acknowledgements**

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