Crop Sensor Research for Corn N Management at DuPont Pioneer

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Right Product, Right Acre = G x E x M

IN THE FIELD OF DISCOVERY

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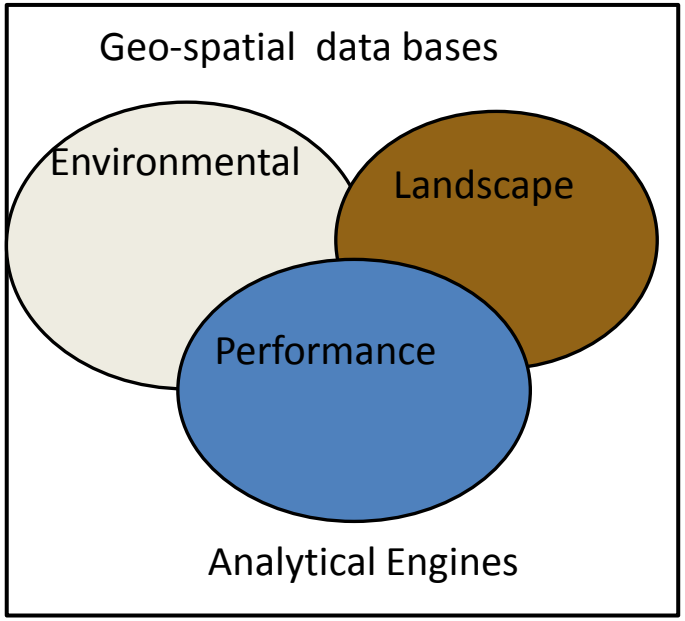
Better Decision Aid Tools

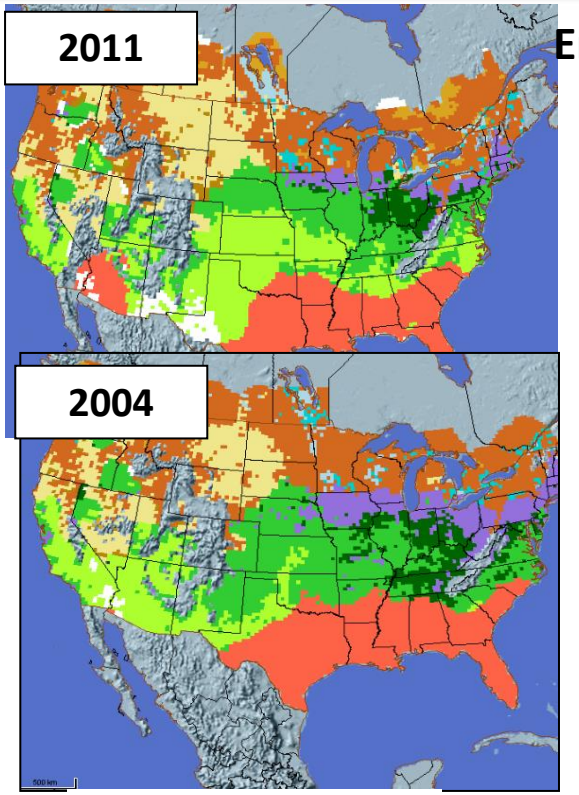
IN THE FIELD OF DISCOVERY

1. *Geo-spatial data bases combined*
   - *Environmental* information (historical & real-time climatic data)
   - *Landscape* information (i.e., soils, topography, imagery, etc.)
   - *Genotypic and agronomic* performance information
2. *Geo-spatial orientation* enables both regional & within field evaluation
3. *Analytical **engines*** to distill information into knowledge and **real-time decisions**

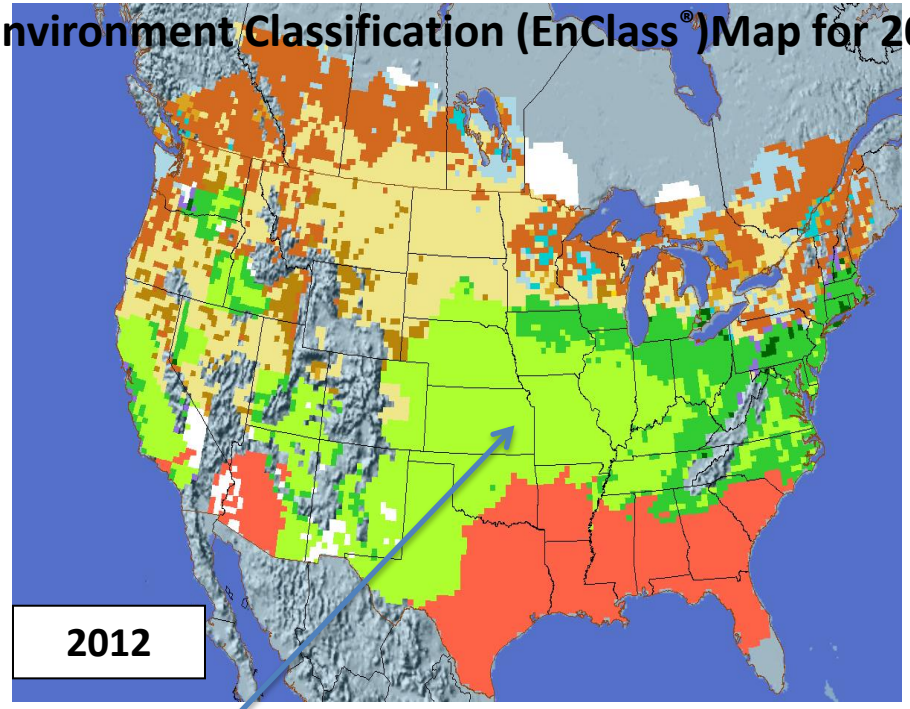


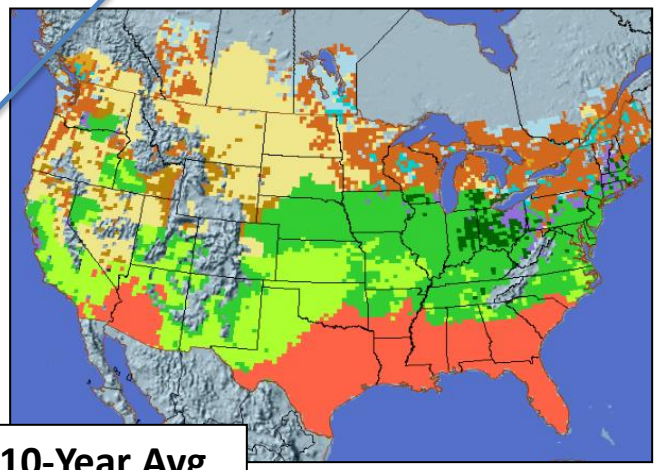
Environmental Information

IN THE FIELD OF DISCOVERY



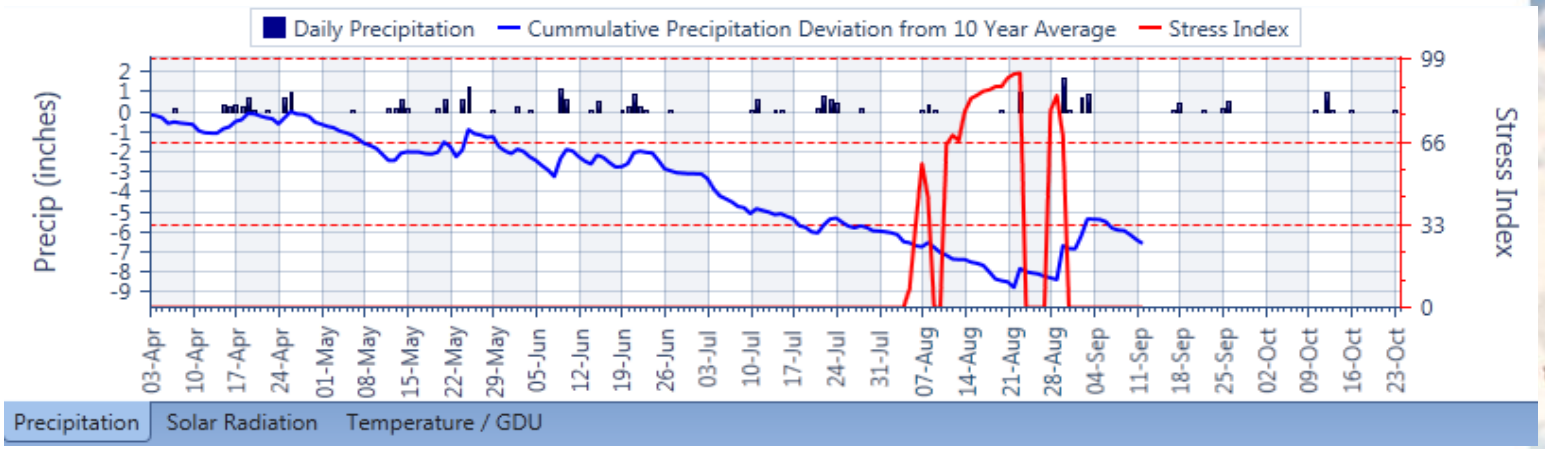
Environment Classification (EnClass®)Map for 2012



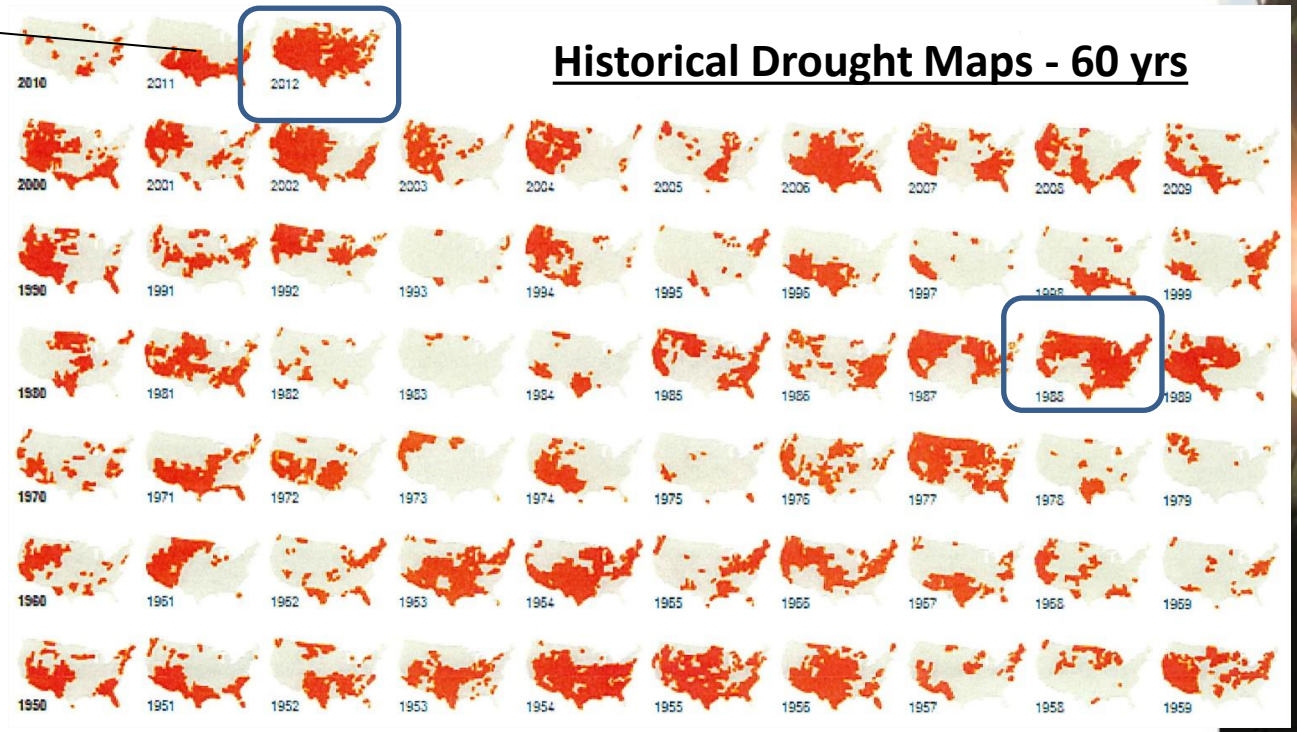


Environmental Information – Real-time & Historical

IN THE FIELD OF DISCOVERY



Individual Location Profile -2012



Historical Drought Maps - 60 yrs

EnClass ® System

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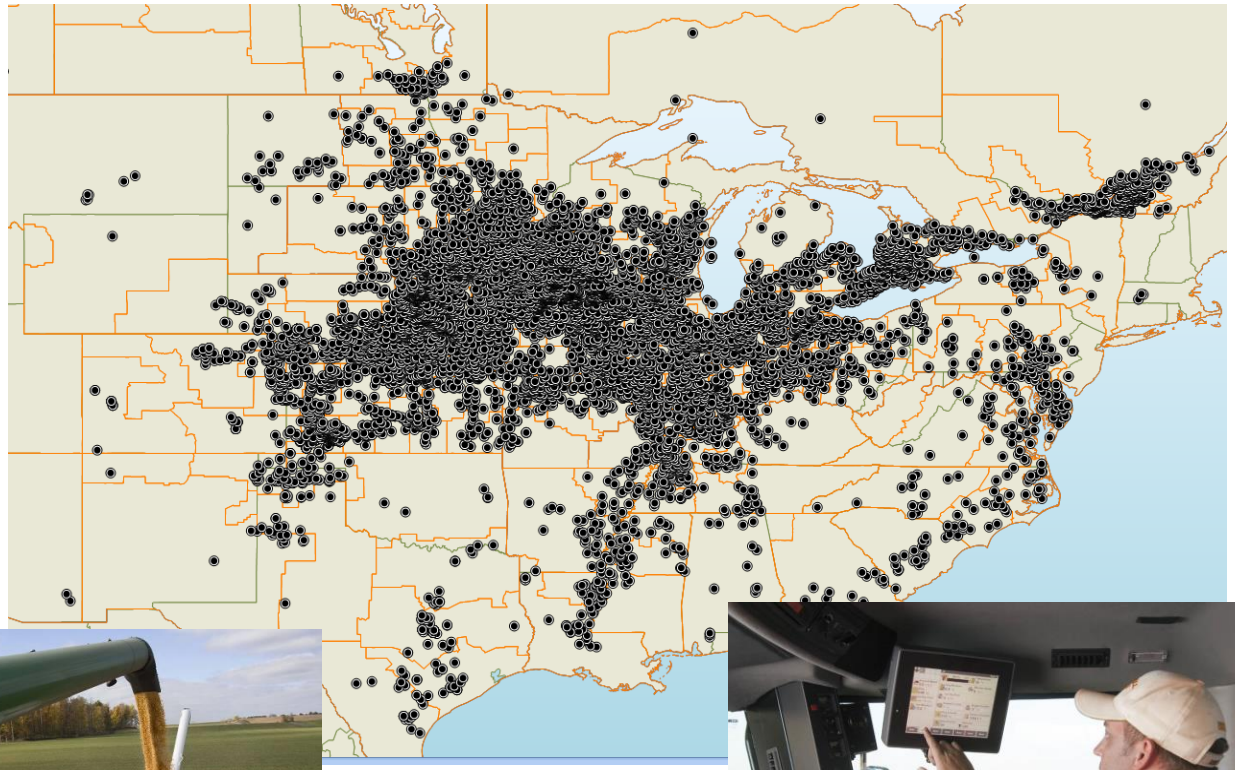
Performance Information

IN THE FIELD OF DISCOVERY

On-farm Agronomy Trial Locations in 2012



Weigh Wagon

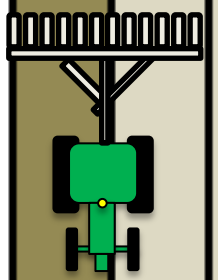
Yield Monitor

On-farm Hybrid by Population Protocol

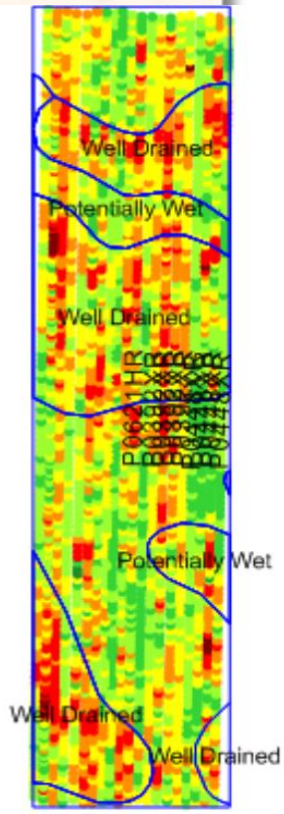
IN THE FIELD OF DISCOVERY

Field Layout of Hybrid and Population Field Strips

Planter Width	Planter Width	Planter Width	Planter Width	Planter Width	Planter Width	Planter Width	Planter Width
		Change Population		Change Hybrid		Change Population	
Hybrid A / Hybrid B	Hybrid B / Hybrid A	Hybrid A / Hybrid B	Hybrid B / Hybrid A	Hybrid C / Hybrid D	Hybrid D / Hybrid C	Hybrid C / Hybrid D	Hybrid D / Hybrid C
26K / 26K	30K / 30K	34K / 34K	38K / 38K	38K / 38K	34K / 34K	30K / 30K	26K / 26K
	Change Population		Change Population		Change Population		Change Population



FIT Yield Map of Strips



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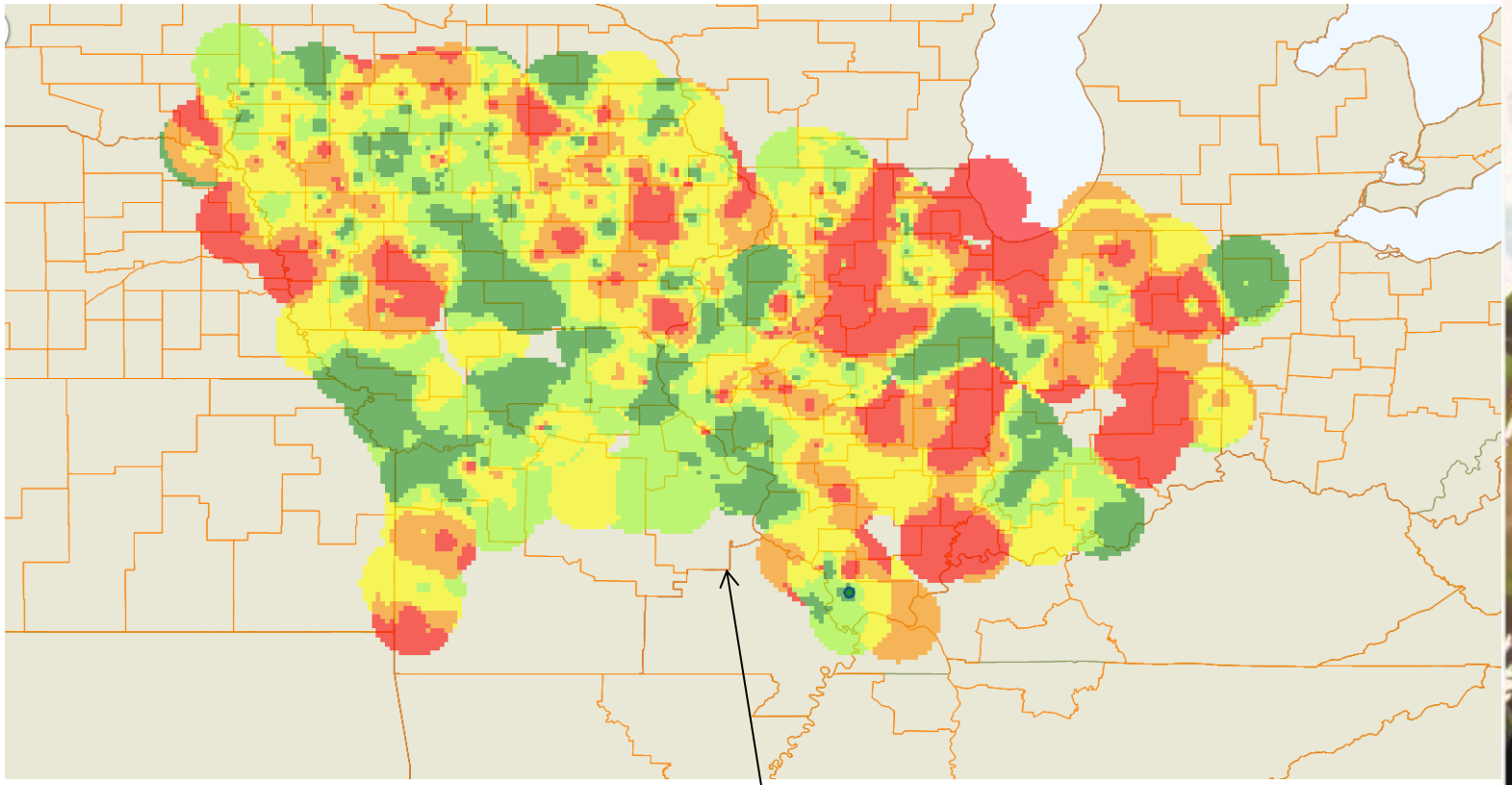
Regional Evaluation of Hybrid Performance

IN THE FIELD OF DISCOVERY



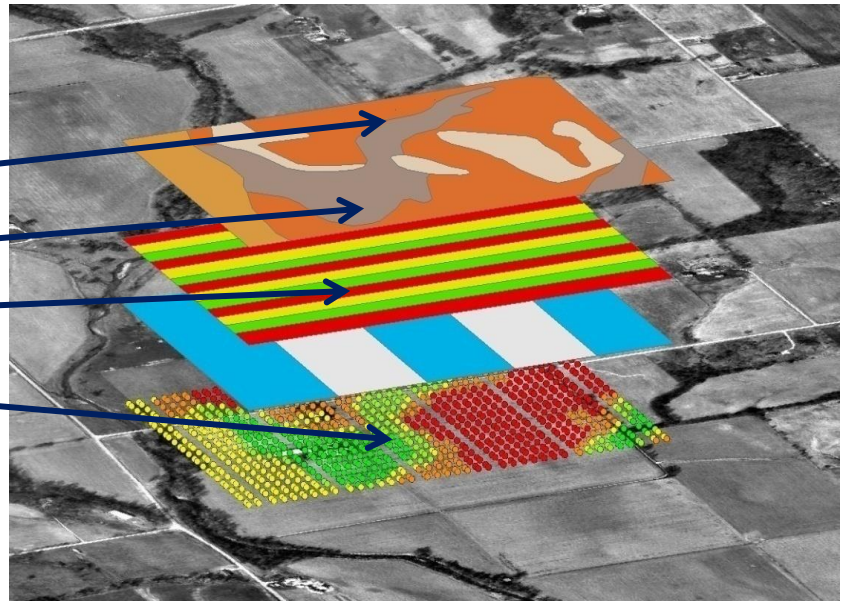
Interpolated Difference Map

Within Field Evaluation

IN THE FIELD OF DISCOVERY

- Pioneer Field360® Studio is a proprietary version of MapShots' AgStudio™ precision Ag software package.
- Customers inputting yield data in system since early 2000's
- GIS analysis tools, with ability to import multiple information layers, Pioneer EnClass® Soils
- Can analyze performance data using unique combinations of polygons

SURGO Soils, Topo, Soil EC, Imagery
As-Planted
Nitrogen Treatment
Yield Map



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PIONEER® FIELD360™

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Other New Tools in 2013

Pioneer Field360® Field Notes app

Pioneer Field360® Select

Corn Plantability app

Precision Ag Education Materials

IN THE FIELD OF DISCOVERY

CROP INSIGHTS — PIONEER. A DuPont Business

Utilizing On-the-Go Soil Sensing Devices to Improve Definition of Management Zones

by Bob Gunzenhauser[1], John Shanahan[2] and Eric Lund[3]

Summary

- Apparent soil electrical conductivity (EC) mapping is a simple, inexpensive tool farmers can use to quickly and accurately characterize soil differences within farm fields.

considerable promise for characterizing field variation in soil properties. Soil EC is a measure of the soil's ability to transmit or conduct an electrical current, and the units are reported in milliSiemens per meter. Soil EC measurements are correlated with soil properties that affect crop productivity,

CROP INSIGHTS — PIONEER. A DuPont Business

Using Crop Sensors to Improve Corn Nitrogen Management

by John Shanahan, Agronomy Research Manager

Summary

to 1/2 of the projected needed N at or prior to planting and using sensors to direct the balance of crop N requirement as in-season applications (Figure 1).

Compared to current N management practices, sensors are better able to account for within field spatial variability and year-to-year changes in rainfall and the soil's capacity to mineralize and supply N. This method has the potential to better match fertilizer N supply with crop N need. Use of sensors minimizes the potential for over- and under-applications of nitrogen. Research results suggest this approach not only allows the grower to maximize yields and profitability, but also leads to the highest crop NUE and reduced potential for environmental pollution (Hong et al., 2007; Shanahan et al., 2008). This *Crop Insights* will discuss the active canopy reflectance sensor systems ("crop sensors") commercially available and their potential for improving N management in corn production.

CROP INSIGHTS — DUPONT PIONEER

Transforming On-Farm Trials into Improved Crop Management Decisions with Pioneer® Field360™ Services

Andy Heggenstaller and Scott Nelson, Agronomy Research Managers

Summary

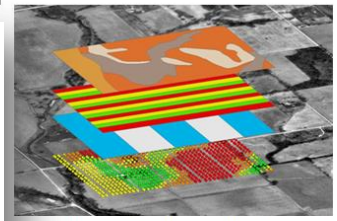

Figure 1. Illustration of how Pioneer Field360 software overlays geo-referenced soils data (upper layer) with hybrid and management zone positions (middle two layers) to determine how these factors affect yield (bottom layer) in an on-farm trial.

CROP INSIGHTS — DUPONT PIONEER

Use of Remote Sensing Imagery for Improving Crop Management Decisions

by Bob Gunzenhauser[1], and John Shanahan[2]

Summary

- Remote sensing is the practice of collecting reflected light information from objects like crop canopies using remote platforms such as satellites, aircraft, or ground-based booms.
- In 2013, DuPont Pioneer is offering remote sensing imagery services to growers in Pioneer® Field360™ via the RapidEye satellite company which can be displayed on mobile version for iPad® or other tablet devices, and can be used for directed field scouting.
- Images can be used to develop management zone directed soil sampling schemes, validating hybrid tests or evaluating other agronomic practices on your farm.

Introduction

Remote sensing is defined as collecting information about objects (e.g., soil or crop surfaces) from remote platforms like satellites, aircraft, or ground-based booms. This practice involves the collection and analysis of reflected light and is potentially important as a source of data for

Figure 1. Aerial color-infrared image depicting spatial variation in crop vigor for several fields. Images courtesy of

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Research Questions

IN THE FIELD OF DISCOVERY

Can Hybrid Canopy Architecture and Color Affect Sensor N Recommendation?

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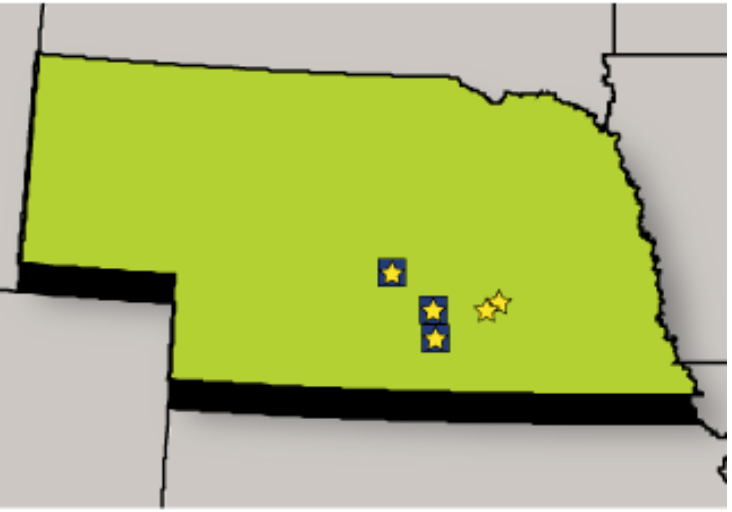
Crop Sensor Study Description

IN THE FIELD OF DISCOVERY

Map of 2011 and 2012 trial locations in central Nebraska
Total of 8 Site -Years.



Hybrids used by year and their respective canopy characteristic.

Year	Hybrid	Color
2011 ■	P0902XR (HXX, LL, RR2)	Dark
	P1395XR (HXX, LL, RR2)	Light
2012 ★	33D49 (HX1, LL, RR2)	Dark
	P1498HR (HX1, LL, RR2)	Light

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Study Description (continued)

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Hybrid Color	Sensor Trt,	Pre-plant or Early Sidedress N (lbs/A)	Description
Dark	1	190-275	**Reference**
	2	75-120	Dark Ref.
	3	75-120	Light Ref.
	4	75-120	Average
Light	5	190-275	**Reference**
	6	75-120	Dark
	7	75-120	Light
	8	75-120	Average

Sensor-directed N applications made around V9

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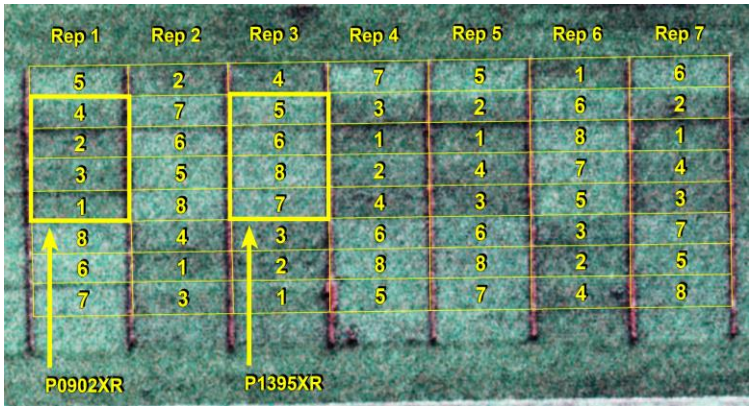
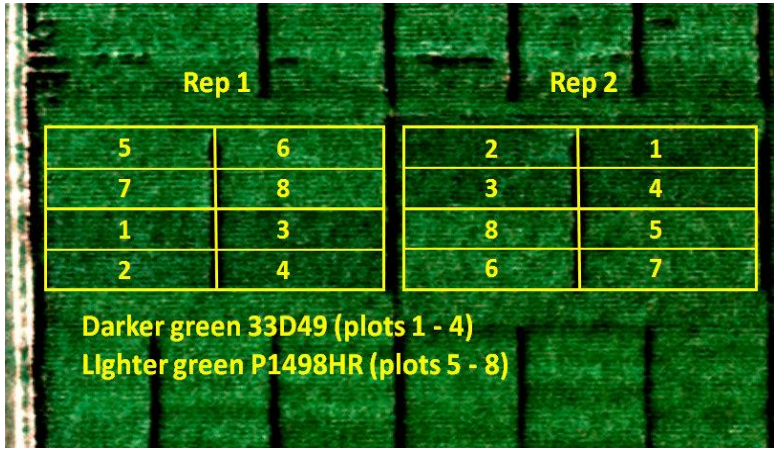
Study Description (continued)

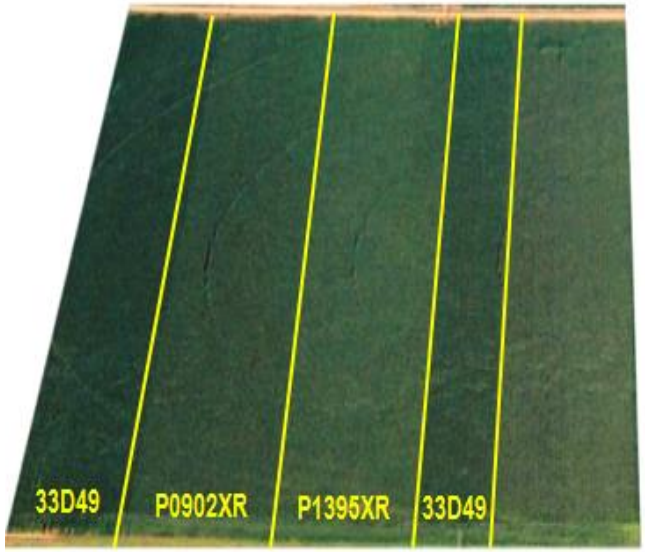
IN THE FIELD OF DISCOVERY

Small-Plot Trials with University of Nebraska in 2011 and 2012





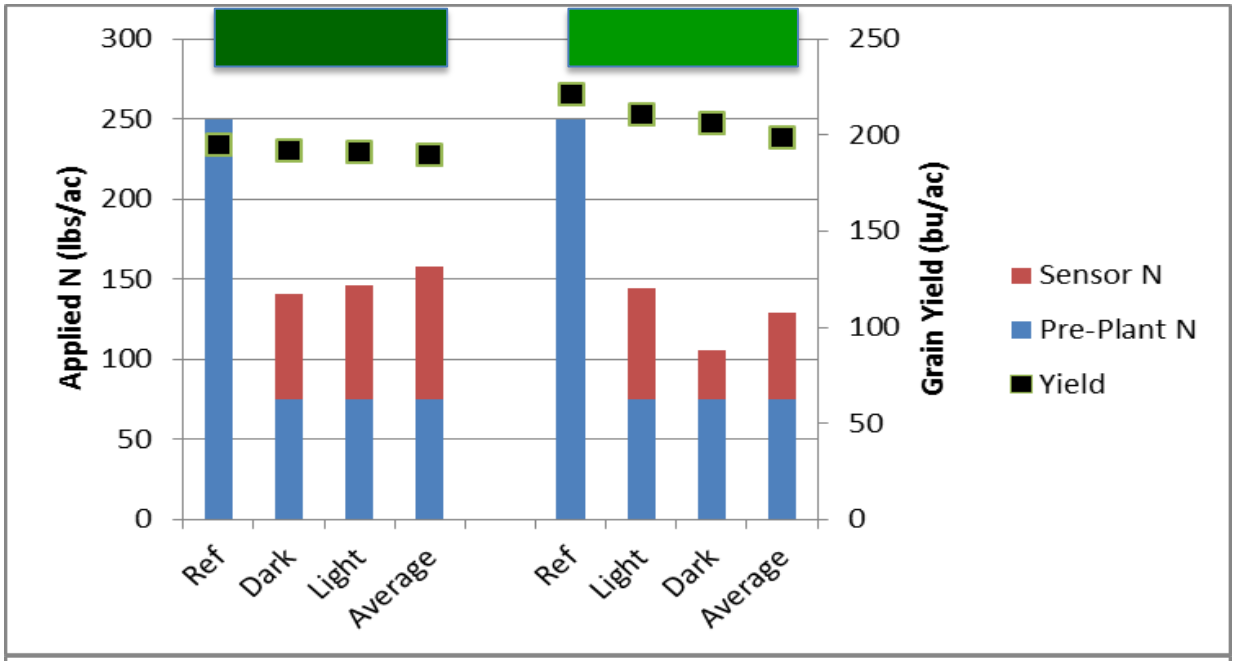
On-farm Trials W/ Field Length Strips In 2011 and 2012



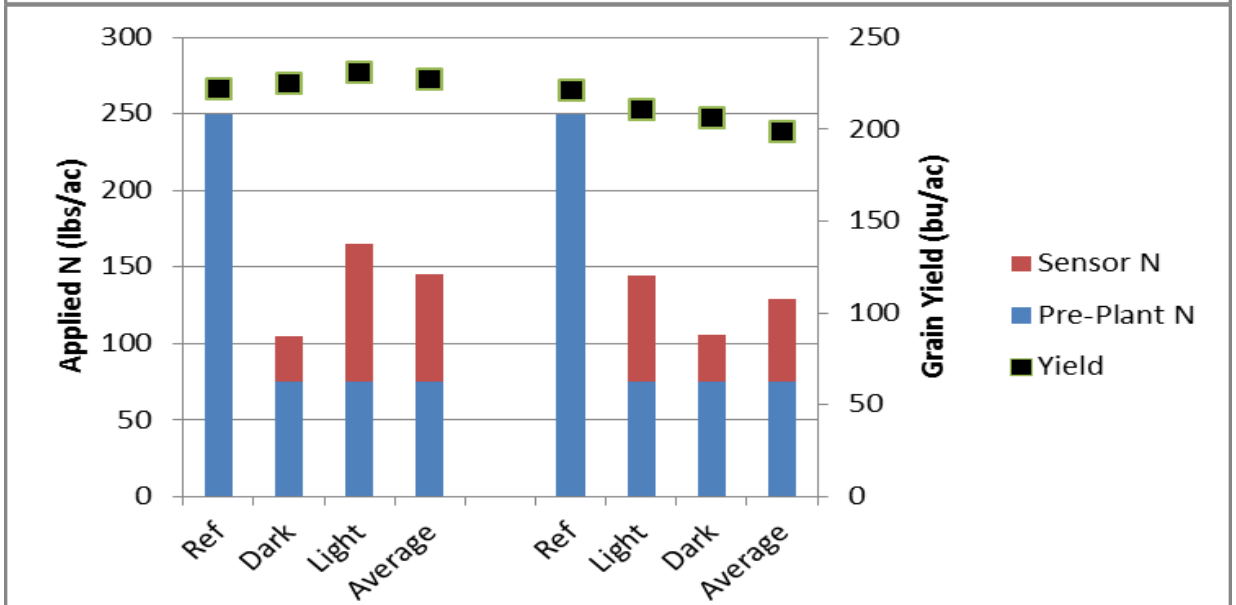
UNL Small Plot Trials

IN THE FIELD OF DISCOVERY

2011

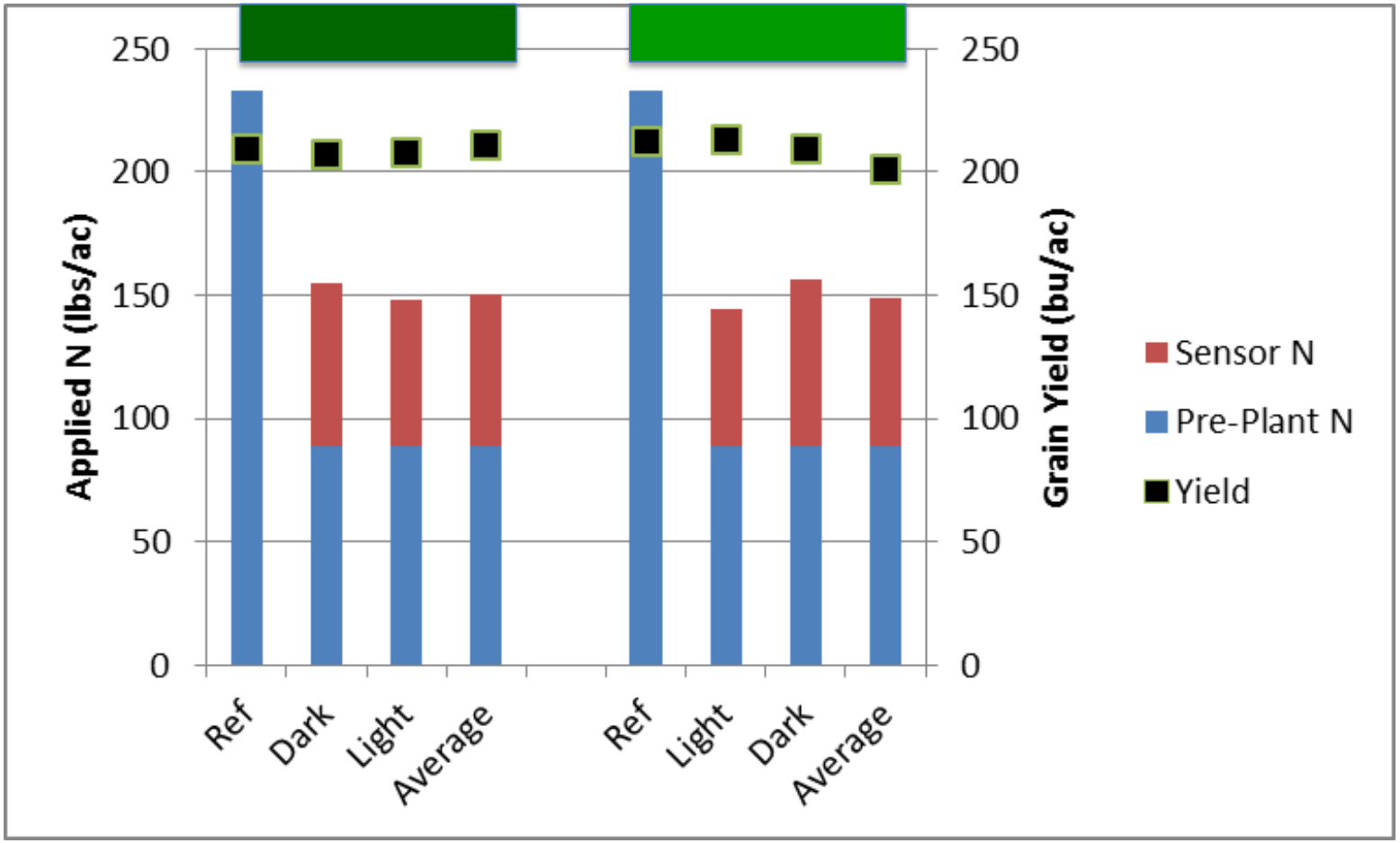


2012



Averaged Across Eight Site-Years

IN THE FIELD OF DISCOVERY



- Profit Potential of $30 to $50 per acre
- NUE substantially improved
- Studies continued in 2013 to confirm results


Thanks for Your Attention
Questions?