



Climate Fieldview™: A platform for advancing innovations in nutrient management

Brad Joern, Principal P and K Soil Scientist, The Climate Corporation
Nov. 16, 2017





Our Belief

The next breakthrough in agriculture will be utilizing data and analytics to optimize decision making.





Our Mission

To help all the world's farmers sustainably increase their productivity with digital tools.

Our Vision

A digitized world where every farmer is able to optimize and flawlessly execute every decision on the farm.



Harvest Map View

Imagine being an ag retailer or trusted advisor on October 15, 2020...

Table Map

Planters Combines Tickets Users



Harvest Map View

Table

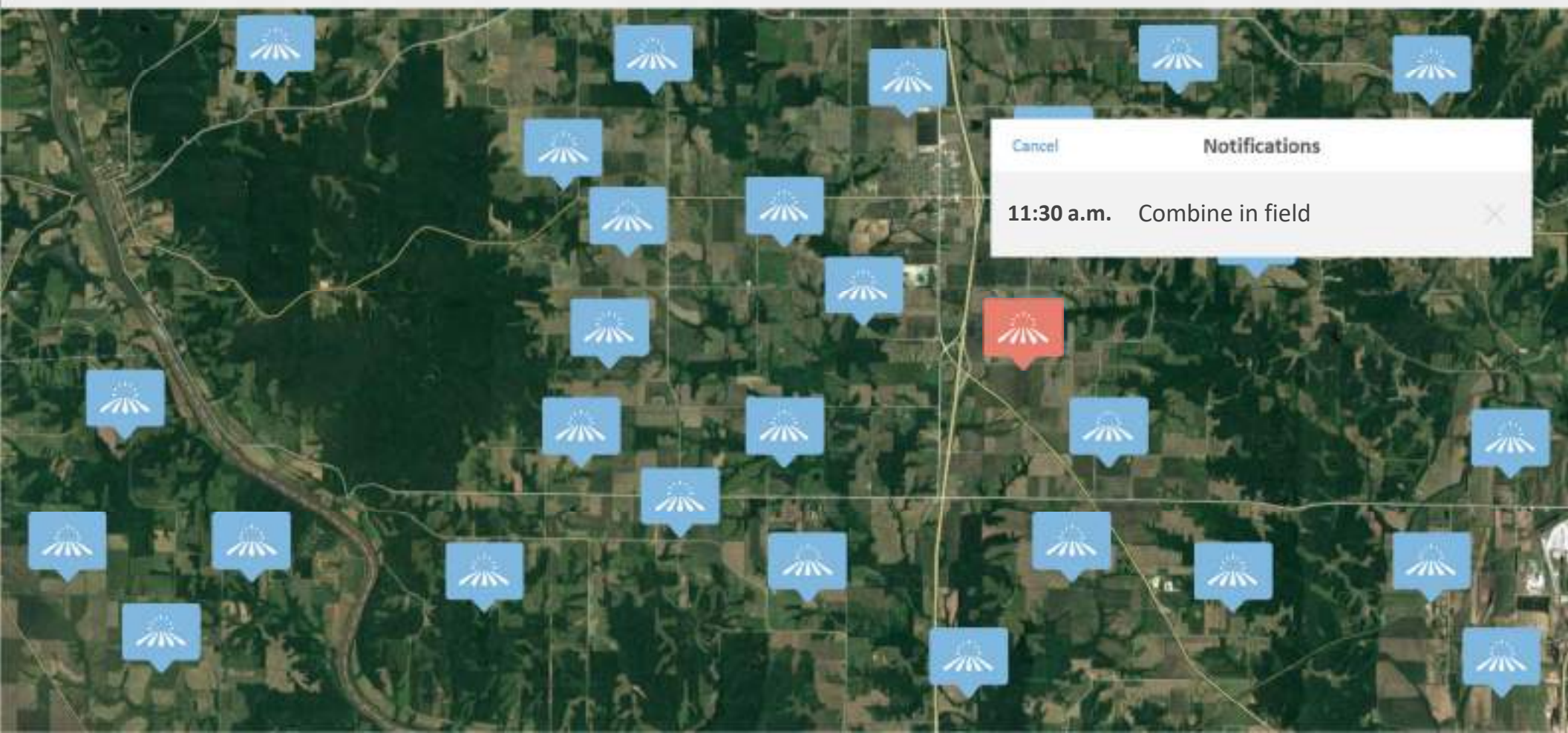
Map

Planters

Combines

Tickets

Users



Cancel

Notifications

11:30 a.m. Combine in field

X

Harvest Map View

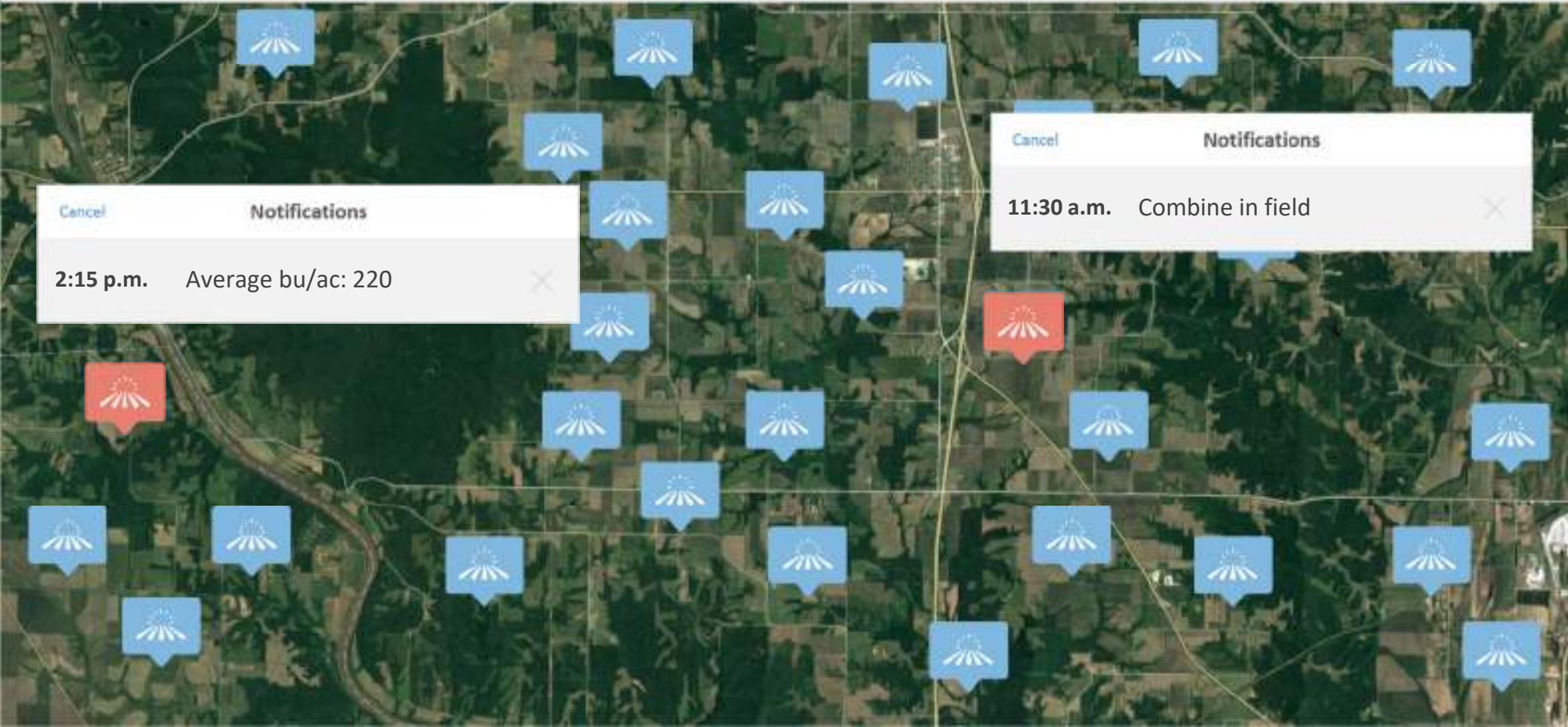
Table Map

Planters

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Tickets

Users



Cancel

Notifications

2:15 p.m. Average bu/ac: 220

Cancel

Notifications

11:30 a.m. Combine in field

Harvest Map View

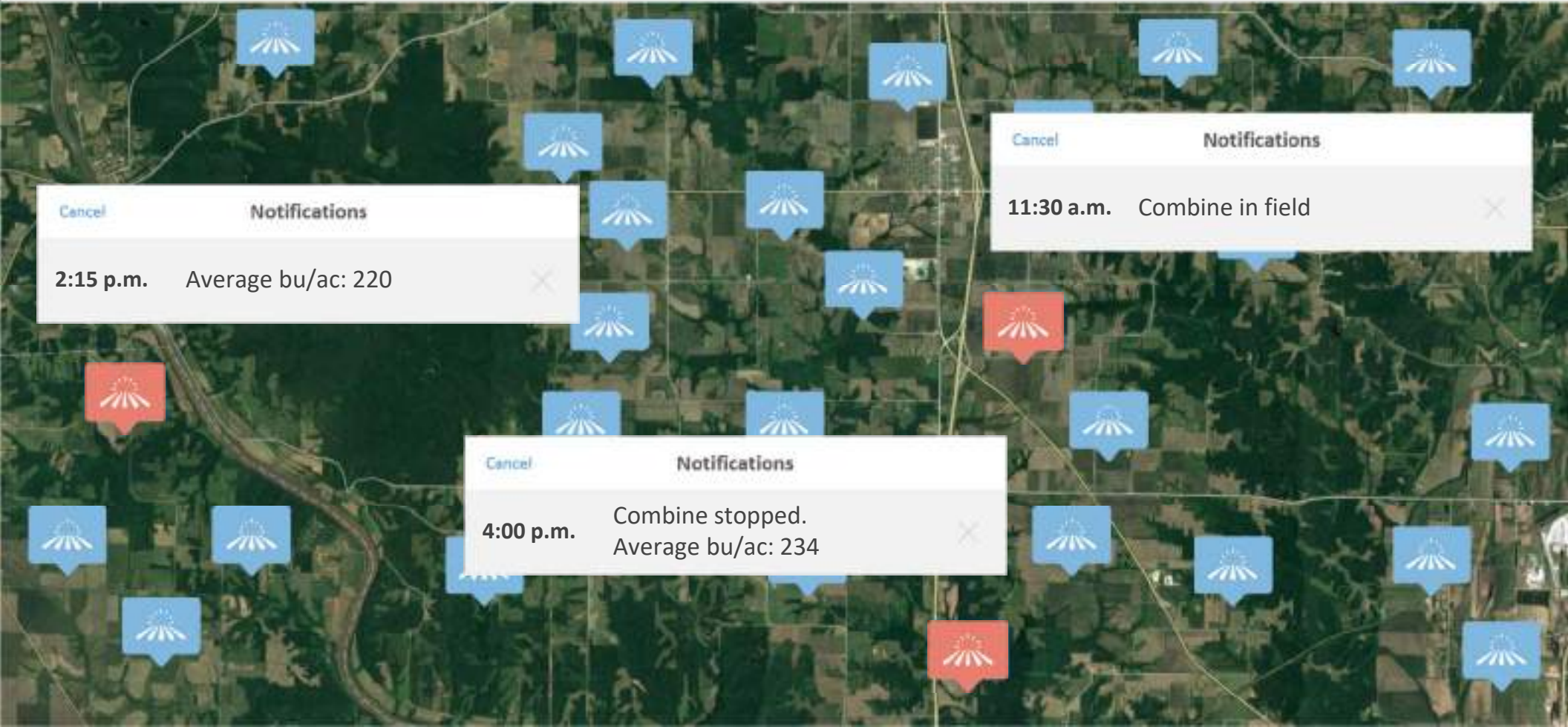
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Cancel Notifications

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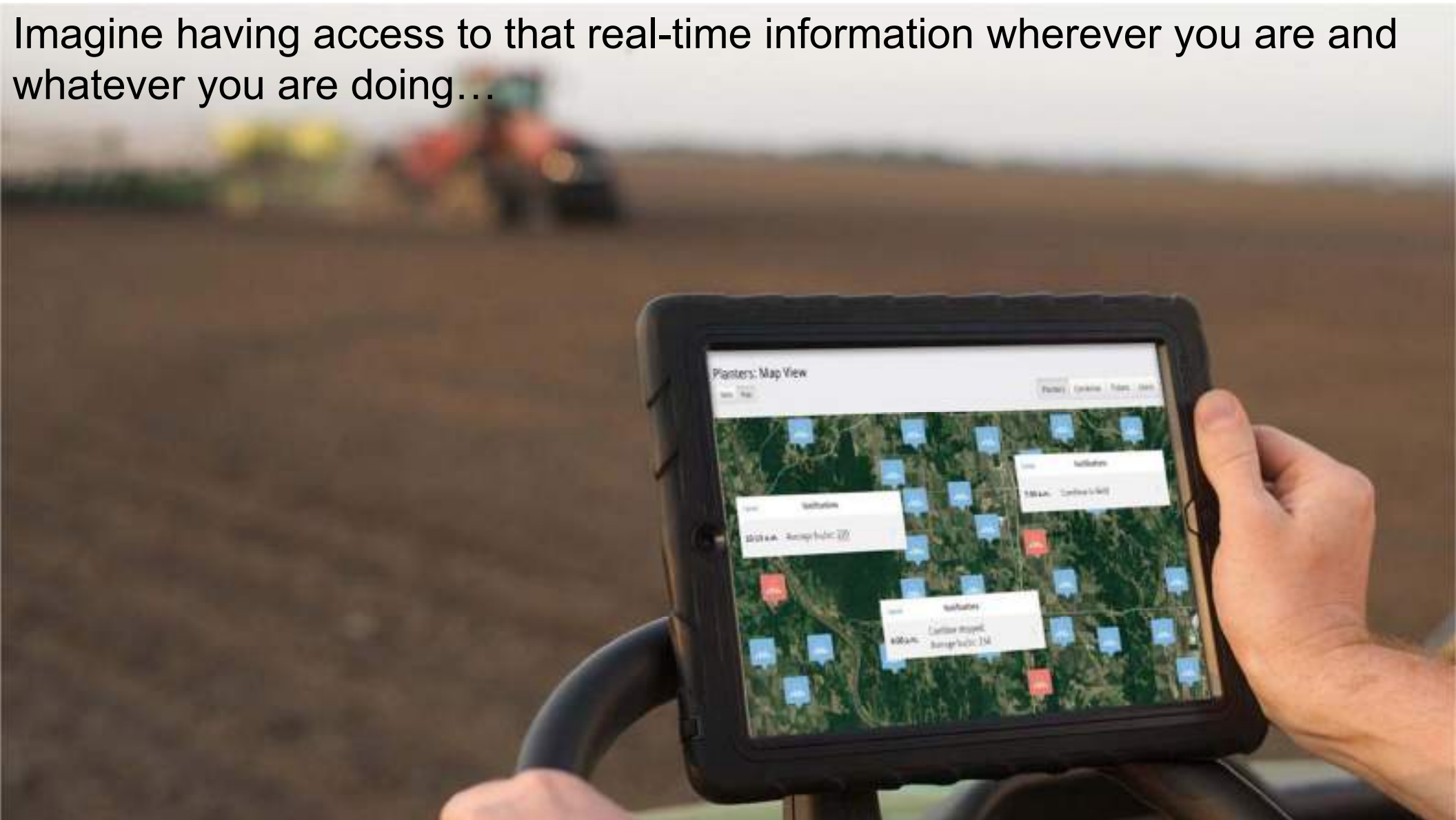
Cancel Notifications

11:30 a.m. Combine in field

Cancel Notifications

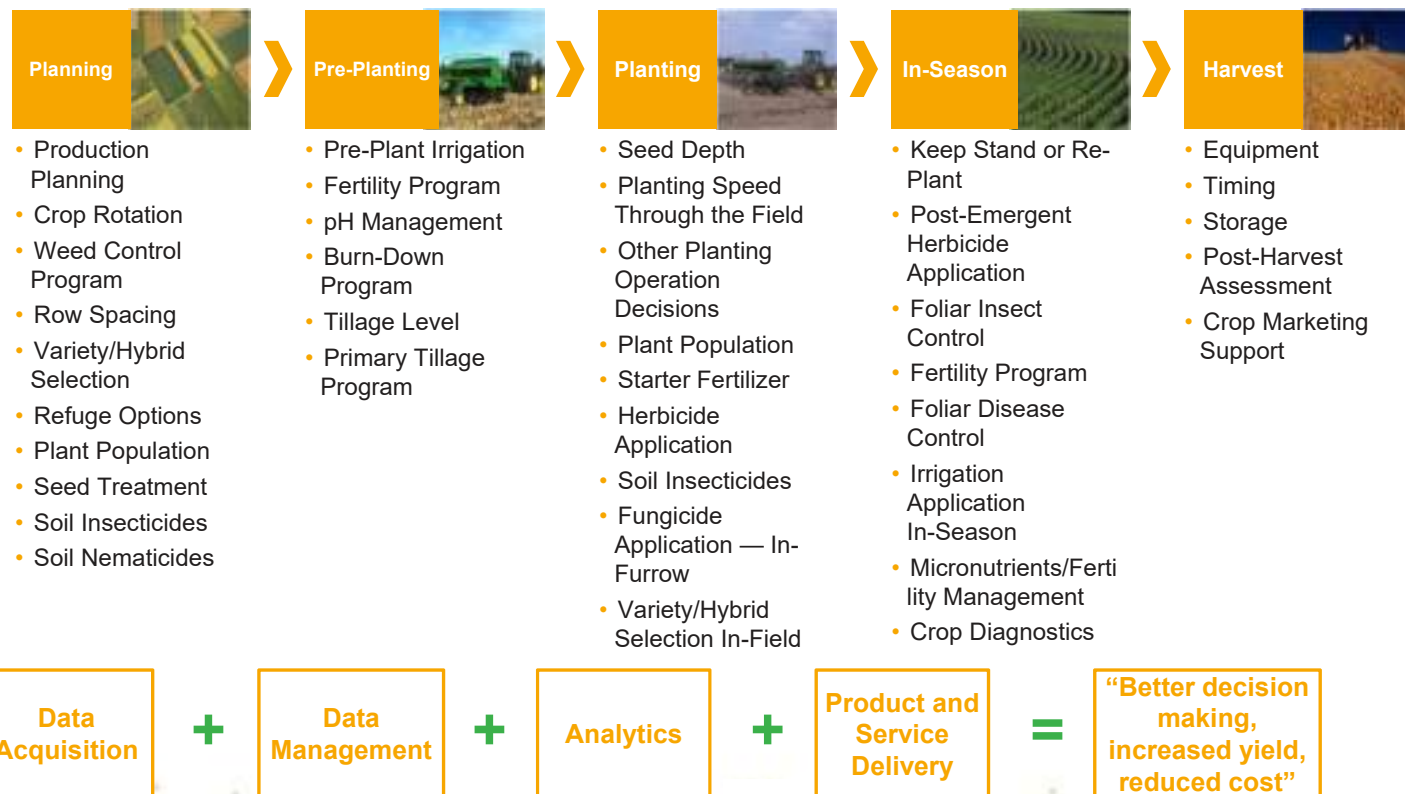
4:00 p.m. Combine stopped.
Average bu/ac: 234

Imagine having access to that real-time information wherever you are and whatever you are doing...



Leveraging the power of data science to optimize yield

Farmers make at least **40 DECISIONS EVERY YEAR ON EVERY FIELD FOR EVERY CROP**
 Digital Agriculture enables data-informed decision making to maximize yield through efficiencies



Climate FieldView Value Pillars



GET YOUR DATA IN ONE PLACE

Centralized field
data management



UNCOVER VALUABLE FIELD INSIGHTS

Visualization &
reporting that create
actionable insights

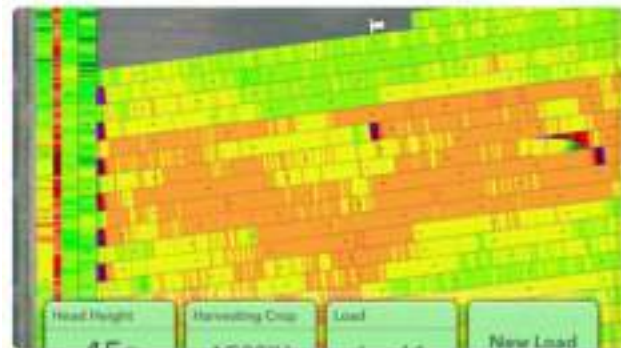


OPTIMIZE INPUTS

Data-driven seed &
fertility subfield insights

Compatible

@FieldView makes it simple for two machines of different colors to share yield data. @evergreenfsinc @ryaninafield



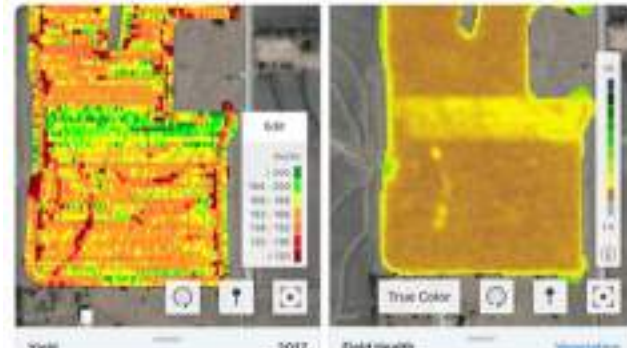
2 23 33



+ 11

Valuable

Fungicide trial stands out in field health as well as yield map. Using @FieldView region report could see that it was a 22 bu advantage.



1 59 111



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Easy

My 8 year old son figured out how to install @FieldView this morning and remote view. Supposed to be cleaning his room#prouddad#futurefarmer



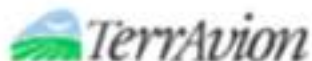
1 9 14



CLIMATE
FIELD
VIEW

FieldView is creating *the* digital ag ecosystem

IMAGERY



OEM



JOHN DEERE



AGCO

SOILS



AGRONOMIC SOFTWARE TOOLS



AGRIAN



conservis



Zone-Based Precision Farming



CONNECTIONS TO SEED COMPANIES / BRANDS



GROWMARK



The next evolution of analytics-based insights

2016



Launched Climate FieldView and transformed data into value for farmers with connectivity, visualization and insights backed by data science

2017



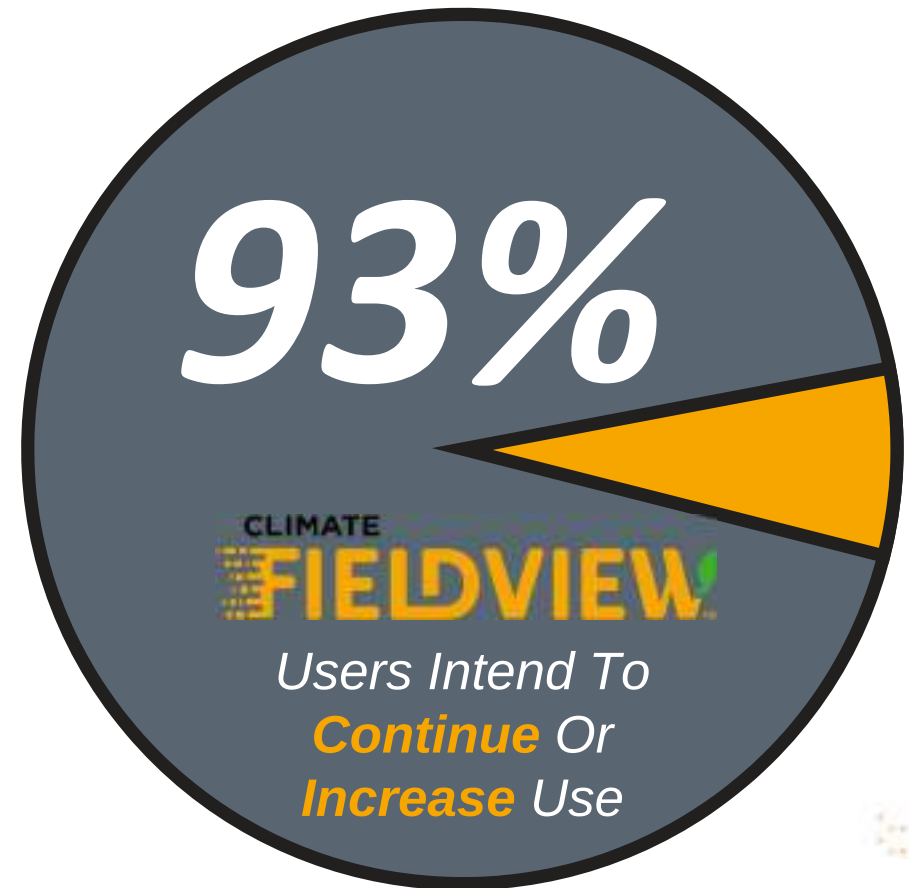
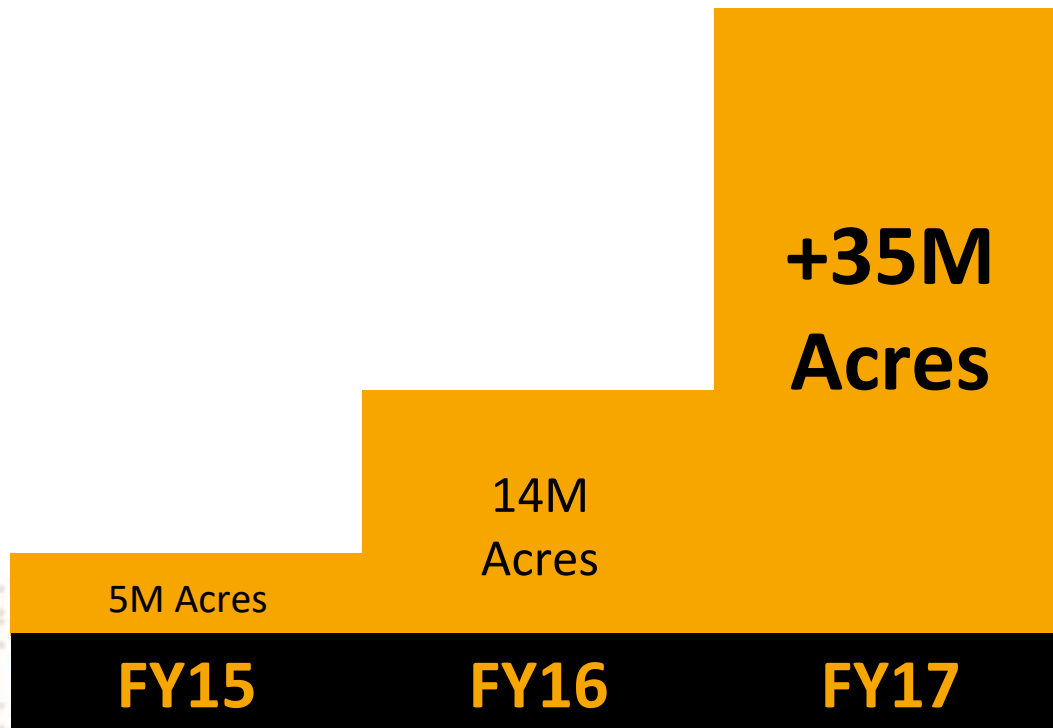
Advanced farmers' ability to manage variability with advanced yield analysis and scripting. Delivered tools to more farmers by expanding connectivity and geography

2018



Ability to manage inputs more precisely *by zone* with next-level analytics, enhancements to seeding and fertility tools and expansion of connectivity

Momentum is building



Source: Internal marketing research

Data collection enables model testing and development

4,500 Acres



Monsanto Research Trials

Thousands of Acres

Climate Research Farms



40,000 Acres



Grower/Partner Data

Climate Research
Partners Network (CRP)



Data collection enables model testing and development



Thousands of Acres

Quality Data

=

Quality Models

=

Quality Advice

4,500 Acres



40,000 Acres

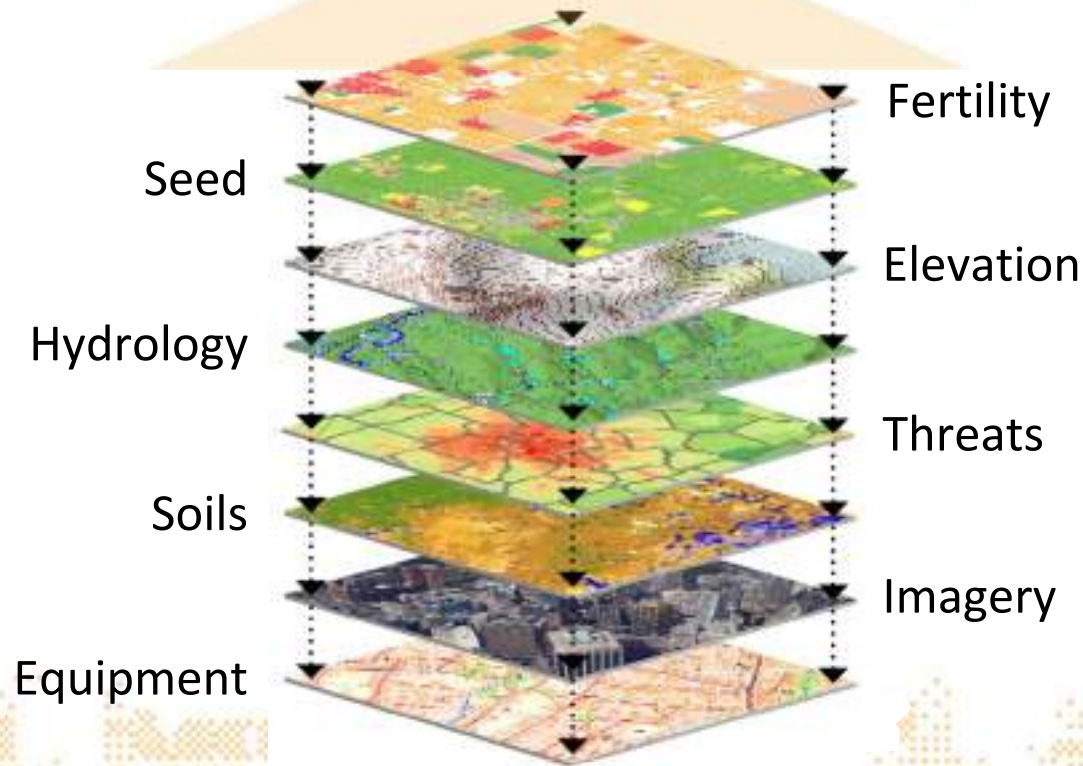


CLIMATE
FIELD
VIEW

We are using our breadth and diversity of data to identify the interdependencies of the variables that drive yield

$$f(g, e, p) + E$$

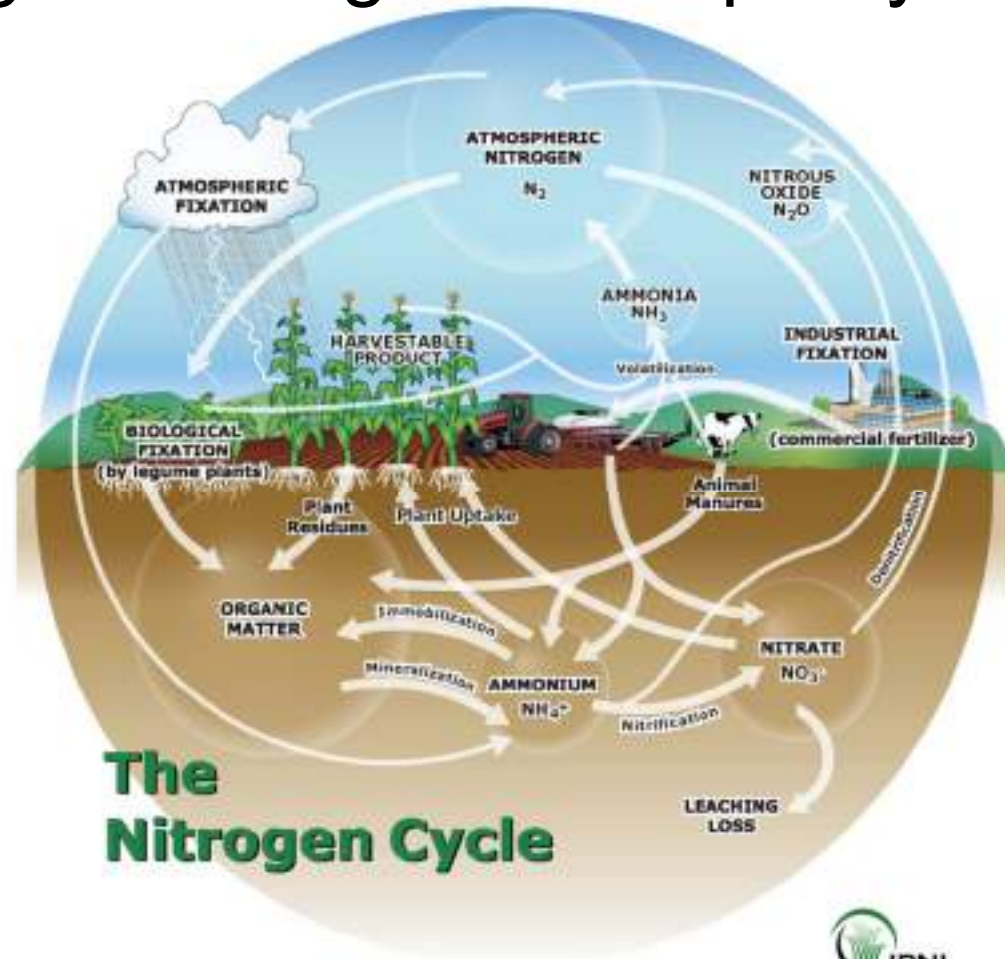
Genetics, Environment, Farming Practice Variability



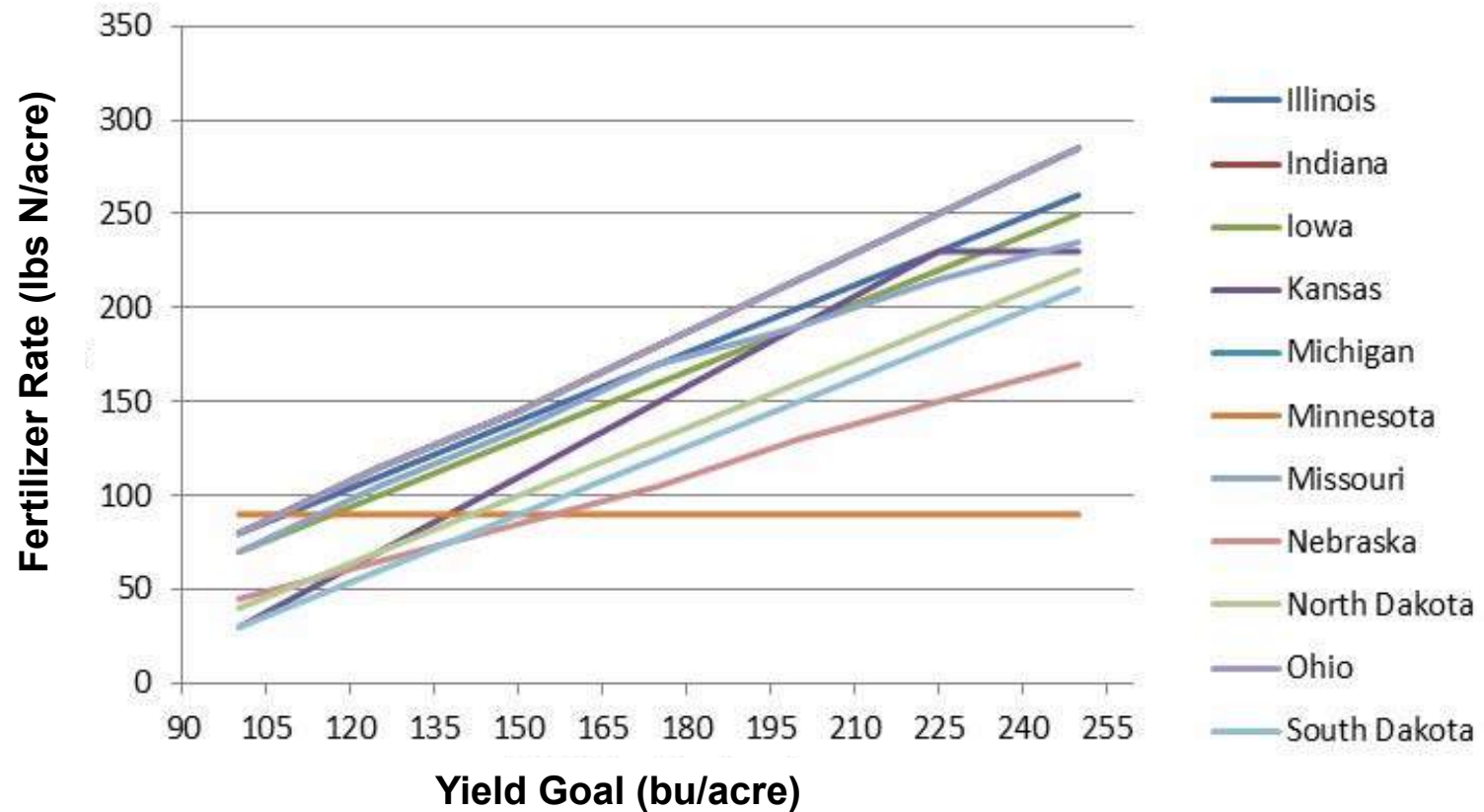
Seven science initiatives are advancing in the innovation pipeline

CORE SCIENCE PIPELINE						
FOCUS AREA	PLATFORM: PRODUCT DELIVERABLE	PHASE 1 Proof of Concept	PHASE 2 Development	PHASE 3 Pre-Commercial	PHASE 4 Commercial/Launch	PHASE 5 Post-Commercial
FERTILITY	Whole-Field Nitrogen Monitoring					
	Sub-Field Nitrogen Monitoring					
	Grid Soil Test Data Ingest and Layers Visualization (OM, CEC, pH, P, K)				Advancement	
	Manual Fertility Scripting (Nitrogen, Phosphorus, Potassium, Lime)			Advancement		
	Advanced P&K Scripting					
	Advanced Nitrogen Scripting					
	Advanced Scripting with Sensors & Imagery					
	Whole Field Nitrogen Monitoring (Canola, Wheat)					
SEEDS & PLANTING	Advanced Seed Scripting, Population by Field Zone				Advancement	
	Additional Zone Sources		Advancement			
	Product Selection by Geographic Region					
	Enhanced Field Zones & Improved Seeding					
	Product Selection by Field					
	Manual Seed Scripting (Wheat)					
	Seed Portfolio Optimization					
	Advanced Seed Scripting (Soybeans)					
FIELD INSIGHTS	Field Health Monitoring					
	Field Analysis (All major row crops and broad-acre crops except cotton)					
	Yield Analysis					
	Corn Disease Vulnerability (GLS, NLB)					
	Yield Analysis (Cotton)					
	Field Health Monitoring (Wheat, Cotton, Alfalfa, Canola)					
	Stress Identification					
	Enhanced Directed Scouting					
	Yield Productivity Enhancement through Benchmarking Analytics					
	Disease Diagnosis & Identification (Corn)					
	Disease Diagnosis & Identification (Soybeans)					
	Disease Diagnosis & Identification (Wheat)					
	Precipitation Accuracy Improvements				Advancement	
WEATHER	Windspeed Spray Advisor					
MEASUREMENTS	Climate Fieldview Digital HUB					
	Climate FieldView Gauge for Enhanced Precipitation					
	Climate FieldView Soil Moisture and Temperature Probe					
	On-Equipment Soil Mapping					
	Nitrate Sensor					

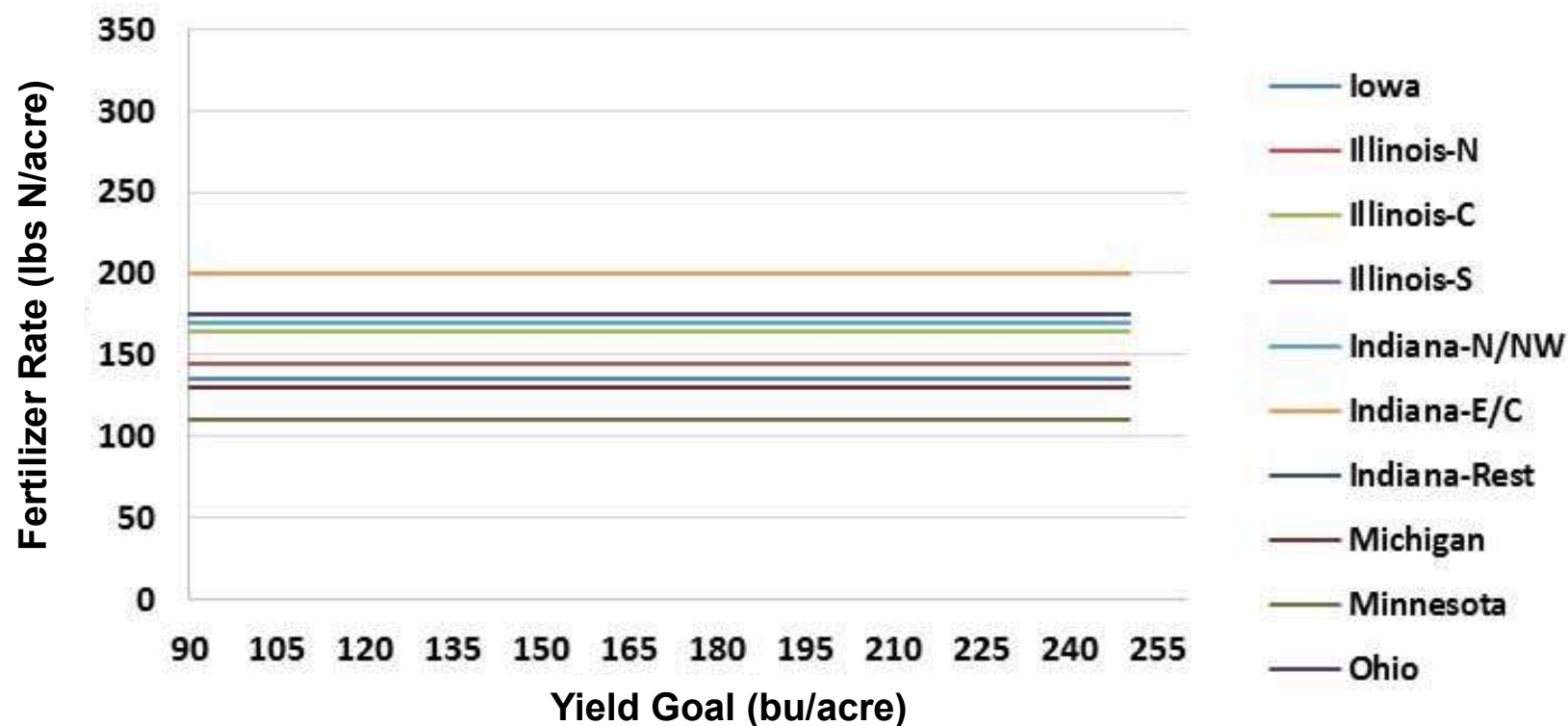
Nitrogen management is pretty complicated!



Corn Grain Yield Goal vs. Nitrogen Recommendation for Several Midwestern States (Corn after Soybean)



Corn Grain MRTN Nitrogen Recommendation for Several Midwestern States (Corn after Soybean)



We are building a comprehensive fertility solution for growers

Today:
Sub-Field N



Future:
P&K



Sub-field nitrogen management protects yield

Protects ~\$1,200 worth of yield with same total N*

**Whole field
nitrogen management**



~30% of field
has higher
than desired
status

~60% of field
has ~3% of
yield
@ risk

**Variable rate
nitrogen management**



100% of the
yield is
protected

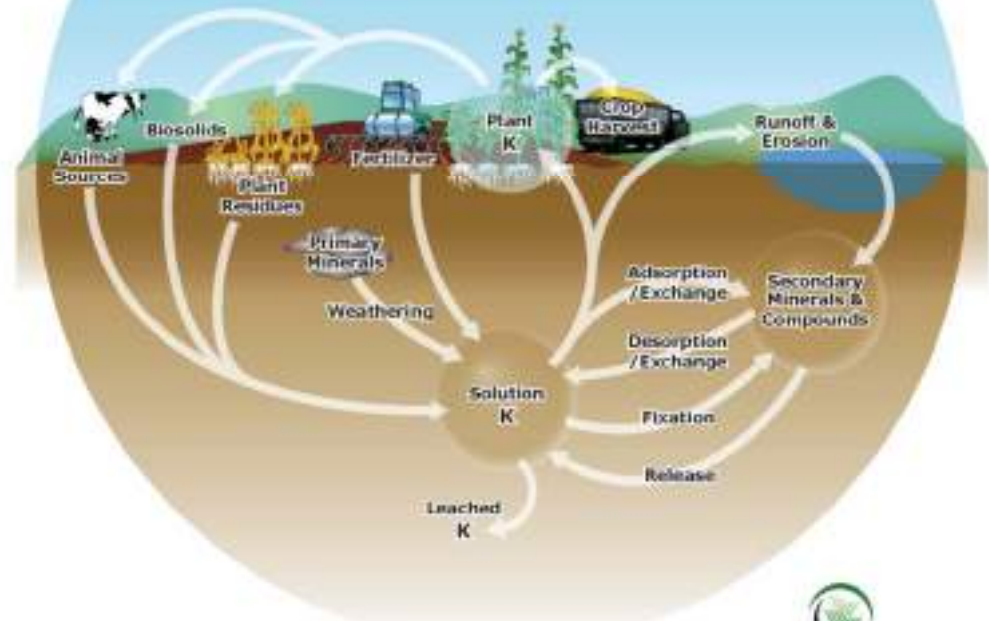
100% of the
field @
desired status

Phosphorus and potassium management is pretty complicated too!

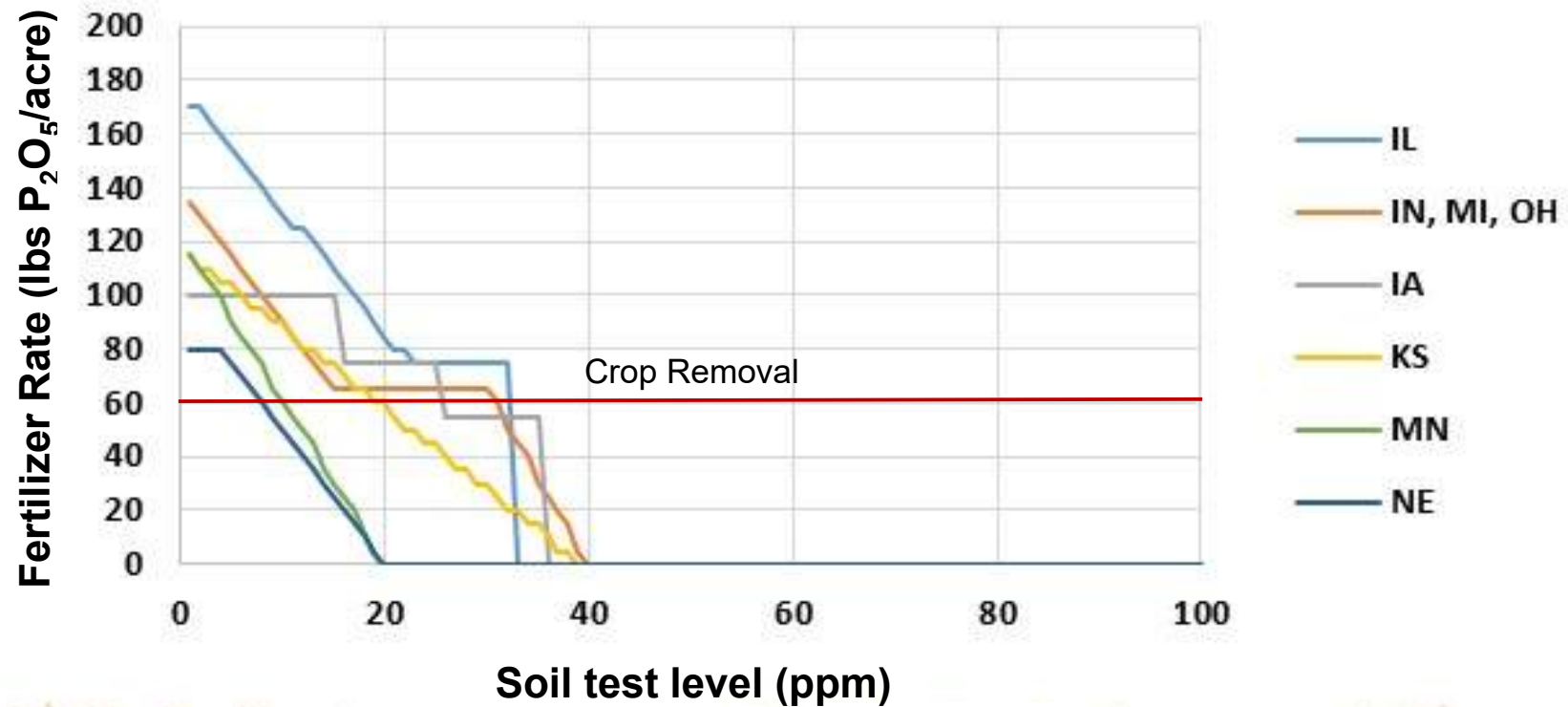
The Phosphorus Cycle



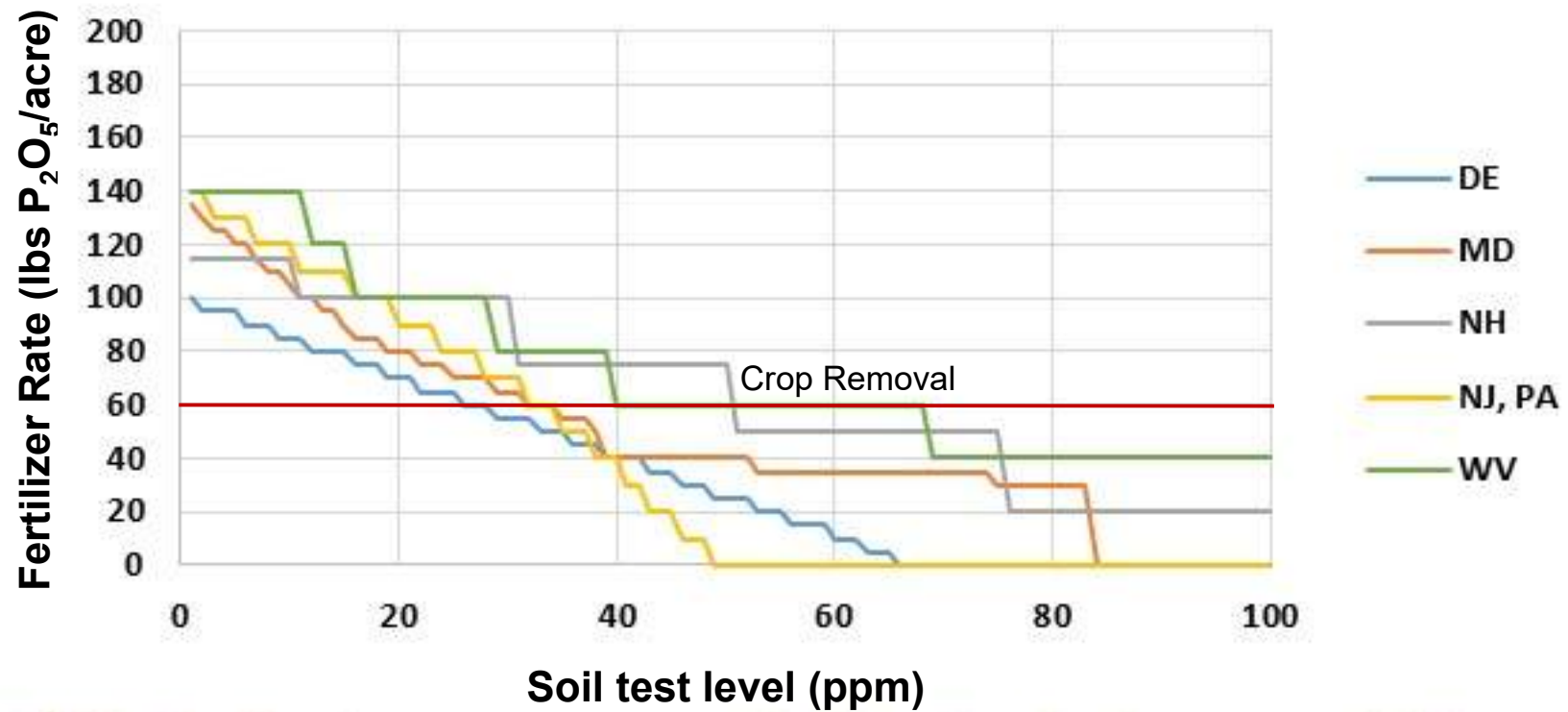
The Potassium Cycle



Mehlich 3 soil test phosphorus levels vs P_2O_5 recommendations for northcentral states, 175 bu/acre corn



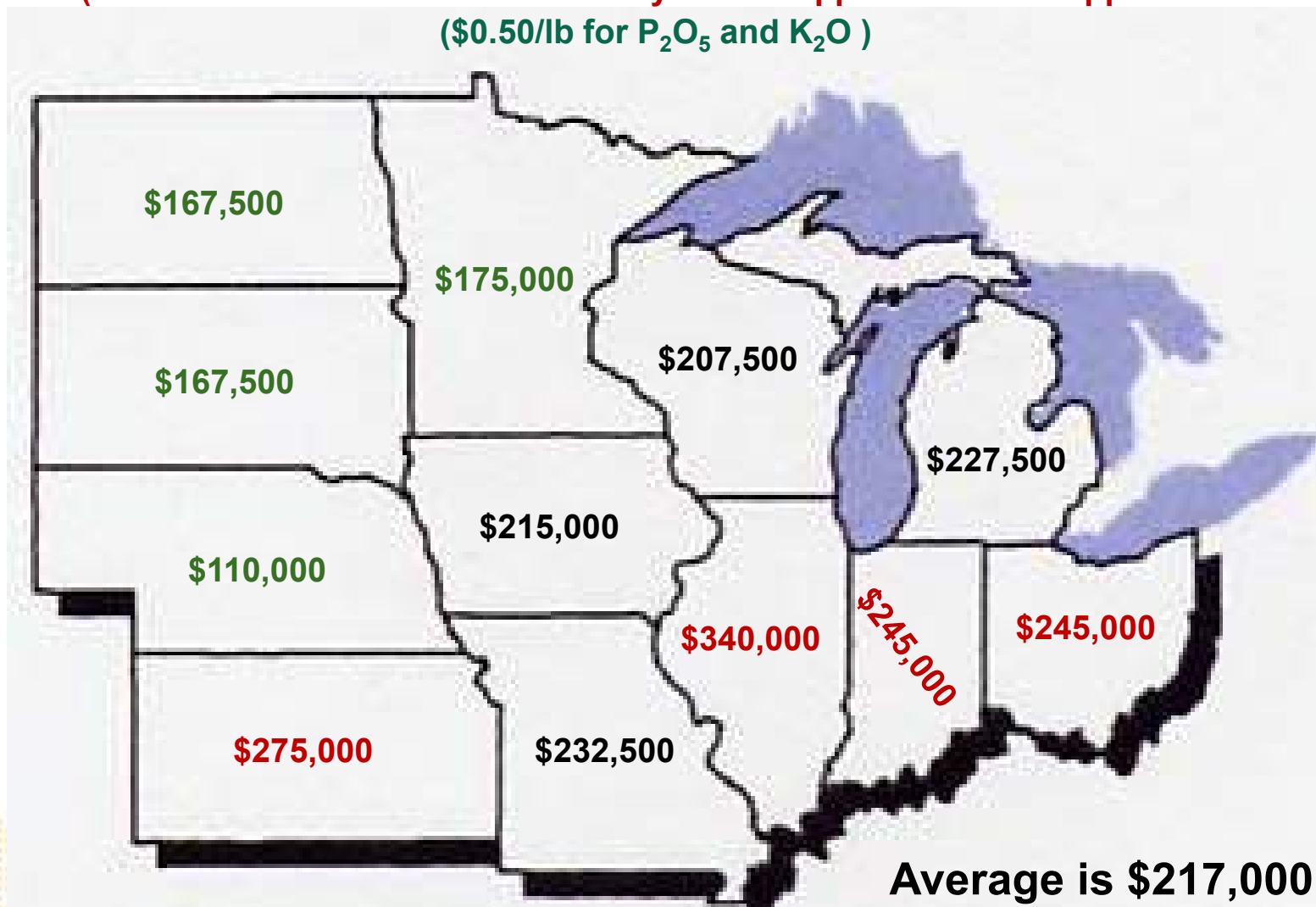
Mehlich 3 soil test phosphorus levels vs P_2O_5 recommendations for northeastern states, 175 bu/acre corn



Two year P_2O_5 and K_2O fertilizer costs per 1000 acres

(175 bu/acre corn and 60 bu/acre soybean: 10 ppm STP and 50 ppm STK

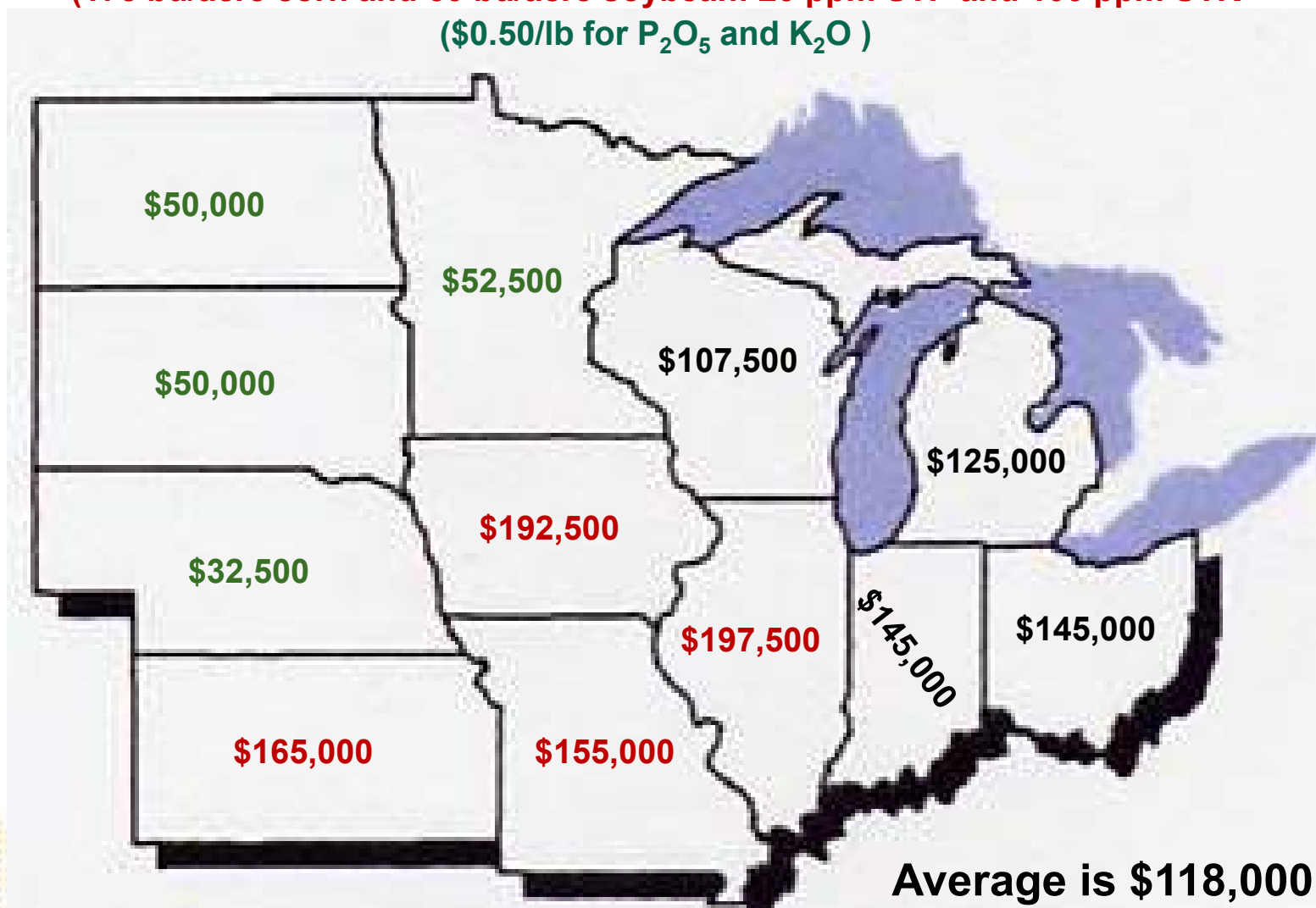
(\$0.50/lb for P_2O_5 and K_2O)



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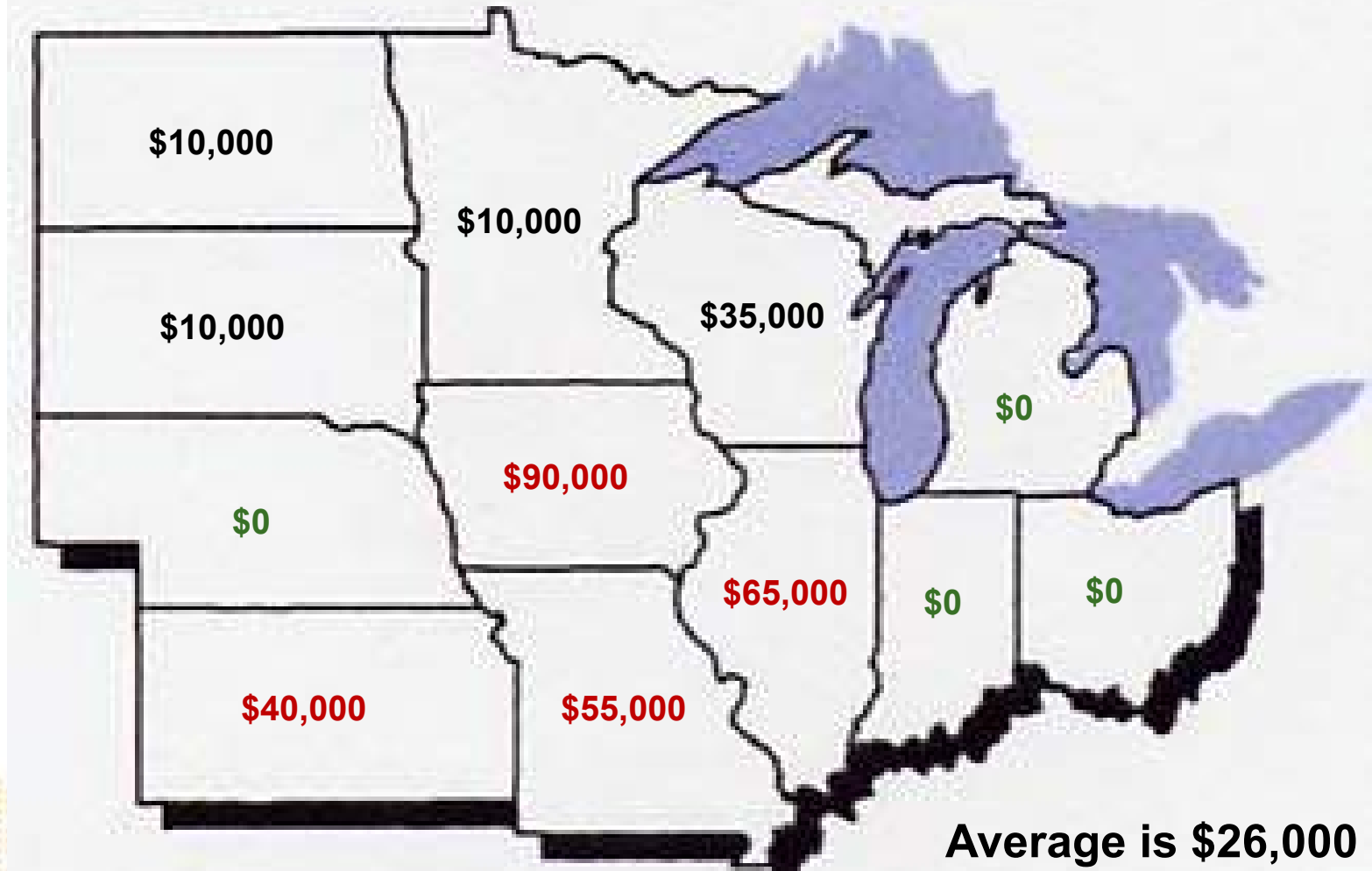
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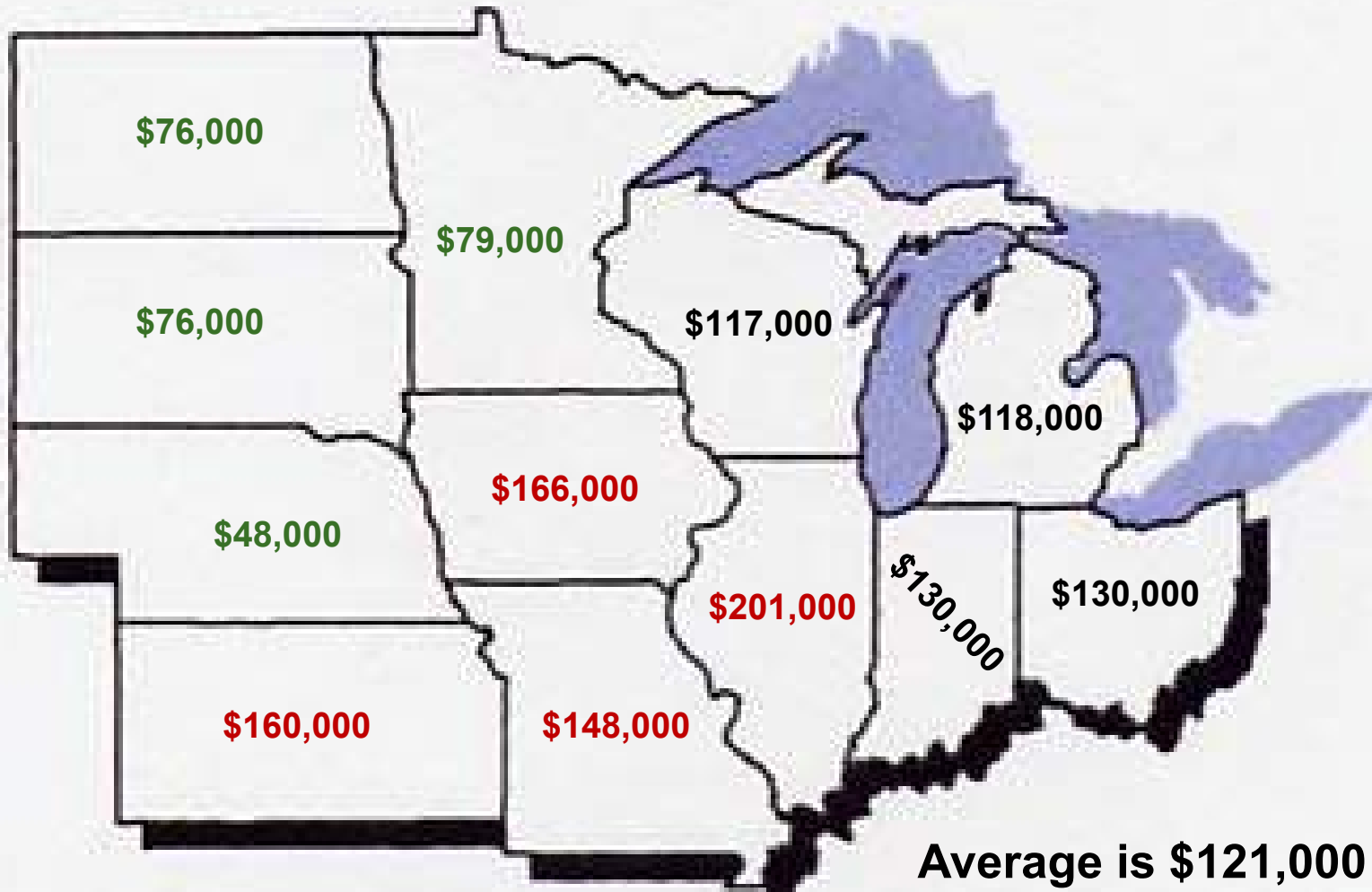
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(175 bu/acre corn and 60 bu/acre soybean: Average of cost of 3 previous examples)

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Soil data increases farmer engagement with P&K

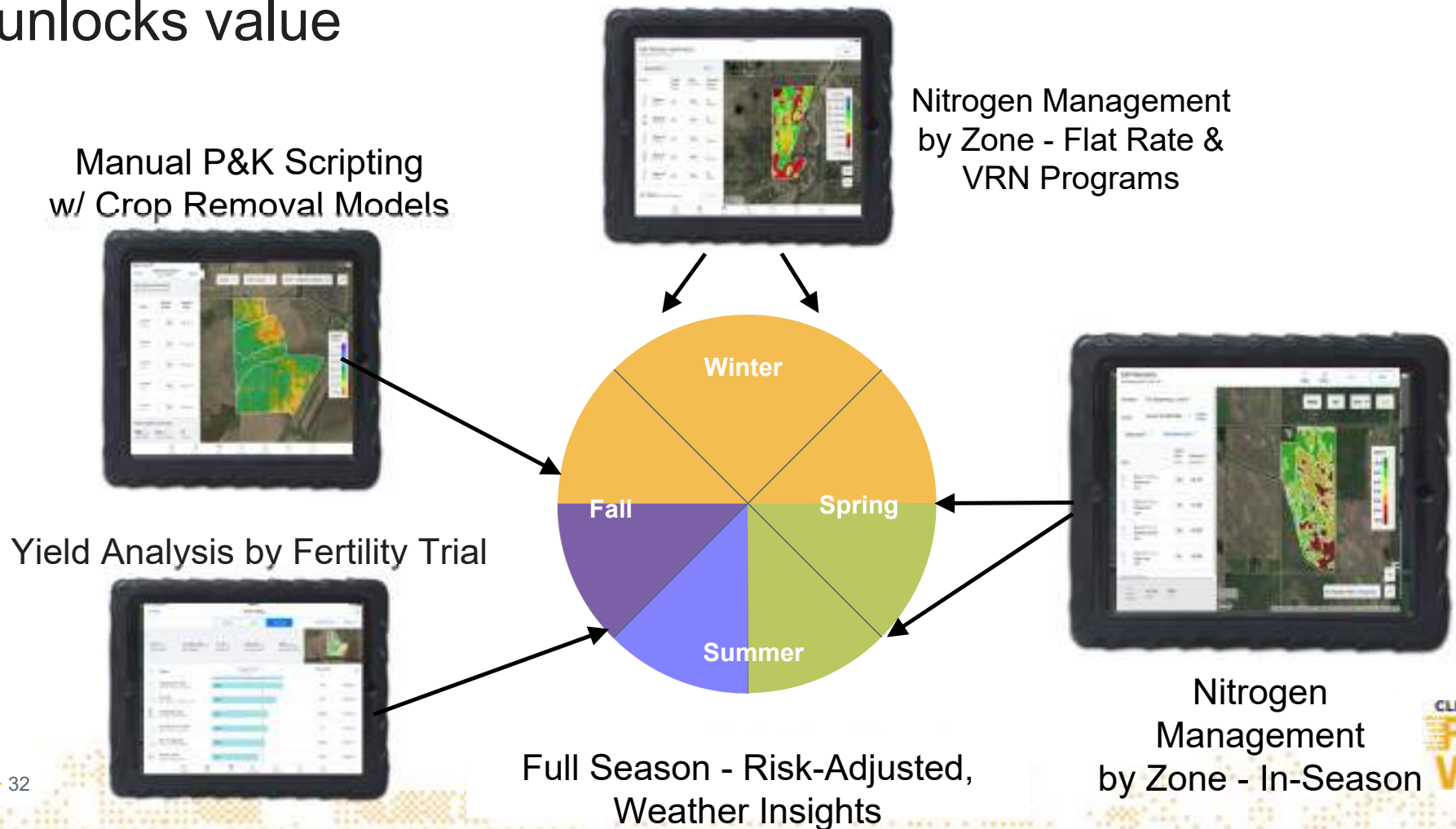
Visualizing soil values with yield reminds growers of P&K needs



Spatial maps highlight areas of need even within high testing fields



Fertility tools have whole season grower interaction and unlocks value



Advanced scripting increased yield and planting density



2016 Analysis

- Compared Beta (98) vs. DIY (354) fields where
 - RM between 96-115
 - Rx matches planting maps

2016 Results

- On **average**, Advanced Scripting beta showed an **+8.5 bu/ac** over people who wrote scripts themselves

In 2017, we also saw that Advanced Scripting increased planting density by 2,000 seeds/ac

Artificial Intelligence Enabling Real-time Disease Identification

Machine learning model showing high probability of success to diagnose right disease using 50,000 images on 9 diseases



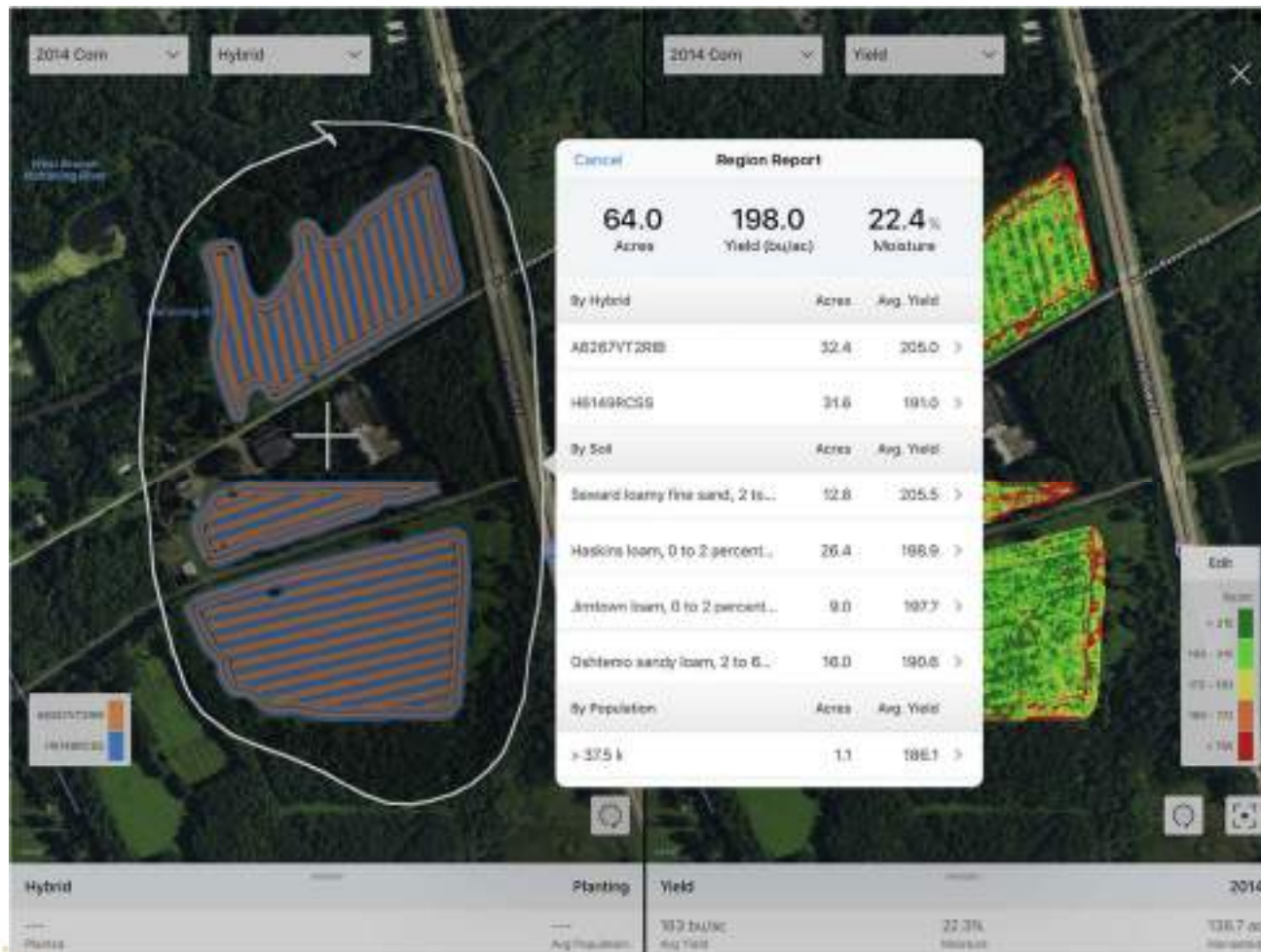
Field Health Imagery in FieldView™ directs a farmer to concerning or under-performing areas of the field



Real-time diagnosis enables farmer to take action & protect yield

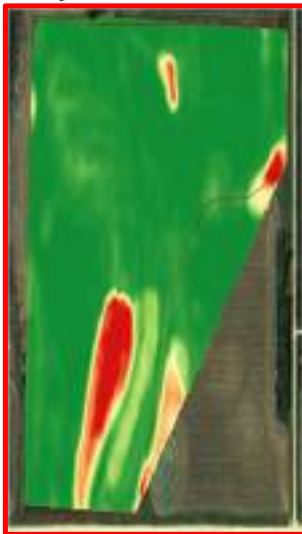


Field region reports make every field an experiment

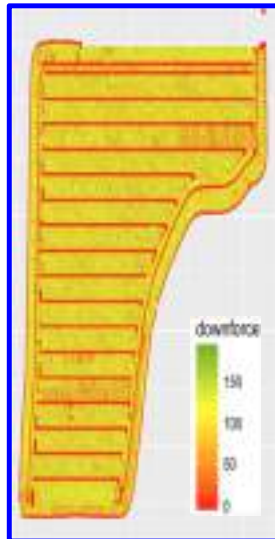


New data layers provide insights about yield variability

Water ponding impacting
3.5 acres



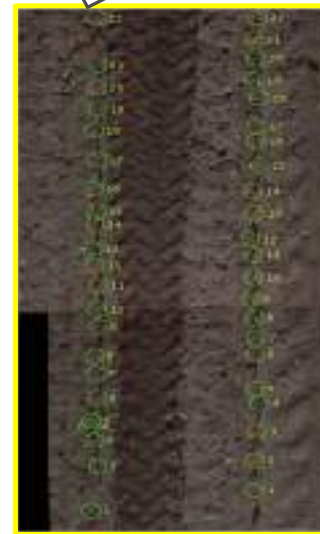
Row unit with no downforce detected on
5 acres



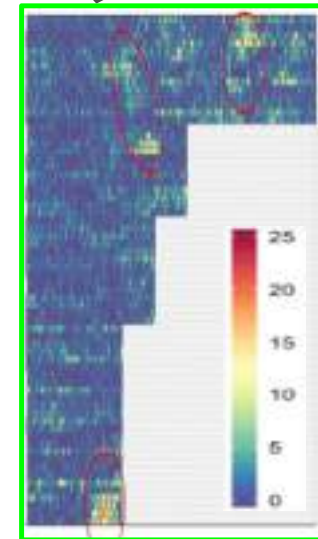
Dry soil moisture detected by SmartFirmer™ on
12 acres



Reduced stand at V3 detected using imaging on
7 acres



Late emergers detected on
2.5 acres



New enhancements & capabilities coming to FieldView™ in 2018

DATA CONNECTIVITY CAPABILITIES

Equipment Compatibility Expansion	Additional planters: Kinze ISOBUS, 2000 Series Case IH, Horsch
	Additional seeders: Bourgault, SeedHawk
	Additional harvesters: Cotton Pickers, Silage Choppers, CLAAS Harvesters, AGCO Combines, New Holland Combines
	Additional fertility applicators: Liquid and Dry Rate Controllers
Data Inbox & Visualization	Planting Data: Applications while Planting, Seed Treatments
	Data Ingest: Map Layers from Manual Activity Entry, My John Deere Data Retrieval API
	More file types: Prescriptions, Imagery, Soil Tests, OEM Application Data, Generic Shapefiles, Expanded OEM Monitor Compatibility

USER EXPERIENCE ENHANCEMENTS

Ease of Use	Scripting Tool Enhancements, Offline Sync Capabilities, Printing Capabilities, Data Usage Management, Expanded Device Support
Enhanced Analysis Tools	Saved Field Regions, Yield By Region Reports, Collaborative Field Notes
Operation-Wide Reporting Tools	Planting, Application, Yield Reports

PLATFORM

		In-Development	Pilot	Launch
Dealer Tools	MapShots, SST - Summit, Agrian, SSI - Agvance Mapping, Echelon, FieldAlytics, FS - AIS,			
Soil	Veris Technologies			
Imagery	Ceres, Agribotix, Terravion			
Enterprise Management	Conservis			

Thank You

For more information, visit Climate.com



/climatecorp



@climatecorp



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@fieldview

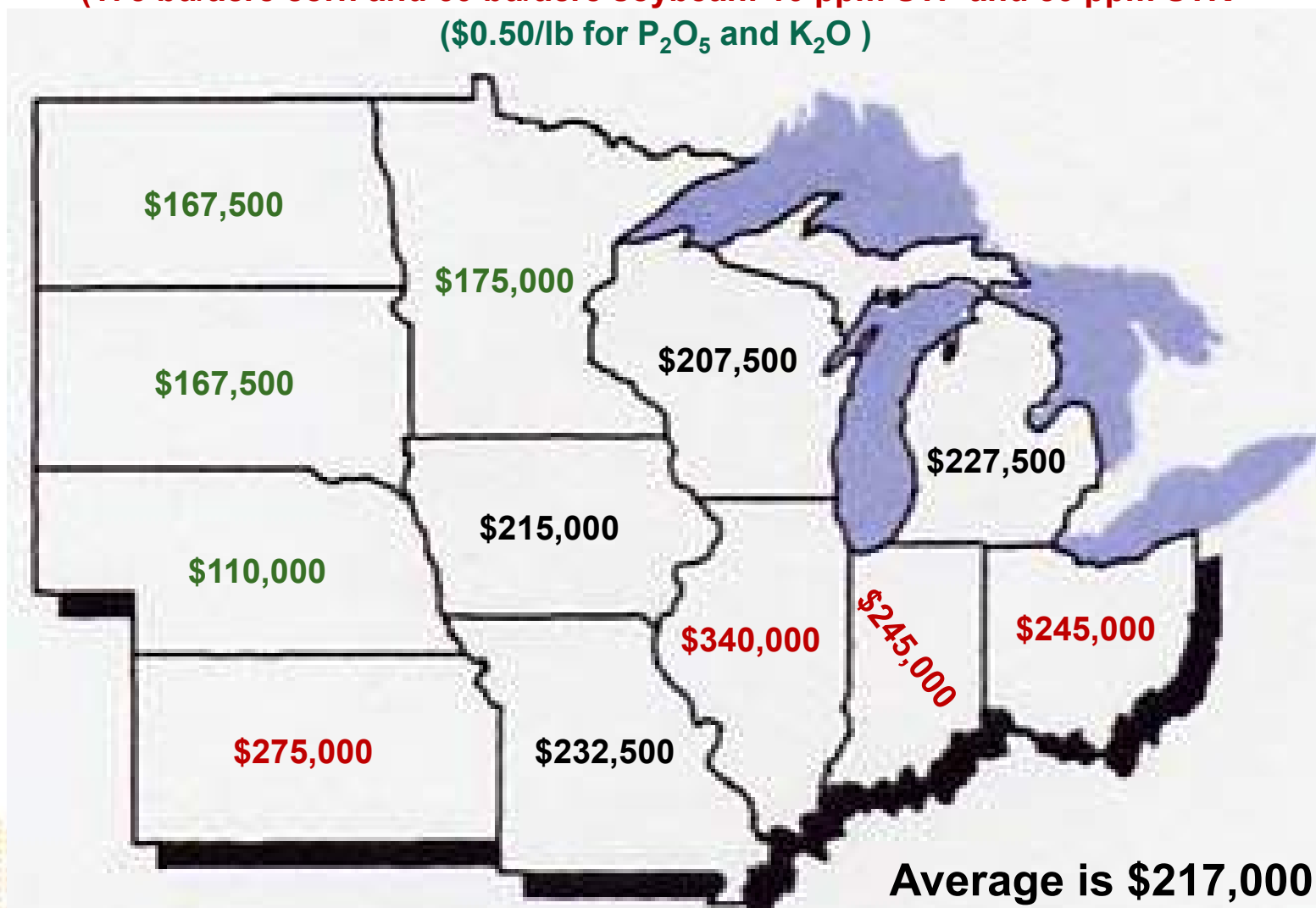


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Two year P_2O_5 and K_2O fertilizer costs per 1000 acres

(175 bu/acre corn and 60 bu/acre soybean: 10 ppm STP and 50 ppm STK)

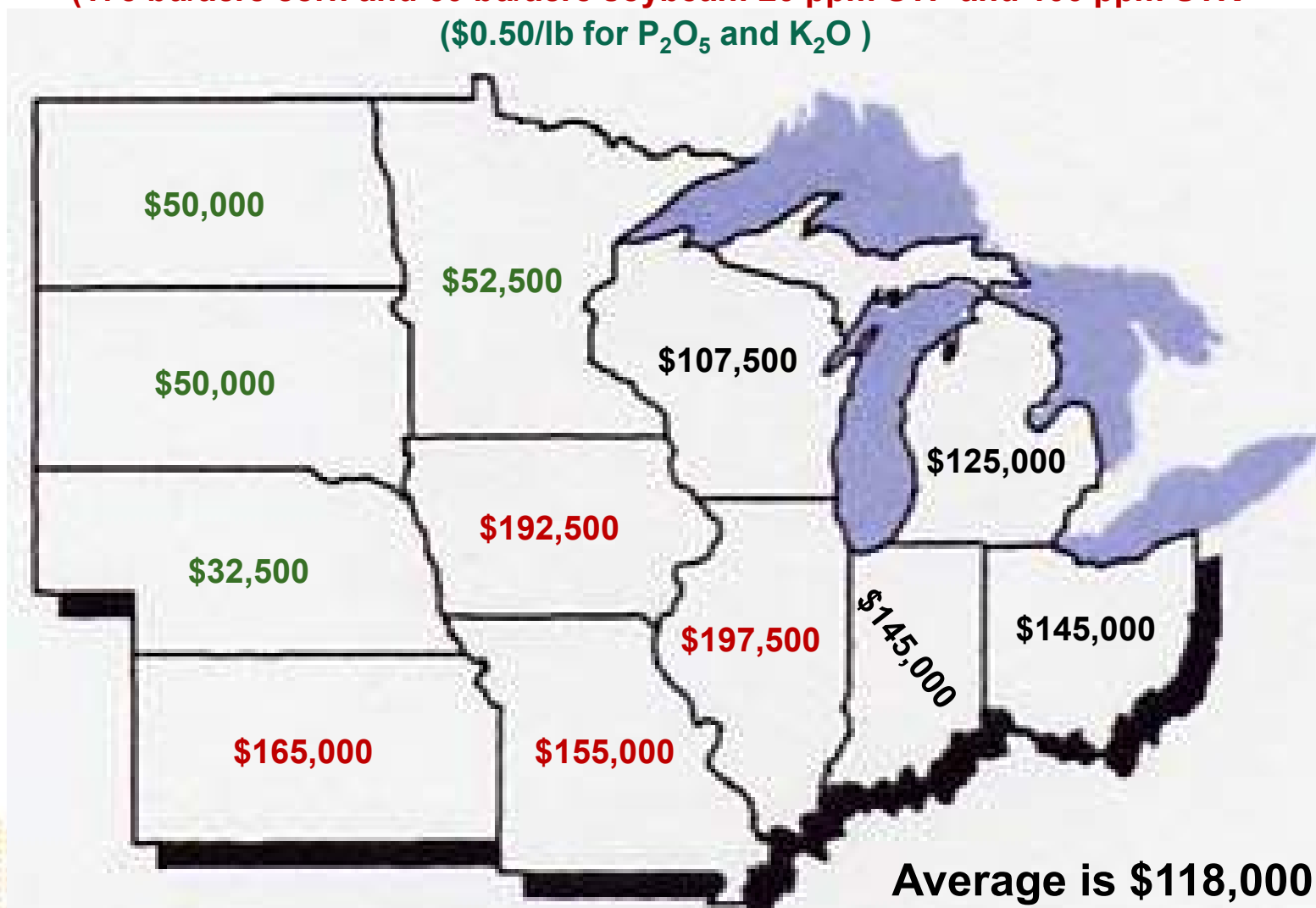
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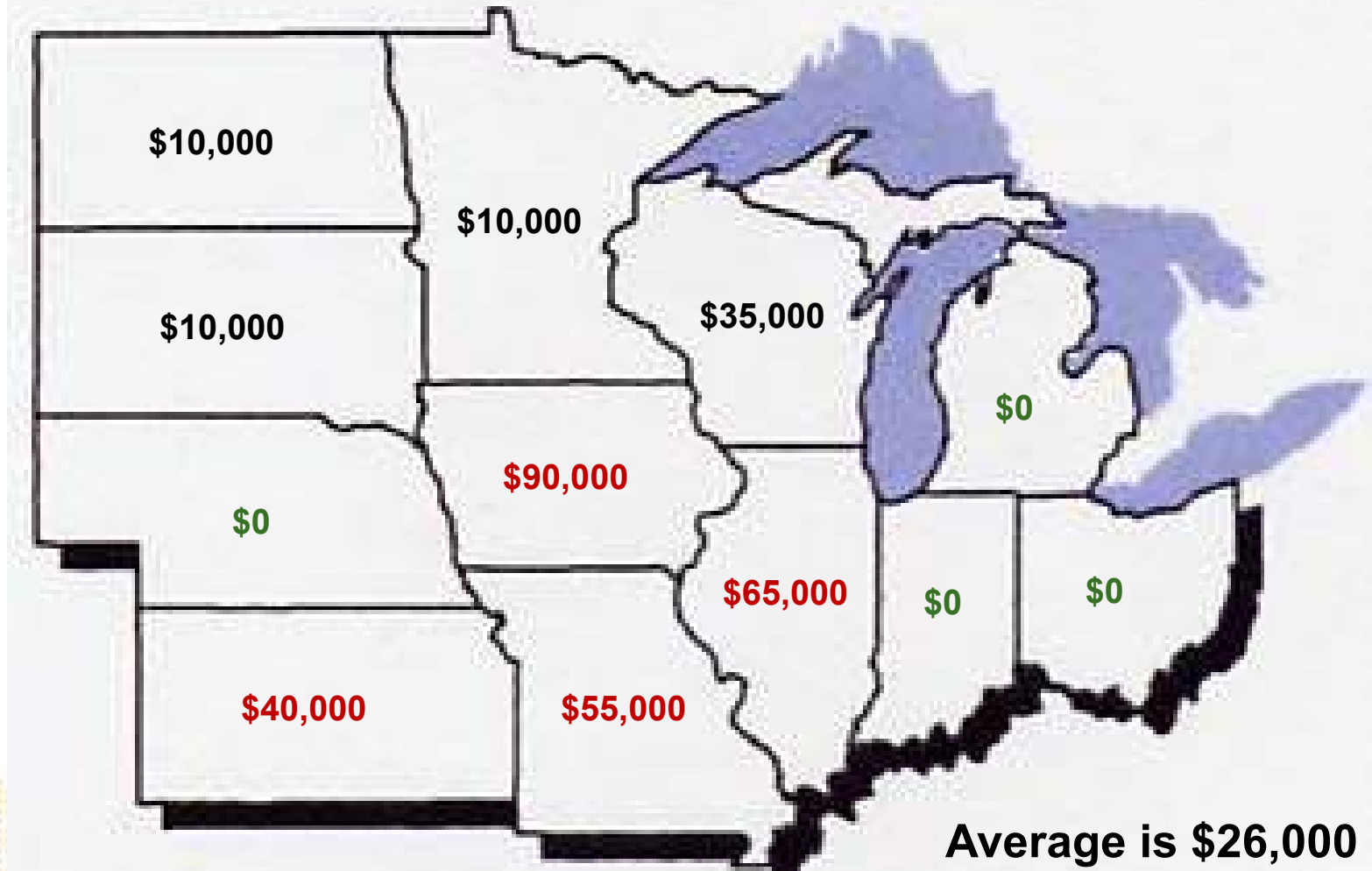
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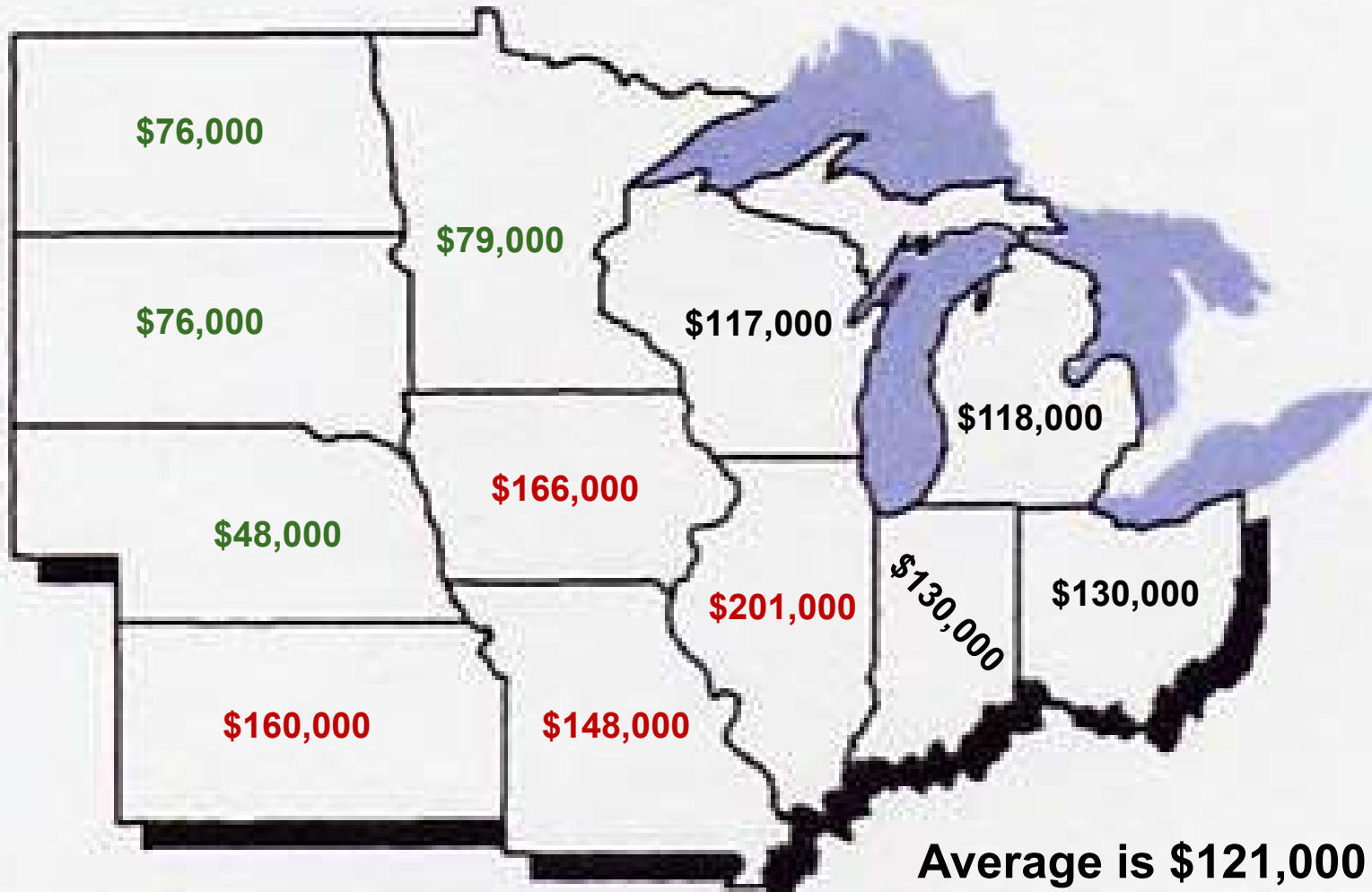
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Complex in-field interactions cause variability

2016 NCGA
Corn Yield
Contest winner
521 bu/acre
vs. 175 bu/acre
national average*

346 bu/acre
opportunity



2016 Monsanto
Soy Yield
Contest winner
133 bu/acre
vs. 52 bu/acre
national average*

81 bu/acre
opportunity

$$Y = f(g, e, p) + \epsilon$$

Yield Genetics, Environment, Farming Practices variability

Help Dealers Maximize Value



Climate Portal Provides Insights into Growers' Operations

Dealer Portal



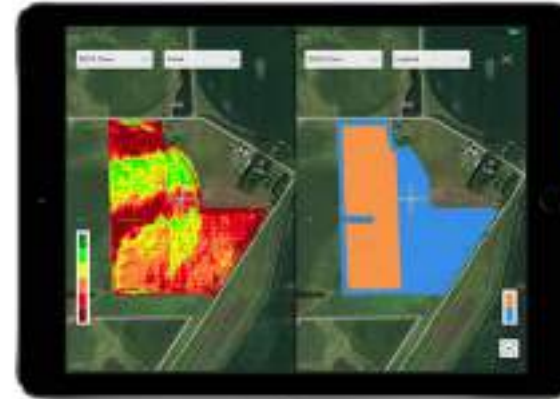
Nitrogen Advisor



Overview



Yield Analysis



Farmers Looking to Dealer for Digital Ag Products



Nearly
1/2

think it's important their dealer offers a digital ag service.¹

97%

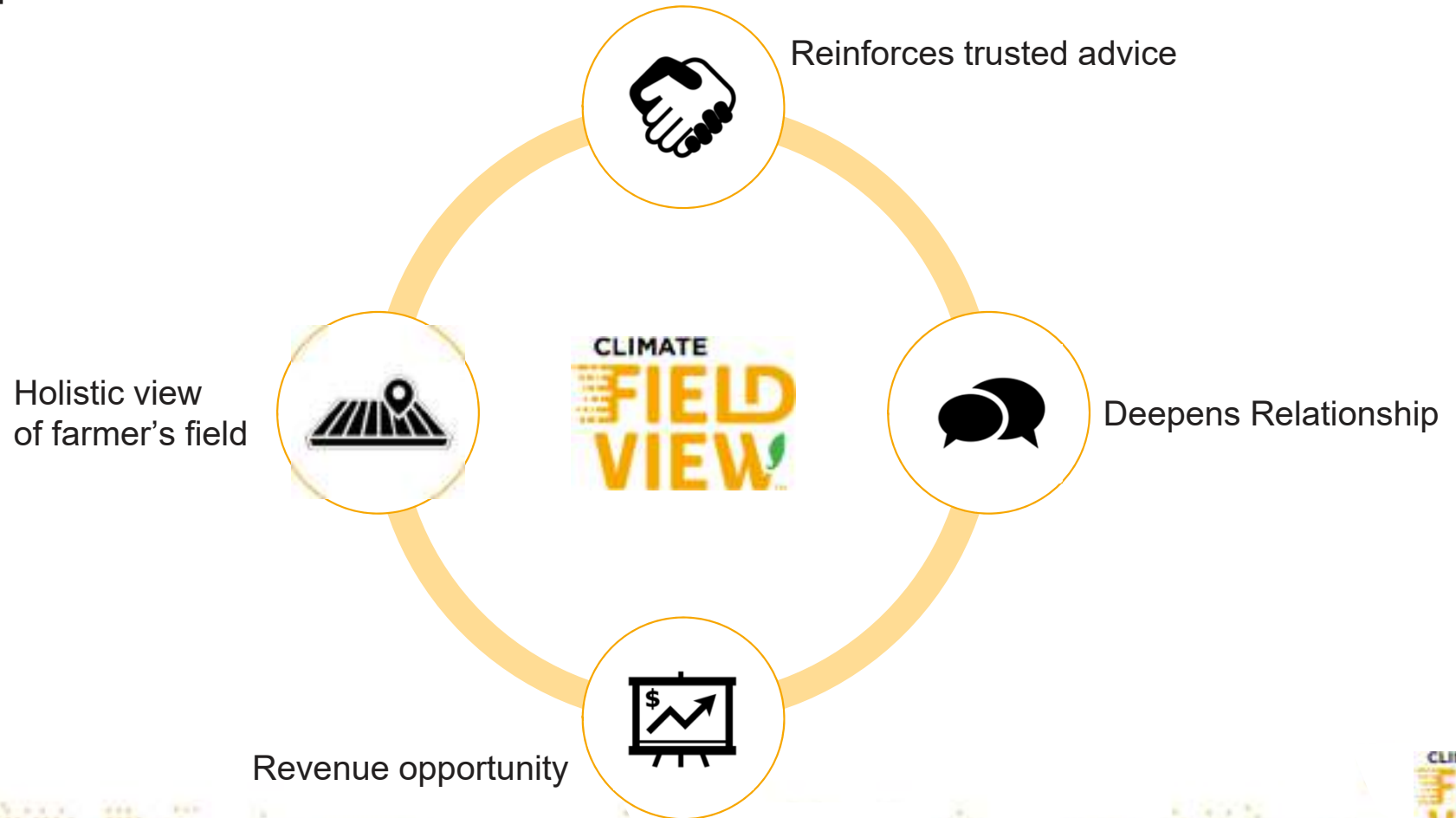
of Climate FieldView™ Pro farmers would like the **same dealer** for future purchase and are **very likely to recommend** their dealer.¹

28%

would consider switching to a dealer that can provide digital ag services.¹

¹ Farmer and Dealer Experience Measurement Program, Verde, 10/2015

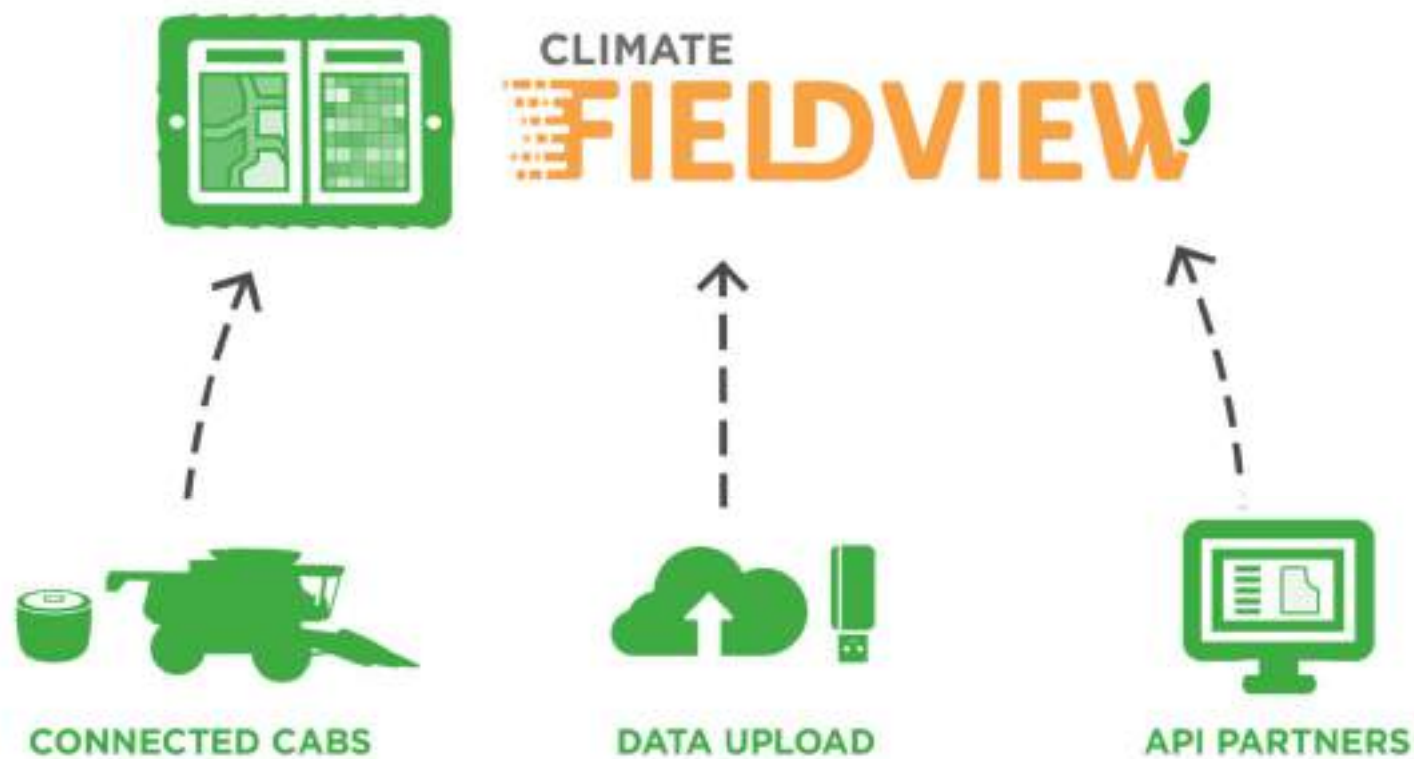
Help Dealers Maximize Value



All Your Data in One Place



All Your Data in One Place



Platform Adoption

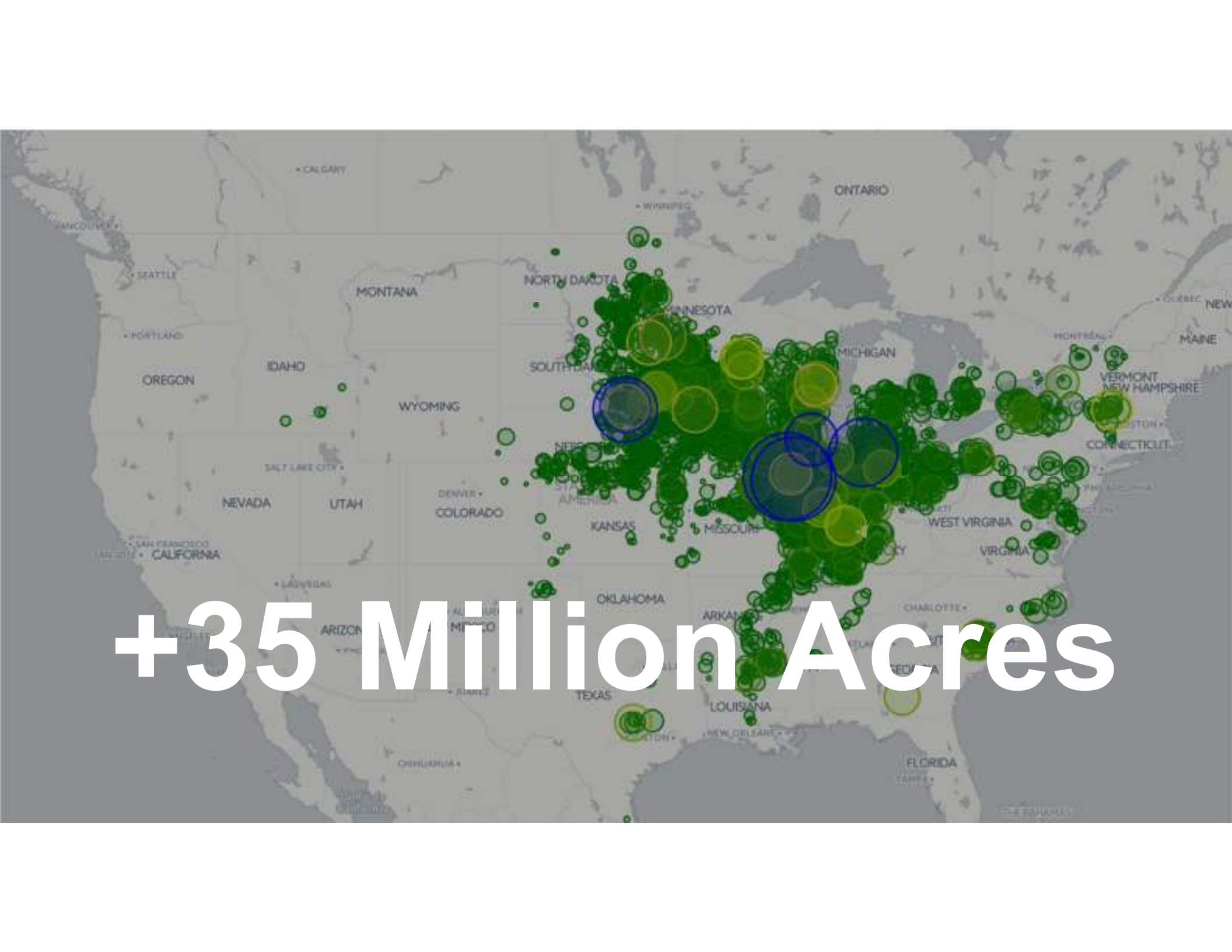
More than **100 MILLION** acres
on the Climate FieldView™ platform

Equivalent to nearly 45% of all corn and
soybean acres planted in U.S.



We Take A Comprehensive Approach to R&D

FOCUS AREA	PLATFORM: PRODUCT DELIVERABLE	PHASE 1 Proof of Concept	PHASE 2 Development	PHASE 3 Pre-Commercial	PHASE 4 Commercial/Launch	PHASE 5 Post-Commercial
FERTILITY	Whole-Field Nitrogen Monitoring					
	Sub-Field Nitrogen Monitoring					
	Grid Soil Test Data Ingest and Layers Visualization (OM, CEC, pH, P, K)					
	Manual Fertility Scripting (Nitrogen, Phosphorus, Potassium, Lime)					
	Advanced P&K Scripting					
	Advanced Nitrogen Scripting					
	Advanced Scripting with Sensors & Imagery					
	Whole Field Nitrogen Monitoring (Canola, Wheat)					
SEEDS & PLANTING	Advanced Seed Scripting, Population by Field Zone					
	Additional Zone Sources					
	Product Selection by Geographic Region					
	Enhanced Field Zones & Improved Seeding					
	Product Selection by Field					
	Manual Seed Scripting (Wheat)					
	Seed Portfolio Optimization					
	Advanced Seed Scripting (Soybeans)					
FIELD INSIGHTS	Field Health Monitoring					
	Field Analysis (All major row crops and broad-acre crops except cotton)					
	Yield Analysis					
	Corn Disease Vulnerability (GLS, NLB)					
	Yield Analysis (Cotton)					
	Field Health Monitoring (Wheat, Cotton, Alfalfa, Canola)					
	Stress Identification					
	Enhanced Directed Scouting					
	Yield Productivity Enhancement through Benchmarking Analytics					
	Disease Diagnosis & Identification (Corn)					
	Disease Diagnosis & Identification (Soybeans)					
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WEATHER	Precipitation Accuracy Improvements					
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MEASUREMENTS	Climate Fieldview Digital HUB					
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	Climate FieldView Soil Moisture and Temperature Probe					
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	Nitrate Sensor					

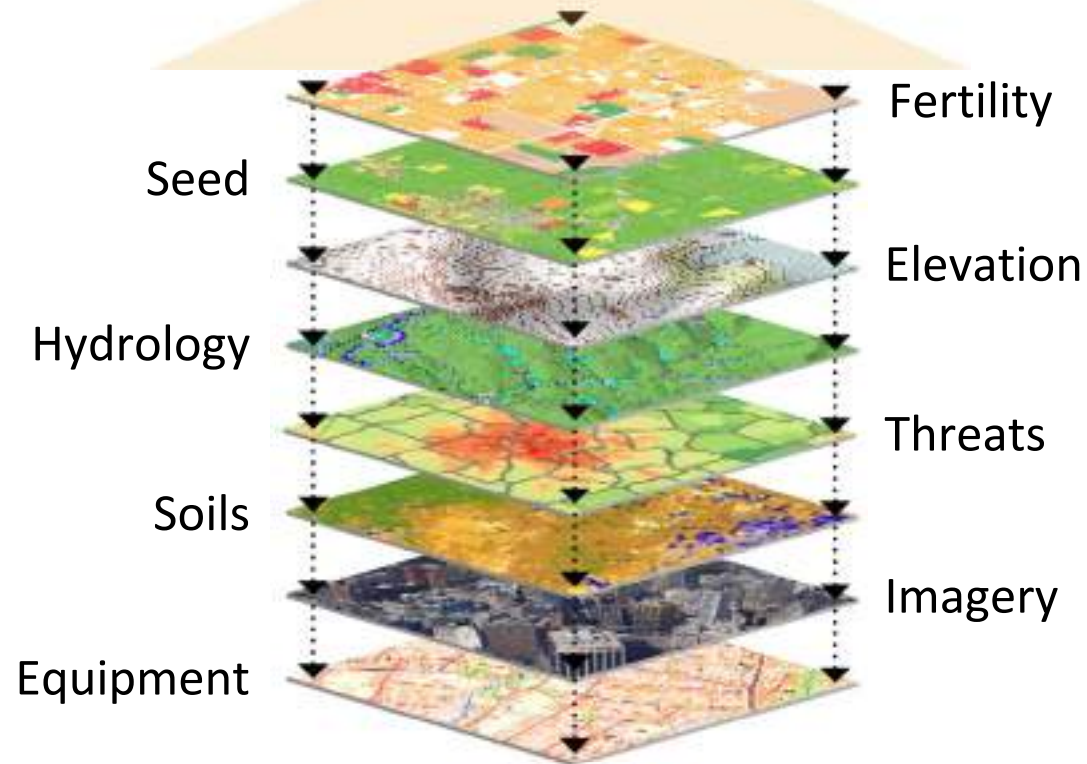
A map of the United States showing numerous green circles of varying sizes, primarily concentrated in the central and eastern regions. Some circles are highlighted with blue outlines. The text '+35 Million Acres' is overlaid in large white font.

+35 Million Acres

$$\text{Yield} = f(g , e , p) + E$$

Genetics, Environment, Farming Practice

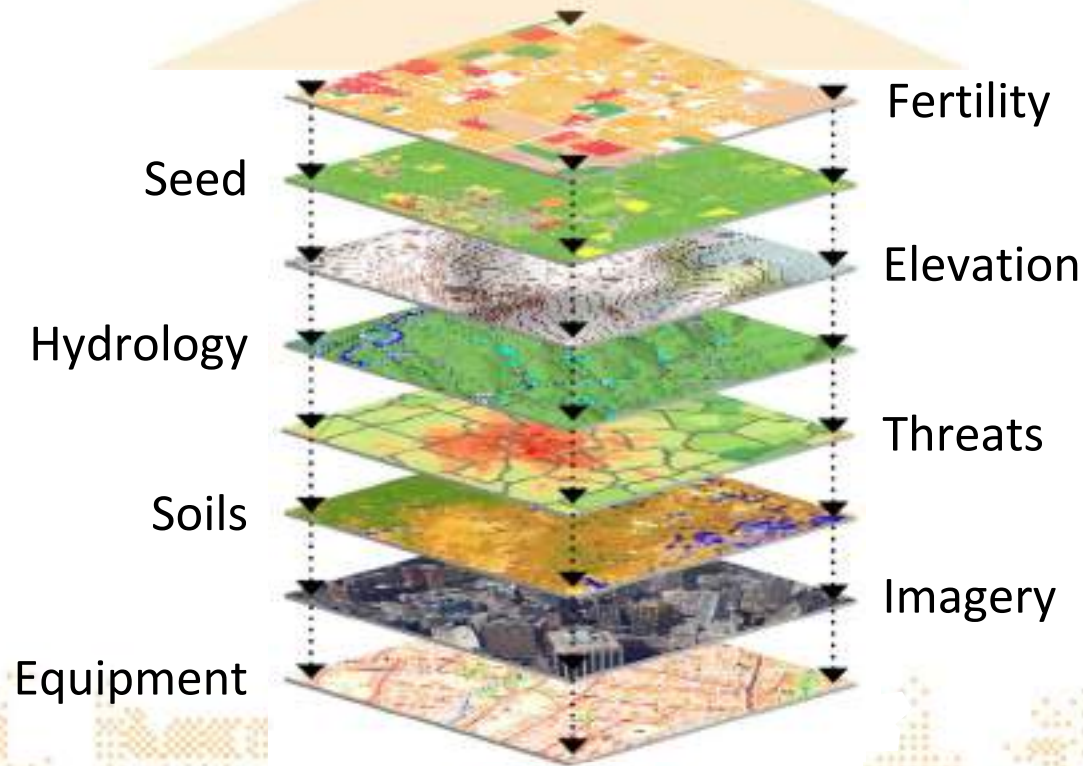
Variability



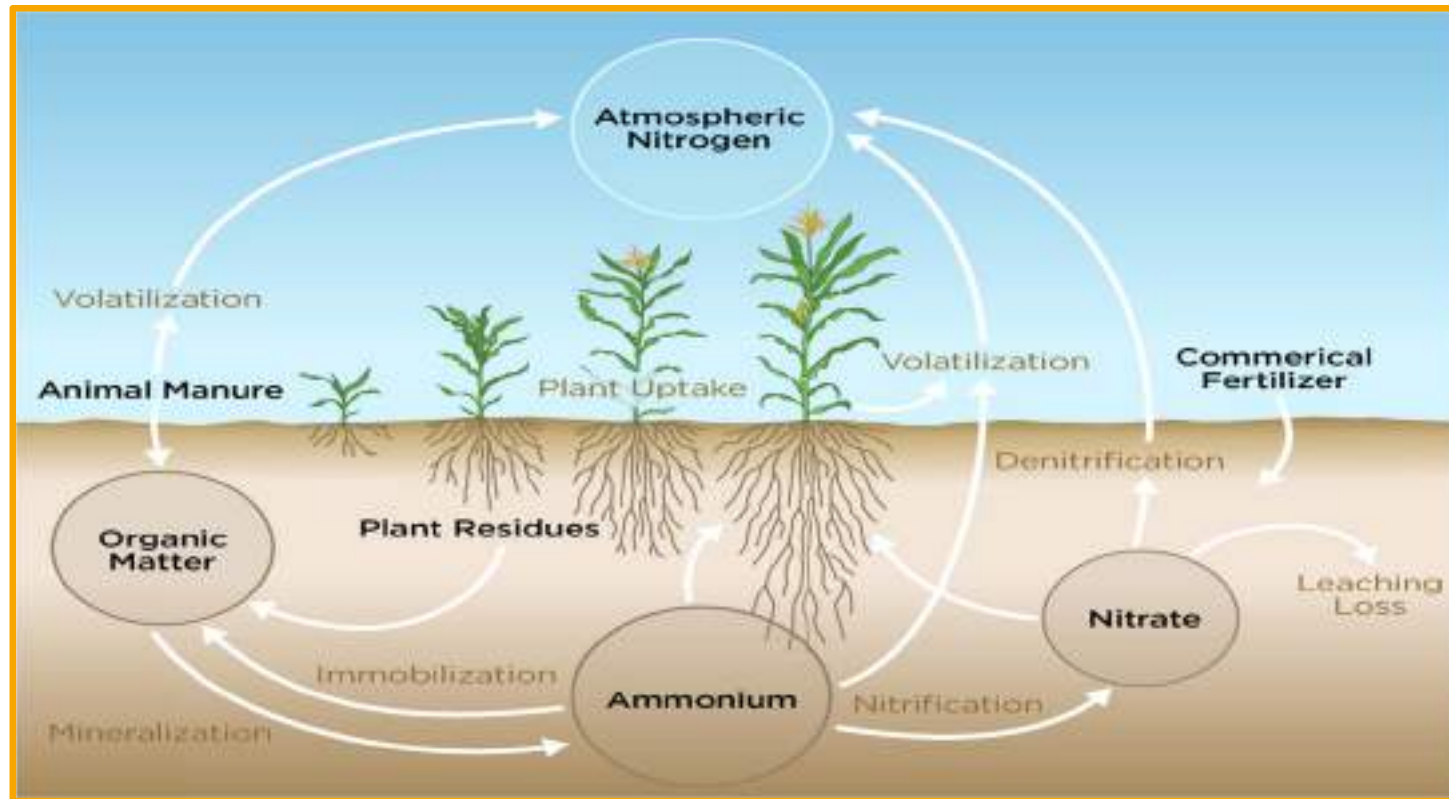
Using Our Breadth & Diversity of Data to Identify Interdependencies of the Variables that Drive Yield

$$f(g, e, p) + E$$

Genetics, Environment, Farming Practice Variability



Nitrogen management is very complex



Sub-Field nitrogen protects yield

Protects ~7 bu/ac worth of yield with same N

**Whole field
nitrogen management**



**~30% of field
has higher
than desired
status**

**~60% of field
has ~3% of
yield
@ risk**

**Variable rate
nitrogen management**



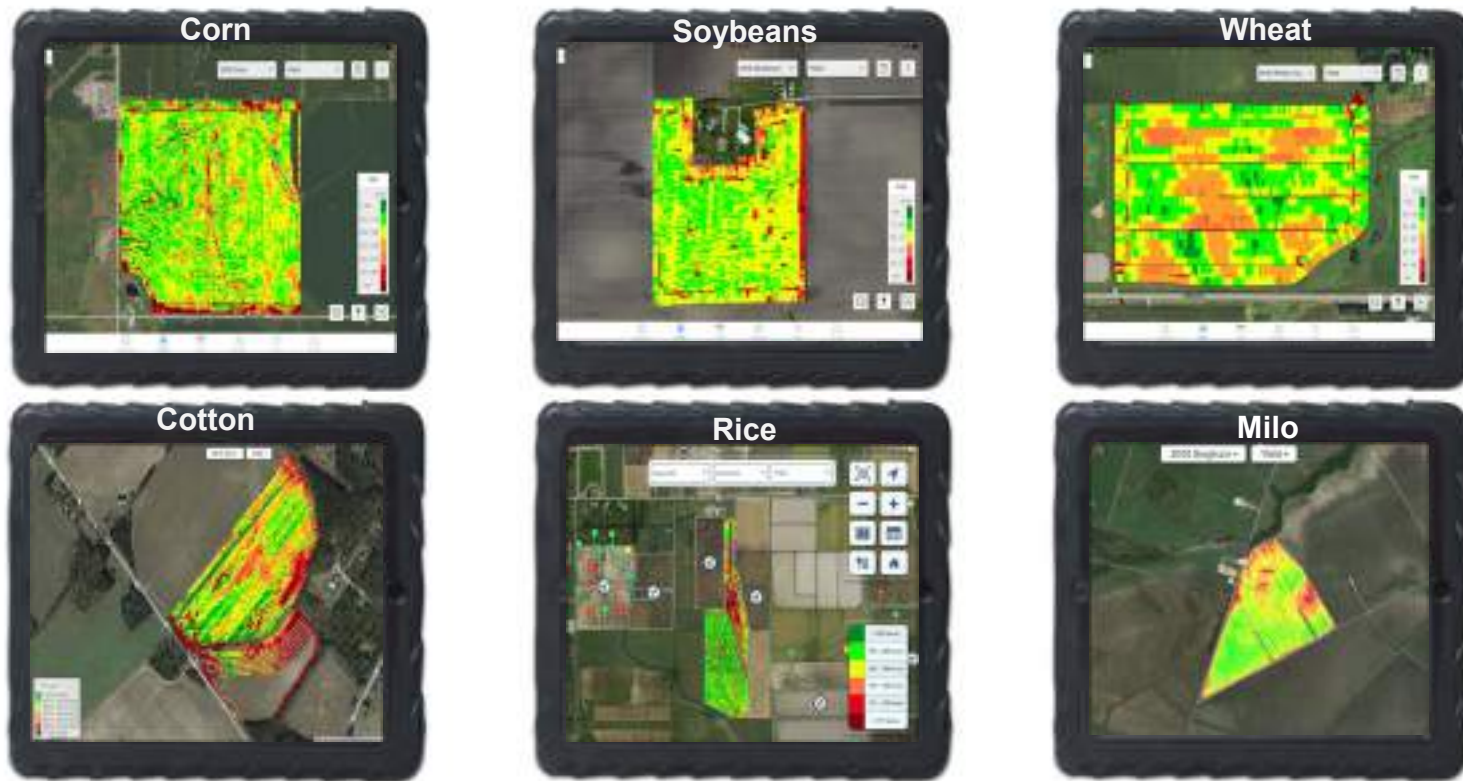
**100% of the
yield is
protected**

**100% of the
field @
desired status**

Whole Farm Overview



Field Variation is a Challenge and Opportunity



Artificial Intelligence Enabling Real-time Disease Identification

Machine learning model showing high probability of success to diagnose right disease using 50,000 images on 9 diseases



Field Health Imagery in FieldView™ directs a farmer to concerning or under-performing areas of the field



Real-time diagnosis enables farmer to take action & protect yield



Data Collection: We've Come a Long Way

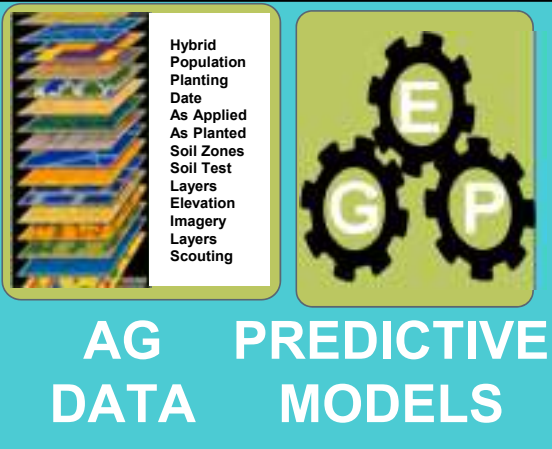


We are Focused on Creating & Delivering Value to Growers

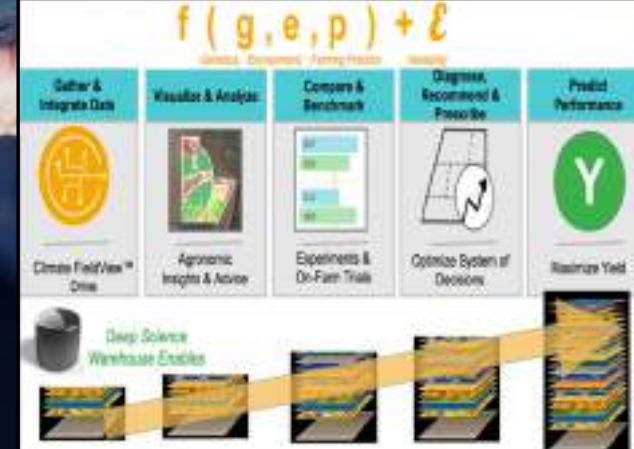
APPLYING DEEP SCIENCE TO AG DATA

CREATING THE FUTURE WITH COMPREHENSIVE RESEARCH

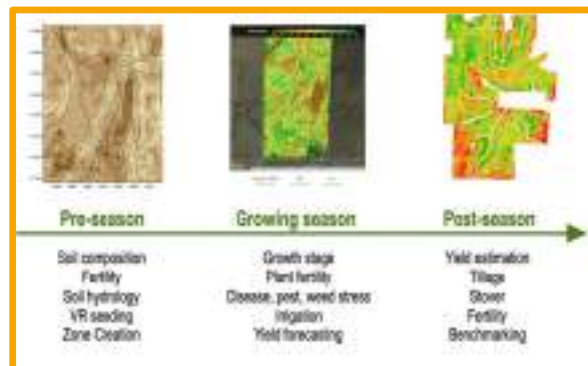
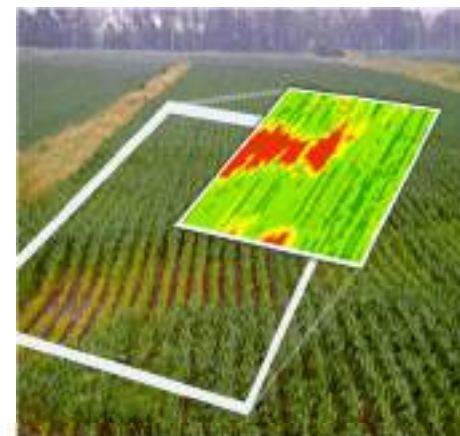
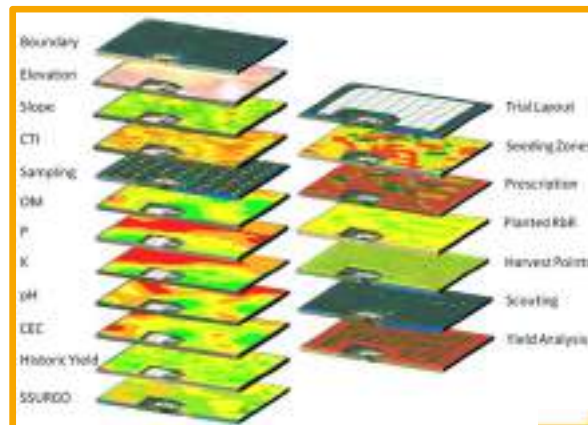
TRUSTED VALUE FOR FARMERS TODAY & TOMORROW



FOCUS AREA	PLATFORM, PRODUCT DELIVERABLE	PHASE 1 Proof of Concept	PHASE 2 Development	PHASE 3 Pre-Commercial	PHASE 4 Commercial Launch	PHASE 5 Scale Commercial
TOPIC 1	Core Platform Development	100%	100%	100%	100%	100%
	Product Integration	100%	100%	100%	100%	100%
	API Development	100%	100%	100%	100%	100%
	Security & Compliance	100%	100%	100%	100%	100%
	Performance Optimization	100%	100%	100%	100%	100%
TOPIC 2	Product Development	100%	100%	100%	100%	100%
	Integration	100%	100%	100%	100%	100%
	API Development	100%	100%	100%	100%	100%
	Security & Compliance	100%	100%	100%	100%	100%
	Performance Optimization	100%	100%	100%	100%	100%
TOPIC 3	Product Development	100%	100%	100%	100%	100%
	Integration	100%	100%	100%	100%	100%
	API Development	100%	100%	100%	100%	100%
	Security & Compliance	100%	100%	100%	100%	100%
	Performance Optimization	100%	100%	100%	100%	100%
TOPIC 4	Product Development	100%	100%	100%	100%	100%
	Integration	100%	100%	100%	100%	100%
	API Development	100%	100%	100%	100%	100%
	Security & Compliance	100%	100%	100%	100%	100%
	Performance Optimization	100%	100%	100%	100%	100%
TOPIC 5	Product Development	100%	100%	100%	100%	100%
	Integration	100%	100%	100%	100%	100%
	API Development	100%	100%	100%	100%	100%
	Security & Compliance	100%	100%	100%	100%	100%
	Performance Optimization	100%	100%	100%	100%	100%

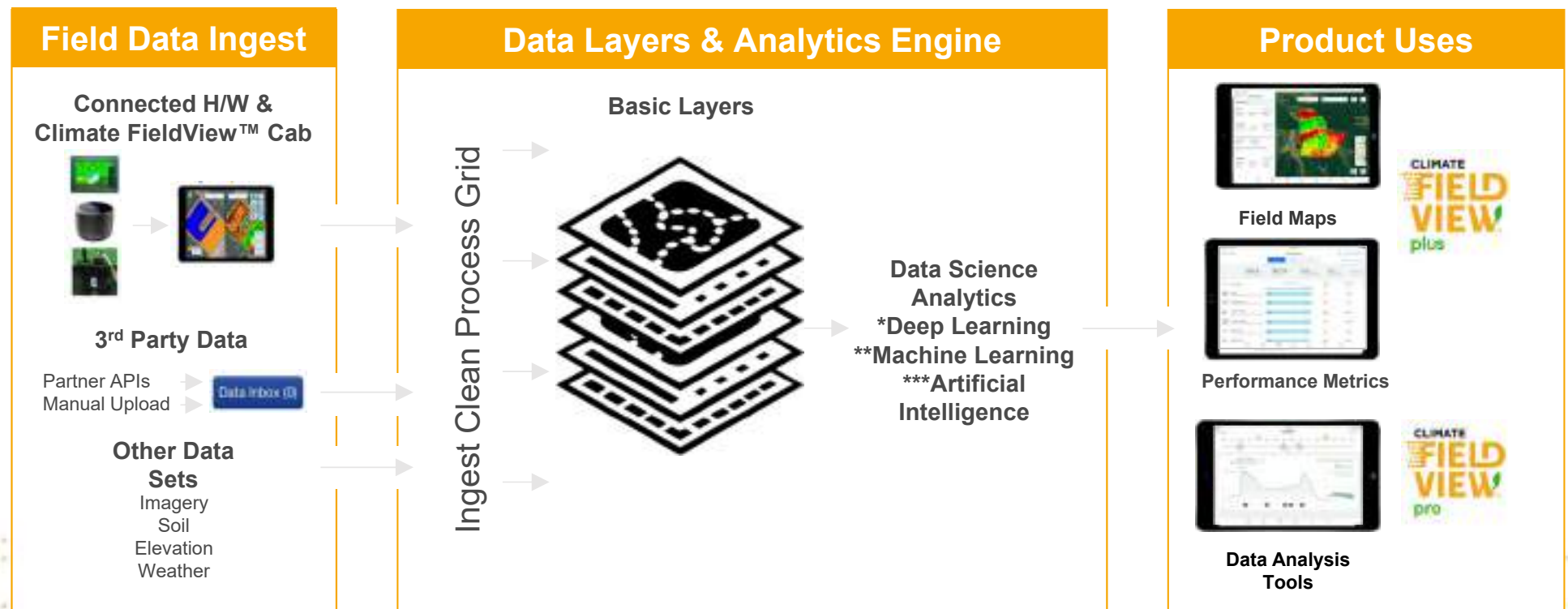


Field Imagery Expands Unlocking Field Insights

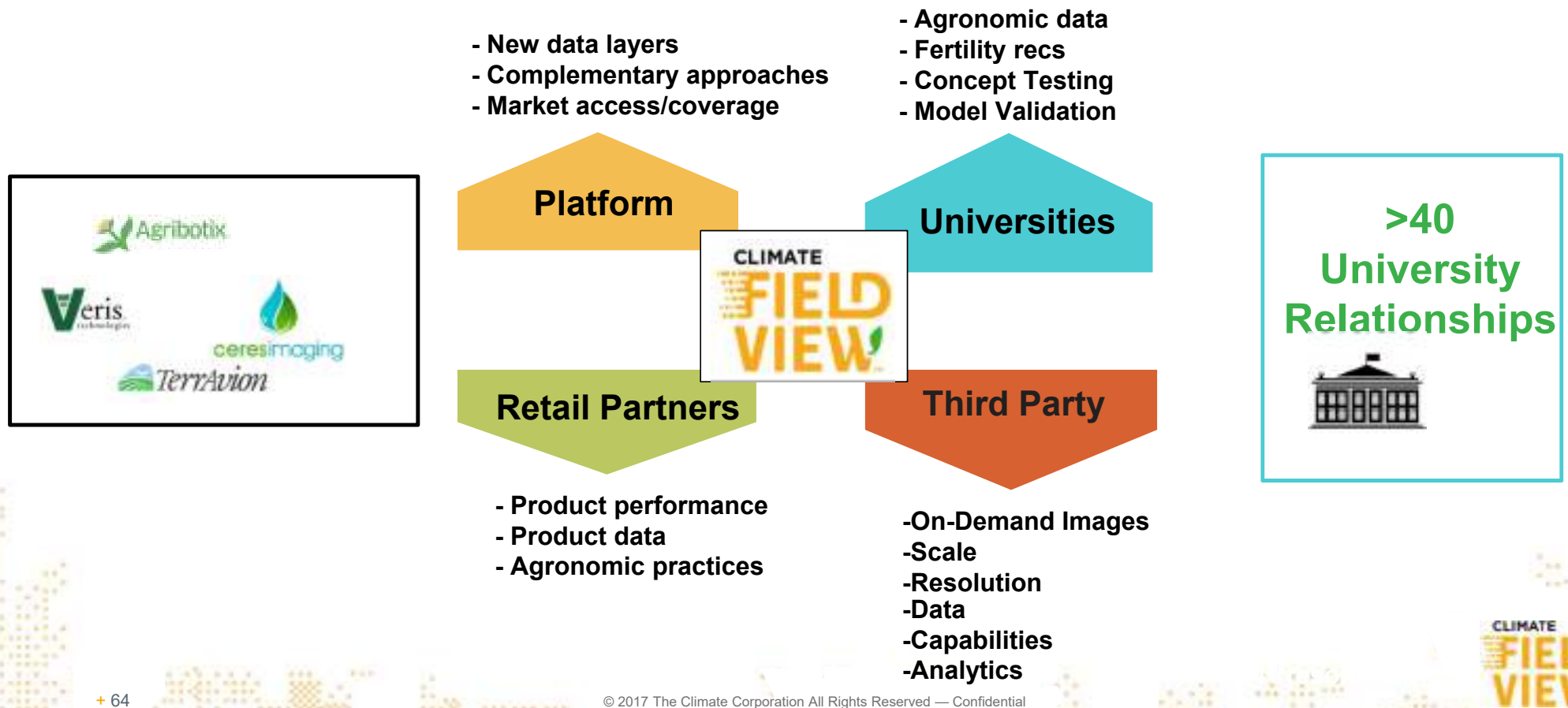


CLIMATE
**FIELD
VIEW**

Climate's Robust R&D Pipeline: Enabled by Data Aggregation & Analysis Through Advanced Technologies



Sourcing External Data & Emerging Technologies

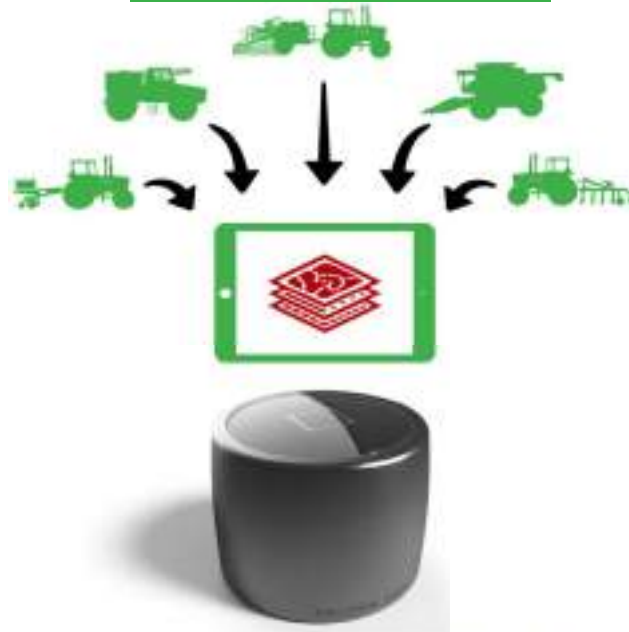


Climate FieldView™ Drive – Simple Data Collection

We've Come
a Long Way



Every Pass
Matters



We Continue
Expanding Compatibility

John Deere

Climate FieldView Drive

Planting - Most 2004+ tractors & planters

Harvest - JD combines - 60, 70, & S Series

WDS

S Series

20/20 SeedSense®

50, 60, 70, S Series, 9400, 9410,
9500, 9510, 9600, 9610

Case IH

Climate FieldView Drive

Planting -

Most 2006+ tractors

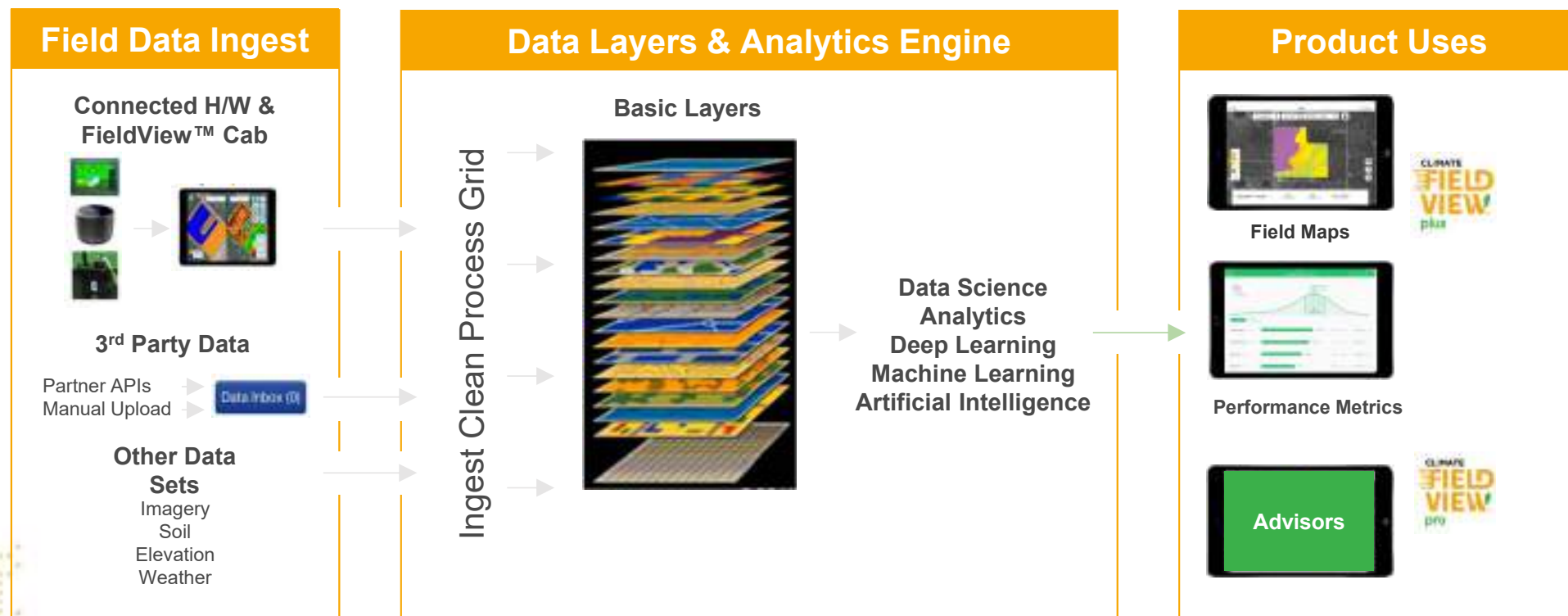
Most 2012+ 12x0 & 12x5 series planters

Harvest - 2009+ Flagship combines

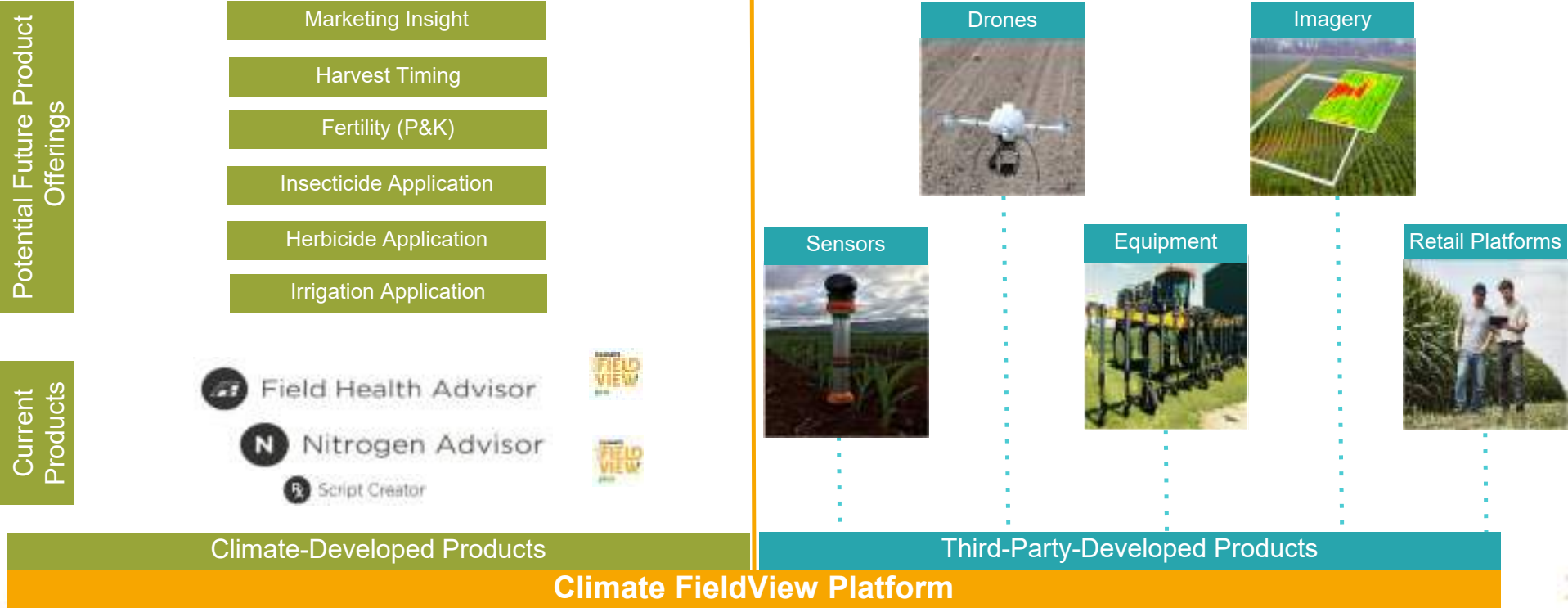
20/20 SeedSense®

5088, 6088, 7088, 5130, 6130, 7130,
5140, 6140, 7140, 2188, 2377, 2388,
2577, 2588

Data Aggregation & Analytics Unlocks New Value for Growers



Climate FieldView™ Platform Expansion Opportunities



Innovative Solutions for Farmers Requires Diverse Workforce

Key Decisions

Planning



Planting



Growing



Harvest



Key Data Layers

Genetics

Pedigree
DNA Information
Disease Tolerance
Biotech Traits

Environment

Soil Data
Weather
Field Health

Practice

Fertility
Planting
Harvest
Tillage

Data Insights

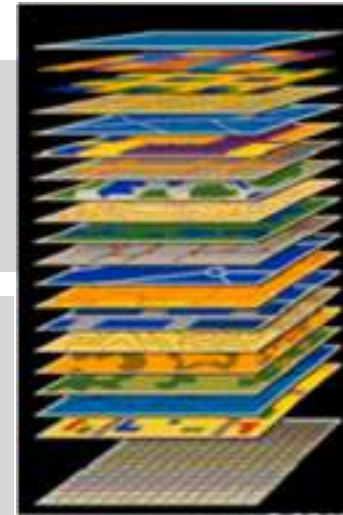
$$Y = f(g, e, p) + \epsilon$$

Yield Genetics, Environment, Farming Practices Variability

Consolidated Scalable Data & Analytics Research Platform

Ingest
Clean
Standardize
Grid
Integrate

>250
Data Layers
coming in off
Climate
Research
Farms



Scalable
Machine
Learning

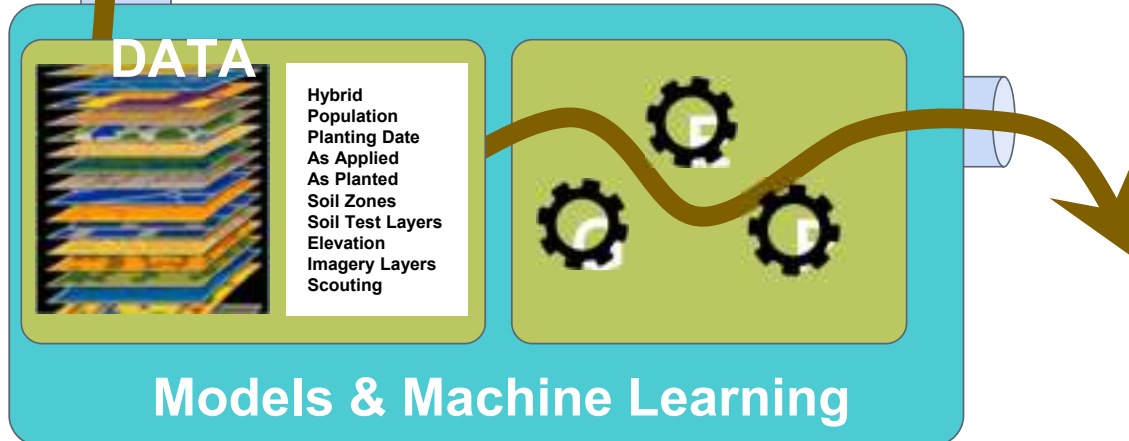
Rapid
Research
Framework

Scalable Data
Visualization

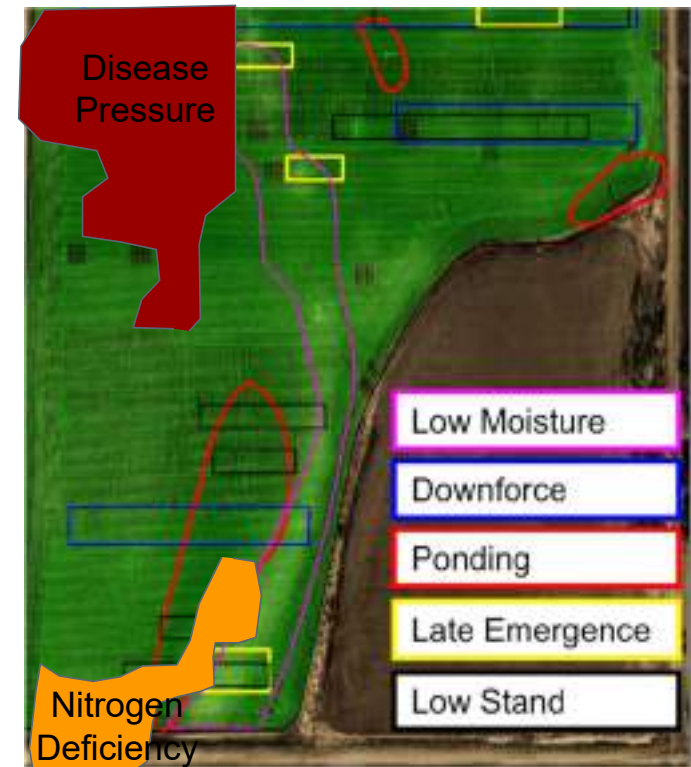
Derived Data
Layers

Yield Insights and Prediction - It's the Future

Using all available data and models...

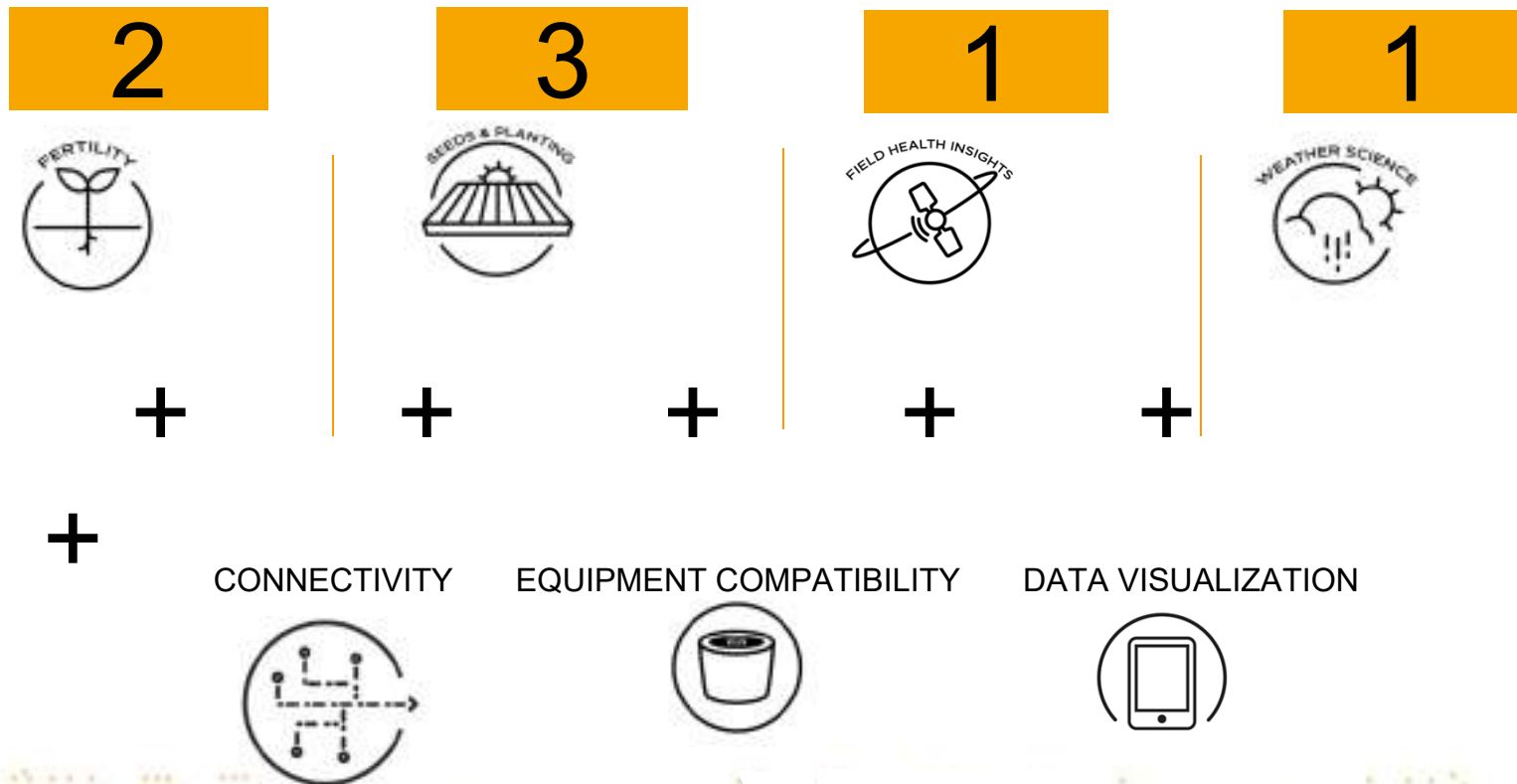


... to help growers understand the primary drivers of yield loss across their fields.



We are Inventing the Future

Seven Core Science Projects Advancing Through The Pipeline



We are Focused on Creating & Delivering Value to Farmers

APPLYING SCIENCE TO AG DATA



Hybrid
Population
Planting
Date
As Applied
As Planted
Soil Zones
Soil Test
Layers
Elevation
Imagery
Layers
Scouting



DATA

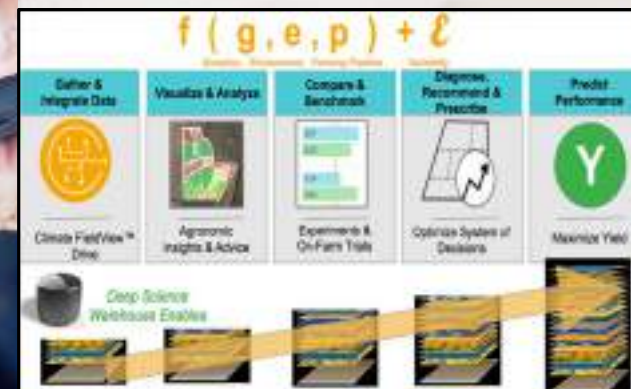
MODELS

INDUSTRY LEADING RESEARCH

Robust Pipeline of Innovation
Updated in **August 2017**

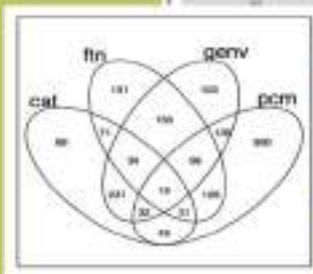
PODS AREA	PLATFORM - PROJECT DELIVERABLE	PHASE 1 Seed of Change	PHASE 2 Development	PHASE 3 Pilot Deployment	PHASE 4 Commercialization	PHASE 5 Full Deployment
Genetics	Genetic Improvement of Corn and Soybean	✓	✓	✓	✓	✓
Plant Health	Plant Health Monitoring and Diagnosis	✓	✓	✓	✓	✓
Soil Health	Soil Health Monitoring and Diagnosis	✓	✓	✓	✓	✓
Weather	Weather Monitoring and Diagnosis	✓	✓	✓	✓	✓
Water	Water Monitoring and Diagnosis	✓	✓	✓	✓	✓
Harvest	Harvest Monitoring and Diagnosis	✓	✓	✓	✓	✓
Storage	Storage Monitoring and Diagnosis	✓	✓	✓	✓	✓
Transport	Transport Monitoring and Diagnosis	✓	✓	✓	✓	✓
Marketing	Marketing Monitoring and Diagnosis	✓	✓	✓	✓	✓
Finance	Finance Monitoring and Diagnosis	✓	✓	✓	✓	✓
Insurance	Insurance Monitoring and Diagnosis	✓	✓	✓	✓	✓
Regulatory	Regulatory Monitoring and Diagnosis	✓	✓	✓	✓	✓
Compliance	Compliance Monitoring and Diagnosis	✓	✓	✓	✓	✓
Security	Security Monitoring and Diagnosis	✓	✓	✓	✓	✓
Privacy	Privacy Monitoring and Diagnosis	✓	✓	✓	✓	✓
Accessibility	Accessibility Monitoring and Diagnosis	✓	✓	✓	✓	✓
Interoperability	Interoperability Monitoring and Diagnosis	✓	✓	✓	✓	✓
Scalability	Scalability Monitoring and Diagnosis	✓	✓	✓	✓	✓
Reliability	Reliability Monitoring and Diagnosis	✓	✓	✓	✓	✓
Security	Security Monitoring and Diagnosis	✓	✓	✓	✓	✓
Privacy	Privacy Monitoring and Diagnosis	✓	✓	✓	✓	✓
Accessibility	Accessibility Monitoring and Diagnosis	✓	✓	✓	✓	✓
Interoperability	Interoperability Monitoring and Diagnosis	✓	✓	✓	✓	✓
Scalability	Scalability Monitoring and Diagnosis	✓	✓	✓	✓	✓
Reliability	Reliability Monitoring and Diagnosis	✓	✓	✓	✓	✓

CREATING NEW VALUE



Data Collection Enables Model Testing & Development

**Thousands of acres
of research trials**



**Monsanto
Research
Trials**

**Climate
Research
Farms**

**Grower
Data**

**Research
Partners
Network**

92 Million acres mapped



4,500 acres



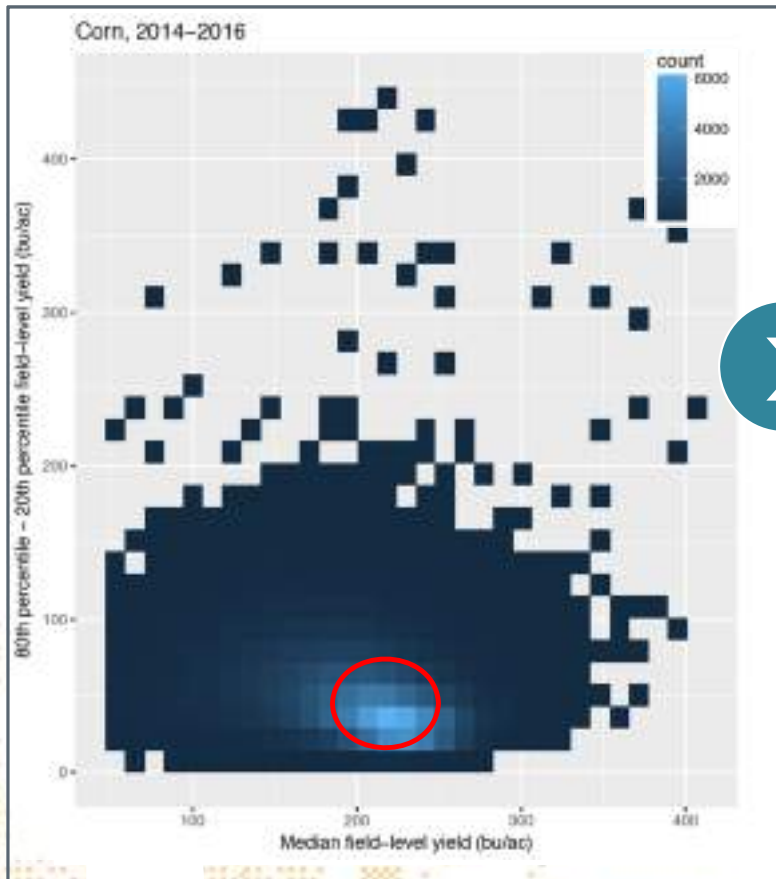
35,000 acres



**CLIMATE
FIELD
VIEW**

Grower Data Confirms Field Variability

Opportunity to Improve Decisions & Outcome



Data:

- 10.3M acres of corn yield data
- 3 years: 2014-2016
- 15 States

Result:

- Median Yield of 225 bu/acre
- ~50 bu/acre spread in yield

Outcome:

- Fields have a lot of variability, are very different and require a suite of solutions

How are we Combining Deep Science with Software Solutions to Create an Advanced Digital Tool in Climate FieldView™?



- We are providing a manual fertility prescription platform for nitrogen, phosphorus, potassium and lime.
- This is our next step to deliver comprehensive fertility solutions to FieldView customers.
- Our goal is to help our customers optimize their fertility management to get the most out of every acre.

New in 2018: Saved Region Reports turn every field into a test plot



Why pick Agrow stand and remastrike? Oh yes yield and yield protection. And best way to view results @FieldView @MyFarmMyYield



My Users

All Users

25

Total

22

Paid

17

Active

7

Uploads Last
30 Days

3

Renewals Next
30 Days

Users (25)

User	Subscription Expiration	Account Logins over last 30 days	Data % this season data uploaded	Engagement % fields using all plus features	Pro Feature % fields using all pro features	Equipment Last upload from Drive or 20/20	Login User's last
TH Tom tom@	Plus Nov 10, 2017 Autorenew: Off	38 logins	88%	100%	Purchase	Yesterday	Login Yesterday
CD Cody cd	Plus Nov 10, 2017 Autorenew: On	0 logins	78%	1%	Purchase	Never	Login Jan 1, 2016
AH Al	Plus Nov 10, 2017 Autorenew: Off	23 logins	22%	25%	Purchase	Never	Login



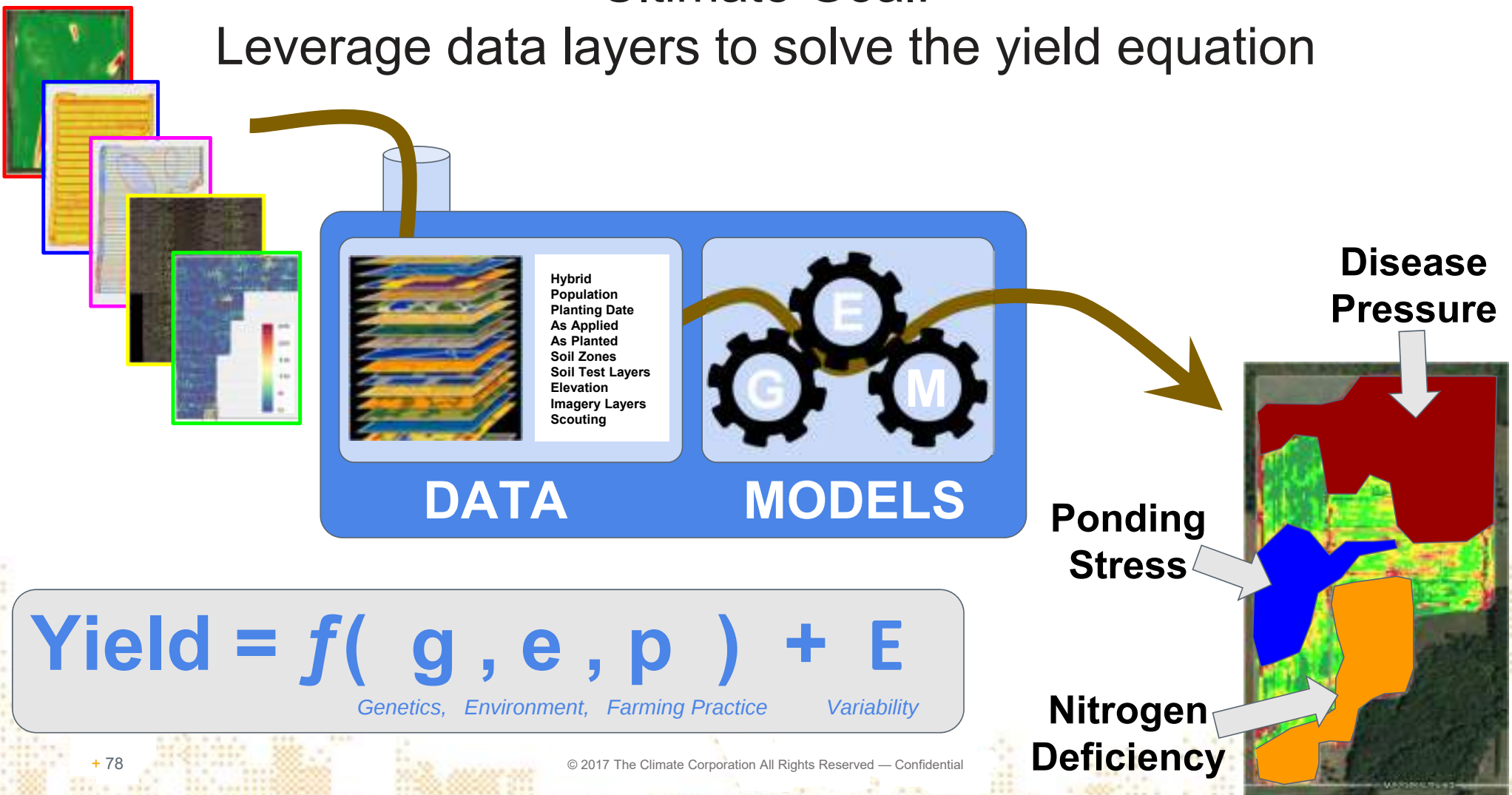
Climate Science Updates

GROWMARK Meeting

October 26, 2017

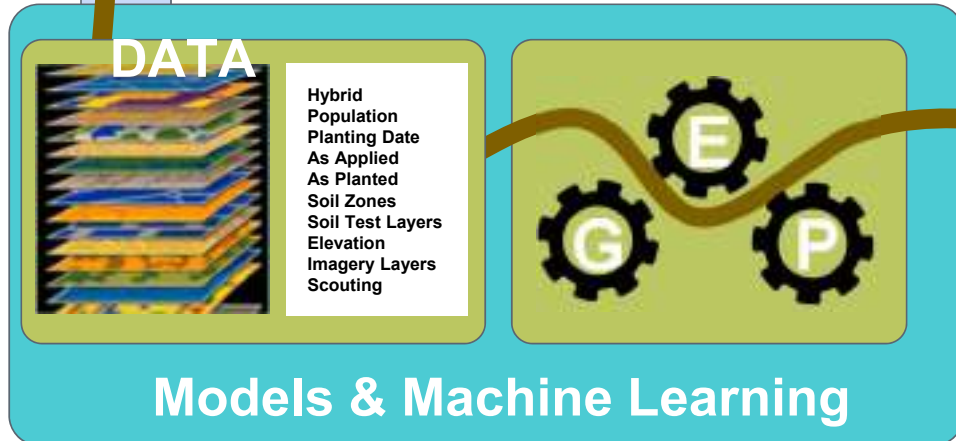


Ultimate Goal: Leverage data layers to solve the yield equation

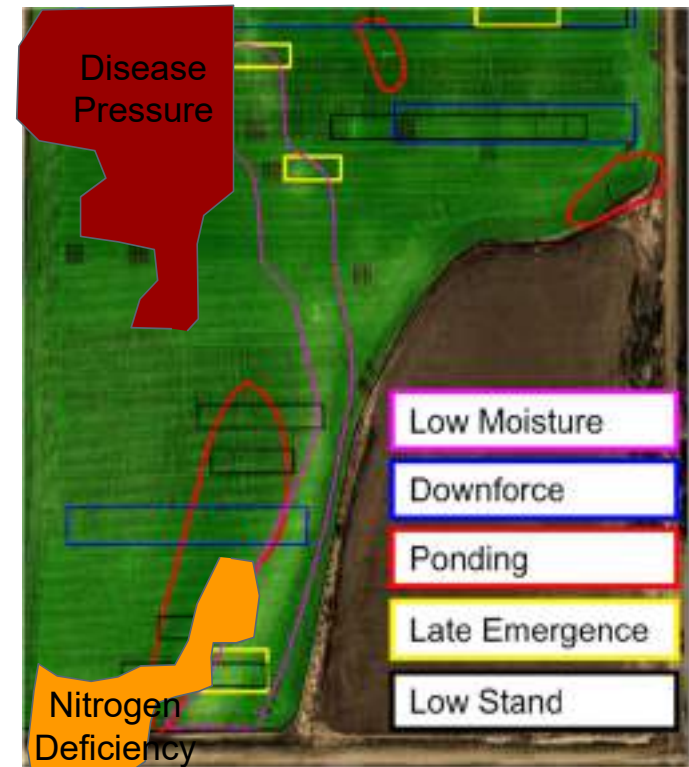


Yield Insights and Prediction - It's the Future

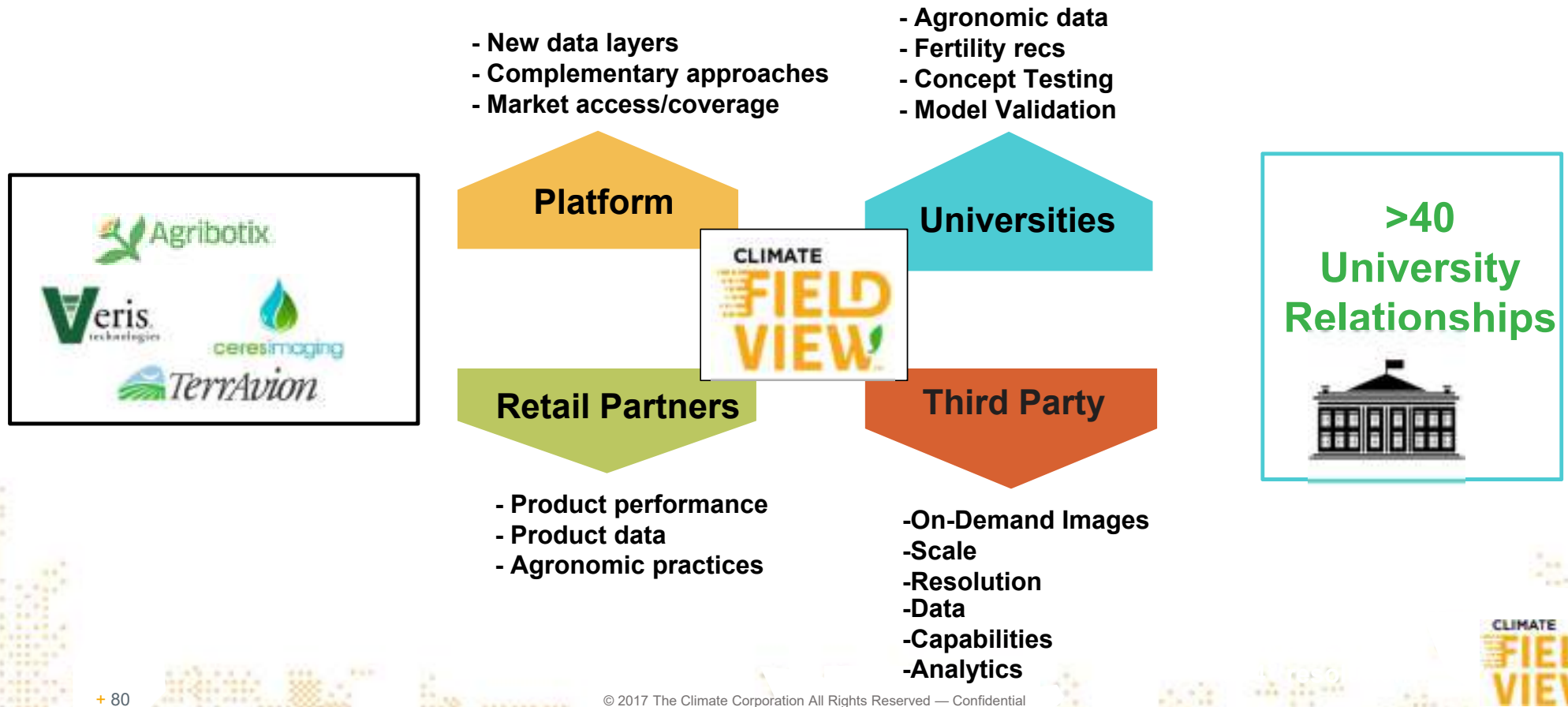
Using all available data and models...



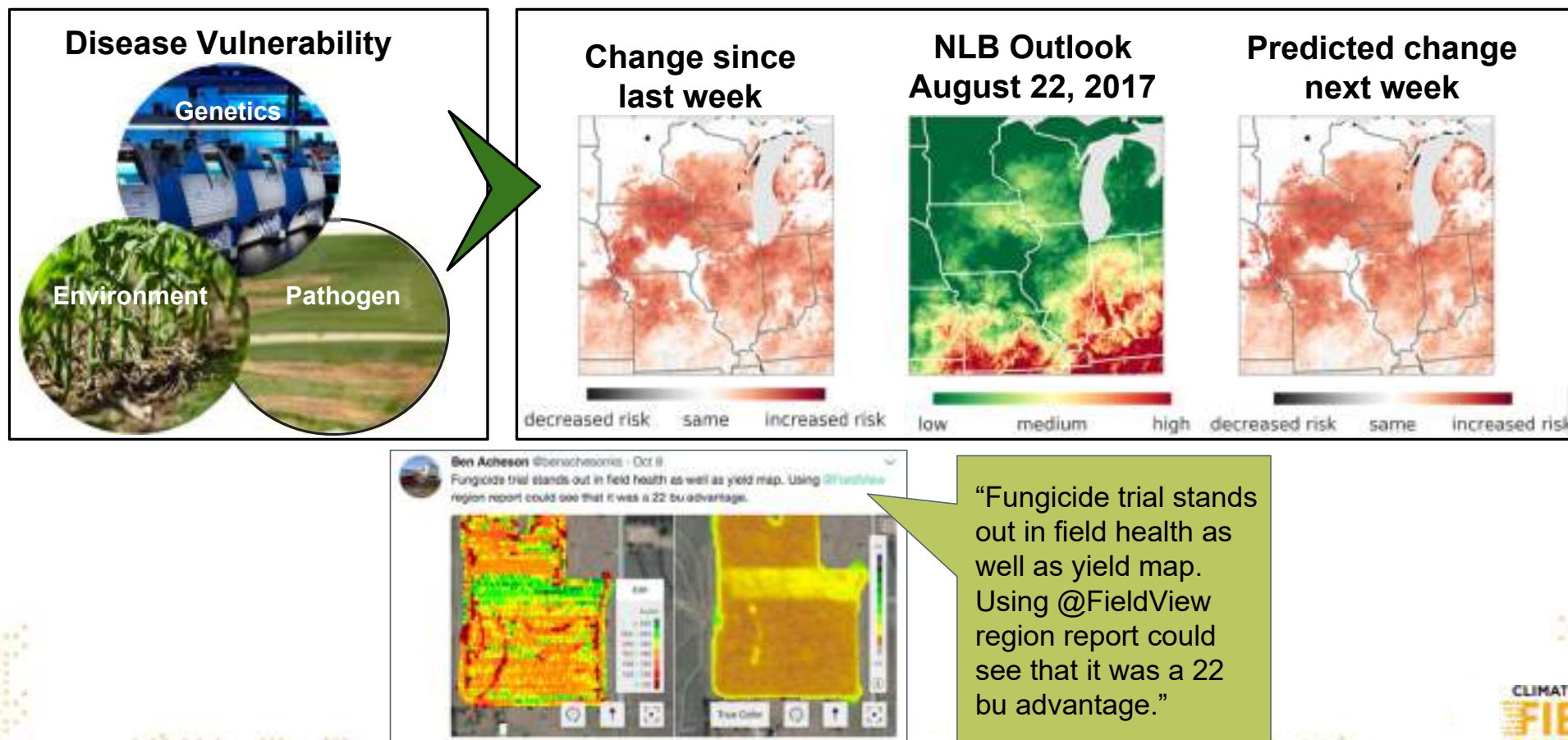
... to help growers understand the primary drivers of yield loss across their fields.



Sourcing External Data & Emerging Technologies



Disease Modeling Informs Fungicide Spraying



Artificial Intelligence Enabling Real-time Disease Identification

Machine learning model showing high probability of success to diagnose right disease using 50,000 images on 9 diseases



Field Health Imagery in FieldView™ directs a farmer to concerning or under-performing areas of the field



Real-time diagnosis enables farmer to take action & protect yield



Climate FieldView is Valuable for Your Relationship with Growers

“Growers feel like we’re working more for them when I bring them alerts that their fields are short on nitrogen.”

“It gives me a few more opportunities to talk to growers about things, especially at the end of the summer.”

“Some of the farmers were buying seeds and fertilizers from a competitor, so Climate was a foot in the door for me.”

Improved customer relationships

More quality touchpoints

Increased revenue

Improved competitiveness

Increased efficiency

“It’s amazing how the Field Health maps in July/August look so much like yield maps after harvest. It helps me prioritize scouting.”

“We added 5 new customers who had previously done no business with us, because of being able to expose them to my business and my staff. Climate has opened new doors.”

Applying AI Technology Across the Pipeline & Through the Season



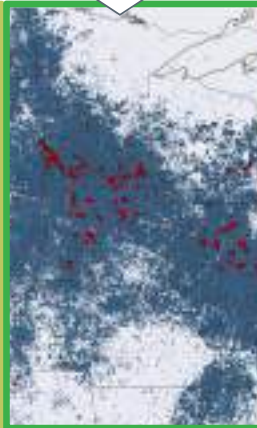
PLANTING

Seed Selection

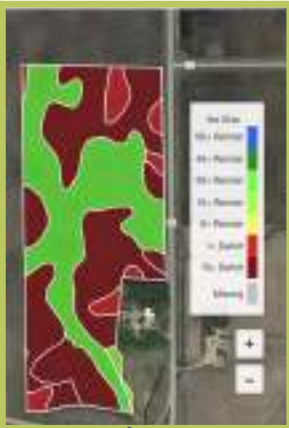


GROWING SEASON

Rainfall Improvements



Nitrogen Management



HARVEST

Disease Identification



Cloud masking

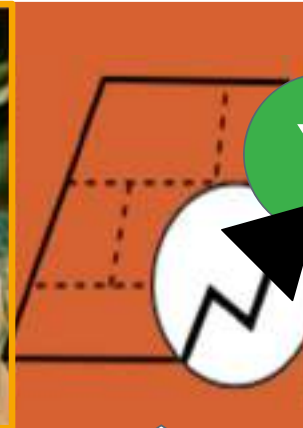


PLANNING

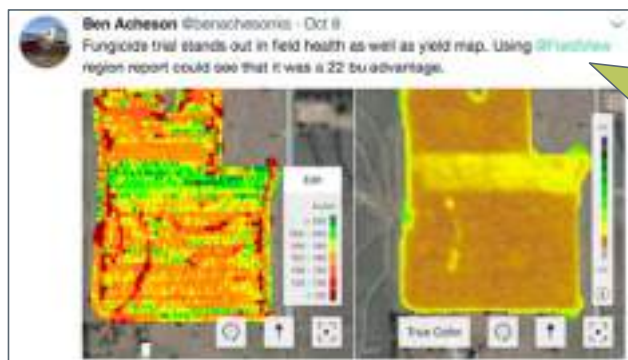
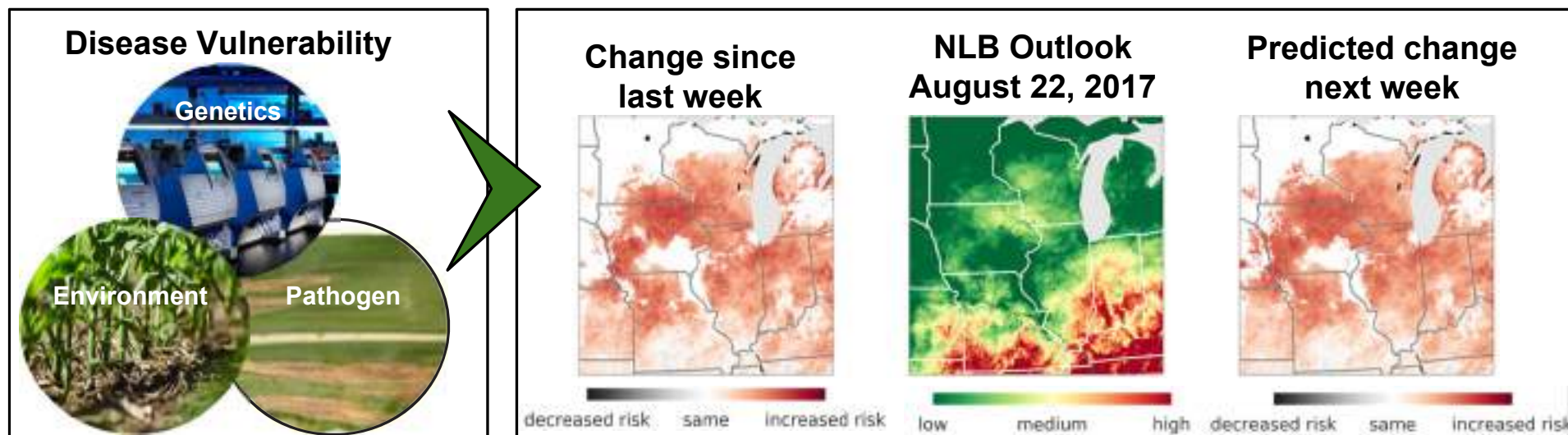
Zone Creation



Yield Prediction



Disease modeling informs fungicide spraying



“Fungicide trial stands out in field health as well as yield map. Using @FieldView region report could see that it was a 22 bu advantage.”

Artificial intelligence enabling real-time disease identification

Field Health Imagery in FieldView™

directs a farmer to concerning
or under-performing
areas of the field



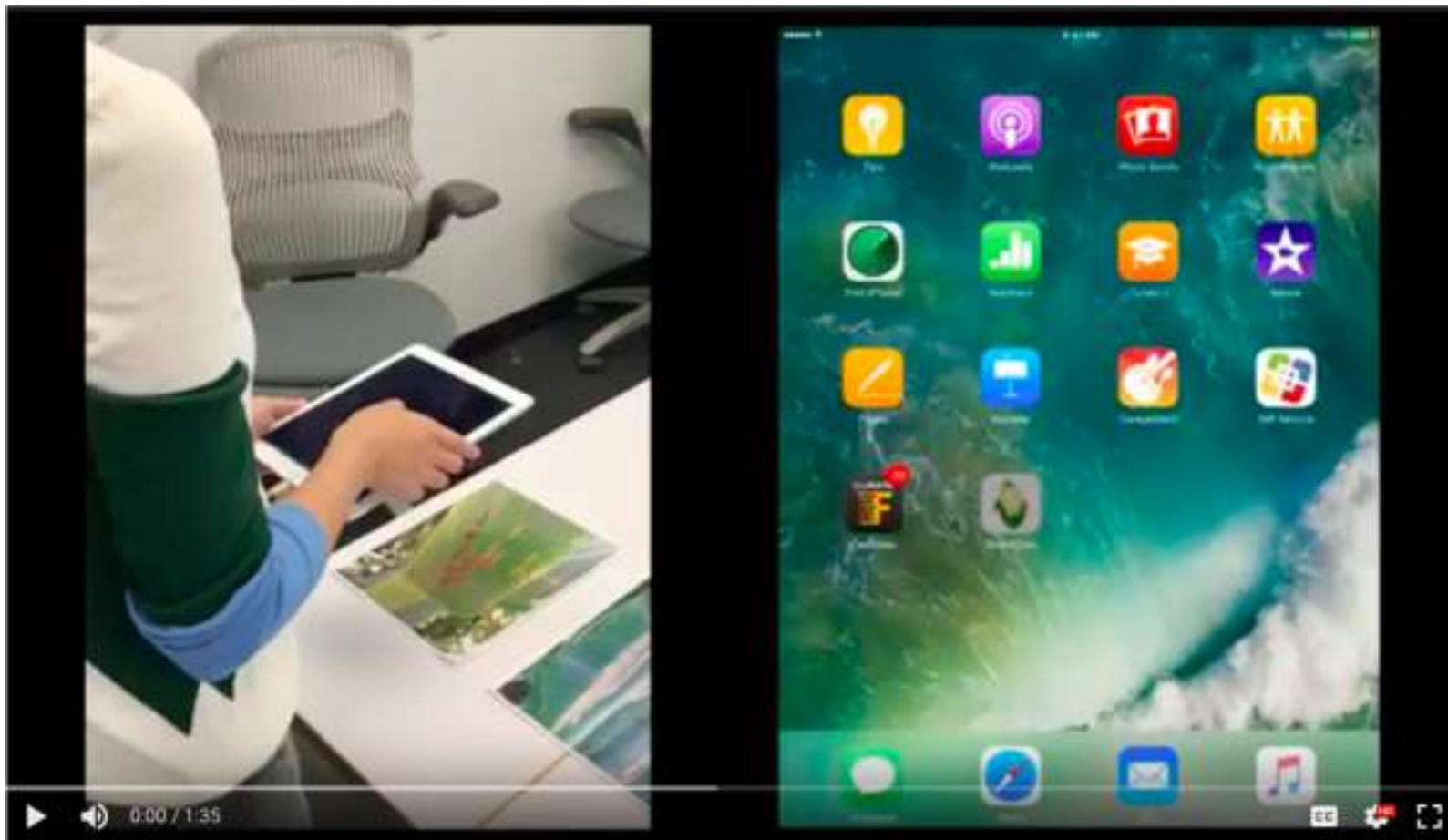
Machine learning model
showing high probability of
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disease using 50,000
images on 9 diseases



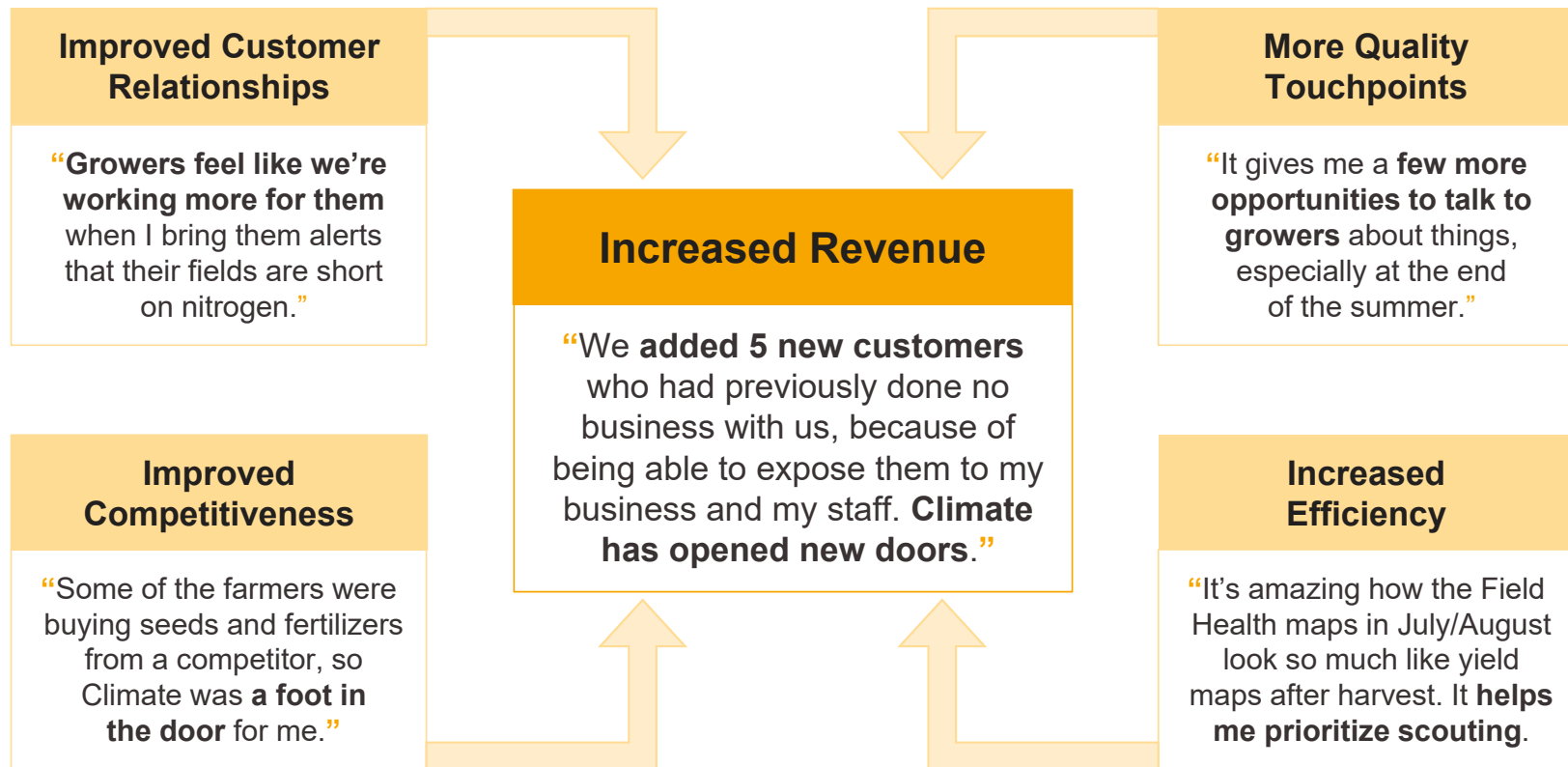
Real-time diagnosis enables
farmer to take action &
protect yield



Disease diagnosis demo



Climate FieldView™ Delivers Dealers Value



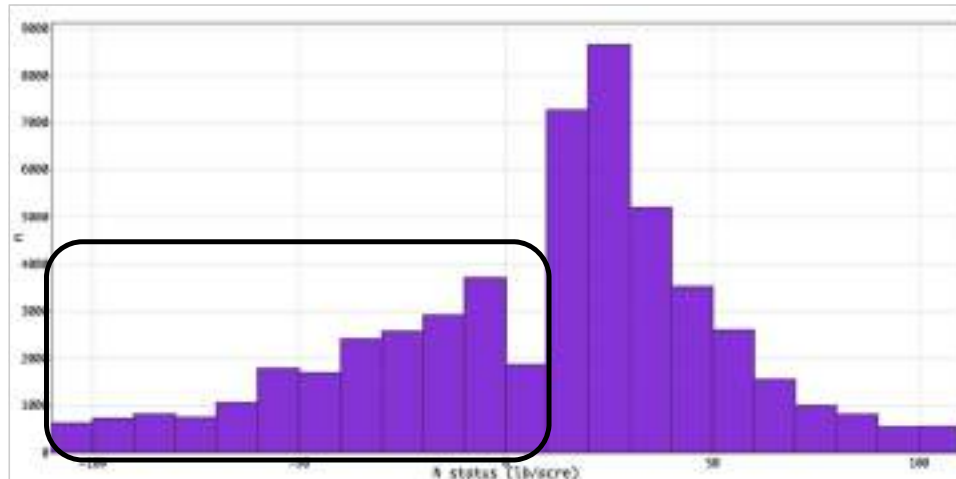
2016 Dealer Panel Research; Beck Ag

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Nitrogen variability unlocks new value opportunities

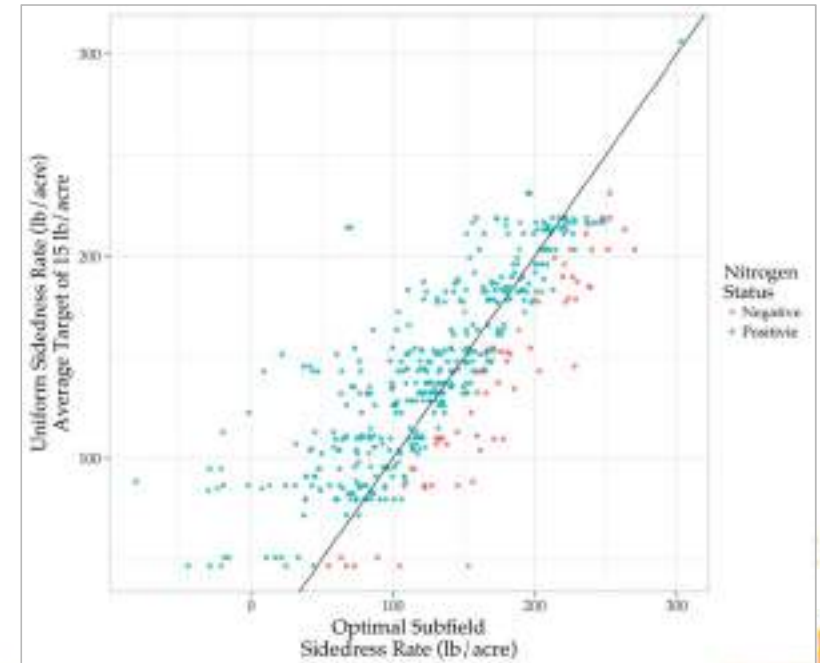
35% of Fields Deficient in Nitrogen

Sample of 61K fields across 16 states in 2017



Field Variability Unlocks VRN

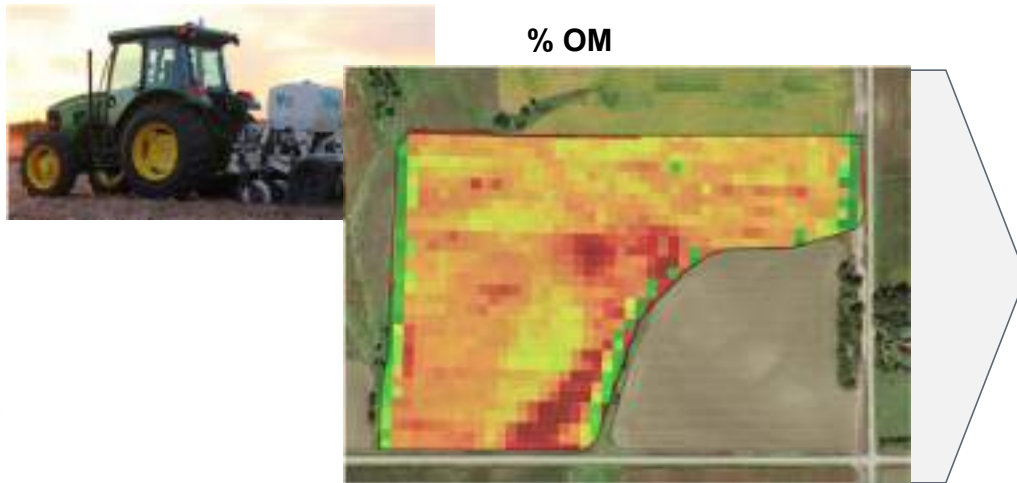
Sample of 68K acres from 867 fields



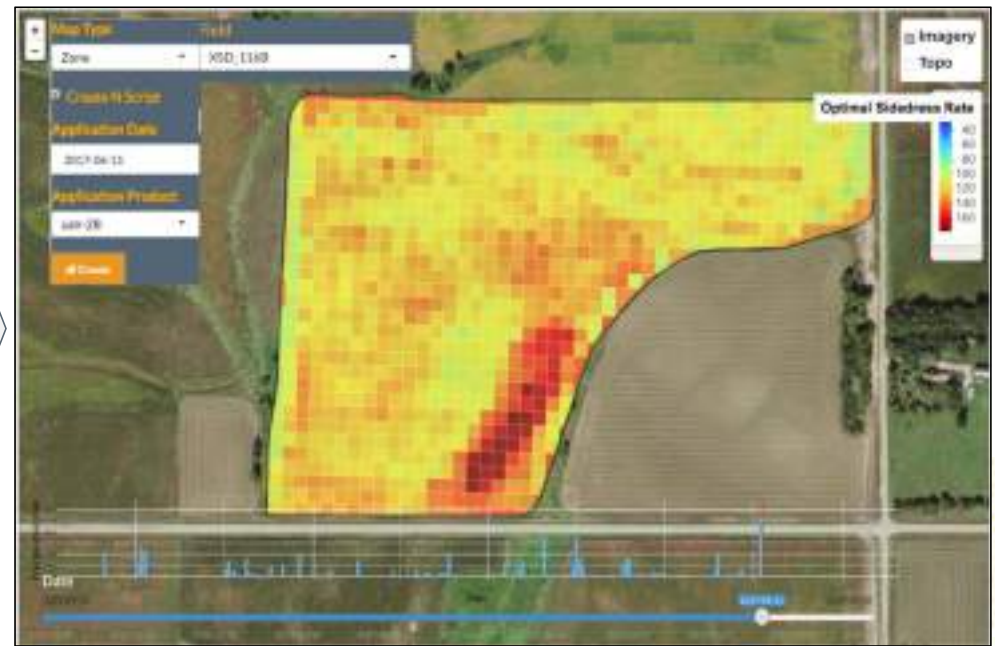
Veris data layer enhances variable rate nitrogen

Example of Integrated Data Layers

High-Res Organic Matter from Veris

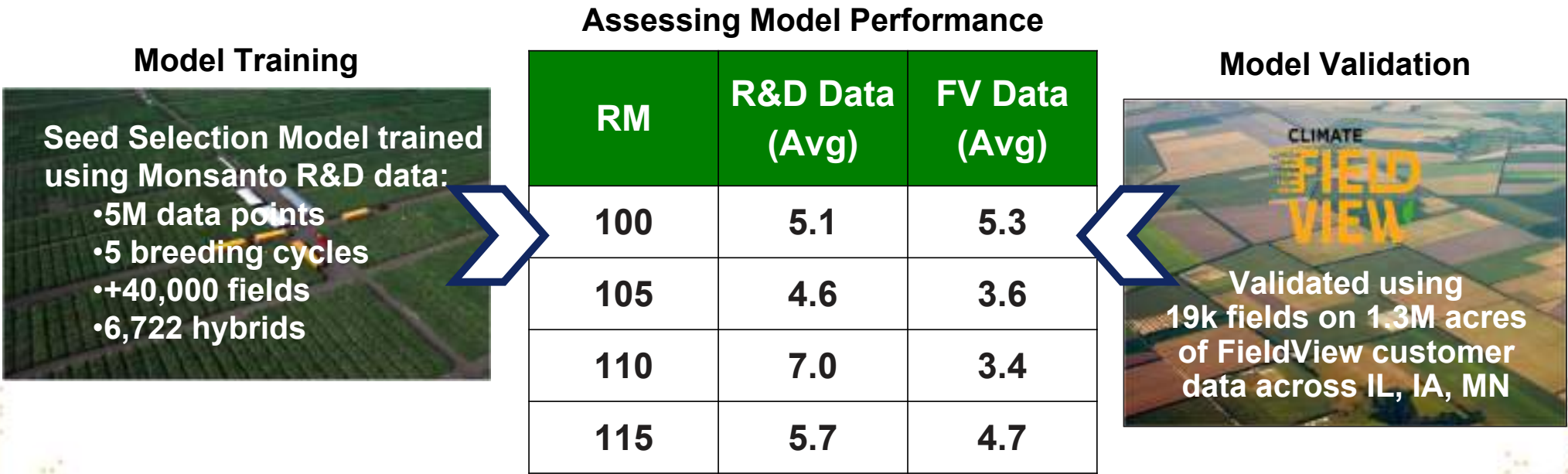


Enhanced Variable Rate Nitrogen



Dynamically changes w/ weather

Data science creates new value with seed placement recommendations



Source: Climate data



Global: Crop Production Demand Climbing

RISING *population*



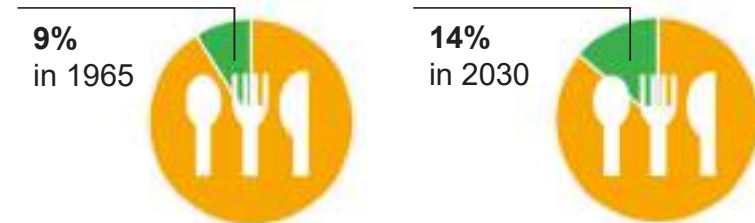
Source: <http://esa.un.org/unpd/wpp>

GROWING *middle class*



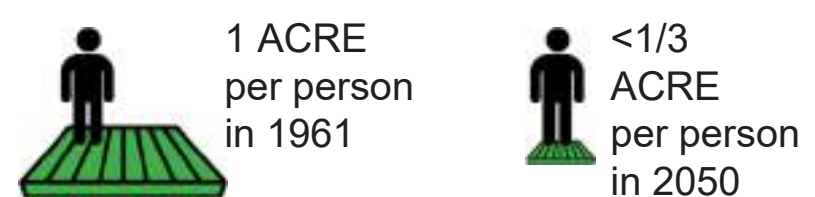
Source: <http://www.reuters.com/middle-class-infographic>

RISING *animal protein consumption*



Source: UN FAO Food Balance Sheet, World Health Organization Global and regional food consumption patterns and trends"

DECLINING *arable land*



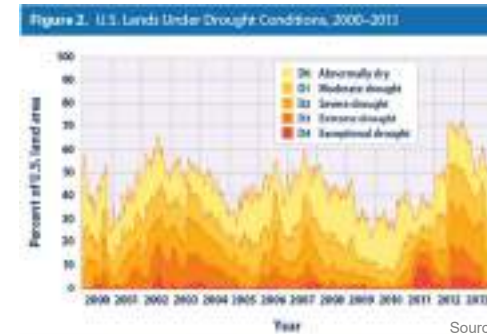
Source: The World Bank, Food and Agriculture Organization of the United Nations (FAO-STAT), Monsanto Internal Calculations

Climate: Greater Variability in Outcomes

Shifting Planting Zones



Increasing Adverse Weather



Source: National Drought Mitigation Center, 2014

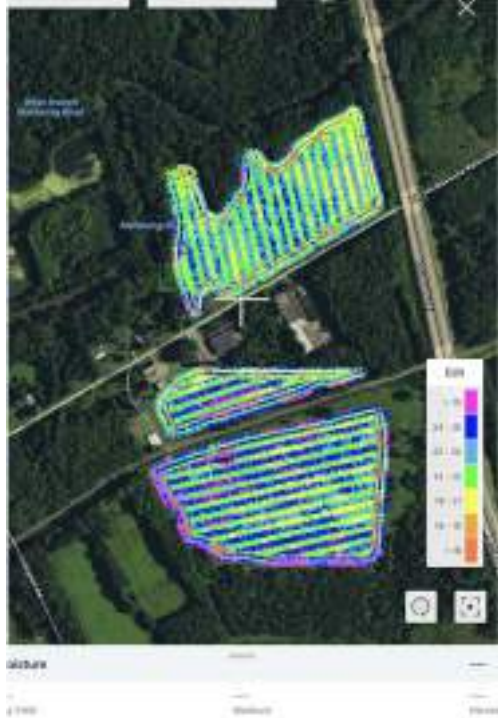
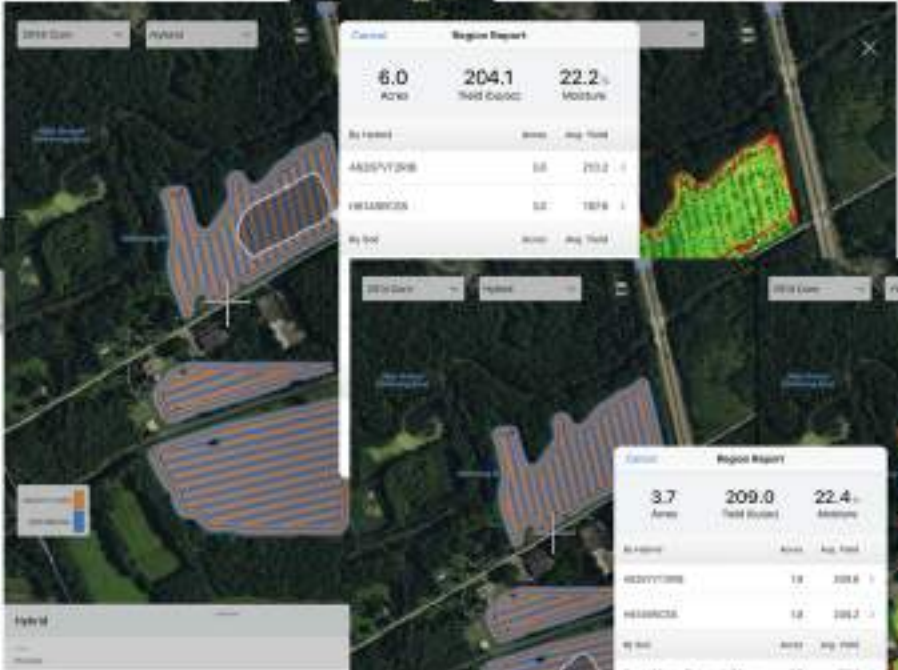
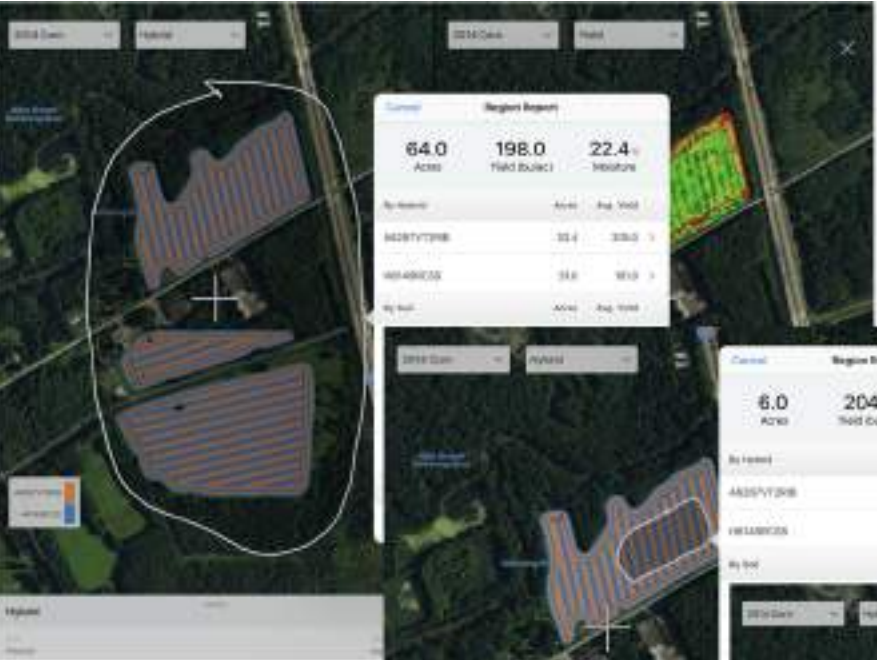
Decreasing Water Availability



Source: Tetra Tech, NRDC, 2010

Increasing Pest Pressure







Data Collection Enables Model Testing & Development

4,500 Acres



Monsanto Research Trials

Thousands of Acres

Climate Research Farms



40,000 Acres



Grower/Partner Data

Climate Research
Partners Network (CRP)



Data Collection Enables Model Testing & Development



Thousands of Acres

Quality Data

=

Quality Models

=

Quality Advice

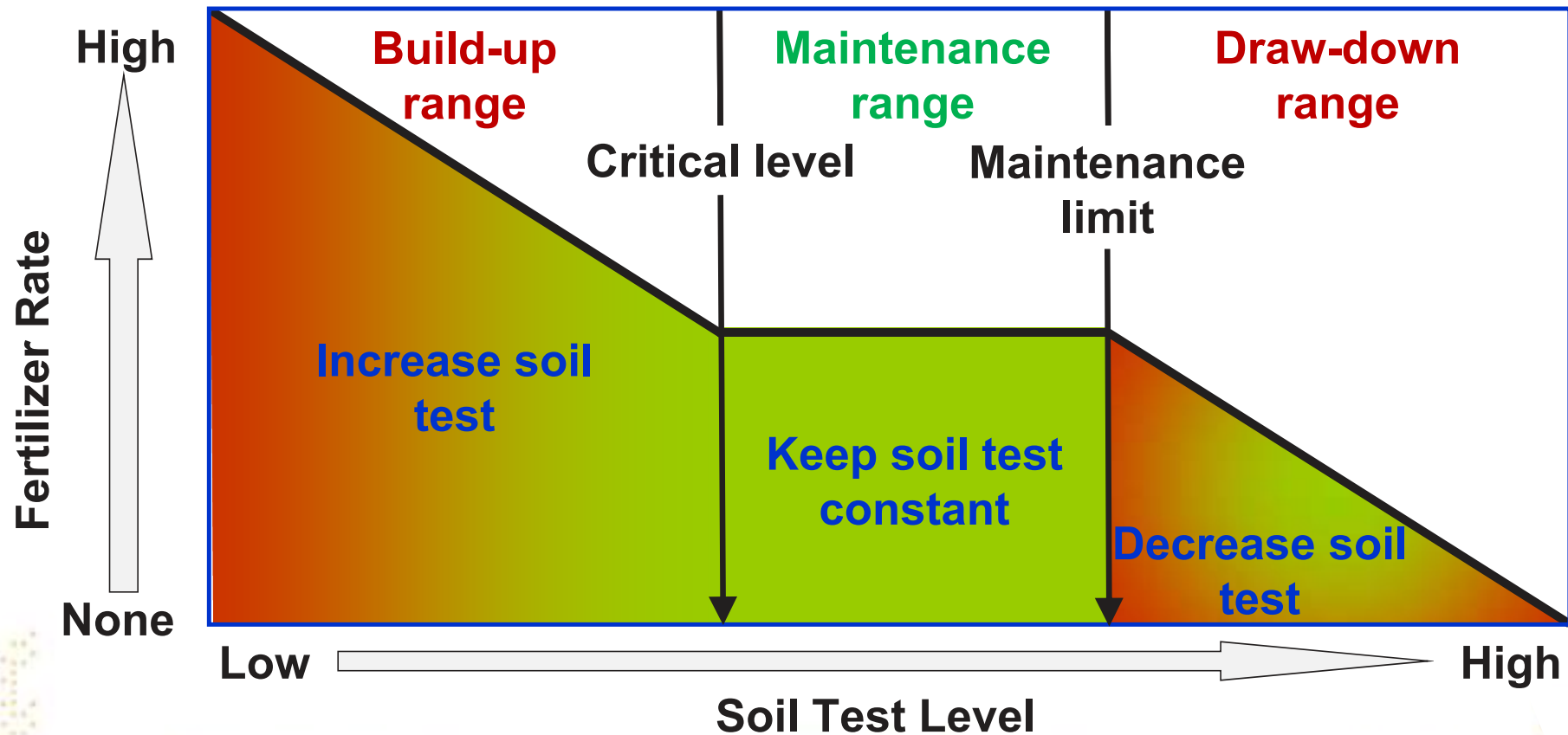
4,500 Acres



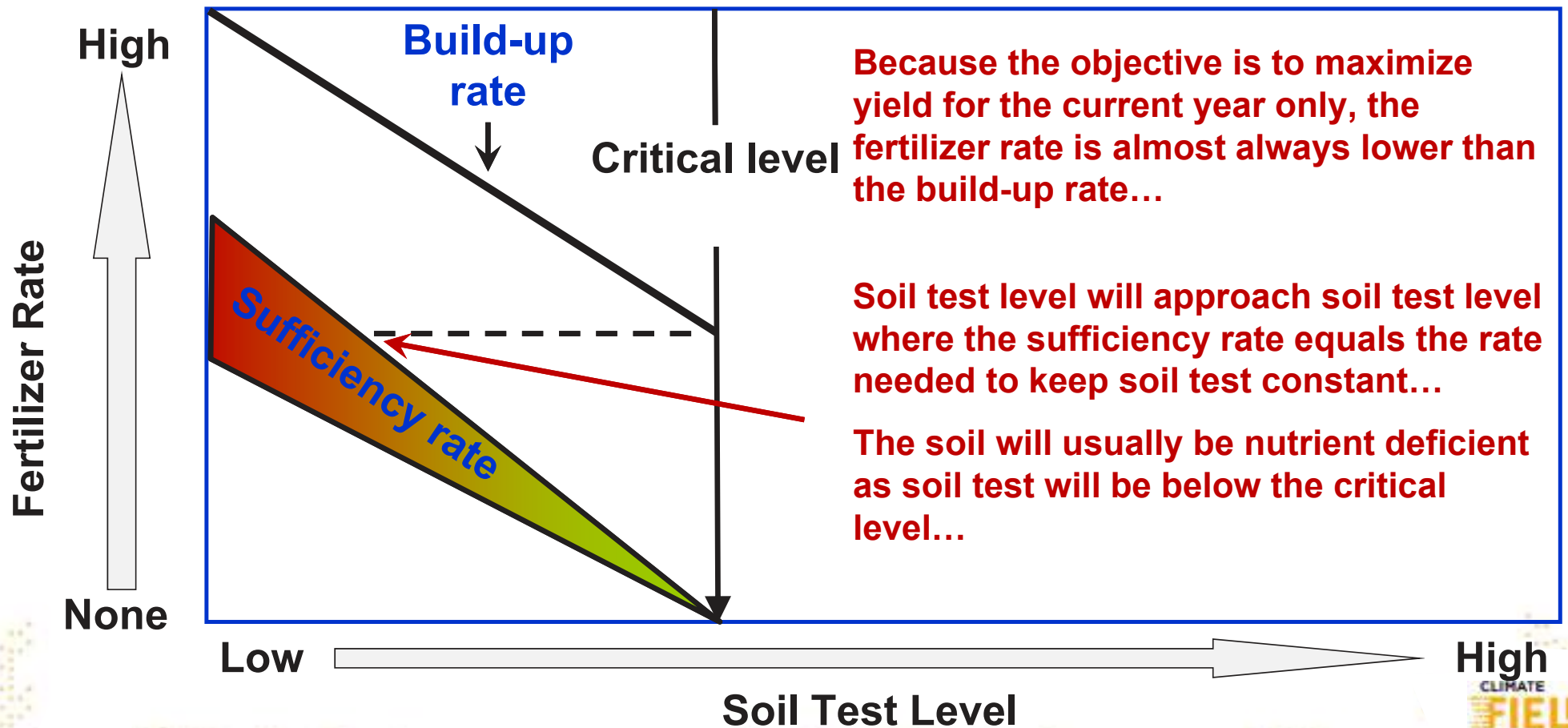
40,000 Acres



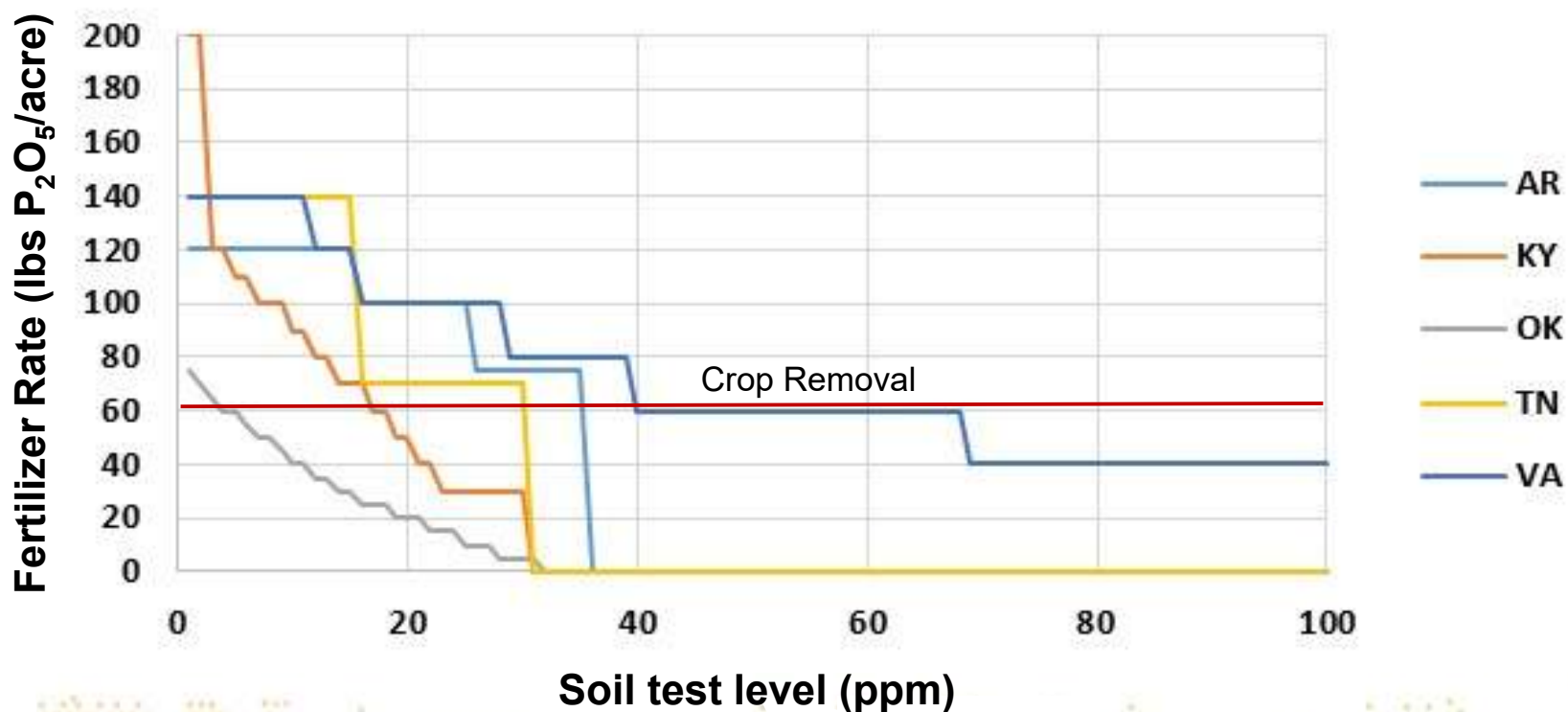
Build-up and maintenance-based fertilizer recommendations for P_2O_5 and K_2O



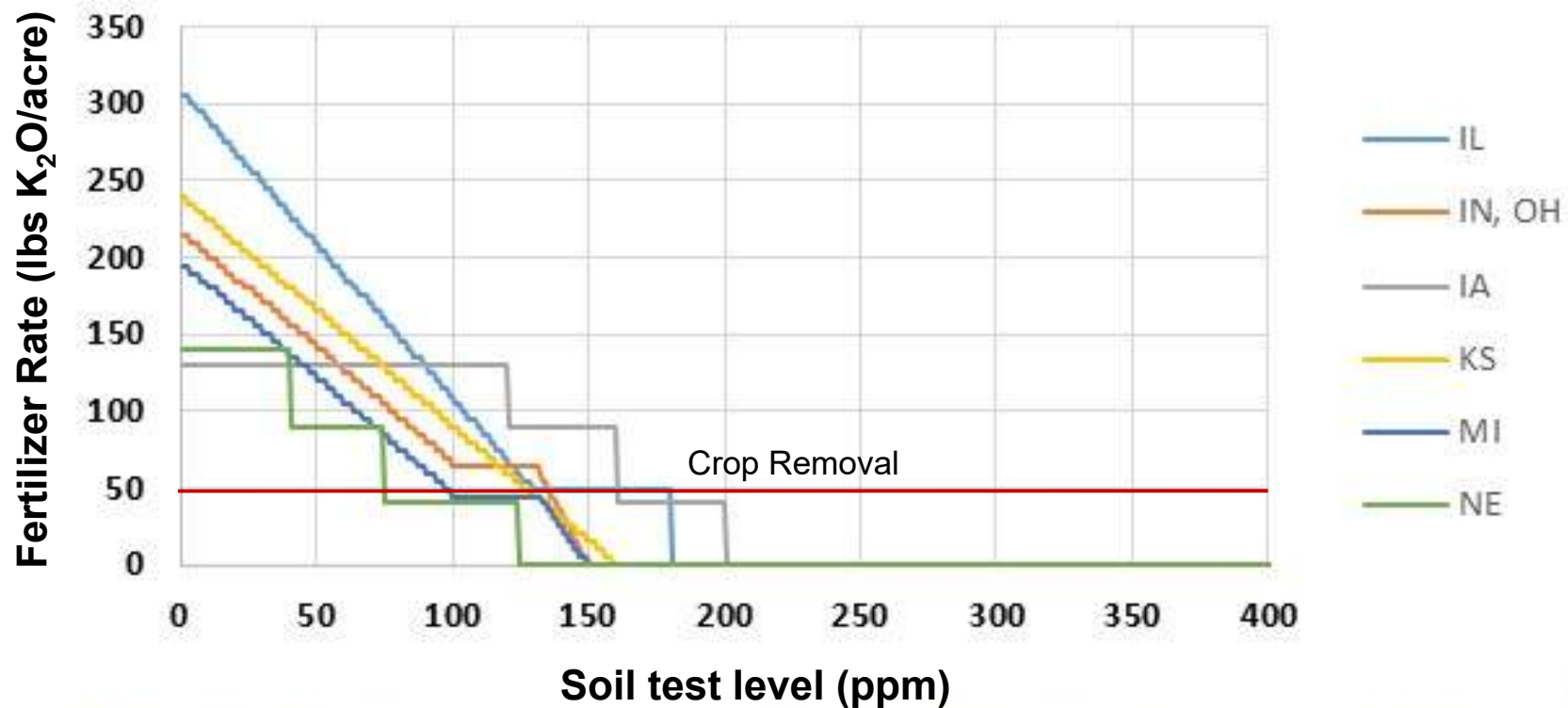
Nutrient sufficiency-based fertilizer recommendations for P_2O_5 and K_2O



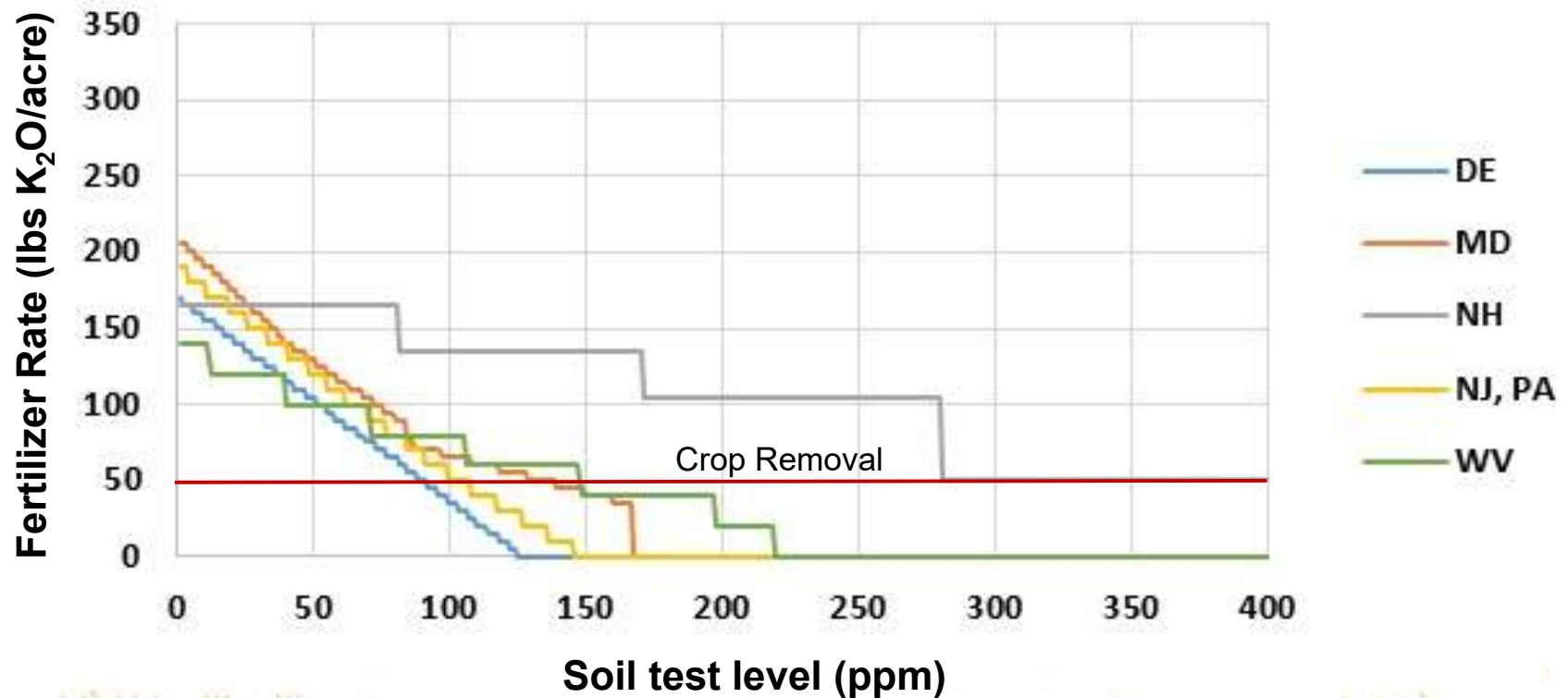
Mehlich 3 soil test phosphorus levels vs P_2O_5 recommendations for southern states, 175 bu/acre corn



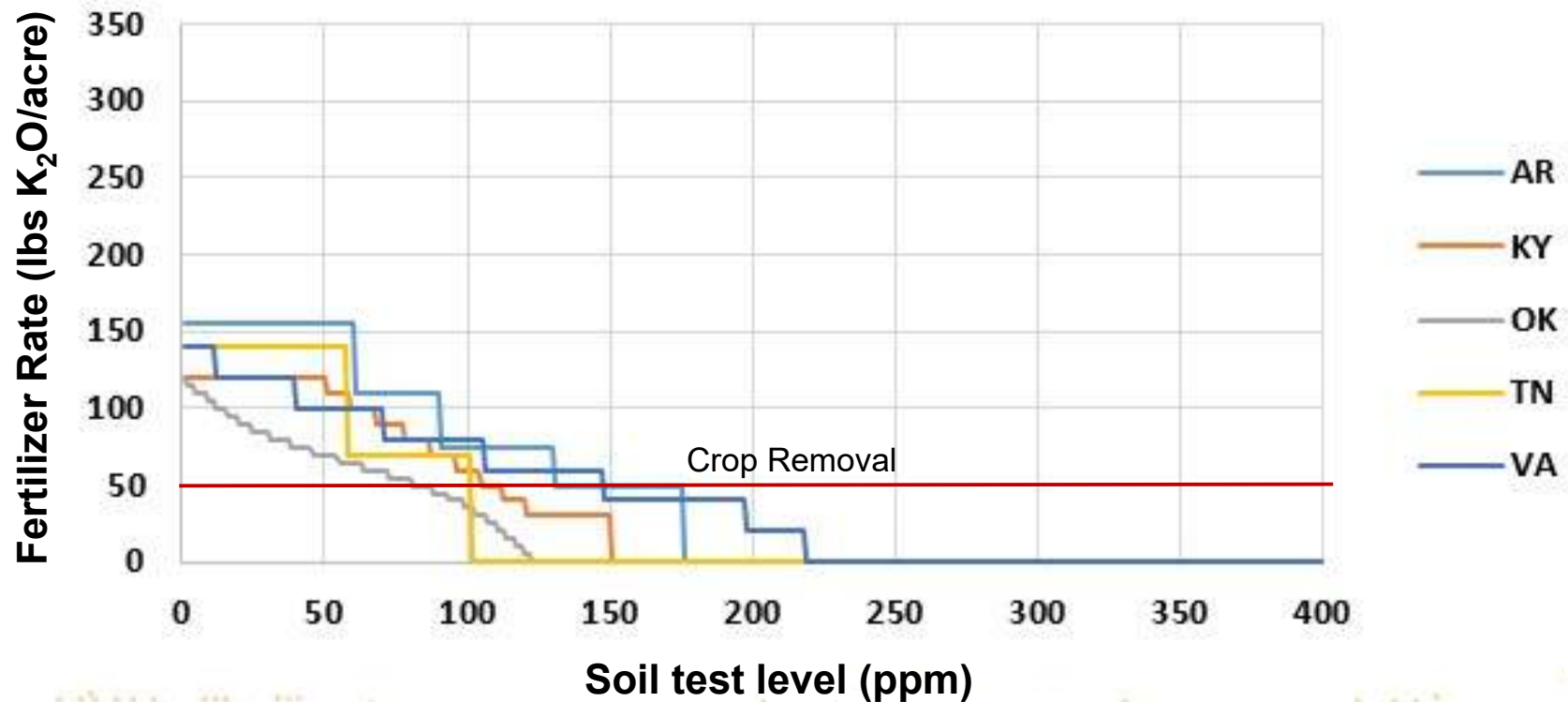
Mehlich 3 soil test potassium levels vs K_2O recommendations for northcentral states, 175 bu/acre corn



Mehlich 3 soil test potassium levels vs K_2O recommendations for northeastern states, 175 bu/acre corn

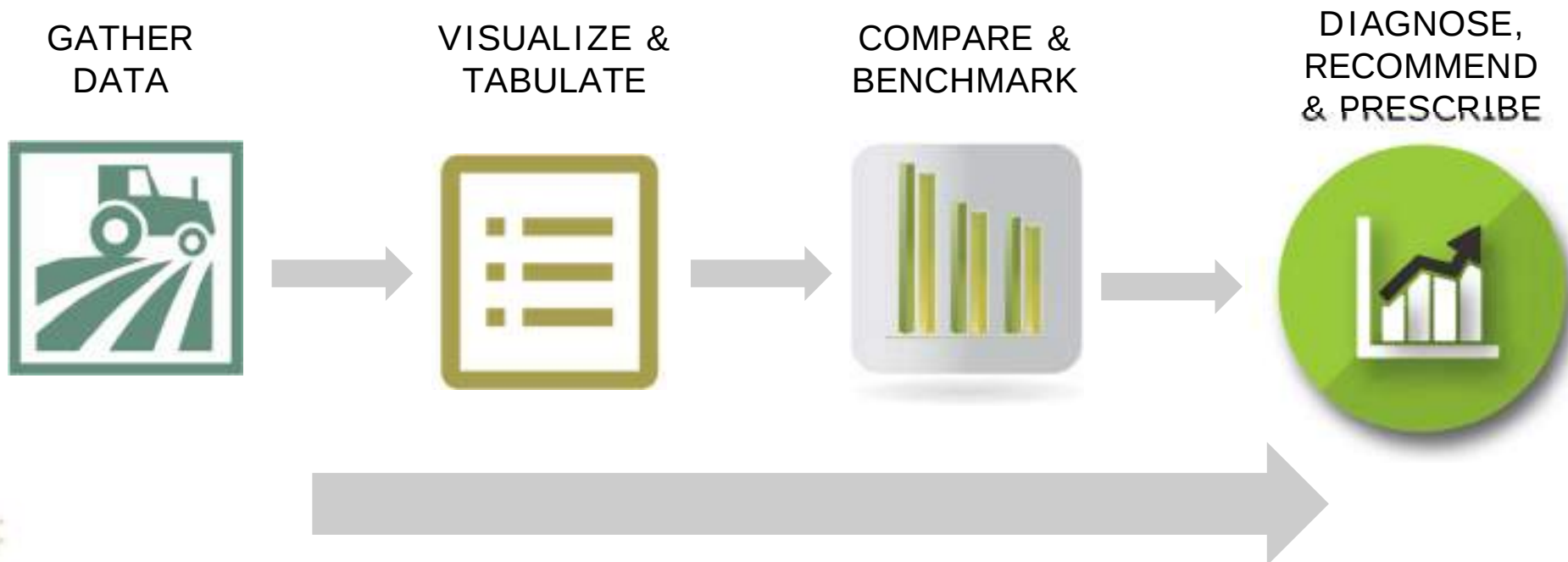


Mehlich 3 soil test potassium levels vs K_2O recommendations for southern states, 175 bu/acre corn



Climate strategy

Collecting and leveraging data to create value for farmers



Increasing Value

FieldView enables wireless connectivity to farm data

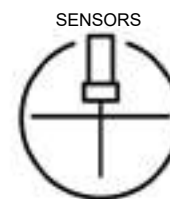


- Plan, track and manage entire fleet of equipment from HQ
- Capture all as applied data - no action needed from operator
- Data flows seamlessly into Retail and Farmer account for future analysis & action

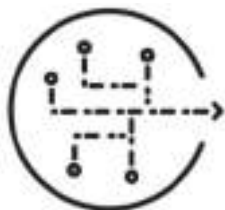


Inventing the future

R&D investment drives value for farmers



CONNECTIVITY



EQUIPMENT COMPATIBILITY



DATA VISUALIZATION



Field measurements and modeling enable precise nitrogen management at the zone level



Agriculture will benefit from advanced fertility solutions for phosphorus and potassium

Current status of P and K soil tests in North America

Percent of Samples Testing Below Critical Levels for P in 2015



Percent of Samples Testing Below Critical Levels for K in 2015



Source: International Plant Nutrition Institute

Combining research & customer data is key to making recommendations that will drive increased grower value

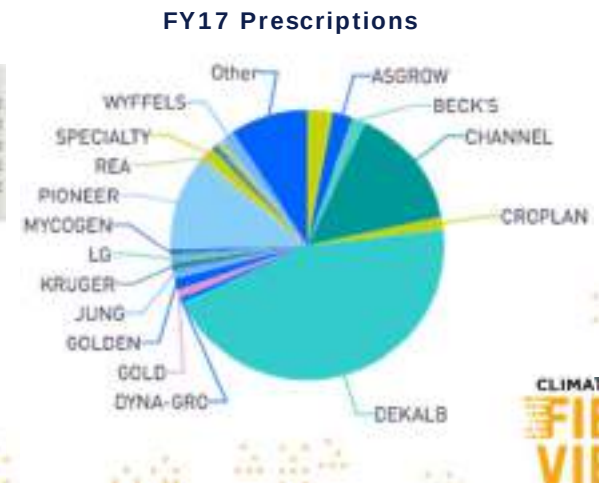
**Monsanto Breeding
& TD&A Data**

**Climate
Research Data**

FieldView™ Data

Rich data – controlled & detailed

Big data – scaled, inferential



Seeds and placement:

Helping growers decide what to plant and how to manage

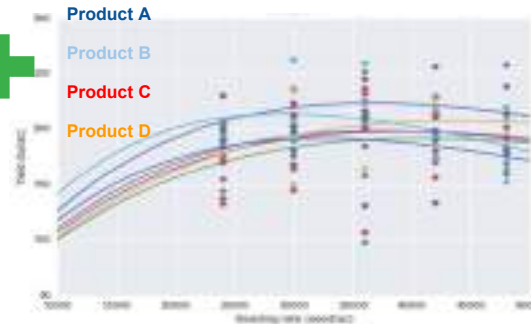
**Management
Zones**



**Seed
Placement**



**Planting
Density**



**Yield
Optimization**



Plant disease outlooks are built on many datasets, some uniquely available at Climate

Agronomic Survey Data



Customized hourly weather



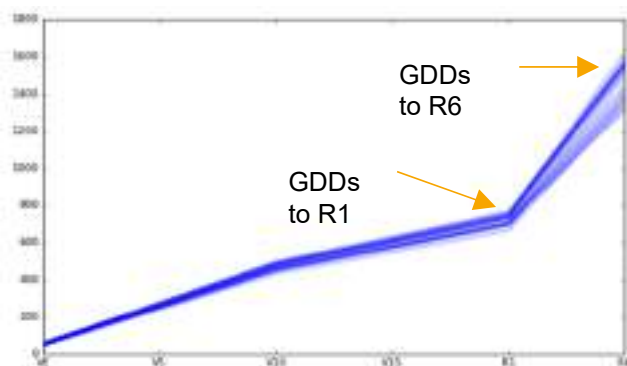
Mon & Climate
Disease Incidence Reports



Seed Catalogs

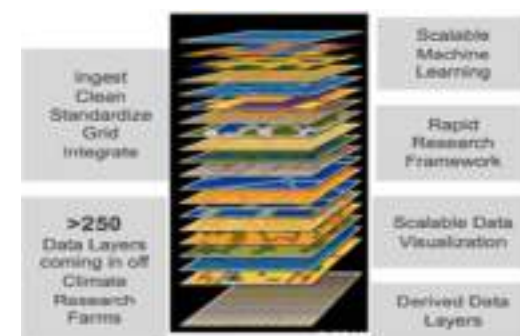


Customized Growth Stage Model



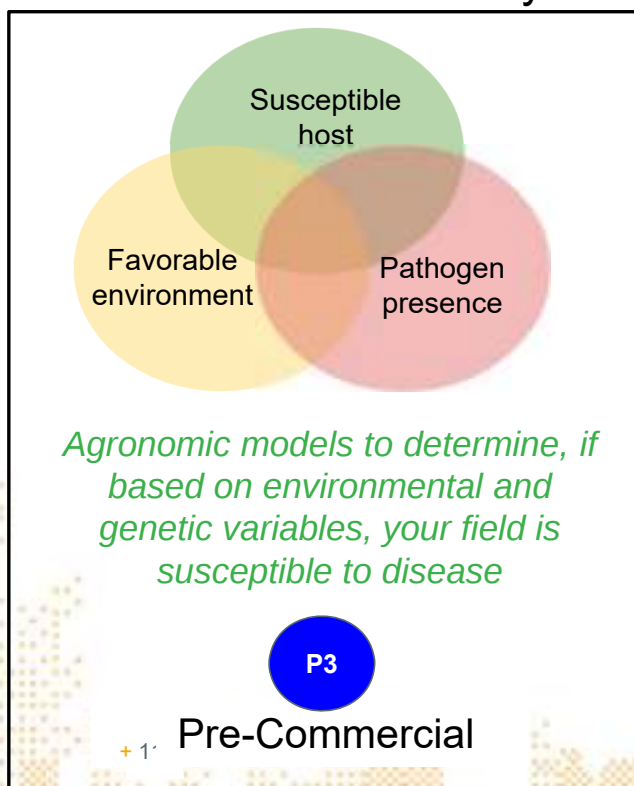
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Climate Field and User Data

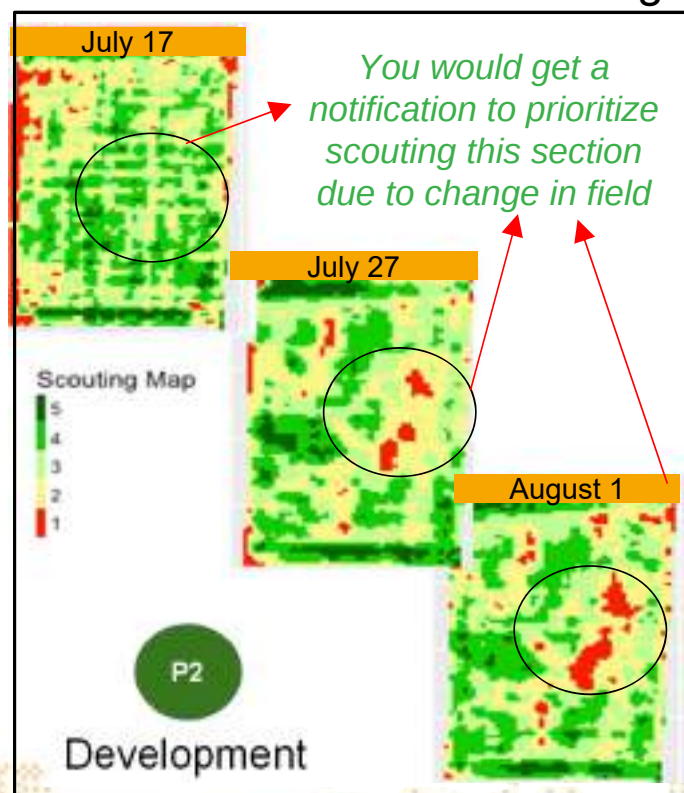


Disease insights will help farmers address issues during the growing season before they impact yield

Disease Vulnerability



Enhanced Directed Scouting



Disease Diagnosis

