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Digital Agriculture within U.S. Crop Production

Dr. John Fulton

The Ohio State University

U.S. Precision Ag Trends

Variable-rate Technology (VRT)

- Variable-rate fertilizer and lime (high adoption; >50%)
- Variable-rate seeding of corn (>25% adoption)
- Variable-rate seeding of soybeans (quickly growing in adoption)

Digital Tools

- New summary analytics for agronomic and business evaluation (farmer have interests; >10%)

THE CLIMATE CORPORATION · JOHN DEERE · syngenta · BAYER · DUPONT PIONEER · indigo · EFC SYSTEMS · FarmersEdge · FARMERS BUSINESS NETWORK · WINFIELD SOLUTIONS

Digital Agriculture (IoT in Ag)

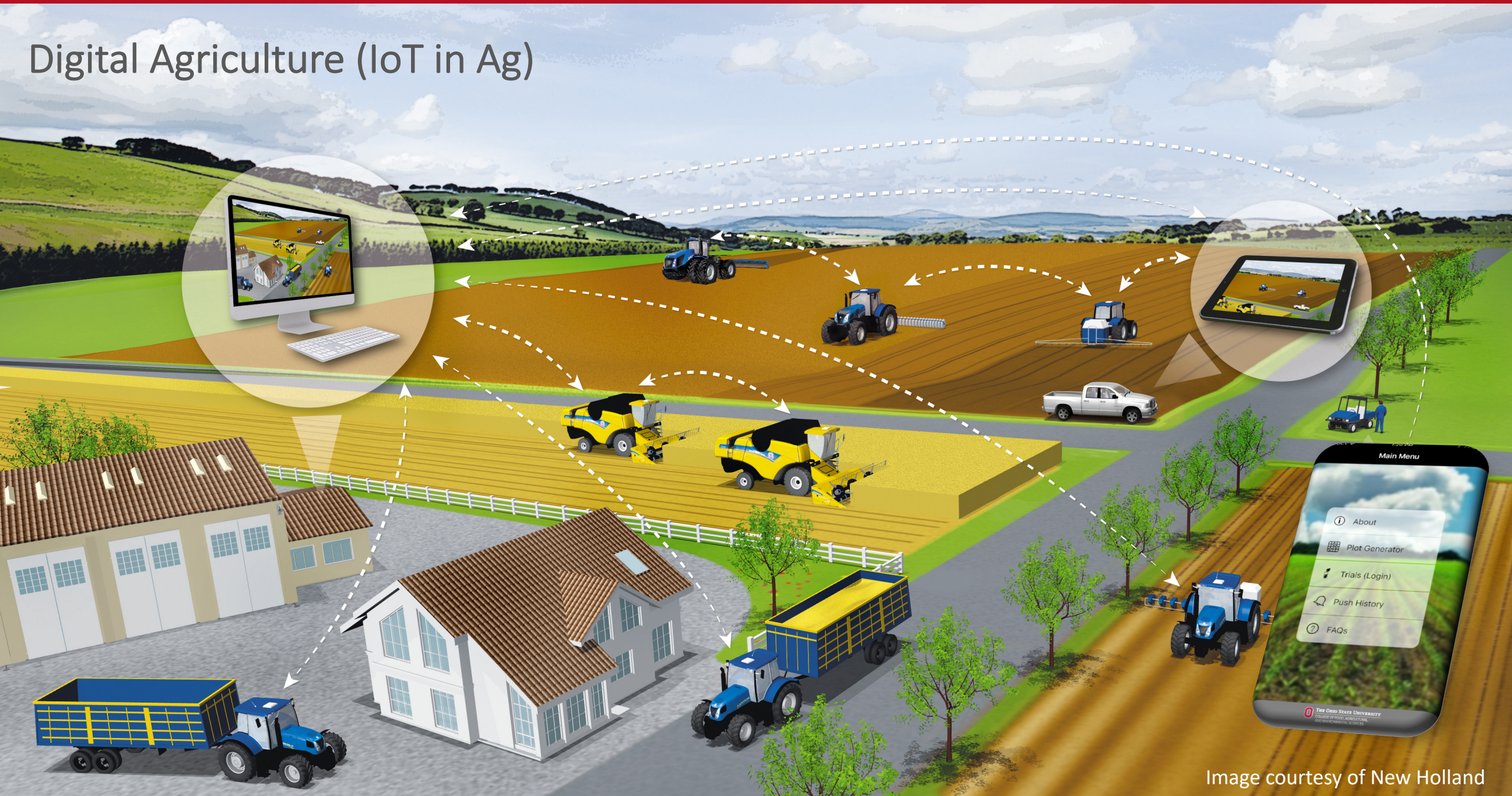
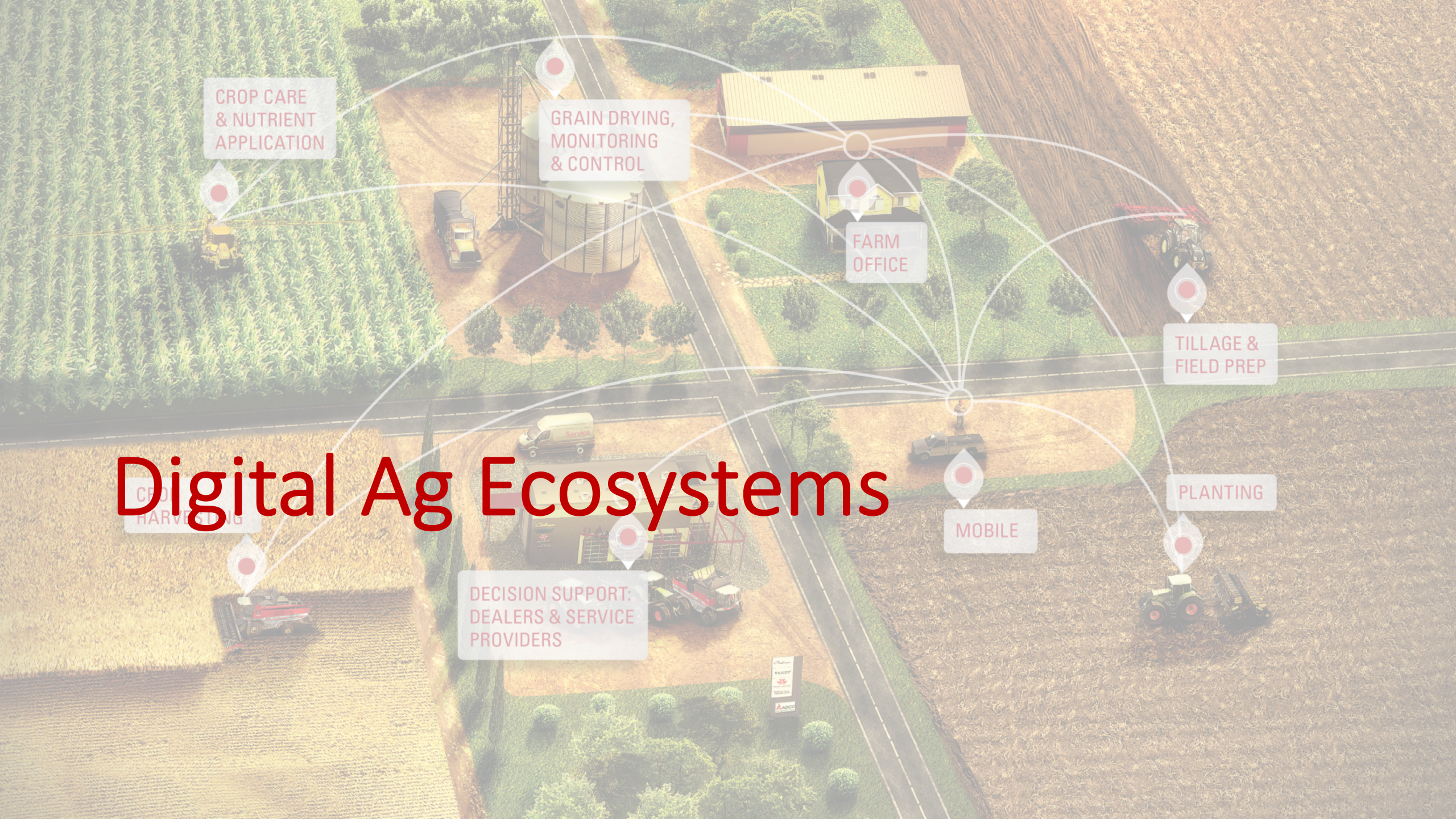


Image courtesy of New Holland



Digital Ag Ecosystems

Emerging Digital Ag Ecosystems

Source: Lisa Prassack

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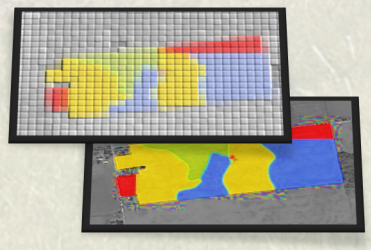
#AgTech and #FarmData

Digital Agriculture - Planting

By-row Prescription (Rx)

- **Hybrid / variety**
- **Population**

2 Rx's



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#AgTech that enables higher planting speeds…

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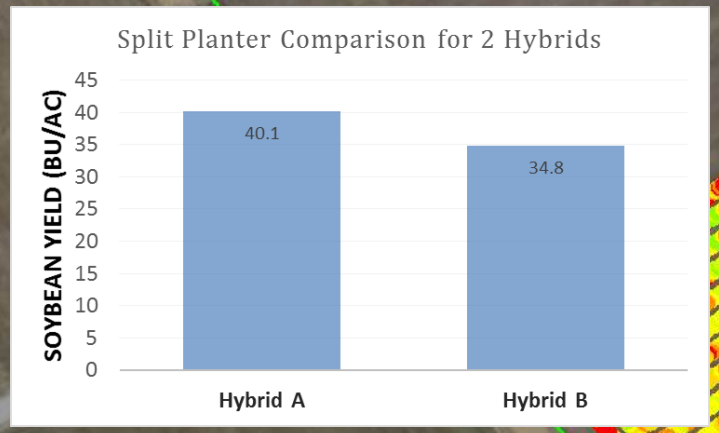
Agronomic Data

Yield Maps, As-applied, As-planted…

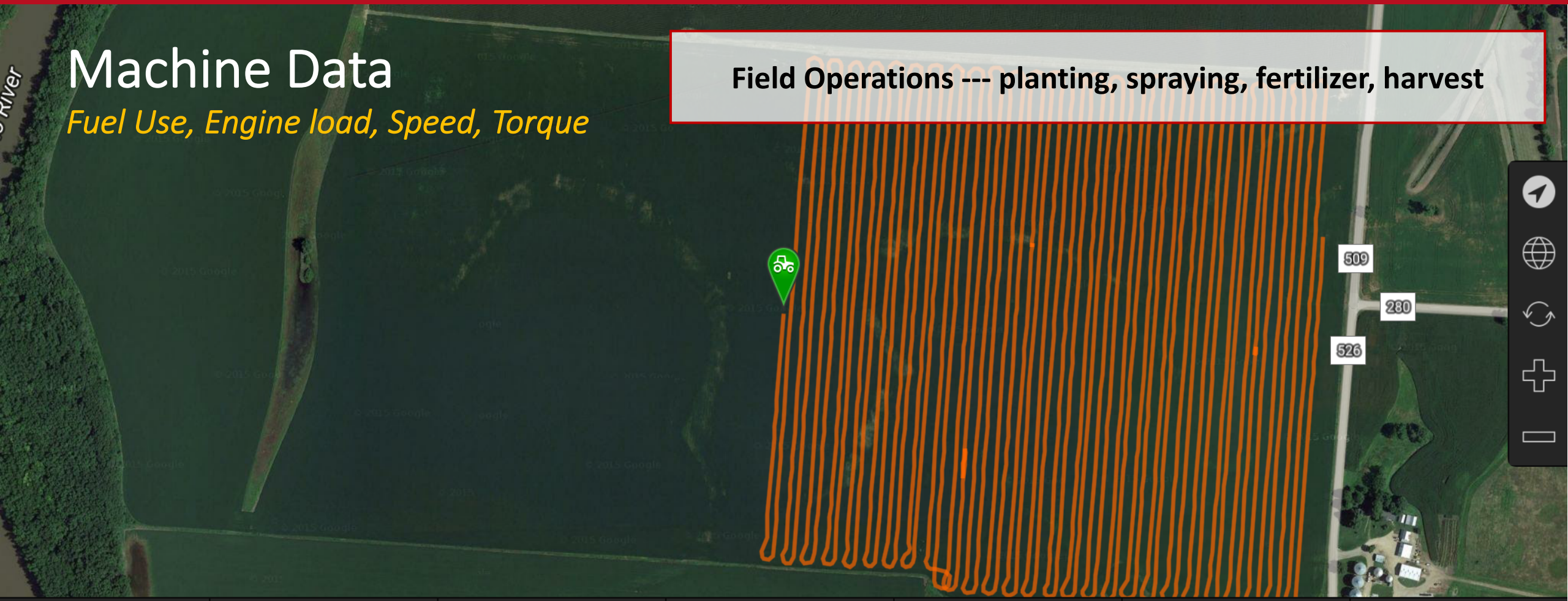


Producer Value:
Identify and quantify limiting productivity factors.

Machine Data

Fuel Use, Engine load, Speed, Torque

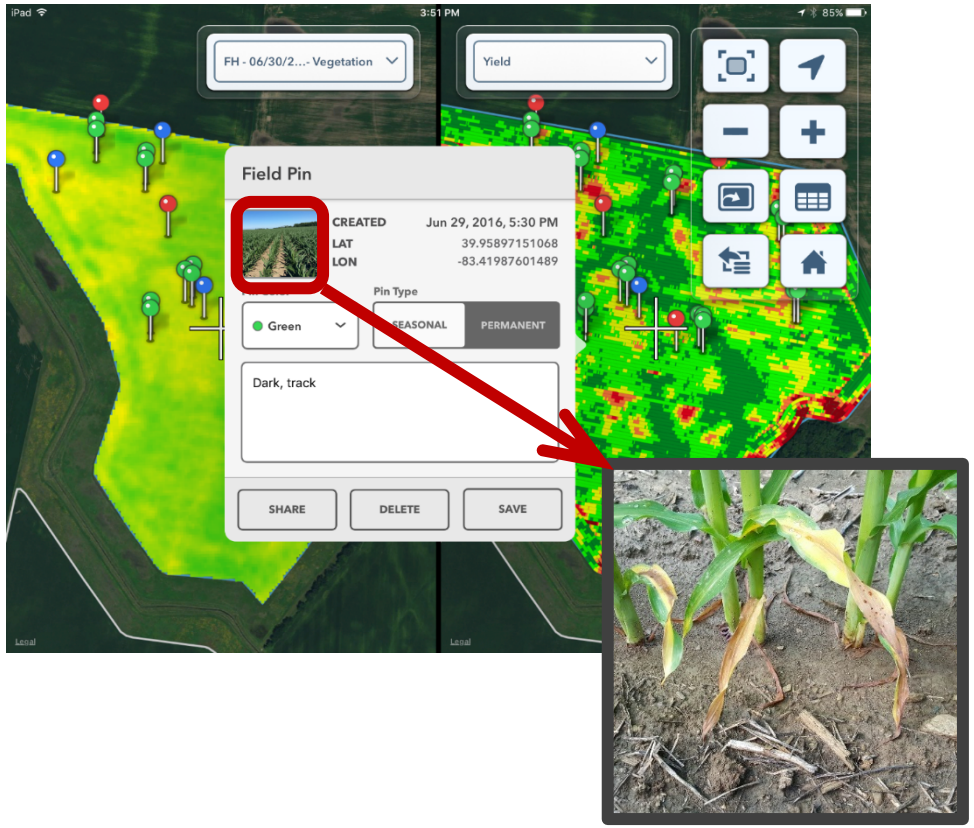
Field Operations --- planting, spraying, fertilizer, harvest

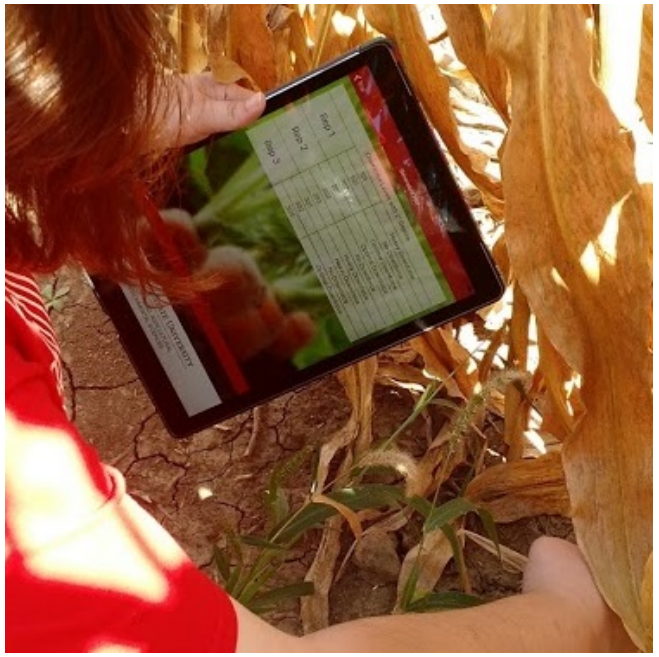


Engine load	Oil Pressure	Speed	Fuel Rate	Engine Torque	Engine Speed	Engine Temp
84	76.6	10.4	18.02	81	1729	198
%	psi	mph	gal/hr	%	rpm	°F


1000
Calories
15
BPM
72
BPM
1762
Steps
6.5
Hours
135
fitbit

COLLECT IN-SEASON DATA





Most popular drone on the market?

Image courtesy of DJI: www.dji.com

UAVs with Larger Payloads - DJI s1000

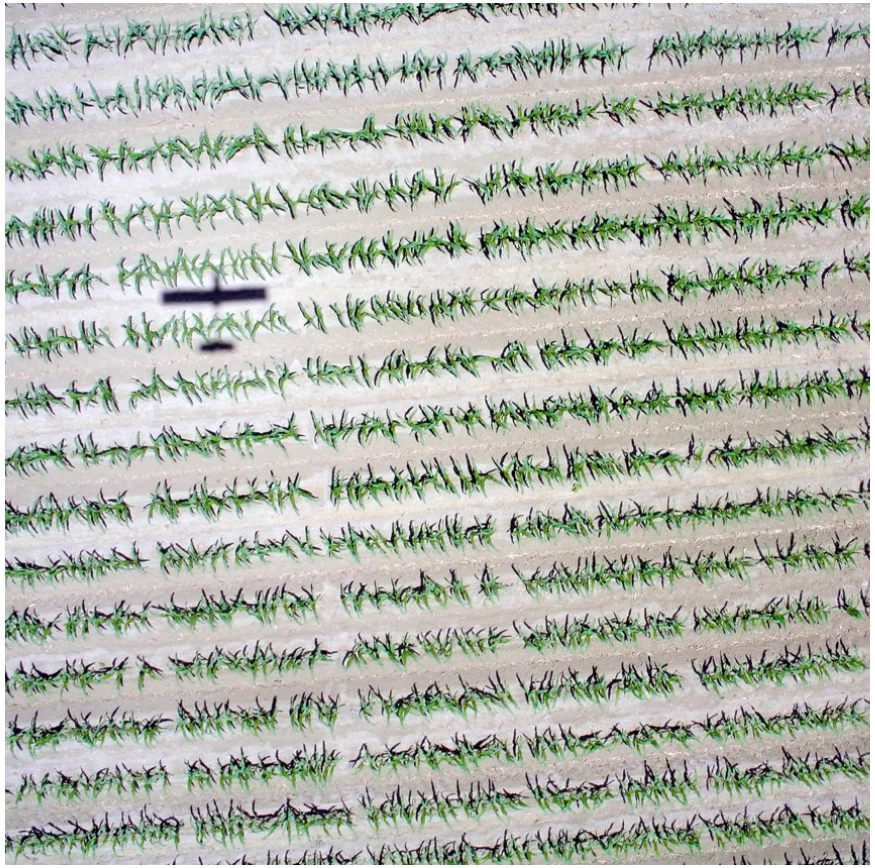
15-lb. payload

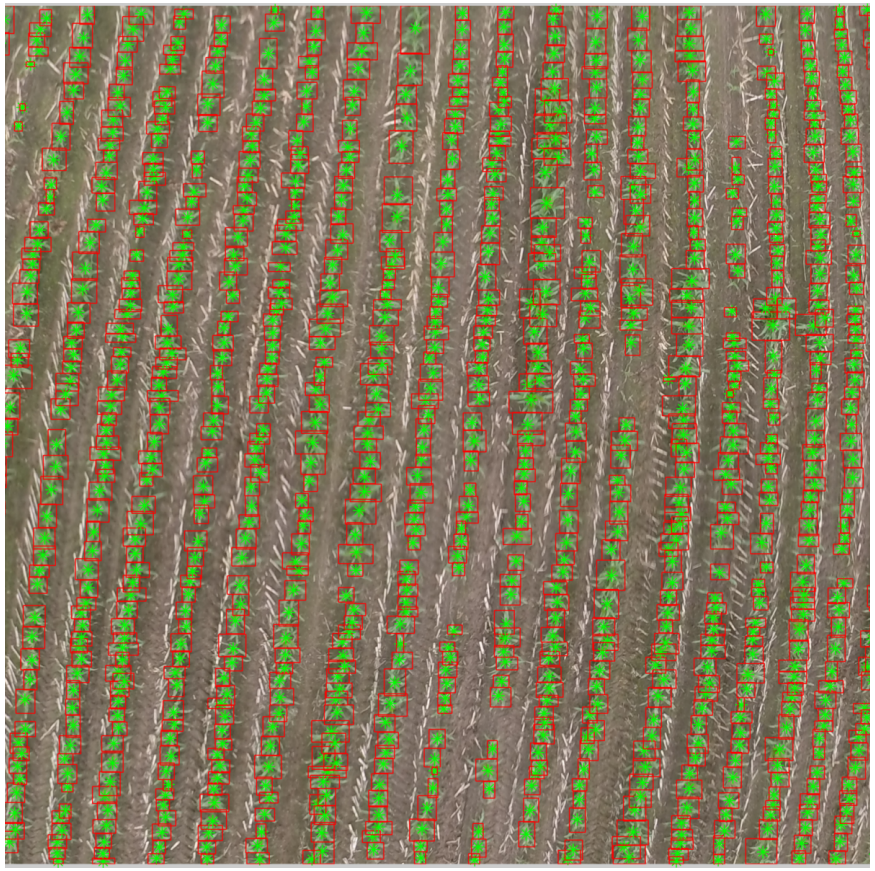


www.dji.com/spreading-wings-s1000/spec

New Quantifiable Insights

Stand Counts (counting corn plants)





Trending in US

https://youtu.be/P2YPG8PO9JU

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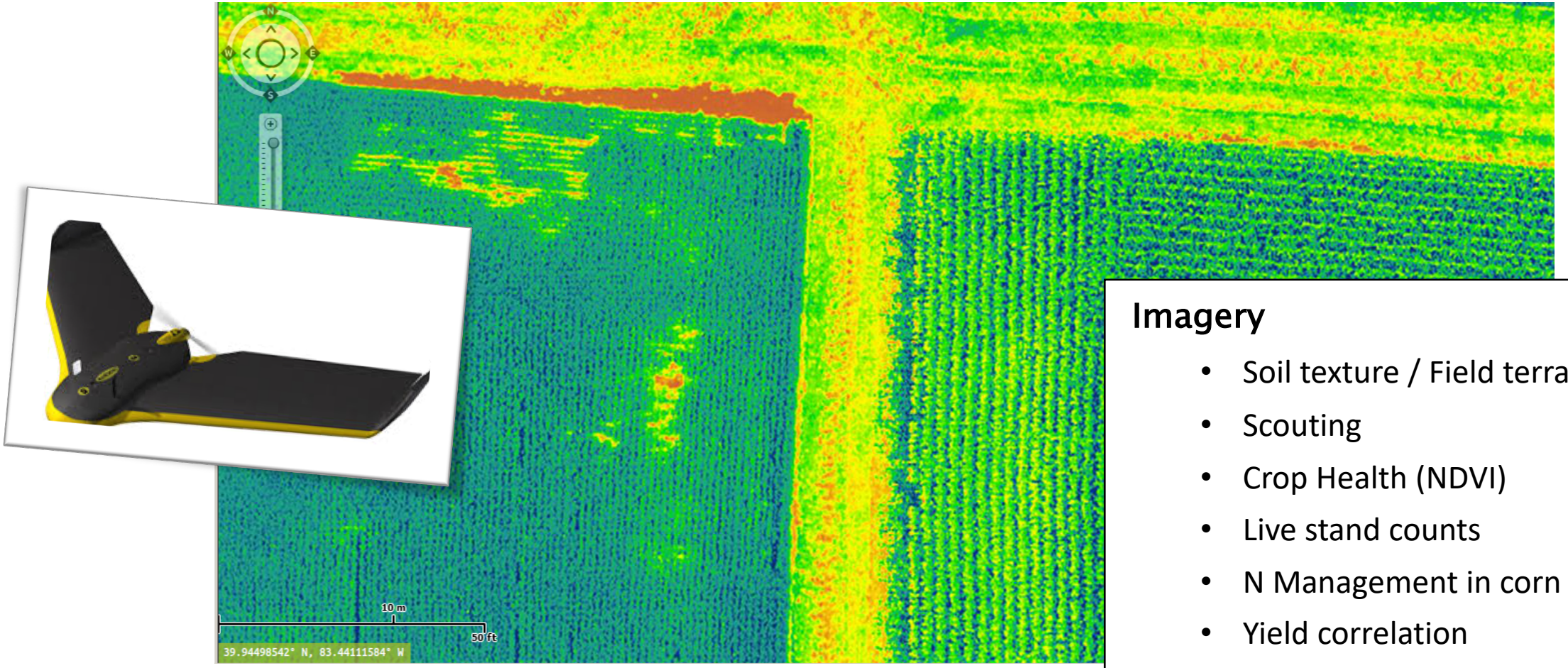
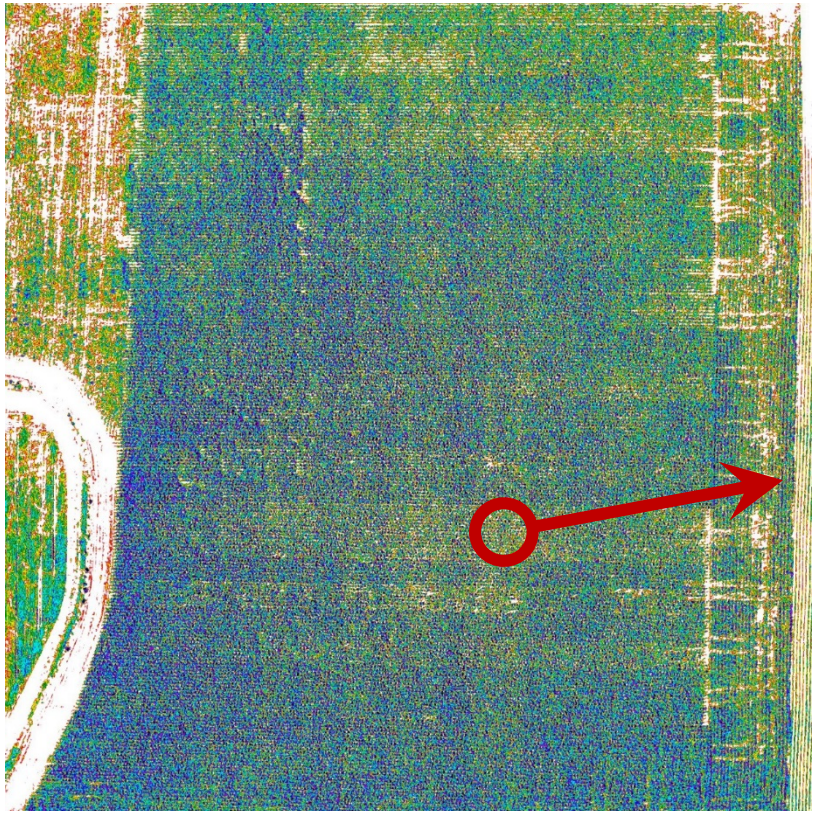
UAS Delivered Imagery

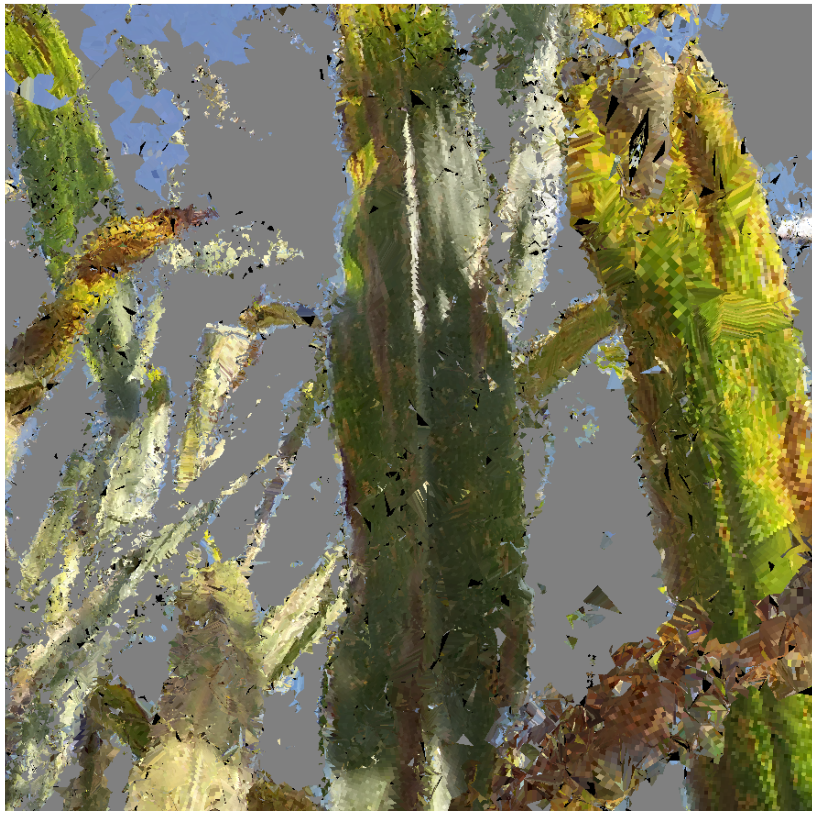


Ohio State University, Woolpert and the Air Force Research Laboratory.

Imagery

- Soil texture / Field terrain
- Scouting
- Crop Health (NDVI)
- Live stand counts
- N Management in corn
- Yield correlation
- Equipment / management issues
- More…





Year 2025 Fertility Decisions: Science – Data – Technology – Agronomy - Economics

Automated weeding solutions

- Several EU companies manufacturing; $90k to $100k
- 2 to 4 mph working speed
- IoT device

- Sensors to map field characteristics and weeds.
  - EXAMPLE, if a less than 7% weed threshold is targeted, weeder will map areas >7% threshold.

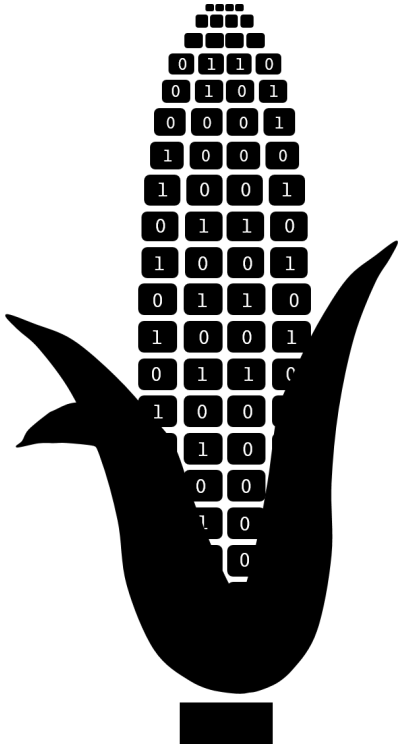
Blue River Technology

- Vision technology coupled with AI
- Purchased by John Deere in 2017

http://www.bluerivertechnology.com

How much data can be collected?

“Terra” Project – Possible data for farmers



18.4 GB per plant

24 MB per kernel

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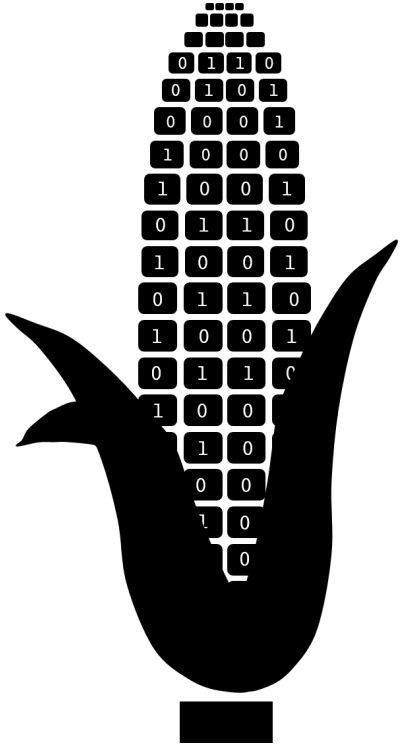
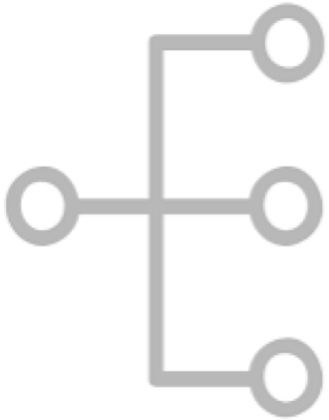
“Terra” Trivia





39 different file types

2475 different files

60.2 Petabytes for the field

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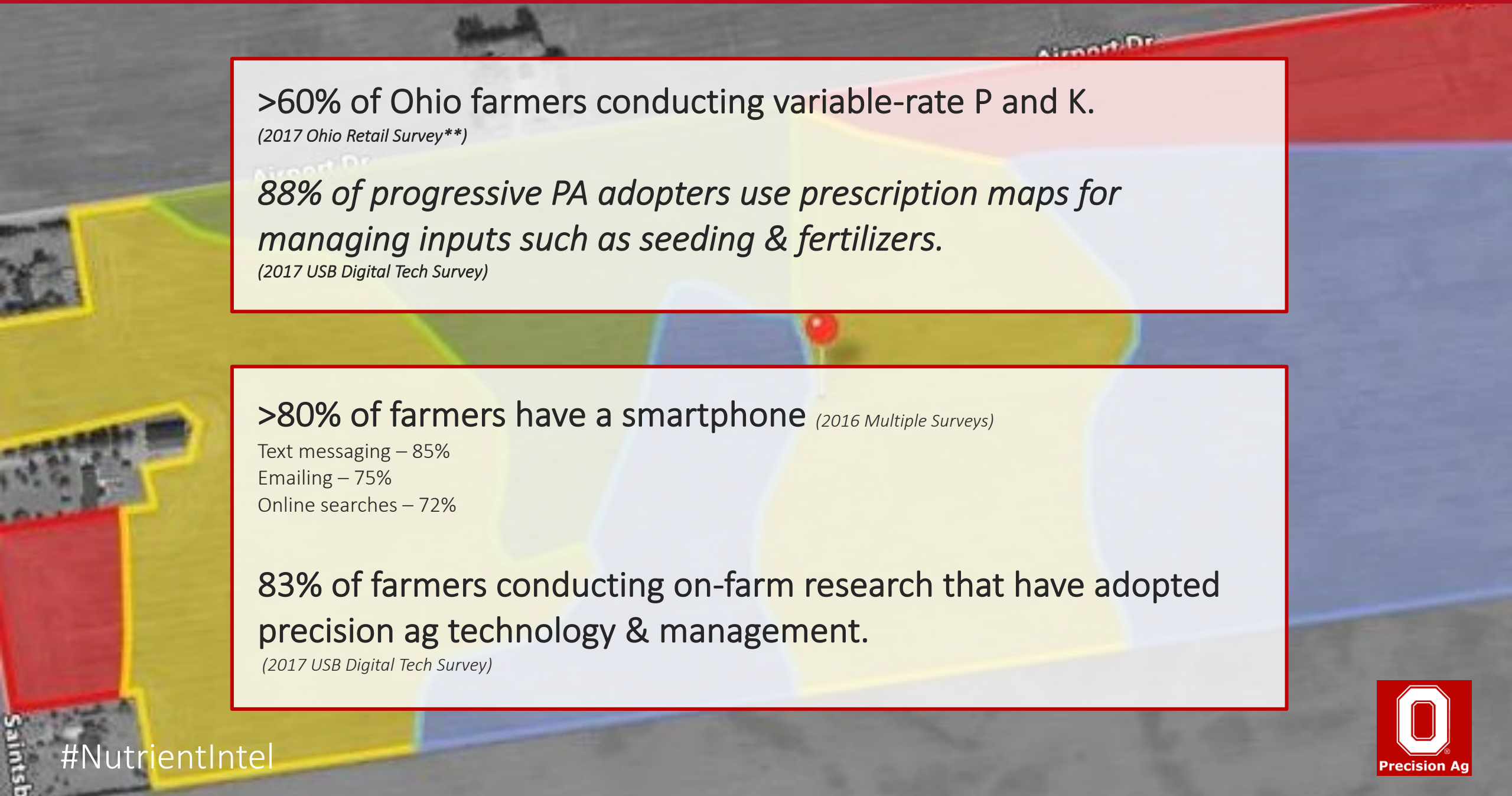

>60% of Ohio farmers conducting variable-rate P and K.

*(2017 Ohio Retail Survey**)*

88% of progressive PA adopters use prescription maps for managing inputs such as seeding & fertilizers.

(2017 USB Digital Tech Survey)

>80% of farmers have a smartphone *(2016 Multiple Surveys)*

Text messaging – 85%
Emailing – 75%
Online searches – 72%

83% of farmers conducting on-farm research that have adopted precision ag technology & management.

(2017 USB Digital Tech Survey)

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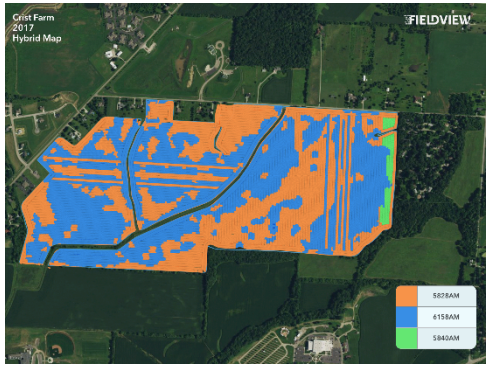
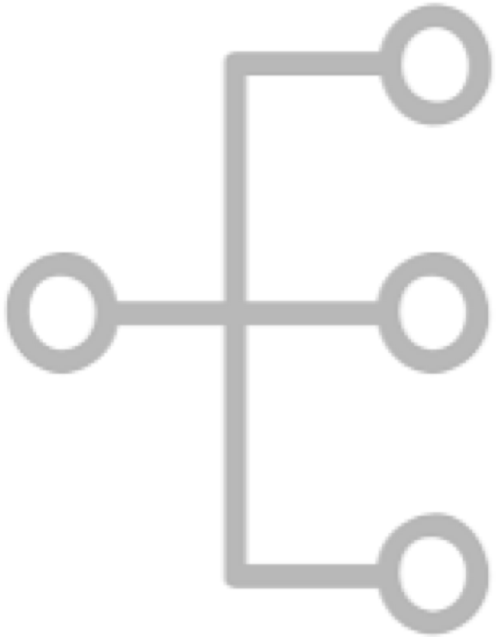
Precision Ag

SUMMARY





Tremendous volume of data being generated and freely flowing today.

Data accessibility and organization limits value and RIO for farmers.

Farmers using digital technologies find value in them today.

#DataIntel

#NutrientIntel

Digital Agriculture

Providing solutions to meet world demand

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