Digital Agriculture within U.S. Crop Production

Dr. John Fulton
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%)
Digital Agriculture (IoT in Ag)

Image courtesy of New Holland
Digital Ag Ecosystems
Emerging Digital Ag Ecosystems

Source: Lisa Prassack
#AgTech and #FarmData
Digital Agriculture - Planting

By-row Prescription (Rx)

- Hybrid / variety
- Population

2 Rx’s

[Diagram of by-row prescription areas]
#AgTech that enables higher planting speeds...
**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

---

### Machine Data

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

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
“Terra” Trivia

39 different file types

2475 different files

60.2 Petabytes for the field
>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)
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.
Digital Agriculture
Providing solutions to meet world demand

John Fulton
Fulton.20@osu.edu
334–740–1329
@fultojp

Ohio State Precision Ag Program
www.OhioStatePrecisionAg.com
Twitter: @OhioStatePA
Facebook: Ohio State Precision Ag