UAS / Imagery Use in Agriculture Production

John Fulton

Digital Agriculture - Planting

By-row Prescription (Rx)
- Hybrid / variety
- Population

2 Rx's
Machine Data
*CAN messages, Health, etc.*

**Producer Value**
Effective tool to evaluate operating costs and capacity when coupled with telemetry technology.

**Fuel Usage, Engine Speed, Engine Load, Etc.**

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**Machine Data Parameters**
- Fuel Rate: 6.88 gal/hr
- Speed: 4.1 mph
- Engine Torque: 55%
- Engine Speed: 1762 rpm
- Engine Temp: 180 °F
- PTO Speed: 0 rpm
- Battery: 13.4 volts

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**Agronomic Data**
*Yield Maps, As-applied, As-planted...*

**Producer Value:**
Identify and quantify limiting productivity factors.
sUAS
Emerging UAV Applications

- Agriculture
- Archeology
- Delivery Services
- Emergency Management
- Inspections
- Law Enforcement
- Mapping
- Meteorology
- Photography
- Search & Rescue
- Wildlife Monitoring

COMMERCIALY AVAILABLE UAVS
Most popular drone on the market?

Image courtesy of DJI: [www.dji.com](http://www.dji.com)

Flight Planning

**Area coverage plan (fixed-wing)**

**Point-to-point plan (rotor)**
UAVs with Larger Payloads - DJI s1000

15-lb. payload

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

Example Applications:
Agriculture
DEM Generation

New Quantifiable Insights

Stand Counts (counting corn plants)
Trending in US

[Image of drone spraying]

https://youtu.be/P2YPG8PO9JU

Drone Spraying (Asia)

Testing in California vineyards the past 3 years. Continued developed for both fixed-wing and rotors.
Water Sampling with Multi-rotors

Remote Sensed Imagery

- Types of Imagery
  - RGB (Visible)
  - IR (Infrared)
  - NDVI
  - Thermal

- Collecting multiple images per year needed for in-season decisions and creating recommendations...

- Accessibility of data...
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...

About perspective...

Producer Value
Identify and quantify equipment / management issues
About perspective...

Producer Value:
Identify and quantify management issues
(wheat lodging)
• Lodged wheat computed estimate of 6% for field.
• Collected with basic, low-cost UAV.

Producer Value:
Identify and quantify equipment / management issues
Visible Image – Bare Soil

Geo-referenced Data Layer

- Identify man-made Vs. natural variability
- Fine-tune in-season nutrient and disease decisions.
- Direct harvest to collect valid on-farm research results to properly evaluate treatment effects.
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RGB  NDVI / ADVI  Thermal

Plugged Sprinkler
Identified Nutrient Application Issue

NDVI / RGB map collected late-July

NDVI Image; Biomass Footprint – July 12th
Field Execution

RX

High Clearance

Placement

Target Rate (Liquid) (gai/US/acre)
- 17.00 (29.64 acres)
- 14.00 (40.46 acres)
- 10.00 (29.64 acres)
- 0.00 (59.27 acres)

Digital Agriculture
Providing solutions to meet world demand

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