Advancement of Prescriptive Ag and Big Data

John Fulton

Ohio No-till Conference, Plain City, OH
“You can't manage what you don't measure!“

(W. Edwards Deming)

Data / information to enhance input decisions during tight times.
By-row Prescription (Rx)

- Hybrid
- Population
- Starter fertilizer
- Down force
- Row-cleaner
Split Planter Comparison for 2 Hybrids

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Yield (BU/AC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid A</td>
<td>40.1</td>
</tr>
<tr>
<td>Hybrid B</td>
<td>34.8</td>
</tr>
</tbody>
</table>
Machine Data

CAN messages, Health, etc.

Effective tool to evaluate operating costs and capacity --- FUEL USAGE, UPTIME vs. DOWNTIME, ENGINE LOAD.
Bridging Agronomic and Machine Data

**Split Planter Comparison for 2 Hybrids**

- **Hybrid A**: SOYBEAN YIELD (BU/AC) = 40.1
- **Hybrid B**: SOYBEAN YIELD (BU/AC) = 34.8

**Fuel Usage by Hybrid**

- **Hybrid A**: FUEL USAGE (GPH) = 17.4
- **Hybrid B**: FUEL USAGE (GPH) = 14.1

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Moisture Content (%)</th>
<th>Ground Speed (mph)</th>
<th>Fuel Usage (gallons per acre)</th>
<th>Mean % Engine Load</th>
<th>Mean Field Capacity (ac/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid A</td>
<td>14.8</td>
<td>2.8</td>
<td>1.71</td>
<td>86</td>
<td>10.2</td>
</tr>
<tr>
<td>Hybrid B</td>
<td>14.3</td>
<td>5.2</td>
<td>0.86</td>
<td>44</td>
<td>18.9</td>
</tr>
</tbody>
</table>

**Big Data** - Accelerate learning and thereby earlier selection of a favorable economic response.
Machine paths still present
Corn biomass variability
Post-harvest crop residue

Soybean

Corn Stover

Corn Stover distribution via combine
Digital Agriculture

Based on information from an Iowa AgState / Hale Group report.

Adoption

Precision Ag: +70% US acres
Prescriptive Ag: +15% of farms
+95% of farmers will outsource data management.
Precision Agriculture

Prescriptive Ag – Big Data

Planting Data

Production Data / Info

Harvest Data

Ag Service Providers

Input Companies

3rd Party Providers

Level of Understanding Today?
1. Ability to move data between data warehouses?
2. Total access of data by owner or trusted advisers?
Future Data Exchange for Growers

- **Preseason Fertility Management**
  - Prescription P and K application (Precision Crop Services)
- **Tillage Management**
  - Prescription tillage maps (AGCO; CNH)
- **Multi-Hybrids**
  - Prescription seeding of multi-hybrids (Beck’s; Pioneer)
- **SCN Management**
  - Prescription application/use of nematicides (FMC)
- **In-Season Fertility Management**
  - Prescription N application (DuPont Pioneer; Climate Corp)
- **Irrigation Management**
  - Prescription Irrigation (AgSmart)
- **Disease Management**
  - Prescription fungicide application (BASF)

Data will need to move through multiple organizations and each organization will need different data sources.
Data Access --- APPs

• **Collect, store and view** field map data in a single mobile tool
• **Share** field map data with your trusted advisors
• **Compare** your maps to other data layers
• Simply understand input response by field, soil zone, rate, etc…
Precision / Prescriptive Agriculture Status
(2015 Survey)

• **3 out of 4 growers** surveyed using precision technologies
  - Financial benefits outweigh the costs
  - Overlap reduction within fields #1 benefit (#2 seed savings)

• Value Proposition
  - **AVG cost savings of 6.8%**
  - **AVG yield increases of 7.6%**

• **+15% using prescriptive ag services**

• **Optimization through data analytics / information**
MISSION:

To organize agriculture’s information and make it universally accessible and useful.
• Internet-related services and products

• **Founded:** September 4, 1998, Menlo Park, CA

• **Mission:** to organize the world's information and make it universally accessible and useful.

• Revenue: $66 billion (2014)

• Net Revenue: $14.4 billion (2014)

• 2 High-use Data Services
  - Gmail
  - Google Search
• Internet-mobile app allowing consumers to submit and secure trip requests.
• Contracts with individual car owners to provide cab services
• **Founded:** March 2009, San Francisco, CA
• **Goal:** connecting riders to drivers
• Privately Held: Estimated 2015 worth $62.5B
How many agriculture companies look or want to look like an Internet-related services and products company?

1. Grow market share, OR
2. Look for other revenue streams
Keeping an eye on “Big Data”...
AFBF Privacy and Security Principles for Farm Data

www.fb.org/tmp/uploads/PrivacyAndSecurityPrinciplesForFarmData.pdf

- 13 Principles with descriptions
- Led by AFBF
- 35 signers --- Ag Technology Providers, Commodity Groups & AFBF

INTRODUCTION

“As technology continues to evolve, the undersigned organizations and companies believe the following data principles should be adopted by each Agriculture Technology Provider (ATP).”
13 Privacy and Security Principles (Signed by 35 Companies)

1) **Education**

2) **Ownership**

3) **Collection, Access and Control:** An ATP’s collection, access and use of farm data should be granted only with the affirmative and explicit consent of the farmer. 

4) **Notice:** Farmers must be notified that their data is being collected and about how the farm data will be disclosed and used. 

5) **Transparency and Consistency:** ATPs shall notify farmers about the purposes for which they collect and use farm data. 

6) **Choice:** ATPs should explain the effects and abilities of a farmer’s decision to opt in, opt out or disable the availability of services offered. 

7) **Portability:** Farmers should be able to retrieve their data for storage or use in other systems. 

8) **Terms and Definitions:** Farmers should know with whom they are contracting with if the ATP contract involves sharing with third parties, partners, business partners, ATP partners, or affiliates. 

9) **Disclosure, Use and Sale Limitation:** An ATP will not sell and/or disclose non-aggregated farm data to a third party without first securing a legally binding commitment with the farmer. Farmers must be notified. 

10) **Data Retention and Availability:** Each ATP should provide for the removal, secure destruction and return of original farm data from the farmer’s account upon request. 

11) **Contract Termination:** Farmers should be allowed to discontinue a service. 

12) **Unlawful or Anti-Competitive Activities:** ATPs should not use the data for unlawful or anti-competitive activities. 

13) **Liability & Security Safeguards**
9 to 11 questions

% of specific questions answered in accordance to the Principles receives a “logo”.

Public record for how questions answered

Coming in 2016
“Precision agriculture is much more than adopting technology, it’s about whole farm management with the goal of optimizing returns to inputs and preserving resources.”
Extension/Outreach: Big Data

Big Data is data whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it.

So what exactly does that mean? This data includes large collections of farm data that is being used by farmers, companies, and government agencies to aid in decision making related to crop production and management practices as well as better predictions around nutrient and water availability. It is important to understand what value all of this farm data provides to the producer. By using farm data to drive input management and other farm decisions, producers can identify and quantify limiting productivity variables.

The Big Data Flow

- A farmer will upload farm and personal data from ground and equipment sensors, drones, etc.
- Agricultural Technology Provider (ATP) will aggregate farmer’s data, combines other relevant data sets, and applies algorithms to analyze.
OSU Crop / Nutrient Trial APP (coming early 2016)

On-farm Research
- Setup
- Notes
- Results
• Prescriptive Services & Connectivity evolving rapidly within agriculture.
• Clearly understand what you will receive from data services
  - Define your need for the service
  - Collect e-copies of Rx and As-Applied data
• Understand terms and conditions, and how data is moved and accessed.
• You are responsible for original data; make a copy.
Ag Data Services and Products NOT going away.
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