Big Data in Crop Production

Dr. John Fulton
1. Large volume data freely flowing to several places.
2. Determine your interaction with this data and at times, represent the traffic cop for your clients.
3. Establish what data the farmer needs.
### Trivia on Technology Adoption

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<tr>
<td><strong>Average Smartphone</strong></td>
<td><strong>120M Monthly</strong></td>
<td><strong>Each Minute</strong></td>
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<td>checked</td>
<td><strong>80% of US Homes</strong></td>
<td><strong>347,222 Tweets</strong></td>
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<td><strong>160 times /day</strong></td>
<td><strong>Zillow</strong></td>
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<td><strong>Each minute</strong></td>
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<td><strong>300 Hrs of New Video</strong></td>
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<td></td>
<td><strong>51k APPs</strong></td>
<td><strong>1/3rd of all downstream</strong></td>
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<td><strong>Uploaded</strong></td>
<td><strong>Internet Traffic</strong></td>
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<tr>
<td></td>
<td><strong>Downloaded</strong></td>
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Internet-related services and products

**Founded 1998**: Menlo Park, CA

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

- Revenue: $74 billion (2017)
- Profit: $5.3 billion (2017)
- $498 Billion Market Capitalization
- Google processes over 3.5 Billion searches PER DAY
- Estimates of 530 Million Gmail users worldwide
- 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 2017 worth >$1B
New Age “Data” Business Models

• Refer to “Users” not “Customers”
• Income generating operations are unclear or kept offline
• Basic model relies on data being fed in to the “system” at zero cost
• There is no revenue sharing intended back to the providers of data
  - Free Email Clients
  - Free Web Browsers
  - Free Search Engines
  - Free Social Media Site
Smart Fridges!

• Track consumption
• Deliver consumer offers
• Manage purchasing and replenishment

Manufacturers extract subsidies from companies in order to tap into data and the revenue stream of each consumer, then provide them with a free refrigerator.
THE ZERO DOLLAR CAR
How the Revolution in Big Data will Change Your Life

JOHN ELLIS
Connecting Farmer Data and Transactions within the Ag “Ecosystem”
The Future of Ag Data

The **fully connected farm** – Multiple brands of equipment, software, and services seamlessly generating, sharing, analyzing, and using data.

Farmers are able to easily manage data, receive recommendations from multiple advisors; fully utilizing technology built into equipment to manage plants, not fields.

The ag **industry** shifts from fighting with data management issues to creating value added products, analysis, and services based on the use of data to drive farm profitability.
Digital Agriculture (IoT in Ag)

Image courtesy of New Holland
OSU Digital Toolbox

APPs / Data Collection
- Climate FieldView Cab
- Farmobile
- Raven SlingShot
- MyJohnDeere
- AirScout
- GeoVantage

Software
- SMS Advanced
- Beck’s FarmServer
- Pix4D
- ArcGIS
- BOX
- ADC Account

#NutrientIntel
“Terra” Project – Most Data for a Corn Plant

18.4 GB per plant

24 MB per kernel
“Terra” Trivia

- 39 different file types
- 2475 different files
- 60.2 Petabytes for the field
Over 60% of Ohio farmers conducting variable-rate P and K.
*(2017 Ohio Retail Survey)**

Over 80% of farmers have a smartphone *(2016 Multiple Surveys)*
Text messaging – 85%
Emailing – 75%
Online searches – 72%

84% of farmers conducting on-farm research that have adopted precision ag technology & management.
*(2017 OSU farmer survey on Digital Technologies***)*
Digital Tech Adoption by Farmers

92% Sharing Data today
  - 66% sharing data with 2 or more people
  - Seed Rep and Agronomic Consultant (>60% sharing with both)

70% have high expectations for their data

50+% feel they get $15/ac value using data and data tools.

50% find value in data warehousing and recommendations (Rx)

(2017 OSU farmer survey on Digital Technologies***)

Food, Agricultural and Biological Engineering
Digital Tech Adoption by Farmers

• 77% review soybean variety results online
• 67% review soybean variety results using an iPad, smartphone, or tablet.
• 88% use prescription maps for managing inputs such as seeding or fertilizers.
• 96% use data collected on their farm today as a direct input into annual crop.
• 92% use digital tools (mobile apps, online services, etc.) on their farm today.
Independent Consultants

1. Large volume data freely flowing to several places.
2. Determine your interaction with this data and at times, represent the traffic cop for your clients.
3. Establish what data the farmer needs.
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.
Prescription (Rx)

- Hybrid
- Population
- Starter & pop-up fertilizer
- Downforce
- Row-cleaner

Rx Management
As-Planted
Machine Data

*Fuel Use, Engine load, Speed, Torque*

<table>
<thead>
<tr>
<th>Engine load</th>
<th>Oil Pressure</th>
<th>Speed</th>
<th>Fuel Rate</th>
<th>Engine Torque</th>
<th>Engine Speed</th>
<th>Engine Temp</th>
</tr>
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<tbody>
<tr>
<td>84 %</td>
<td>76.6 psi</td>
<td>10.4 mph</td>
<td>18.02 gal/hr</td>
<td>81 %</td>
<td>1729 rpm</td>
<td>198 °F</td>
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COLLECT IN-SEASON DATA

#4Rs

#NutrientIntel
High Resolution Information
Digital Ag Ecosystems
Zillow for Ag
Tremendous volume of data being generated and freely flowing today.

Data accessibility and organization limits value and RIO for farmers.

Ability of a consultant to interact and use data.
Digital Agriculture
Providing solutions to meet world demand

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