OHI O STATE DIGITAL AG

A world record: insights into the current state of ag data.
Goals:

• Understand the methods and magnitude of data
  1. collection,
  2. analysis, and
  3. implementation on the farm today.

• Determine value of digital tools and services.
Why use data?
Collection → Visualization → Analytics → Decisions
If data is *unable to be acted upon*, it’s value is not being maximized.
How much data?
How do we quantify plant specific data?

1. **Adjusted field data** – data files divided by number of plants in the field
2. **Plant specific data** – data files that are assigned to the WR plant only

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**Adjusted field data**

- Imagery
- As-applied Data
- Machine Data

**Plant specific data**

- Weather Data
- Intensive Soil Tests
- Emergence Data

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1 Adjusted field data – data files divided by number of plants in the field
2 Plant specific data – data files that are assigned to the WR plant only
As-planted data file:
- Geo-referenced .dat file
- 54.4 Mb (54,400,571 bytes)
- 3,243,417 plants in field

= 54.4 million bytes/3.2 million plants

= 17 bytes per plant
What are the possibilities today?
Terra's Data Collection Timeline

Data Collected (GB)

18.5 Gb Total!
28 Mb per kernel
2.57 Tb per bushel
If we collected this much data for every plant in the field:

60 Petabytes of data

(0.06 Exabytes)

(0.6 Pb/acre)
360,000,000 Filing cabinets
Equivalent to 466,000 16 Gb iPhones
What types of data?
Data Types

Agronomic
- Yield
- As-Applied
- As-Planted

Machine
- Fuel Usage
- Engine Speed
- Engine Load

Prescription
- Seeding
- Fertilizer
- Multi-hybrid
- Fungicide

Remote Sensed
- Visible (RGB)
- IR
- NDVI
- Thermal

Production
- Weather
- GDD
- Scouting
- Notes
- Dates
London, OH

Today is forecast to be nearly the same temperature as yesterday.

**Forecast**

<table>
<thead>
<tr>
<th>Day</th>
<th>Hour</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thu 12</td>
<td>82°F</td>
<td>0%</td>
</tr>
<tr>
<td>Fri 13</td>
<td>86°F</td>
<td>0%</td>
</tr>
<tr>
<td>Today</td>
<td>88°F</td>
<td>60%</td>
</tr>
<tr>
<td>Sun 15</td>
<td>87°F</td>
<td>20%</td>
</tr>
<tr>
<td>Mon 16</td>
<td>87°F</td>
<td>20%</td>
</tr>
<tr>
<td>Tue 17</td>
<td>82°F</td>
<td>60%</td>
</tr>
<tr>
<td>Wed 18</td>
<td>83°F</td>
<td>60%</td>
</tr>
<tr>
<td>Thu 19</td>
<td>79°F</td>
<td>60%</td>
</tr>
<tr>
<td>Fri 20</td>
<td>81°F</td>
<td>20%</td>
</tr>
<tr>
<td>Sat 21</td>
<td>80°F</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Air Quality Index**

71 Moderate

**Smart Forecasts**

Running
In-season Focus

Pre-plant
- Weather
- CPU's
- Bare Soil
- Base Scouting

Emergence
- As-planted
- Weather (GDUs)
- Seeding Rx's
- Base Scouting

Side-dress
- Weather
- CPU's
- Historical Yield
- Imagery
- Base Scouting

Tassel
- Imagery
- Base Scouting (Disease)
- Rescue N
- Population

Key Data Layer
- Bare Soil Image
- Seeding Rx
- Historical Yield
- Disease Scouting

Base Layer
- CPUs
- Imagery
- Weather Data
Data Hurdles

Compatibility

- **Interoperability** - ability of a system to work with other systems without special effort on the part of the user.
  - *Example: Brand A tractor with Brand B planter*

- **Portability** - ability for farmers to reuse their data across applications and platforms.
  - Move, copy or transfer data easily between environments securely without affecting usability of the data.

Formats

- A wide range of file formats used within the industry.
- Both open and proprietary file formats exist for storing and exchanging data.

- *.TXT
- Shapefile (*.shp)
- *.XML
- *.DAT
- *.agdata
- *.yld
- *.gsd
- *.rbin
- *.log
- Many others…
39 File Types – 2,475 individual files

- .txt
- .mxd
- .xml
- .tlb
- .bmp
- .cpg
- .dat
- .pdf
- .dbf
- .data
- .fds
- .fshp
- .jpg
- .json
- .kml
- .m
- .fdata
- .fig
- .doc
- .csv
- .xls
- .ppt
- .ovr
- .png
- .prj
- .sbn
- .sbx
- .shp
- .shx
- .vrs
- .scf
- .pdf
- .ver
- .avi
- .mov
- .mp4
- .lyr
- .gsd
- .log
39 File Types – Spatially Referenced

- .txt
- .mxd
- .xml
- .json
- .kml
- .dat
- .dbf
- .data
- .xls
- .ovr
- .prj
- .sbn
- .sbx
- .shp
- .shx
- .ver
- .lyr
- .gsd
- .log
Data Storage
Data Storage

- 1 Tb is $6.99/month
- 0.6 Pb/acre

For 1,500 acre grower:
  = 900 Pb of Storage

Storage cost for one year:
  = $6,291,000
Does it bring value?
When planter hits the field, we’ve used 14 different data layers
These data layers bring quantifiable value to the farm.
Data Collection by Value (Gb)

- Basic Data: 0.04 Gb
- Operational Data: 0.33 Gb
- Field Management Data: 0.31 Gb
- Imagery: 1.60 Gb
- Scouting Data: 15.62 Gb
- Unactionable data

25% of collected data able to be used in making on-farm decisions today
Valuable Data by Category (Gb)

- Basic Data: 2.89 Gb
- Operational Data: 0.33 Gb
- Field Management Data: 0.31 Gb
- Imagery: 1.60 Gb
- Scouting Data: 0.04 Gb
Tier 1:
• As-planted Data (4.7)
• Soil Sampling Data (4.7)
• Yield Data (4.0)
• Seeding Rx
• Base Scouting
• Aerial Imagery

Tier 2:
• CPU Zones
• Weather Data
• As-applied Fertilizer
• Historical Yield Data
• Scouting Plus
Potential Value

Bullish:

- As-applied fertilizer
- As-planted
- Yield data
- Management zones
- All Imagery
- Weather Data
## Data Layers

<table>
<thead>
<tr>
<th>Only for Geospatial Reference</th>
<th>One time use for zone generation</th>
<th>Result of a decision, input savings potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool to combat weather and drive inputs</td>
<td>Cool but no decisions made</td>
<td>Single most investment saving potential (Over 5 years)</td>
</tr>
</tbody>
</table>

“Depiction of current conditions for crop. Currently reactive, potential for proactive”

Historical, recent, forecasting…but still dependent on accuracy
Summary

- Vast amounts of data being collected on the farm today.
- This data becomes valuable when acted upon, need to be able to make concrete decisions in current state of digital ag.
- Growers demand clear ROI for these digital tools and services.
Questions?

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