Figure 1: The evolution of (precision) agriculture

- **PAST**
  - Machinery & GPS Tracking: ~2008
  - GMO: 1980s
  - The Plough: 19th century

- **PRESENT**
  - Confused Farmer (Overwhelmed by data)

- **FUTURE**
  - DATA INSIGHT
    - Connected Ag Weather Stations
    - Doppler Weather Forecast
    - Plant Sensors (e.g. sap flow)
    - UAV with Sensor Payload

**INCREMENTAL BENEFIT OVER PREVIOUS GENERATION**

**NEW GROWTH POTENTIAL FOR FARMERS**
Farmers are excited, challenged, pleased, confused, fearful and intimidated.
How do you feel about the new technology?

- Skeptical/Fearful: 16%
- Neutral: 19%
- Embracing: 65%
81% think they own their data and 77% are worried about data security (September 2014 AFBF Survey)
Do you intend to use data analysis?
(September 2014 AFBF Survey)

- Yes: 66%
- Maybe Later: 34%
The benefits of Big Data for farmers are enormous

- Make more informed business decisions more quickly
- Improve Return on Investment
- Identify and reduce inefficiencies on the farm
- Improve crop yields, livestock and dairy production
- Reduce production costs
- Manage risk
- Improve marketing strategies
- Reduce fraud
- Meet regulatory compliance
- Improve sustainability
- Builds history for your fields over time
- Verify results of agronomic changes
But there are issues of concern – and a desire for farmers to have more information and more options

- Data ownership and control
- Data privacy and security
- Data availability
- Compatibility and interoperability of data
- Quality of data
- Data sharing
- Storage of data
Market manipulation?
NCBA was notified by the EPA in February 2013 that the agency had been collecting information from states on CAFOs. The information was requested by extremist groups, including Earth Justice, the Pew Charitable Trust and the Natural Resources Defense Council through a Freedom of Information Act request and the was given to them.

The information released by EPA covers livestock operations in more than 30 states, including many family farmers who feed less than 1,000 head and are not subject to regulation under the Clean Water Act.
“My data is valuable – and I want to be paid for it.”

Only one company currently wants you to share in the potential profits.
Working Group of 13
(April 2014)

- Farm Bureau
- Farmers Union
- Soybeans
- Corn
- Wheat
- Cotton
- Rice
- John Deere
- Monsanto
- Beck’s Hybrid Seed
- Raven
- Pioneer
- Dow
.... the undersigned organizations and companies believe the following data principles should be adopted by each Agriculture Technology Provider (ATP).

....an ATP’s principles, policies and practices be consistent with each company’s contracts with farmers. The undersigned organizations are committed to ongoing engagement and dialogue regarding this rapidly developing technology.
35 Groups Signed 13 Principles
(February 2016)

- Education
- Ownership
- Collection, Access and Control
- Notice
- Transparency and Consistency
- Choice
- Portability
- Terms and Definitions
- Disclosure, Use and Sale Limitation
- Data Retention and Availability
- Contract Termination
- Unlawful or Anti-competitive Activities
- Liability and Security Safeguards
35 Supporting Groups

- AGCO
- Ag Connections, Inc.
- AgSense
- AgWorks
- Ag Leader Technology
- American Farm Bureau Federation
- American Soybean Association
- Beck’s Hybrids
- CNH Industrial
- Crop IMS
- CropMetrics
- Dow AgroSciences LLC
- DuPont Pioneer
- Farmobile LLC
- Granular
- Grower Information Services Cooperative
- GROWMARK, Inc.
- Independent Data Management
- John Deere
- Mapshots, Inc.
- National Association of Wheat Growers
- National Barley Growers Association
- National Corn Growers Association
- National Cotton Council
- National Farmers Union
- National Sorghum Producers
- North American Equipment Dealers Association
- OnFarm
- Raven Industries
- Syngenta
- The Climate Corporation – a division of Monsanto
- USA Rice Federation
- Valley Irrigation
- ZedX Inc.
Farm Bureau finished the privacy and security principles and signed a “peace treaty” with the ATPs.
We found the one paragraph dealing with data privacy we were looking for buried on page 25 of a 38 page privacy agreement.

It was 172 words out of nearly 17,000 in the agreement.
Bringing transparency to ag data contracts.
How do we solve these problems?

- Industry led effort to create standards: *Privacy and Security Principles for Farm Data*.

- Signed by 35 farmer-led organizations and ag technology providers.
How do we solve these problems?

- Create a seal that promises adherence to the Data Principles and a commitment to data transparency.
How does a company get the seal?

Answer 10 Questions.

- 10 Question evaluation form.
  - Data collection
  - Data privacy
  - Data control
  - Data portability

- First: Completed by ag tech providers.

- Second: Reviewed by Ag Data Transparent Administrator.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</thead>
<tbody>
<tr>
<td>What types of information does the product collect from me?</td>
<td>Agronomic Data</td>
</tr>
<tr>
<td>Can I terminate the contract at any time? (Understanding that payment obligation may remain)</td>
<td>Yes</td>
</tr>
<tr>
<td>Can I delete my data upon termination?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the product allow the ATP to share my data with third parties without my authorization?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the ATP pledge not to sell, trade or give my data to third parties without my consent?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the ATP confirm that marketing materials are consistent with contracts governing use of the product?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the ATP notify me if its privacy policies change?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the ATP define any third parties that may have access to my data?</td>
<td>Yes</td>
</tr>
<tr>
<td>Will the ATP notify me if a breach of data security occurs, causing disclosure of my data?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the ATP take appropriate security measures to safeguard my data?</td>
<td>Yes</td>
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# 10 Questions: A Closer Look

<table>
<thead>
<tr>
<th>Question 1</th>
<th>Answer</th>
<th>Additional Information</th>
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</thead>
<tbody>
<tr>
<td>What categories of data does the product collect from the farmer?</td>
<td>Agronomic Data</td>
<td>Agronomic Data is defined as planting information, fertilizer applications, and yield data.</td>
</tr>
<tr>
<td></td>
<td>Machine Data</td>
<td>Machine Data is defined as engine speed, load, fuel usage, and miles traveled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>These are defined in the <a href="#">Terms and Conditions</a>.</td>
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</table>

ownership, control, portability, and termination.
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<tr>
<th>Question 4</th>
<th>Answer</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will the ag technology provider obtain my consent before providing other</td>
<td>Yes</td>
<td>In our <strong>Privacy Policy</strong>, we inform you that we will never sell or share your data without your consent.</td>
</tr>
<tr>
<td>companies with access to my data?</td>
<td></td>
<td></td>
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</table>

- Farmers can click on [links](#) to view the actual policies.
Research Tool: Ag Data Transparent Website

- Allows farmers to search for products.
- Easy comparison.
- Lots of information.
Why use the Evaluator?

- **Trustworthy:** Backed by farmer led organizations and the industry
- **Quick:** Seal of Approval
- **Simple:** 10 questions
- **Free**
Will the Industry Participate? Yes.

- Designed for startups and legacy companies
- Product specific, not corporate-wide mandates
- Focus on “transparency”
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<th>AG TECHNOLOGY PROVIDERS</th>
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<td>• Dow Agrosciences</td>
<td></td>
</tr>
</tbody>
</table>
4. Why Information & Data are Disclosed by John Deere

John Deere understands that you may not want us to provide Personal Information and Machine Data to third parties for their own marketing purposes. We limit our sharing of Personal Information and Machine Data as follows:

- We may share Personal Information and Machine Data with our affiliated companies, suppliers, authorized John Deere dealers and distributors, and business partners, which may use it for the Purposes listed above.
- We may also share Personal Information and Machine Data with our service providers to fulfill the Purposes on our behalf. Our service providers are bound by law or contract to protect the information and data, and to only use it in accordance with our instructions.
- We may disclose Personal Information and Machine Data where needed to affect the sale or transfer of business assets, to enforce our rights, protect our property, or protect the rights, property or safety of others, or as needed to support external auditing, compliance and corporate governance functions. We will also disclose Personal Information and Machine Data when required to do so by law, such as in response to a subpoena, including to law enforcement agencies and courts in the United States and other countries where we operate.

Please note that we may also disclose information and data about you that is not personally identifiable. For example, we may publish reports that contain aggregated and statistical data about our customers and equipment. These reports do not contain information that would enable the recipient to contact, locate or identify you.

5. Cookies and Similar Collection Technologies
Education is challenging - numerous audiences within agriculture (and maybe mostly generational)

- Comfortable with technology, but not with usage, privacy, transparency issues

- Uncomfortable with technology (103 beta tests and only 20 downloaded and 20 more hired someone)

- Nonbelievers- “have more in their head about their farming operation than data could possibly provide” – Outlaw – “what’s a browser”? 
Everyone agrees we need to educate farmers about the technology, BUT....

- In a generic way, ATPs want to educate farmers to “remove the fear so they will use the technology more”.

- Farm groups want to make sure farmers understand the issues so they can make the decision that is best for them.

- From a “working group” perspective, this may be our biggest failure---
“Data was neither accurate nor complete. Data was in formats and structures that were practically unusable. Proprietary formats made it so I couldn’t transfer data from its source system to a place where I could use it. The data structures made it so I couldn’t make apples-to-apples comparisons.”
Being part of an agricultural organization that’s not tied to any company and is fully independent is huge for me.
Is your data portable between equipment manufacturers or seed dealers?

- Yes: 36%
- No: 39%
- I don't know: 25%
Farmers can retrieve their farm-level data for storage or use in other systems;
The repository will not sell and/or disclose non-aggregated farm data to a third party without first securing approval of the farmer;
Farmer data can be removed, securely destructed and returned if the farmer so requests;
A farmer will be able to discontinue the service or halt the collection of data at any time subject to appropriate ongoing obligations. Procedures for termination of services will be clearly defined in the contract; and
The data will not be used for unlawful or anti-competitive activities, such as a prohibition on the use of farm data to speculate in commodity markets.
Farmers maintain ownership and control of their data and have unrestricted access to their data;
Farmers are notified about the purposes for which the repository will collect and use farm data;
Farmers will be provided contact information for the repository in case of inquiries or complaints;
The repository’s principles, policies and practices will be transparent and fully consistent with the terms and conditions in their legal contracts;
Farmers will determine who, if anyone, gets access to which portion of their data;
Data will be exportable if a farmer so chooses. Farmers will have the freedom to move their data between input suppliers and retailers or analytics services;
Data security is a priority;
The repository will allow farmers to capture data from a variety of devices and sources;
The repository is structured so that it is not subject to the Freedom of Information Act;
Do farmers have usable and accurate data? If you don’t clean it, it will likely lead to poor decisions this year AND in the future.

- Raw yield map data needs to be cleaned. 30-75% has errors.
- Is the GPS wobbly?
- Overlaps?
- Missing data?
- Are high and low yields removed?
- Have the combine speed changes been minimized?
“My data is valuable – and I want to be paid for it.”
John Deere has said precision services and its "intelligent solutions group" would be a major piece of doubling its size from a $25 billion company in 2010 to a $50 billion company by 2018.

Monsanto underscored its devotion to farm data analytics when it bought weather data-mining company the Climate Corporation in October, describing it as its "entry ticket into a $20 billion market opportunity."

DuPont Co. anticipates generating as much as $500 million a year in revenue from high-tech farm data services over the coming decade, a senior official said Thursday.
AFBF/Measure Study

- July 2015
- Determine value of drones to ag
- Corn, wheat, beans will benefit from field crop scouting and 3D maps
- Crop insurance for fraud and abuse
Drone service to enhance crop scouting

- $12/acre for corn
- $2.60/acre for soybeans
- $2.30/acre for wheat

ROI calculator for:
- Crop scouting
- 3D mapping
- 3 crops – corn, beans, wheat
• Big Data is here to stay and WILL change the way farmers “farm”

• Most farmers have always thought what they did was private. With technology changes, including drones, it is a paradigm shift.

• Very likely to lead to more rapid consolidation in agriculture