Iowa AgState Report on Digital Agriculture

Dr. Matt Darr, Iowa State University

Material adapted from "The Digital Transformation of Row Crop Agriculture"

Authors: The Hale Group, Ltd & LSC International, Inc.

Full Report Available At:

http://www.iowafarmbureau.com/articles/135766/iowa-agstate-big-data-report

Who is Iowa AgState?

Vision Statement

Empower Iowans to lead the world in responsibly-produced food and agricultural products to not only meet, but exceed, the demands of customers.

Mission Statement

Dedicated to identifying challenges and opportunities in Iowa agriculture and recommending changes to help the entire state achieve the greatest possible benefit from Iowa's food, materials, and products industry.

Member Organizations

- Agribusiness Association of Iowa
- Dairy Iowa
- Iowa Cattlemen's Association
- Iowa Corn Growers Association
- Iowa Corn Promotion Board
- Iowa Department of Agriculture and Land Stewardship
- Iowa Department of Economic Development
- Iowa Farm Bureau Federation
- Iowa Institute for Cooperatives
- Iowa Pork Producers Association
- Iowa Poultry Association
- Iowa Soybean Association
- Iowa State University College of Agriculture and Life Sciences
- Iowa Turkey Federation
- Midwest Dairy Association

Motivation for this Project

- Iowa farmers have always been innovators in adopting new technology.
- During the last two decades, precision agriculture tools have been adopted by Iowa farmers with somewhat mixed success: –
  - *Some tools being highly regarded as very useful;*
  - *Other tools providing minimal value to farmers..*
- During 2013-14, concern began to grow within farmer organizations about the use and potential misuse of farm data.
- The promise of Big Data in agriculture was alluring, but there was also concern about the potential adoption challenges of the technology.
- Several farmer organizations in Iowa decided to ask Iowa AgState, as an umbrella organization for state-wide agriculture, to investigate the implications of Big Data for farmers.

Highlights of the Situational Analysis

Farmer Survey

- A web-based survey was conducted among row crop farmers in Iowa. Participants were recruited by three organizations through emails inviting them to complete an online survey:
- A total of 384 people answered most of the questions in the survey; 101 of them provided write-in comments – a hefty 26%.

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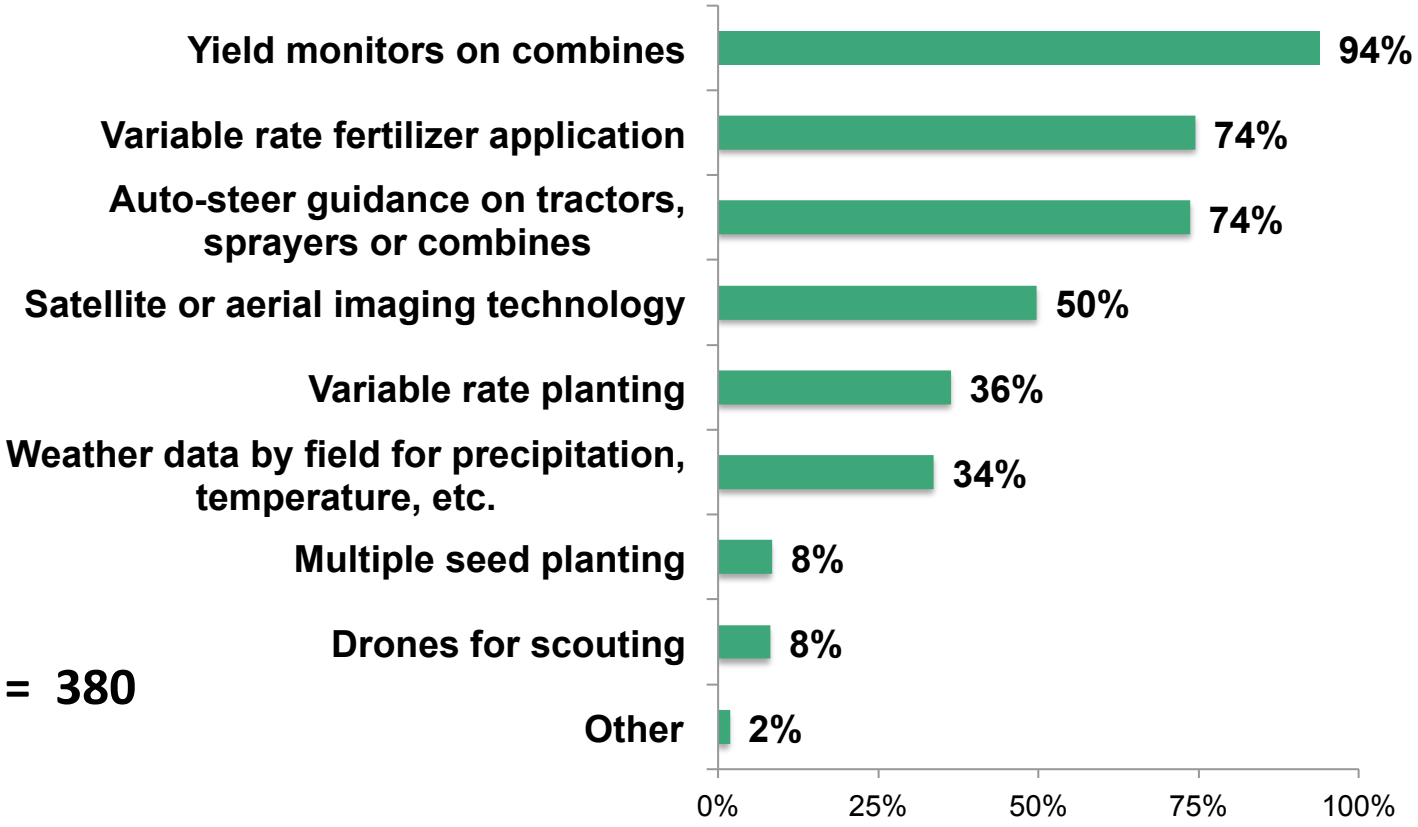
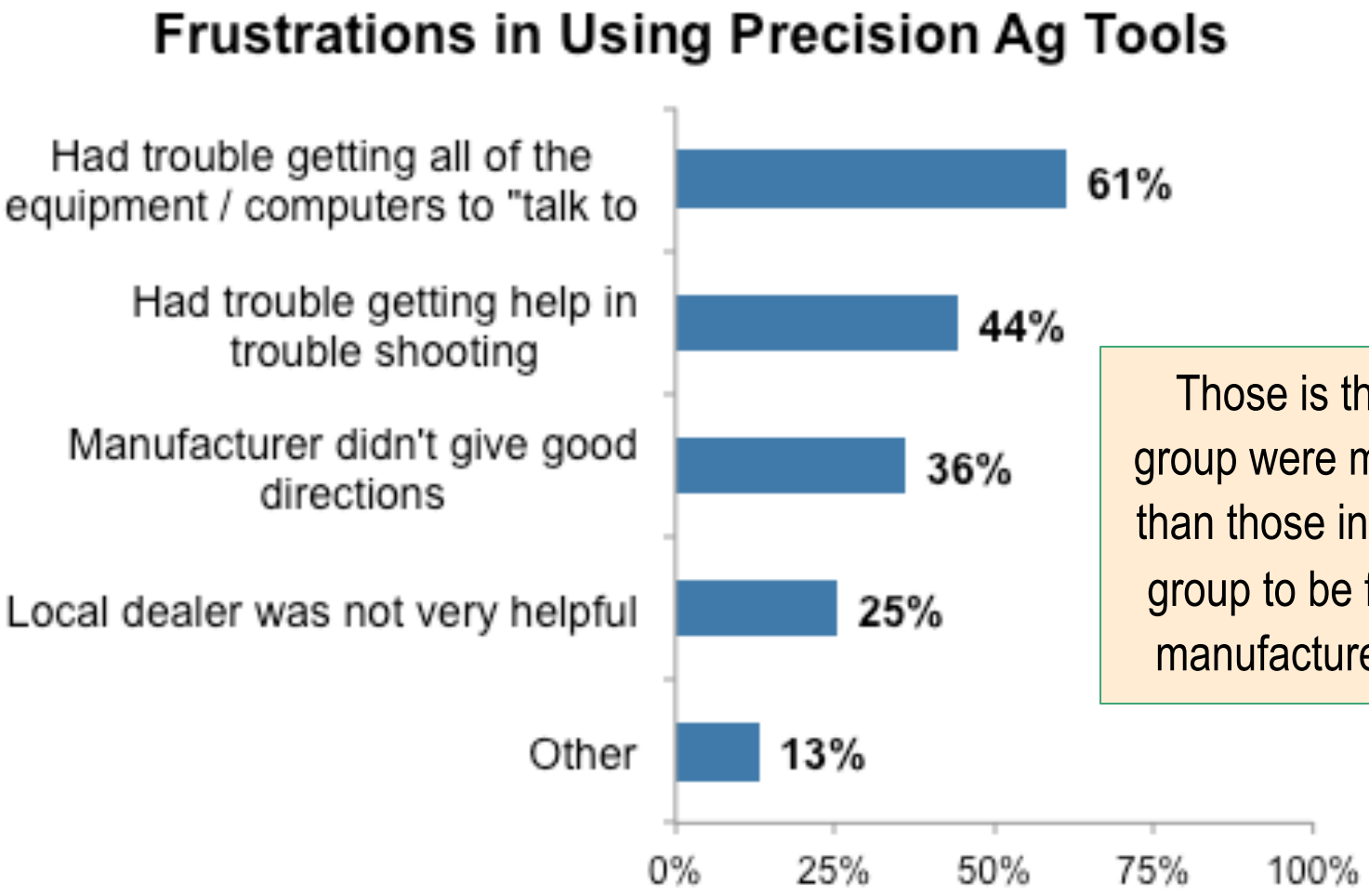
Precision Ag Tools Utilized



N = 380

Those with a high school degree as their highest level of education are much less likely to use satellite or aerial imaging technology or weather data.

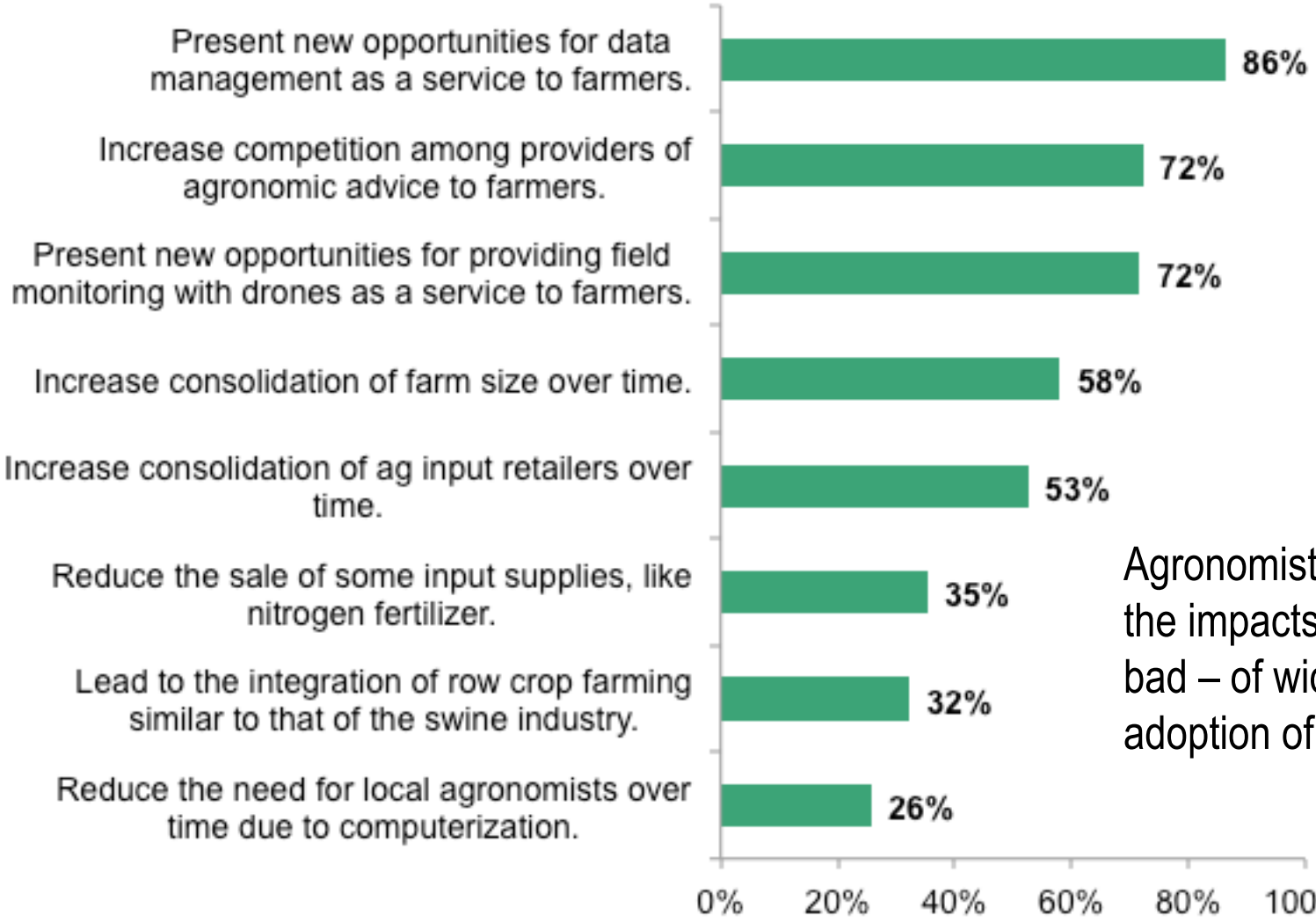
Frustration with Precision Ag Tools



N = 278

Those is the 36-45 age group were much less likely than those in the 46-55 age group to be frustrated with manufacturers directions.

Agronomist Focused Question:
Impacts of Widespread Adoption of Prescription Ag



Agronomists were asked the impacts – good and bad – of widespread adoption of Prescription Ag

N = 198

Summary of Write-In Comments from Electronic Survey

Skeptical and/or Fearful of the New Technology – 65%

- The biggest concern is misuse of farm data by:
  - *The ATPs*
  - *Activist groups*
  - *Grain traders*
  - *The government*
  - *Computer hackers*
- Fear that it favors the large farmers.
- Prescriptions will recommend only some products, i.e., are biased.
- It doesn't work. Agriculture is a complex biological system.

Neutral or Nuanced in Attitudes – 19%

- It has potential, but must be implemented carefully.

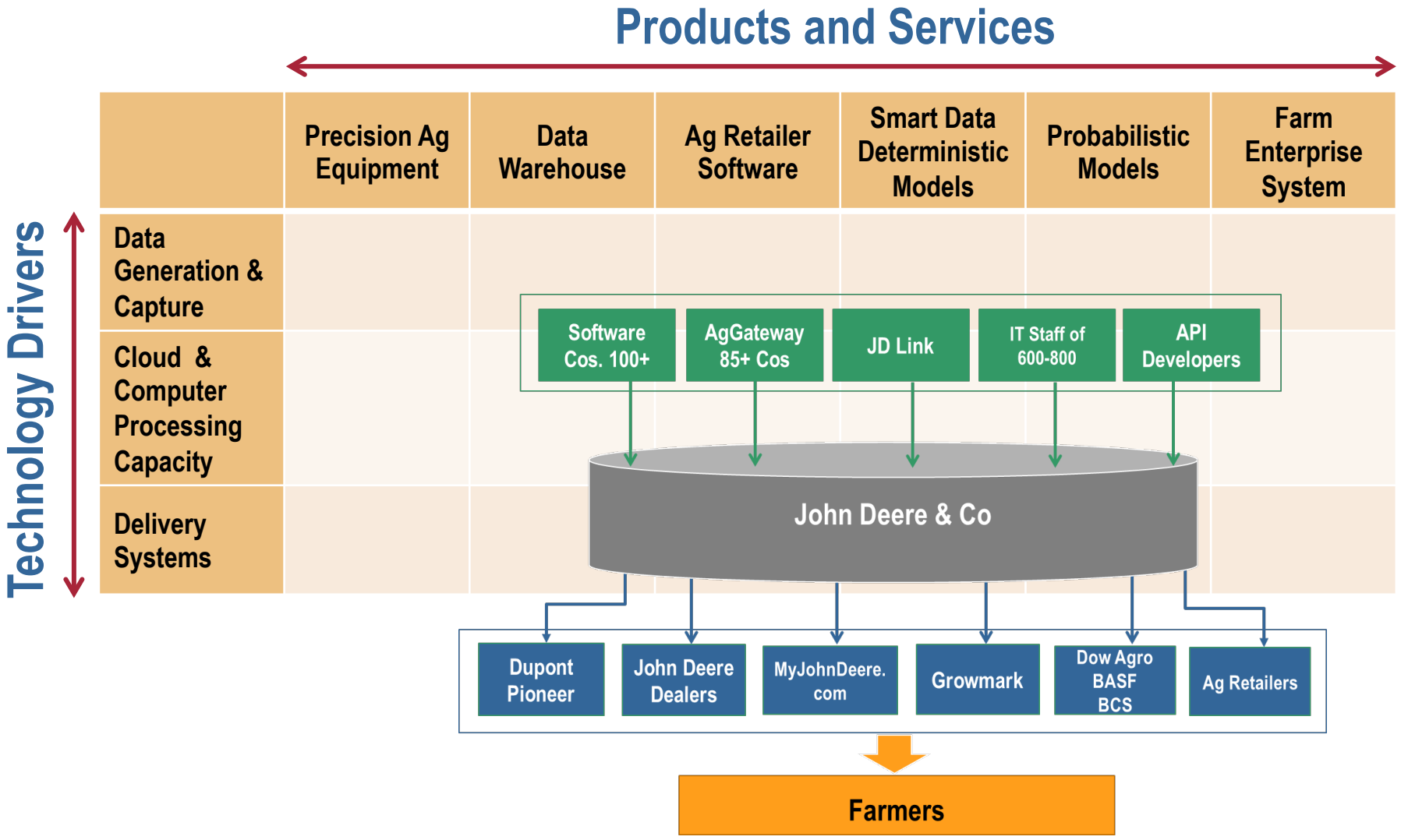
Embracing the New Technology – 16%

- The technology is here to stay. Let's embrace it and make it work for us.
- No one that is highly profitable today is doing it with only their own ideas and crop data.

Key Data Challenges to be Resolved

- **Human Capital:** Farmers need to be **Tech-Savvy** and to have access to **IT skills** for use of data in decision making.
- **Quality Data:** The majority of Data generated currently is not useable due to poor quality, e.g., lack of calibration.
- **Data Access:** Much of the Data is on cards, sticks, hard drives or in binders of printed documents, and is very hard to access. Lack of industry standards to support data access.
- **Better Analytics** are required to automate the analysis of imagery and maps. Need to attract more data scientists to agriculture.
- **Agronomic Data held by Ag Retailers** is not easily available for farmer use and aggregation in a broad manner.

Technology Map of the 'Current' Industry



Considerations for Strategy Development

The Problems to be Address in the Strategy

Unequal Market Power

- Farmers do not have equal negotiating power with major ATPs
- Information asymmetry puts farmers at a major disadvantage
- There are few places a farmer can turn for detailed information

Complexity

- Farmers find the hardware, software, and business models hard to understand
- Hardware and software is not fully compatible across ATPs
- Many companies are marketing "tools" rather than "solutions"

Legal Obstacles

- Some user agreements limit farmers' choices
- Some legal documents are hard to understand

Unclear Benefits

- There is a mixture of fact and hype in the marketplace
- The economic benefit of some products is not quantified

Four Strategic Questions

1. Will all of the components of Digital Agriculture combine to create a major "inflection point" similar to the introduction of hybrid corn many decades ago?
2. Will Digital Agriculture Technology cause the row crop sector to become integrated, i.e., coordinated through contracts with farm operators by:
   - *a few large ATPs, or*
   - *a handful of large corn and soybean customers?*
3. How rapidly will consolidation occur within the row crop sector?
4. Will the sophisticated agronomy models allow computers to provide agronomic advice with little local agronomic input?

All four questions are difficult to answer.
We provide our opinions on the following slides.

Incremental Change or Inflection Point

Inflection Point	• Not likely at this time since the value gain has not been established.	• **Given rapid changes in Digital Technology and the age profile of farmers an inflection is likely in the 2019-2023 period.**
Incremental Change	• **Most likely for the next 4 years since neither a dramatic breakthrough nor clear value have been developed as yet.**	• Most likely if the value created is at the current modest level of +/- 5%.

Years – 0 ——— 4 ——— 8 →

What Will Be the Rate of Farm Consolidation?

Current Speed

- If adoption of Digital Agriculture is slow due to complexity human constraints.
- If the ATPs can't demonstrate value.
- If the data security issues become more severe.
- Caps on total farm payments under Farm Bill may limit consolidation in low price environment.

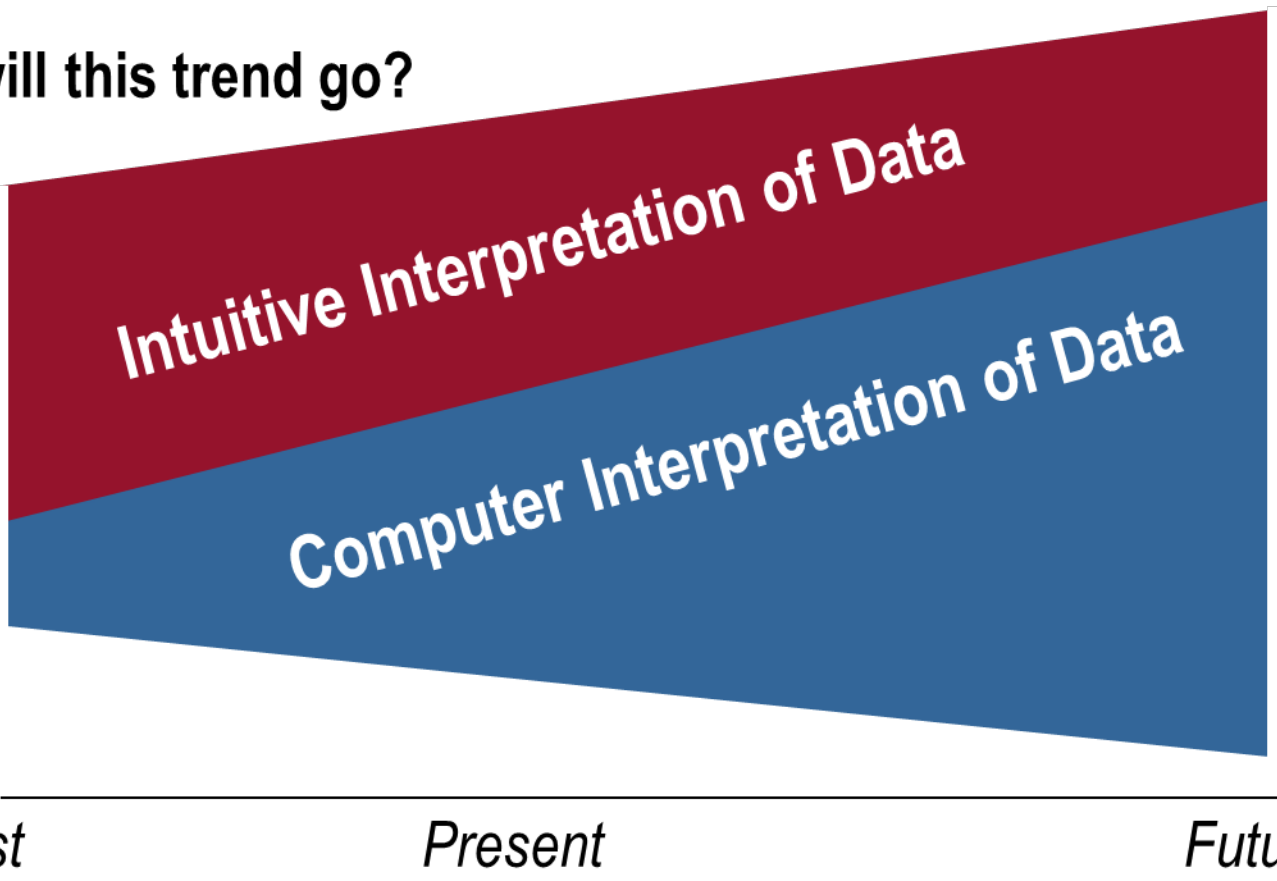
Accelerated Speed

- The prospect of low crop prices provides incentives to leave farming.
- Aging farmers retire and high tech, low cost producers capture land rentals.
- This technology is simplifying operations for large-scale farmers.
- Large farmers can hire people with specialty skills, e.g., IT and agronomy.
- The data privacy fears and concerns are mitigated through company action and experience.

We believe that because of Moore's Law, the technology will develop quickly and farm consolidation will accelerate.

The Digitization of Agronomic Advice

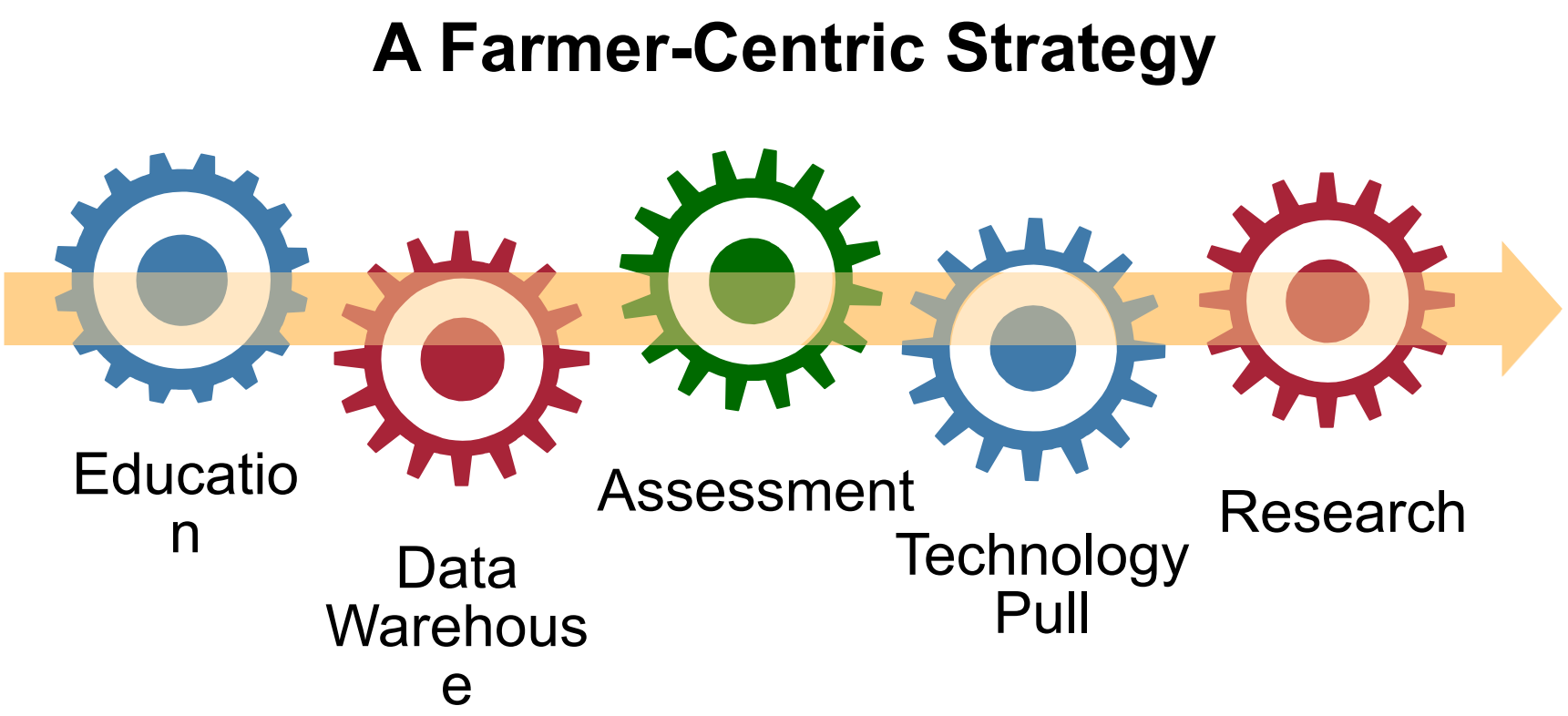
How far will this trend go?



Obviously the actual trend is not a straight line – the graphic is directional only. It's too early to tell how far this technology will go.

A Farmer Centric Strategy

Five Components of a Farmer-Centric Strategy



Initiative #1 – Educate Farmers, Ag Retailers, Local Businesses, Policy Makers

Provide continuous, on-going education for farmers, ag retailers, other local businesses, and policy makers that will enable them to make informed decisions:

a. Distribute The Hale Group report
b. Conduct state-wide and regional workshops and webinars for farmers, ag retailers, and other businesses on Digital Agriculture
c. Provide the AgState Board with regular updates on the Digital Transformation of Agriculture developed for this project.
d. Create short videos on specific topics
e. Educate State and Federal policy makers

Initiative #2 – Support a Grass Roots Data Warehouse

Support an independent, farmer-controlled data warehouse for farm level data and aggregated agronomic data which can be used to better serve farmer participants.

a. Develop guidelines for the ownership and use of data among land owners, farm operators, ag retailers and local businesses.

b. Define the scope and scale of the agronomic data sets currently held by farmers, ag retailers and their software providers.

c. Define the costs and capital requirements for the establishment of a cloud based data warehouse for farmers that is coordinated with ag retailers.

d. Evaluate business structures that would enable both farmers and ag retailers to collaborate in an independent data warehouse entity.

e. Develop a set of Privacy, Use and Control polices that fully protect the interests of the farmer while providing a high level of security.

f. Establish the required API's to facilitate access on a permission basis for trusted advisors and ATPs.

g. Develop a strategy to optimize the value of local data if the results of the pilot project are positive and establish feasibility.

Initiative #3 – Evaluate Products, Services, Business Models

Create mechanisms to provide an assessment of the many products, services, and business models in the market while promoting uniform, agreed-upon industry standards and guidelines.

a. Create a website where farmers share their assessment of specific Digital Agriculture tools similar to Amazon's book evaluation.

b. Create a mechanism for timely technical assessment for complex products and services similar to the Nebraska Tractor Test, Profi in Germany or Underwriters Laboratory.

c. Engage with companies at early development stages so that the products launched receive early, practical feedback and reflect farmer priorities.

d. Create a mechanism for estimating the economic value of products and services to farmers.

e. Evaluate alternative business models used by industry participants in terms of clarity, benefits provided, and fee structure.

f. Simplify the technology through collaboration with standards organizations.

g. Provide an assessment of the farmer-friendliness of legal documents used by manufacturers and service providers, by collecting, analyzing, and scoring the documents.

Initiative #4 – Development of Farmer-Friendly Products and Services

Drive a "technology pull" strategy focused on products and services that provide solutions to farmer problems rather than just complicated tools.

a. Conduct focus groups and surveys to identify the key "pain points" for farmers which are not being addressed by the ATPs.

b. Conduct outreach to the Tech Community and ATPs so that the needs of farmers are understood and can be taken into account during the design and development phase for new products and services.

c. Evaluate the potential for a "Challenge Award" process as a way to influence the direction of new technology development.

Initiative #5 – Create an Institute for Advanced Farming

Create a center for inter-disciplinary research that will position Iowa farmers to be at the cutting edge of digital technology for generations to come.

a. Commence the Development of an Institute for Advanced Farming that would be based on the White House Policy to create six large Innovation Institutes in the Agriculture Sector using the public-private partnership model.

b. Define an inter-disciplinary research platform that includes Digital Agriculture, computer engineering, sensors, robotics, chemistry, genetics, genetic engineering, genomics, phenomics, and other non-traditional disciplines, supported by advanced simulation and predictive computer models.

c. Conduct an Advanced Farming Workshop that would bring together all of the interested stakeholders from within the University and across the State of Iowa.

d. Position the Advanced Farming Institute as the equivalent of the US Advanced Manufacturing Institutes which focus on the development of new opportunities in that sector.

e. The Ag State members adopt a coordinated approach for this initiative and raise specific funding to support the development of an Institute.

f. Obtain the support of the National Farm Organizations since the research conducted at the Institute will be applicable across the Midwest Region.

Implementing a Path Forward

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Dr. Matt Darr, Iowa State University

The over-all point is that new technology will not necessarily replace old technology, but it will date it. By definition. Eventually, it will replace it. It's like people who had black-and-white TVs when color came out. They eventually decided whether or not the new technology was worth the investment.

~ Steve Jobs, former CEO of Apple Inc.

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