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Big Data – The catalyst for a transformation to digital agriculture

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Background

The digital transformation of row crop agriculture has been a work in progress for over 20 years. It started with the development of combine yield monitoring equipment in 1992, gained additional traction with the adoption of GPS targeted soil sampling in the mid 1990's, and developed into a major ag industry by the mid 2000's as documented by widespread adoption of autosteering and section control technology. Precision agriculture initiatives focused on right time, right place, and right rate input management as well as waste reduction associated with automated machine controls has played a key role in improving on-farm productivity and profitability in the last two decades of agriculture. Over the past 18 months there has been strong growth in a new industry that promises additional advances in management and decision tools that can further improve on-farm profitability. This new industry goes by many different names including Big Data, Decision Agriculture, and Digital Agriculture. While the terminology may vary, the goals are consistent – to merge ag production data, complex weather and environment models, satellite and UAV imagery, and crop input choices into a comprehensive decision support solution which empowers producers to make more informed, lower risk, and broadly sustainable decisions.

What is Big Data?

Big data is hard to define without some context. Classically big data refers to data whose scale, diversity, and complexity require new techniques and analytics to manage and extract value from. For many in agriculture we deal with big data every day in our operations. This may be from stacks of past yield maps, historical soil sampling data, field level profit and loss statements, and a library full of crop production recommendations. This data is and will continue to be big data to producers but the new industry built around ag big data looks to take this a step farther and a step deeper. Specific examples include weather modeling to provide risk assessment for nitrogen availability in corn throughout the growing season, planting soil suitability recommendations based on soil, terrain, and weather forecasting, UAV imagery that is so precise it can distinguish individual aphids on soybean plants, and streaming of live machine data from thousands of machines across the country.

In agriculture the value of big data is in the extraction of knowledge and actionable decisions that it presents. For example, modeling of soil moisture to make better decisions around field traffic and nitrogen management can generate significant financial gains in a single year. Are the gains possible without the use of big data tool? Absolutely, but just like email has changed the way we communicate so will these new data tools change the way we make daily ag decisions by allowing access to knowledge in a much faster, streamlined, and productive way.

Transformation to digital agriculture

While big data is a term that has caught on in agriculture it is specific to the information sources that we collect within production ag. The industry that is empowered by this data is better described as Digital Agriculture. Digital agriculture broadly encompasses Precision Ag (autosteer, yield monitoring, grid soil sample), Prescription Ag (customized farming plans, variable rate application), and Enterprise Ag (integrated farming, risk, and business planning solutions). Digital agriculture has the primary mission to turn knowledge into actionable decisions. These decisions should lead directly to the value demands of the producer whether that be through increased profitability or through reduction of production risk.

Digital agriculture is synonymous with adding new tools to a tool box. It is not intended nor will it remove a producer's role in farm decision making. It is not intended to eliminate the need for crop advisors or ag retailers in supporting on-farm decisions. It is specifically intended to give everyone in the ag supply chain additional information, analysis, and options to support the production decisions. Each and every year producers navigate dozens of complex input selection and crop management decisions. As digital agriculture takes hold within the US it

will provide support to the complex crop, weather, soil, and environment interactions.

What to look for in a digital agriculture partner?

With the growth of the industry producers are going to see a growing list of companies that are offering services within the digital ag sector. These could include one or more of the following digital ag services:

- Wireless data transfer and cloud storage for ag data. This eliminates the complexity and potentially the compatibility concerns with ag data management.

- New technologies to capture data including existing or advanced on-machine sensors, UAVs and other remote sensing applications, and personal interactions through smart phones and mobile technologies.

- Smart data models that automate feature extraction from large datasets. These could include yield benchmarking, variable rate recommendations, definition of management zones, and input recommendations.

- Crop recommendations based on historical data and probability models. These include using historic climate and environmental data along with yields and crop input records to help make decisions based on a combination of data sources.

The selection of a data partner is very similar to choosing any partner for your business. Key points to consider and discuss with your potential data services provider include:

- Will my data be pooled with any other producers for large scale data analytics?
    - If so, who will have access to this data? Am I compensated for the value of my production intellectual property in the development of improved services?

- How do you manage data ownership?
    - The majority of data services providers will stress that producers own there data. Focus on the fine print around "licensing". Data services providers may stipulate a perpetual royalty free license. This means they can use your data for free even if you close your account.
    - Will copies of my data be retained within the data service provider if I close my account?

- Who has access to my data? Can I redirect my data to third parties of my choice?

- What type of security protocols are in place to protect against cyber hacking and data piracy?

- Is the data service provider independent or are they also trying to provide agronomic or business management services?

The transformation to digital agriculture is coming rapidly and producers that actively take advantage of these new data tools will have an opportunity to improve profitability within their operations. Like any other tool within agriculture these will require an investment by the producer to extract the maximum value. The transformative part of this technology though is that these new data services offer a brand new industry that is driven to provide value added services which help translate into improved on-farm decisions.