Data Management at the Farm Level: 2013 Update

"Big Data" is the talk of the agricultural community today. While precision agriculture has seen significant adoption in the United States since the mid-1990s, agriculture is just embarking on the fringe of data management in which machine and agronomic data are being collected and stored on the web using servers or cloud technology. Analytical tools are being developed to draw site-specific information and new knowledge for farmers from this information. The evolution of this data management movement will allow growers, ag retailers, crop consultants, machinery manufacturers, and others in the ag community to learn more about crop production at an accelerated pace compared to the past and will be a critical contributor to meeting the future food demand for the growing world population.

> "More communication between machines…information that can be seamlessly shared in real-time. This is actually a reality for single companies through telematics, but it will take a while before we can utilize this technology across different colors."
>
> (Grower)

Today, growers are able to create management zones, implement variable-rate applications, produce detailed harvest reports and maps, and oversee associated costs and profits through accounting and record keeping. These capabilities for site-specific management have been implemented since the mid-1990s with increased growth in farm data collected over the past 5 to 10 years as growers have accelerated precision ag technology adoption. Farmers, ag retailers, and custom operators have essentially been equipping themselves with the required

technology and information to enable this Big Data evolution. While many growers have downloaded and stored their data, many have not analyzed it as a means to help make management decisions to improve their operation. However, growers are repeatedly reminded by ag professionals to save all their data so it can be used as a means to drive site-specific management. For many, there is no clear incentive or objective about the relevance of taking the time to collect and archive all this data. Many growers do not have the time or do not know where to start so they never successfully engage in data collection and management.

> "Making data management more productive and informative relies not in the software but in the user…his/her capabilities will be the limiting factor of what you get out of any particular piece of technology."
>
> (Grower)

To better understand the concerns about ag data management, a survey was conducted during winter 2012/2013. The survey was given to farmers across the Midwest and the southern United States and ag professionals nationwide. It contained one question, *"What are the needs related to data management at the farm level in order to make it more successful and valuable?"* Ag professionals included representatives from academia, equipment and technology manufacturers, popular farm press, and grain and cotton commodity leaders. The results were analyzed and the most common responses from farmers and ag professionals were assembled then ranked into the top five. The following presents those rankings listed in order with 1 signifying what was considered most important. Selected comments are also provided as examples of direct thoughts from respondents.

> "Need a program that has record-keeping for finances and GIS data summarized into cost per acre for each field and broken down further into zones associated with variable-rate seeding to view profit or loss in exact locations."
>
> (Grower)

Grower Needs and Expectations

The top five responses that growers indicated will make data management more valuable for their farming operation:

- Automatic and seamless wireless data transfer between machines and between machines and a web-based, open source database or cloud so data is stored in one location.

- Resources to find help on how to get started along with local support and training.

- Simplified farm-management software that is more user friendly. Web-based is preferred so data can be accessed from any electronic device (e.g., smartphone, tablet, laptop).

- Quick start guides as reminders on how to use interfaces or displays year to year. This response includes making sure technology is setup and operating correctly thus data is being collected successfully.

- Standardized data formats and compatibility between different brands for the ability to easily share data between different machines and operating platforms.

In these responses, the terms "automatic" and "simple" were repeatedly used with wireless data transfer being a key requirement for success at the farm level. Growers are definitely warming up to data management in agriculture but hurdles at the equipment and software levels are limiting progress. Additional recurring comments from the survey:

- Software solutions are needed to better merge accounting and precision ag data layers that provide field and product level costing.

- Software solutions that are not tied to one supplier or service provider are needed. They should be farmer managed and able to receive and send data to and from multiple field devices and suppliers.

Concerns and Advice from Professionals

These represent the top responses from precision ag specialists, Extension agents, professors, consultants, and crop managers nationwide ranked in order:

- Growers need to understand that to succeed in a precision agriculture program it takes dedication and discipline on their part to be able to interpret data and put it into context.

- Wireless data transfer is a great tool and an easy way to transfer data back and forth between the machine and office computer.

- Few growers have a plan or goal for their data, therefore it is not being used in a meaningful way.

- Adoption of precision ag technology is often challenging to the older generation. Some leave application to industry because it is easier to manage.

- User interfaces of software need to improve for wider adoption. Programs are too complex and not compatible for use by farmers. A universal dictionary is needed for consistency.

> "I know the data I am saving is valuable, but on a rainy day I would rather be in the shop than sit in front of a computer and manage my data."
>
> (Grower)

Final Comments and Recommendations

Here are recommendations for growers looking at having someone else manage their precision ag data and provide analytical services to generate Rx maps or recommendations to farm operations. It is important to do your homework and make a decision that will allow you to have several years of consistent data management assistance.

Be engaged in all discussions related to data management. You have to understand how data is

> "We, as suppliers, all operate different precision ag programs with one single goal in mind, to maximize fertility while helping to protect our environment."
>

being managed and who has access. Ask questions and understand while remembering those providing data management solutions are there to help you improve your management and ultimately your farming operation.

Look for partnering companies to provide assistance on precision ag data transfer and management. As an example, a machinery dealer working with an ag retailer in unison providing precision ag solutions for whole farm operations. This idea may be new to many, but those partnering will have more robust data solutions and reduce frustration. They will want the complete data system (hardware and software) to work seamlessly for you.

- Look for partnerships and representatives of the companies you trust.

- Look for Software solutions with capabilities to view, upload, and download data on the web and mobile electronic devices. You should be able to view on any mobile device. These are the solutions that will be around in the future.

- Find company representatives willing to clearly explain data security. The following are three questions to ask: 1) What assurance is provided that no one other than those with permission can access the data? 2) Is all my data password protected? 3) What additional security do you provide?

- Become familiar with online imagery tools such as Google Earth.

> "People struggle with basic setup information. There needs to be consistency in naming fields as operators may call fields something different than what is programmed."
>
> (Precision Ag Specialist)

> "Data integrity and collection efficiency would be made much simpler and adopted by more growers if it moved around more seamlessly, and that [servers and cloud technology] is where data management is headed."
>
> (Ag Media)

Note to Ag Data Management Solution Providers

Provide simple, easy-to-understand solutions. Growers are going to entrust you to provide the analytical capabilities, but you need to provide web portals that are intuitive to use.

Ensure an individual farmer has more than ample opportunity to provide input during the analysis step. More times than not, the farmer's insight as a data layer will provide more meaningful input than all other data layers.

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