

Measuring For Success: Precision Agriculture

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Introduction to Precision Agriculture

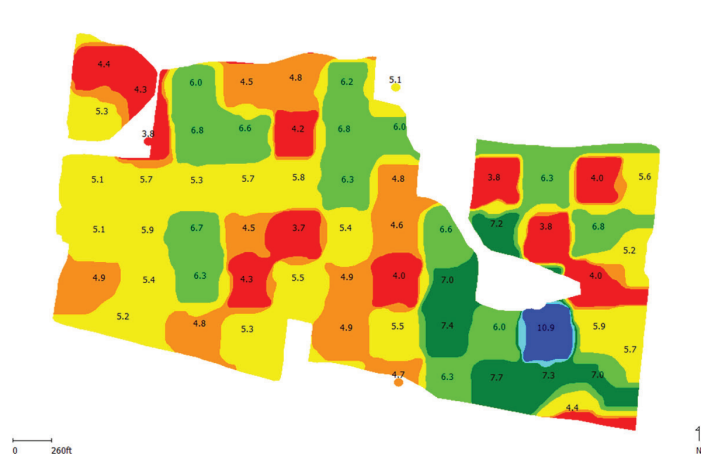
The idea of precision agriculture or site-specific field management is built on the concept that if we can measure and document crop and landscape differences and where they occur, then producers can manage these differences to their best agronomic, economic, and environmental benefit.

Documenting differences across a landscape lends itself to using a map as the most efficient way to capture, store and communicate information at any given location. With the advent of GNSS/GPS systems that capture geographic positions, along with the availability of mobile computing to log those positions, the mapping of any kind of field information at its source is now becoming routine.

Most growers already have many of the tools needed to capture useful data and deliver site specific crop production plans. Geo-referenced yield and soil test information are the most essential elements in this realm, because their use outreaches the confines of one cropping season.

What do you need to pair information with location?

- GNSS for positioning (auto-steer/guidance)
- In-field data logging (monitor/computer)
- Flow control/monitoring (meter/sensor)
- Training and support
- Keeping data that has been logged
- Software to work with the data
- Agronomic support, to identify the conditions that require treatment, where those conditions are resulting in variation in the field, a plan for treating your field using this additional information, and measuring the results (often with yield monitoring)



Map showing distribution of CEC values from site-specific soil sampling.

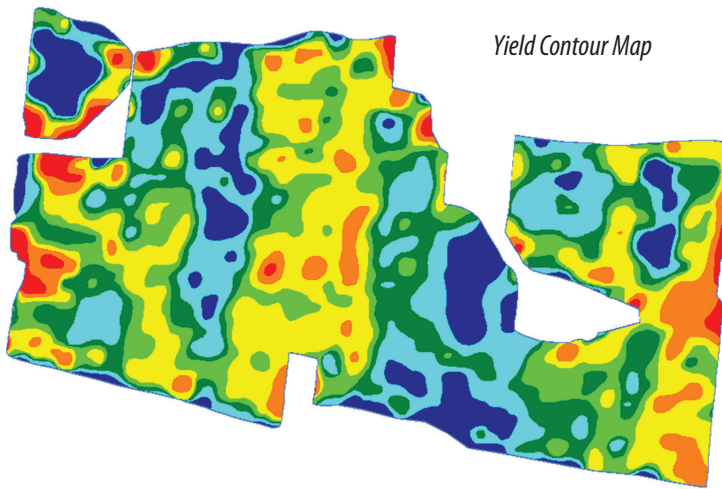
The Power of Maps:

Maps are the visual spreadsheet of any data set. Legends, either detailed or simple, help us understand patterns, location, and magnitude of differences.

Using a “Birds Eye View” or 3D view map will enable the producer to graphically represent soil test data, imagery data, and data from field activities (ie. yield monitoring) to either assist with making agronomic or operational decisions.

In addition, maps are not just pictures of data. They can also enable mathematical calculations such as nutrient removal rates by the crop, nutrient use efficiencies, and profit/loss analysis. Yield maps (particularly for potatoes) do not have to show exact harvest values to provide value; instead, showing relative yields and differences across the field can still provide significant value for the producer.

Maps from one operation can also serve as a useful backdrop to other operations, and multiple sources of data can be “layered” to provide additional context. Additionally, today’s technology enables us to carry our maps with us in the field, share our data with trusted advisors, or store that data for future decision making down the road.



Working with Yield Maps

Data from site-specific soil testing tends to be displayed on a grid, and will result in maps that are generally easier to read on first glance. In contrast, data coming from sources such as yield monitors can appear at times to be more variable.

It is essential when working with machine-collected data to clean it up, scale it, use it as a diagnostic tool to refine calibrations to your monitoring devices, and store it for future analysis with the proper identification. Most GIS software provides tools to help clean and calibrate data in order to make the most use of it, often by creating different zones rather than individual data points.

When looking at resultant yield maps, it's important to remember that they show us the cumulative response to yield limiting factors. They don't tell us why yield is higher or lower, but they indicate where there is variation in the field, providing a tool for investigating the reasons for yield variability. Straight lines on these maps are generally man-made influences, while irregular shapes tend to be naturally occurring influences.

Making the Value Proposition:

The use of precision agriculture tools all comes down to having more information to make management decisions...that is where the economic return lies. Collecting and using site-specific data can enable the producer to use variable rate fertilizer and lime application, avoiding over-application in some parts of the field while ensuring adequate rates in other areas. This has the potential to produce significant, long-term savings on crop inputs.

Use of site-specific data can also uncover other operational efficiencies, including not planting parts of fields

that are unlikely to produce economically viable crops, or identifying where beneficial changes can be made to field operations or field geography to reduce equipment operation, fuel use, erosion and more.

Working with Your Data:

Some key messages to consider relating to working with your data:

- **Log it:** read instructions, practice with equipment before the harvest season, and learn how to offload your data (USB or wireless)
- **Map it:** store, organize, rename, merge, and clean data as needed. Upload a clean field list to your monitors and necessary maps and product lists to application equipment.
- **Keep it:** ensure that you have a reliable method to store and access your data for future use.

8 Easy Data Tips:

1. Collect as much map-based information as is possible and practical from your operation.
2. Keep a copy of all "original" or source data from the field.
3. House data in a computer software package to view and store data for the long term.
4. Follow good "data hygiene," including using the best GNSS/GPS possible, using recommended calibrations and setup for your particular equipment, keeping in-field and in-office data management software current, backing up data often to a secure, off-site location, and requiring service providers to provide you with copies of digital map files, not just paper copies.
5. Commit to learning new ways of using this information in your business.
6. Do not wait for a perfect system to be complete. It is all part of a fluid and ever-changing process and always has benefits.
7. Team up with service providers or colleagues to share data, learning, and insights.
8. Actually look at your maps and information. Ask questions about it! Be curious and become "map literate!"