Ag101: Precision Agriculture

Extension
UNIVERSITY OF WISCONSIN–MADISON
DUNN COUNTY

What is Precision Agriculture?

Precision agriculture is a way for farmers to optimize economic returns by managing soil variability and limiting excess application of cropping inputs. Instead of one application rate across a field, technologically advanced equipment allow crop inputs to be applied at varying rates across a field.

To establish the most efficient application rates of inputs, large amounts of data about a field need to be collected first. Important data includes soil information, yield mapping, normalized difference vegetation index (NDVI) and satellite imagery for the field.

- **Soil sampling** attempts to determine the varying nutrient levels within a field. Precision agriculture requires greater soil sampling intensity to accurately evaluate this variability.
- **Yield mapping** plots the actual crop yields across the whole field instead of estimating a field wide average.
- **Normalized difference vegetation index** (NDVI) is a graphical indicator that can be used by sensing devices to determine if plant growth is normal during the growing season.
- **Satellite imagery** is used as a background picture for maps and to establish GPS coordinates used by application equipment.

This data is utilized when greating prescription maps used during crop input applications. **Prescription maps** are a combination of data from several sources:

- Crop yield
- Soil type
- Soil fertility tests
- Soil moisture
- Land characteristics or land capability classes

Technology

Precision agriculture uses the most innovative technology in agriculture to achieve a high rate of accuracy while limiting field variability.

Remote sensing identifies and collects information without having to physically touch the object being studied. Precision agriculture uses remote sensing to monitor crops during the growing season. Satellites and unmanned aerial vehicles (UAVs) are the most common types of remote sensing devices used.

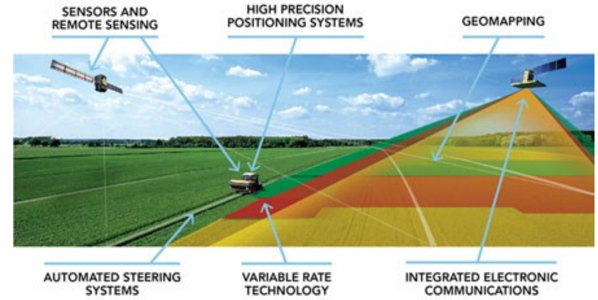

Photo: cema-agri.org

Technology (cont'd)

Global positioning systems (GPS) are a network of orbiting satellites that determine the precise location of someone on Earth. GPS is essential to precision agriculture. It is used to identify field and equipment locations when using satellite imagery, unmanned air vehicles (UAVs), application equipment, and various other precision agriculture tasks.

Unmanned air vehicles (UAVs) are small airborne vehicles that are used to quickly evaluate crops within a field. The types of UAVs include:

Fixed wing UAVs move at speeds from 27 to 56 mph and fly higher than rotor type UAVs. Many have autopilot capabilities. Launching fixed wing UAVs may require help using mechanical launching.

Photo: agriexpo.online

Rotor type UAVs move at speeds from 0 to 30 mph and fly lower than fixed wing UAVs. Most rotor type UAVs have autopilot capabilities. Rotor type UAVs do not need to be mechanically launched.

Photo: pixabay.com

In late August of 2016, the Federal Aviation Administration (FAA) relaxed regulations for allowing the use of UAVs for agriculture and commercial use.

Equipment

Application equipment that is used for precision agriculture tends to be bigger and heavier than traditional agriculture equipment. Planters widths from 40 to 80 feet are common place in precision agriculture, as well as sprayers that are 90 to 120 feet. This equipment speeds up planting and harvesting because it takes fewer passes to complete a task, yet provides greater precision due to the use of new technology such as remote sensing and GPS.

Application

Precision agriculture can be very successful when all of the technology, equipment, data, and mapping are pulled together. Various data sources aid in achieving more accurate nutrient applications, pesticide applications, seeding rates, and various other farming tasks. All of the information from the data allows farmers to accurately apply nutrients, manage soil variability and optimize return on their investment in cropping fields.

Source: Schulte and Walsh. *Management of Wisconsin Soils. Extension publication A3588, P29 to 43*

For more information please visit Extension Dunn County website at https://dunn.extension.wisc.edu/