

Precision Ag

Lesson 2 What it can do.

Objectives:

1. Learn about the differences and relationship between Hardware and Software
2. Learn about the different ways Precision Agriculture is used.
3. Learn how precision agriculture is useful for different scales of operations and how it can be used to fit the needs of their operators.
4. Learn what inputs can be controlled using precision agriculture.
5. Learn what maps are created using Precision Agriculture and how to interpret what the maps show.



Hardware

- Any electronic technology system consists of Hardware and Software
 - Hardware is the mechanical equipment
 - Software is the computer program that controls what the hardware does.
 - As a reminder.....
 - Within precision ag there are three main types of hardware:
 - Sensors
 - Meters
 - Monitors

Sensors

- Sensors (as the name implies) “sense” somethings
- Sensor can use lasers, light emitters, thermometers, hygrometers, impact plates, scales and gauges.
- Sensors can monitor characteristics of the environment:
 - location on a map, when a seed is planted, how close the seeds are, if a seed is missing, if more than one seed is planted, and how much of something is being used.
- **SmartFirmer** is an example of a sensor being used in Precision Planting.

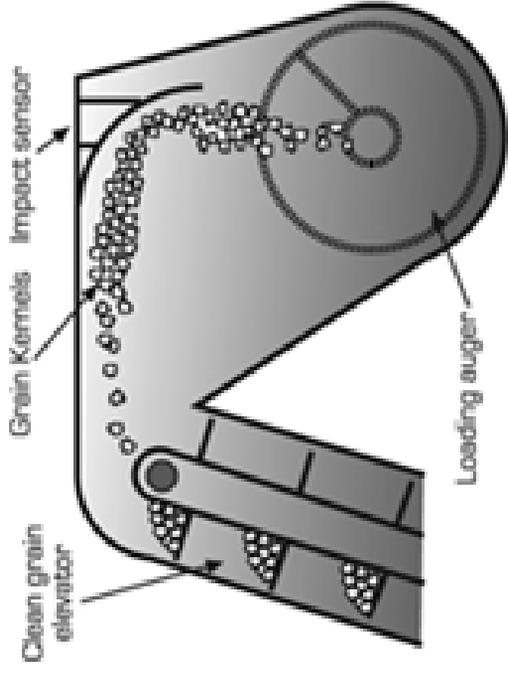
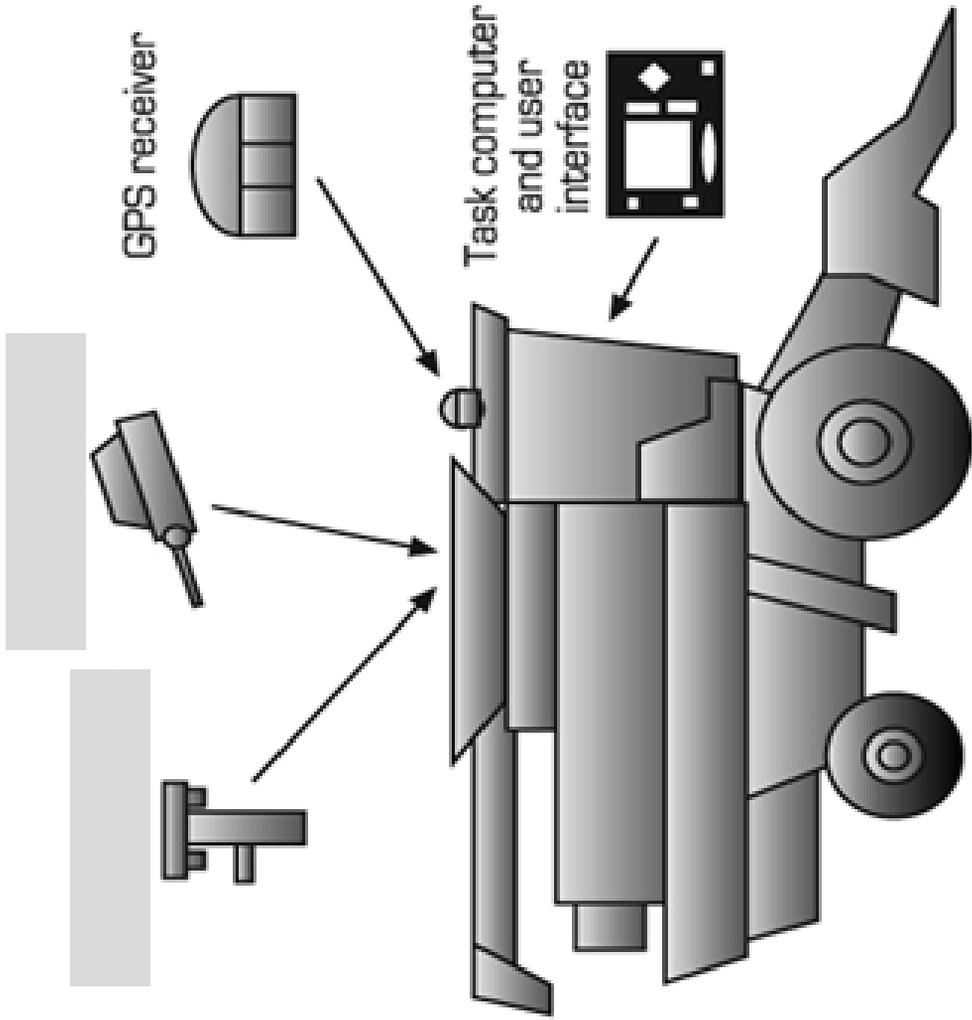
Sensors - Precision Planting SmartFirmer

A SmartFirmer is an example of a very complex highly technical set or “array” of sensors.



Sensors - Precision Planting: Mass Flow Sensor & Moisture Sensor

- A second example and less complex or technical sensor is the Mass Flow sensor. This sensor measures the weight of the grain being harvested.
- A third example and less complex sensor is the Moisture sensor which measures the amount of moisture in the grain on a combine.
- Both these sensors are located on a combine near the flow of clean grain on the combine.

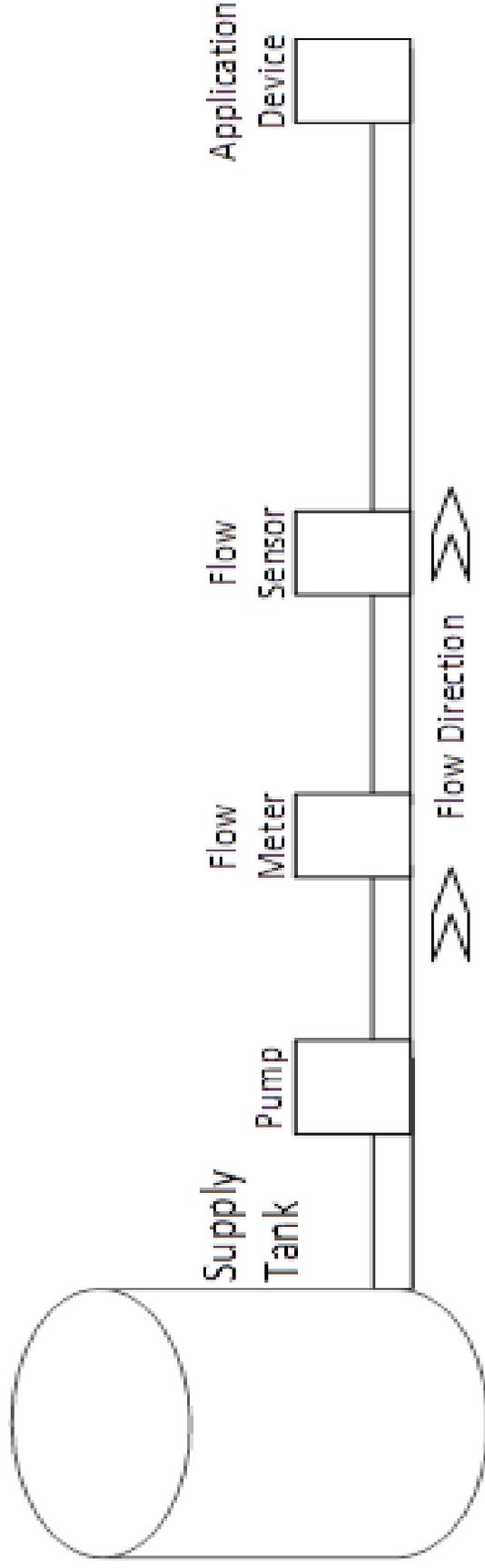


Meters

- A meter controls the amount of something that is applied
- An example of a meter is a flow meter.
- Flow meters are valves that are electronically controlled and work with a flow sensor to control the amount of fluid that is allowed to flow through a sprayer.

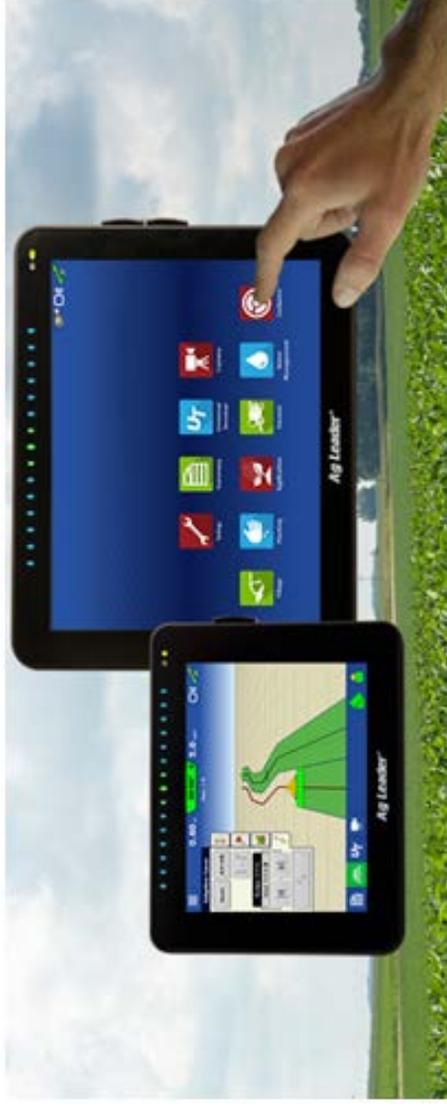


Simple delivery system



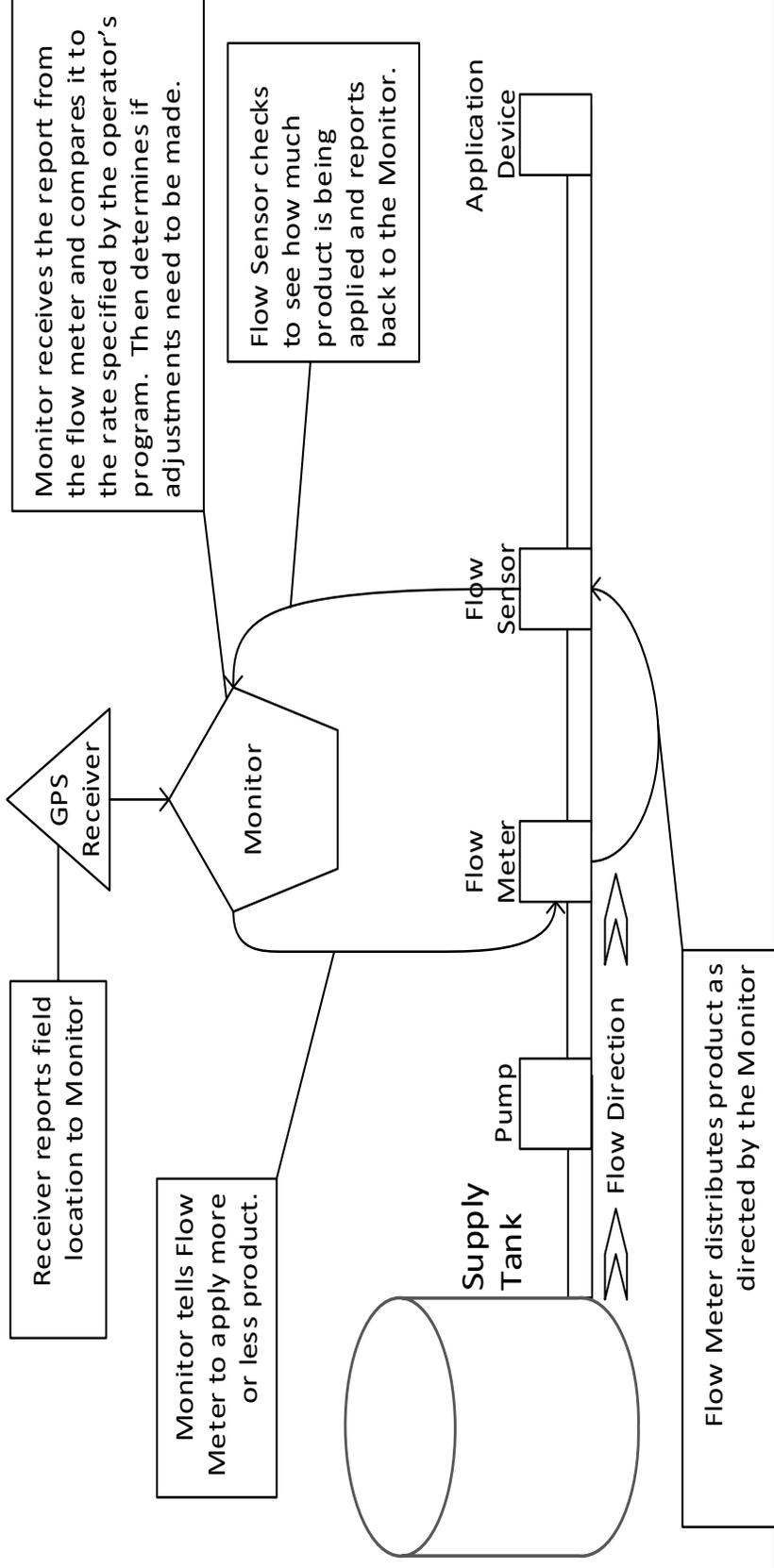
Monitors

- Pieces of hardware that contain the brains of the system.
- Monitors take in signals from sensors and interprets if any adjustments are needed.
- If changes are needed the monitor will send a signal to the meter to make the corrections.



Meters, Sensor & Monitor Review:

Below is an example of a complete Precision Ag system including many meters and sensors. The monitor captures all the information so it can be analyzed later for future planning and evaluation of management decisions.



What can be controlled??

- **Inputs** can be controlled by Precision Agriculture management practices.
 - Seed/Hybrid Variety - can change as the planter moves across the field
 - Seed Spacing - (seeding rate)
 - Seed depth
 - Irrigation
 - i. When it's time to water
 - ii. How much is applied
 - iii. Can be varied as the pivot moves across the field

What can be controlled??

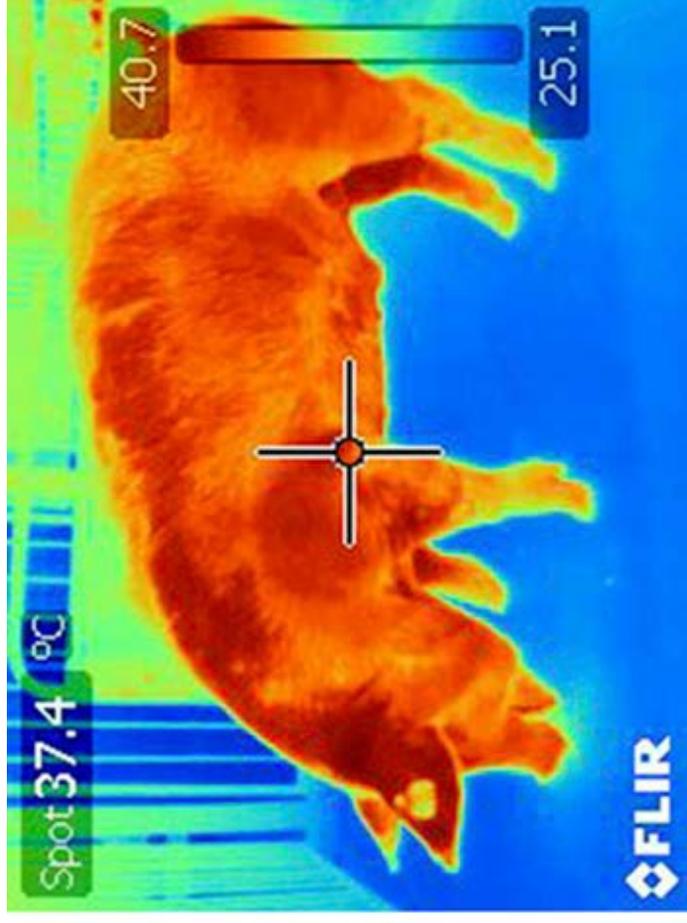
- Fertilizer
 - i. Initial
 - ii. Starter
 - iii. Subsequent
 - iv. Gradual
- Herbicides
 - i. Rate can be varied based on weed pressure
 - ii. Weed types can be ID
 - iii. Can be shut off in areas where it is against the law to apply (waterways)
- Fungicides

What can be controlled??

- Plant Health
- Soil moisture
- Soil Temperature
- Soil pH
- Organic matter
- Yield

What can be controlled??

- In Animals
 - i. Location
 - ii. Maximize milking
 - iii. Last time animal drank/ate
 - iv. body temperature
 - v. Heart rate
 - vi. Invisible fence (for grazing management)



Thermal Images show promise in determining heat tolerance for pigs and poultry.



Take a few minutes to complete a computer search on how collars, such as the one shown on this dairy cow, are used in the dairy industry today. Discuss your findings with your class.

Scalability of Precision Agriculture/Myths

- There are three Myths about precision agriculture among operators.
- 1) I have to be a big operation to use precision agriculture
 - 2) The operator has to implement an entire precision agriculture package across the operation in order to see a benefit.
 - 3) The operator has to buy all new equipment in order to implement Precision Ag, costing additional tens if not thousands of dollars. Any age equipment can be equipped with Precision Ag technology.

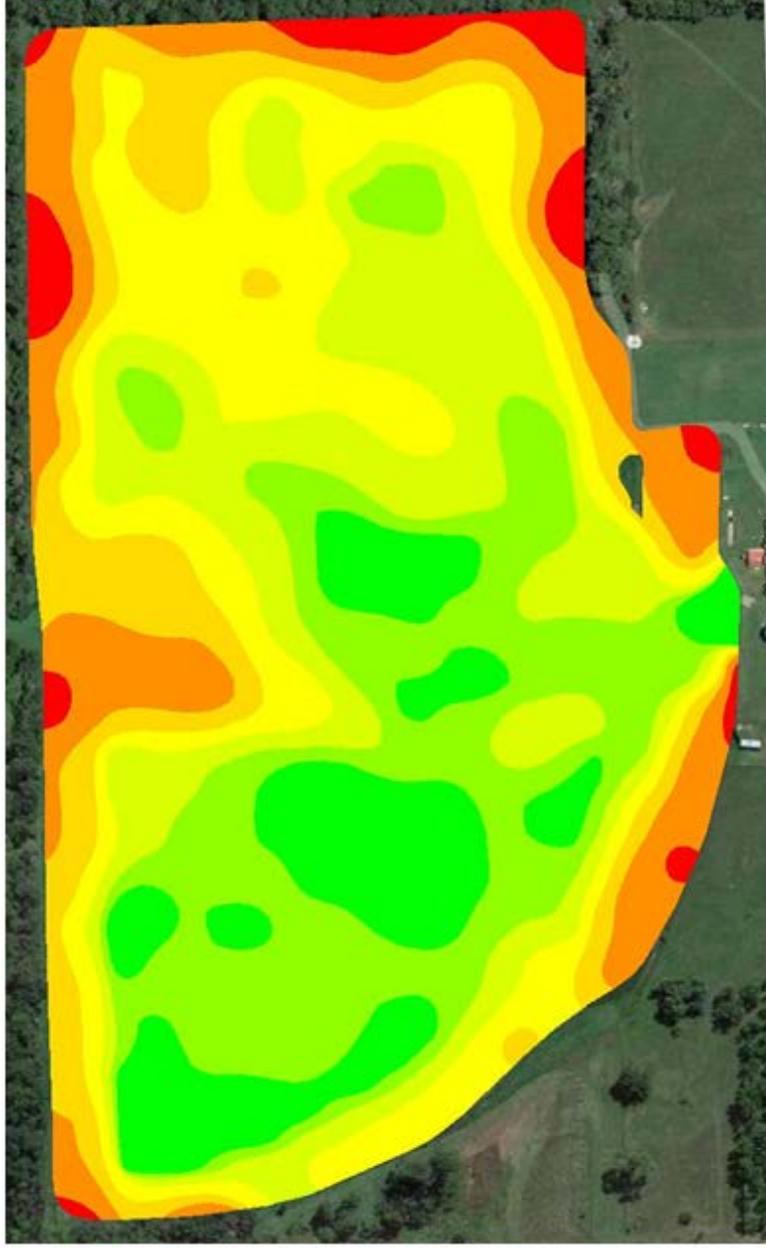
Three of the most well known vendors who set up older equipment with Precision Ag technology are:

Precision Planting, AgLeader & Raven Industries

Types of Precision Ag Maps

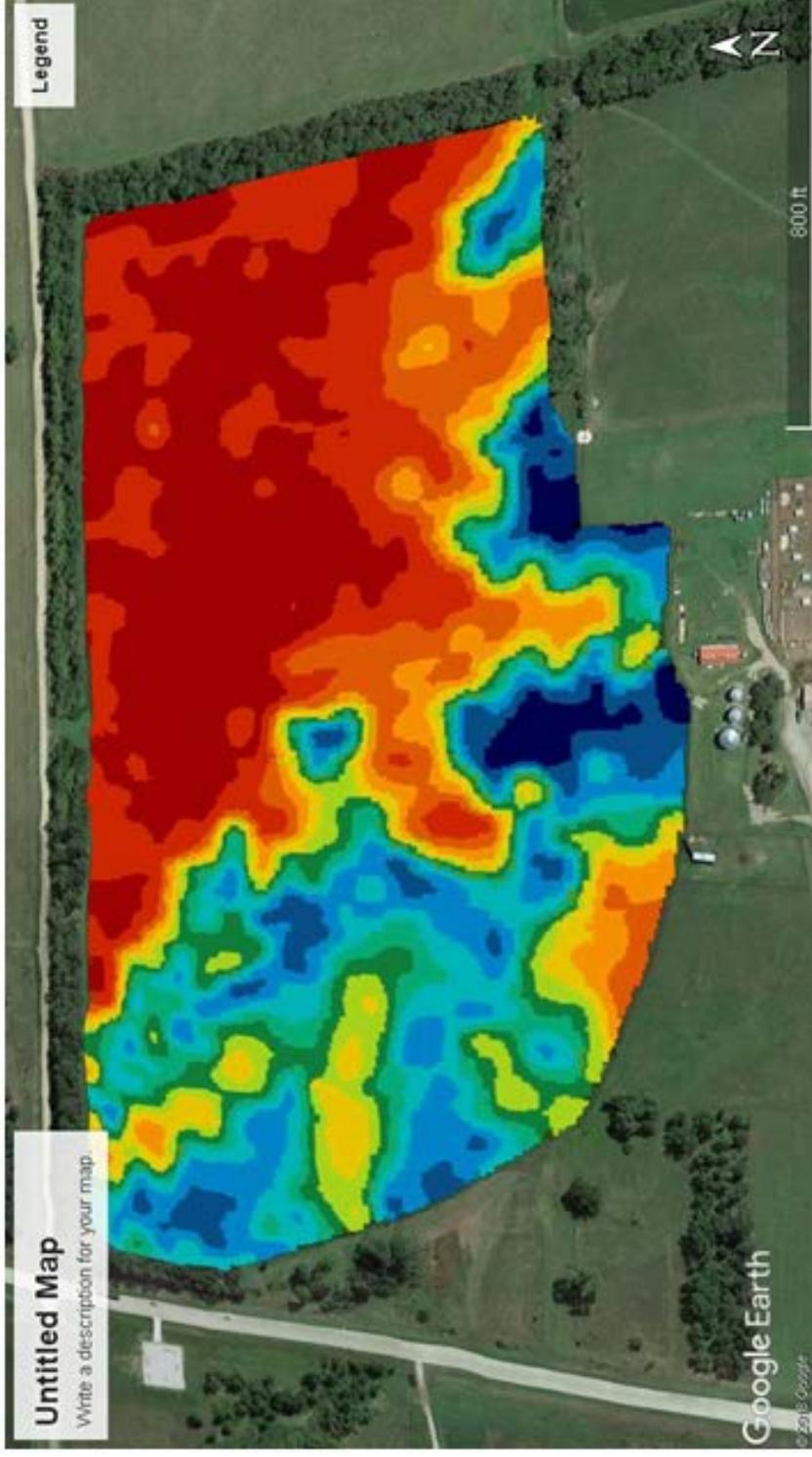
- Each map was produced when information was gathered.
- Each kind of map displays different kinds of data. Here are examples.

**layers are built in, starting with yield first. The following maps go in “order.



1. Yield Map

2. Subsoil Moisture Map



3. Nutrient Maps (fertility)

A) Organic Matter Map



3. B) Soil Phosphorus Map



3. C) Fertilizer Application Map



4. Water - Irrigation Application Map



Pros of Precision Agriculture:

1. Get more information about the operation
2. Make better informed decisions
3. GPS allows fields to be surveyed with ease
4. Yield and soil characteristics can be mapped
5. Non-uniform fields can be subdivided into smaller plots according to their specific requirements
6. Provides opportunities for better resource management
7. Could reduce waste and increase profitability
8. Minimizes the risk to the environment by reducing nitrate leaching and runoff

Students can add more

Cons of Precision Agriculture

1. Will take several years to gather the data needed to fully implement the system
2. Steep learning curve to analyze data
3. Data analysis is a time consuming project
4. Working with so much data can be daunting
5. Initial investment may be high

Student can add more