*Traditional Farming vs. Precision Agriculture*

- Compare/Contrast
  - How _____ is gathered
  - _____ of the data
  - _____ making and _____ based on data
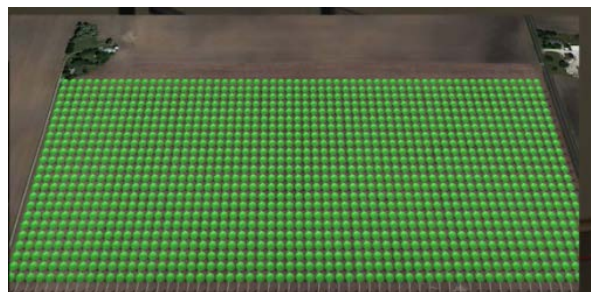
*Gathering Data*

| *Traditional Farming Practices* | *Precision Agriculture* |
|---|---|
| _____ piece of data gathered per location at _____ time. | _____ pieces of data may be collected at _____ location. |
| _____ time required for physical observations. | Data recorded _____. |
| Number of sites observed _____ due to time constraints. | Significantly _____ number of sites observed and recorded. |
| Accuracy dependent upon viewpoint of _____. | Data is accurate to level of equipment _____. |



The green pin indicates how often data is taken for this field using _____ observation.

Using _____ Ag, data can be gathered up to 200 times per second, and

when combined with a _____ receiver, the data can be mapped at each location recorded. Giving a coverage map looking like this.

*Detail of the Data*

| *Traditional Farming Practices* | *Precision Agriculture* |
|---|---|
| Detail is subject to amount of _____ observer has to record what is observed. Very _____. | Detail is _____ as observations are taken and recorded to the same level of accuracy. Very _____. |
| _____ observations are made per field making data _____ applicable as distance from point of observation becomes greater. | Because observations are taken _____, data is completely applicable to the _____ operation. |

*Decision Making and Implementation*

| *Traditional Farming Practices* | *Precision Agriculture* |
|---|---|
| Decisions are applied to _____, broad areas of the operation such as an _____ field or a section of a field. | Decisions are applied to much _____ areas because observations are being taken _____ the time. |
| All adjustments must be made _____. | Many adjustments are made _____ based upon parameters set in equipment because of _____. |
| Management implemented is applied to large areas based on very _____ data. | Management implemented is applied _____ to an area based upon its _____. |

*Where Does the Data Come From?*

- Websites

- Remote Sensing

- Digitized Historical Maps

- Physical Sampling

- Equipment with Sensors Installed

*Websites*

- _____ Data
  - _____
  - _____
  - Etc.
    - https://www.usclimatedata.com/
    - https://www.wunderground.com/
    - https://www.climate.gov/
    - https://www.ncdc.noaa.gov/
    - https://www.agweb.com/weather/temperature-band/
    - https://weatherspark.com/

*Websites (continued)*

- _____ weather data analyzed for _____

  _____ _____ or Heat Units.

  - Growing Degree Days (GDD) or Growing Degree Units (GDU)

  - Organisms such as _____, insects, etc. require a certain number of _____ units to reach different stages of _____.

  - (_____ Temp + _____ Temp)/_____ - _____ Temp

  - Example for corn: (83 + 61)/2 - 50 = 22 GDD for that day

  - NOTE: The max temp used cannot exceed _____ Degrees F and the min temp used cannot be less than _____ Degrees F.

- http://www.nutrien-ekonomics.com/tools-to-calculate-fertilizer-needs/calculators/gdd/

- http://www.greencastonline.com/growing-degree-days/home

*Remote Sensing*

- Analyzed _____ or _____ images
  - https://farmlogs.com/
  - geovantage.com/
  - Can supply crop _____ images on a given date.

- A _____ _____ is drawn around a field using a web tool.
  - http://www.gmapgis.com/
  - Field boundary is used to identify _____ _____ _____ (AOI) on which to gather data.
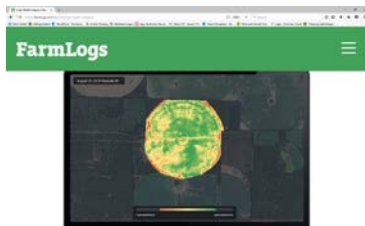


Example of an

image from FarmLogs.



Example of imagery

from

Geovantage.com.

## Digitized Historical Maps

- _____ Maps

- _____ Maps

  - This type of data experiences very _____ change over the years.
  - Maps from 5, 10 or even _____ years ago are still valid and valuable today!

## Physical Sampling

- Example - Soil Sampling
  - Identifies:
    - Soil _____
    - Soil's ability to _____ water
    - Soil's ability to _____ water
    - Fertility _____
    - _____ needs

## Soil Sampling

- Drive to the field to be _____.
- Use a soil _____ to remove a sample of soil from the ground.
  - May be taken from different _____.
  - _____ samples may be taken within a zone.
    - All soil samples within the zone are _____ to get an average.
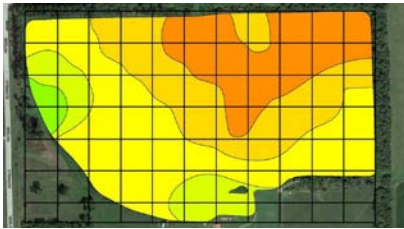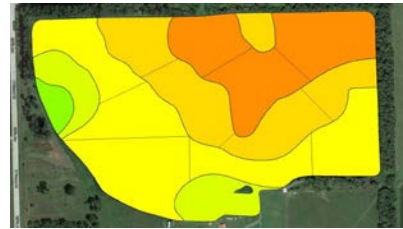- Soil samples are sent to a _____ for analysis.

Using a soil probe to collect
a soil sample.



Preparing soil for shipment to
the lab for analysis.



***Grid Sampling*** - a soil sample
is taken within each square across
a field. This is very _____
consuming and expensive.



***Zone Sampling*** - _____ soil
samples are taken and is less costly
for _____ testing. In addition, some
detail is lost.

*Sensors*

_____ Data Collection

- Examples:
  - Soil _____
  - Soil _____
  - _____
  - _____ matter

_____ Data Collection

- Examples:
  - Planting
    _____
  - Seed _____
  - Seed _____

Need to be known on a higher

level of _____
so sensors provide more precise
rather than general information.

Sensors in the SmartFirmer can capture

_____ points of data such as seed spacing, soil moisture, organic matter, etc.

Sensors can also be found on weather stations to gather wind

_____, speed, rainfall, etc.

## *Saving and Transferring Collected Data*

● When data is collected it is stored in a _____ memory module _____ the equipment.

● Stored data is transferred by a variety of methods.
  ○ _____ to a portable memory module.
    ■ _____ Drive, SD Card, etc.

  ○ Transfer directly to _____ or tablet using a cable.

  ○ WiFi or cellular transmitter sending it to the _____ to access directly.