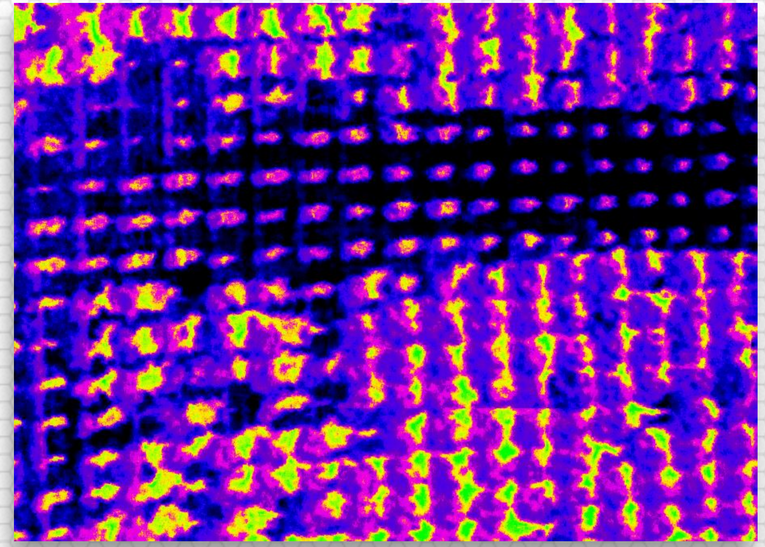
The Leader in Agricultural Drone & Data Solutions

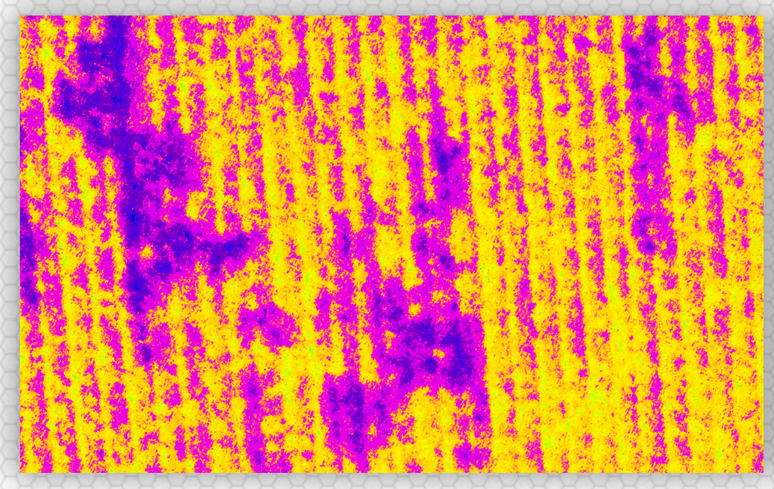
Practical Uses of UAS Data For Managing Inputs

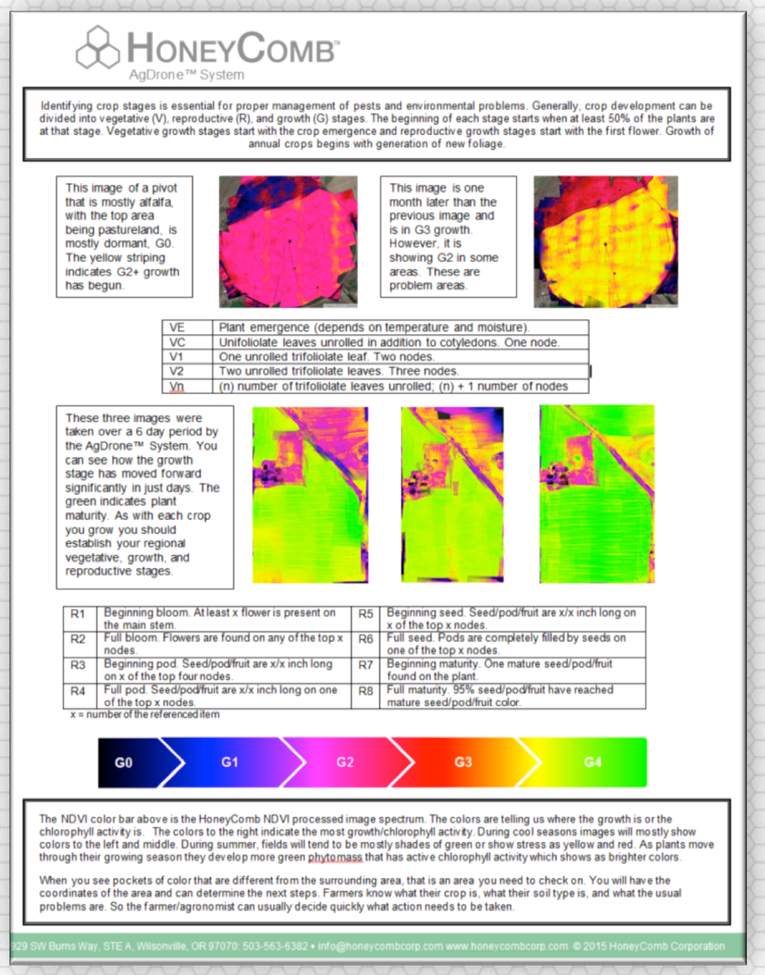
What we will cover today:

- Concept: Practical versus Scientific NDVI
- NDVI can show where to spray (apply)
- Why Farmers care
- Healthier Crops – Yield Improvement
- UAS adds to your current data sources
- Technology continues to change how we farm

Concept: Practical versus Scientific







HONEYCOMB™
AgDrone™ System

Identifying crop stages is essential for proper management of pests and environmental problems. Generally, crop development can be divided into vegetative (V), reproductive (R), and growth (G) stages. The beginning of each stage starts when at least 50% of the plants are at that stage. Vegetative growth stages start with the crop emergence and reproductive growth stages start with the first flower. Growth of annual crops begins with generation of new foliage.

This image of a pivot that is mostly alfalfa, with the top area being pastureland, is mostly dormant, G0. The yellow striping indicates G2+ growth has begun.

This image is one month later than the previous image and is in G3 growth. However, it is showing G2 in some areas. These are problem areas.

VE	Plant emergence (depends on temperature and moisture).
VC	Unifoliolate leaves unrolled in addition to cotyledons. One node.
V1	One unrolled trifoliolate leaf. Two nodes.
V2	Two unrolled trifoliolate leaves. Three nodes.
Vn	(n) number of trifoliolate leaves unrolled; (n) + 1 number of nodes

These three images were taken over a 6 day period by the AgDrone™ System. You can see how the growth stage has moved forward significantly in just days. The green indicates plant maturity. As with each crop you grow you should establish your regional vegetative, growth, and reproductive stages.

R1	Beginning bloom. At least x flower is present on the main stem.	R5	Beginning seed. Seed/pod/fruit are x/x inch long on x of the top x nodes.
R2	Full bloom. Flowers are found on any of the top x nodes.	R6	Full seed. Pods are completely filled by seeds on one of the top x nodes.
R3	Beginning pod. Seed/pod/fruit are x/x inch long on x of the top four nodes.	R7	Beginning maturity. One mature seed/pod/fruit found on the plant.
R4	Full pod. Seed/pod/fruit are x/x inch long on one of the top x nodes.	R8	Full maturity. 95% seed/pod/fruit have reached mature seed/pod/fruit color.

x = number of the referenced item

G0 G1 G2 G3 G4

The NDVI color bar above is the HoneyComb NDVI processed image spectrum. The colors are telling us where the growth is or the chlorophyll activity is. The colors to the right indicate the most growth/chlorophyll activity. During cool seasons images will mostly show colors to the left and middle. During summer, fields will tend to be mostly shades of green or show stress as yellow and red. As plants move through their growing season they develop more green phytomass that has active chlorophyll activity which shows as brighter colors.

When you see pockets of color that are different from the surrounding area, that is an area you need to check on. You will have the coordinates of the area and can determine the next steps. Farmers know what their crop is, what their soil type is, and what the usual problems are. So the farmer/agronomist can usually decide quickly what action needs to be taken.

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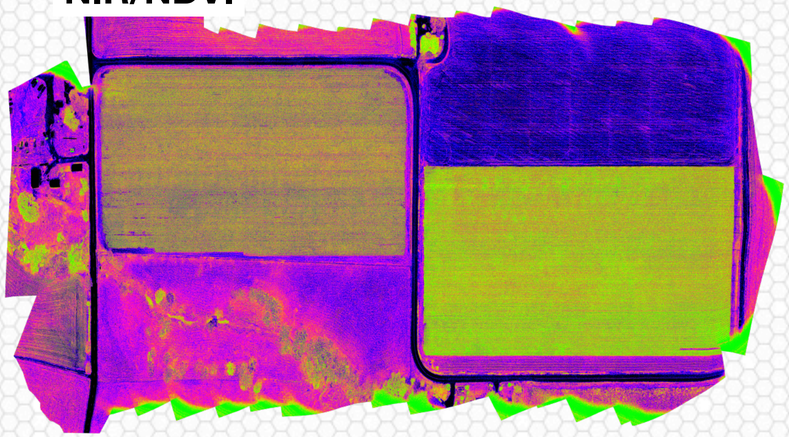
NDVI shows you variances

NIR/NDVI



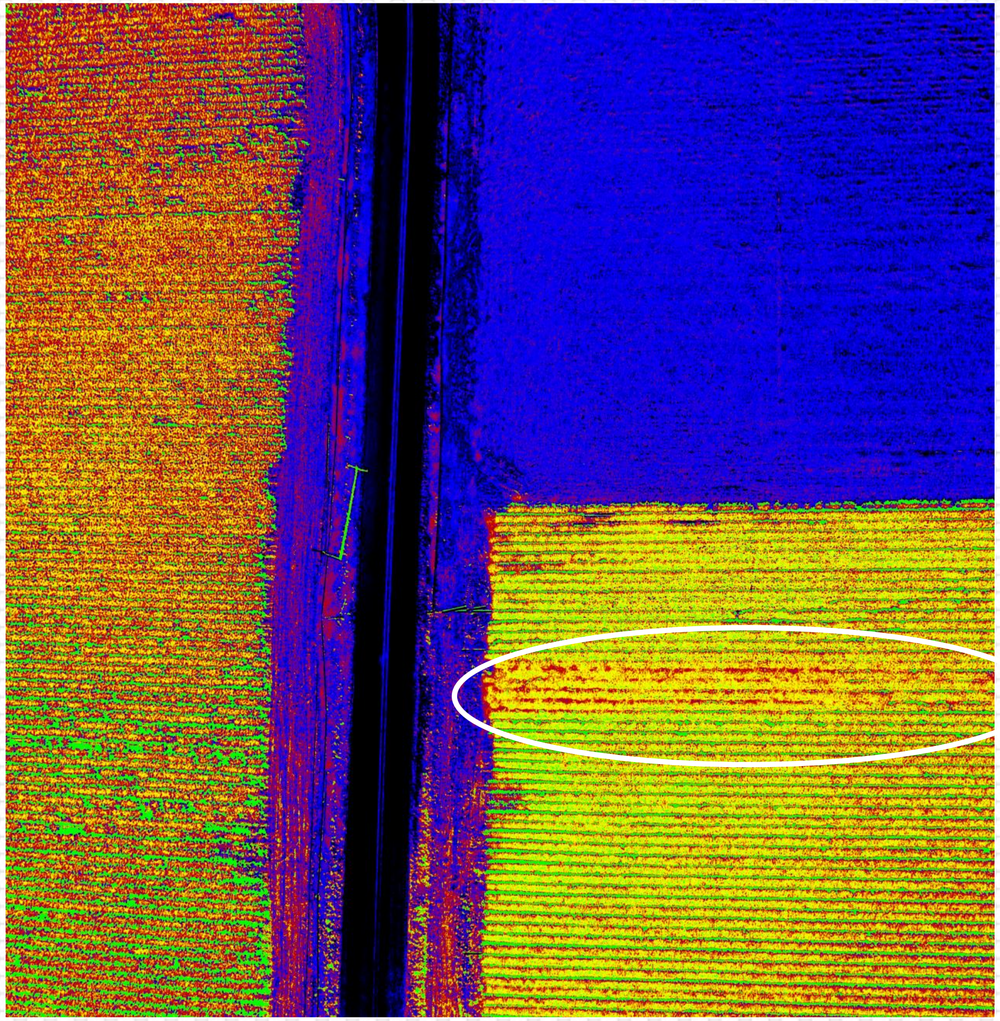
Crop stress detection

Visible

Maps for scouting/measure

- Zoom Capability
- Images Georeferenced
- Automatically Triggered
- Export: TIFF, JPEG, XML…
- Simultaneous Data Collection

A closer view



UAS shows 100% of the field versus 10 to 15%

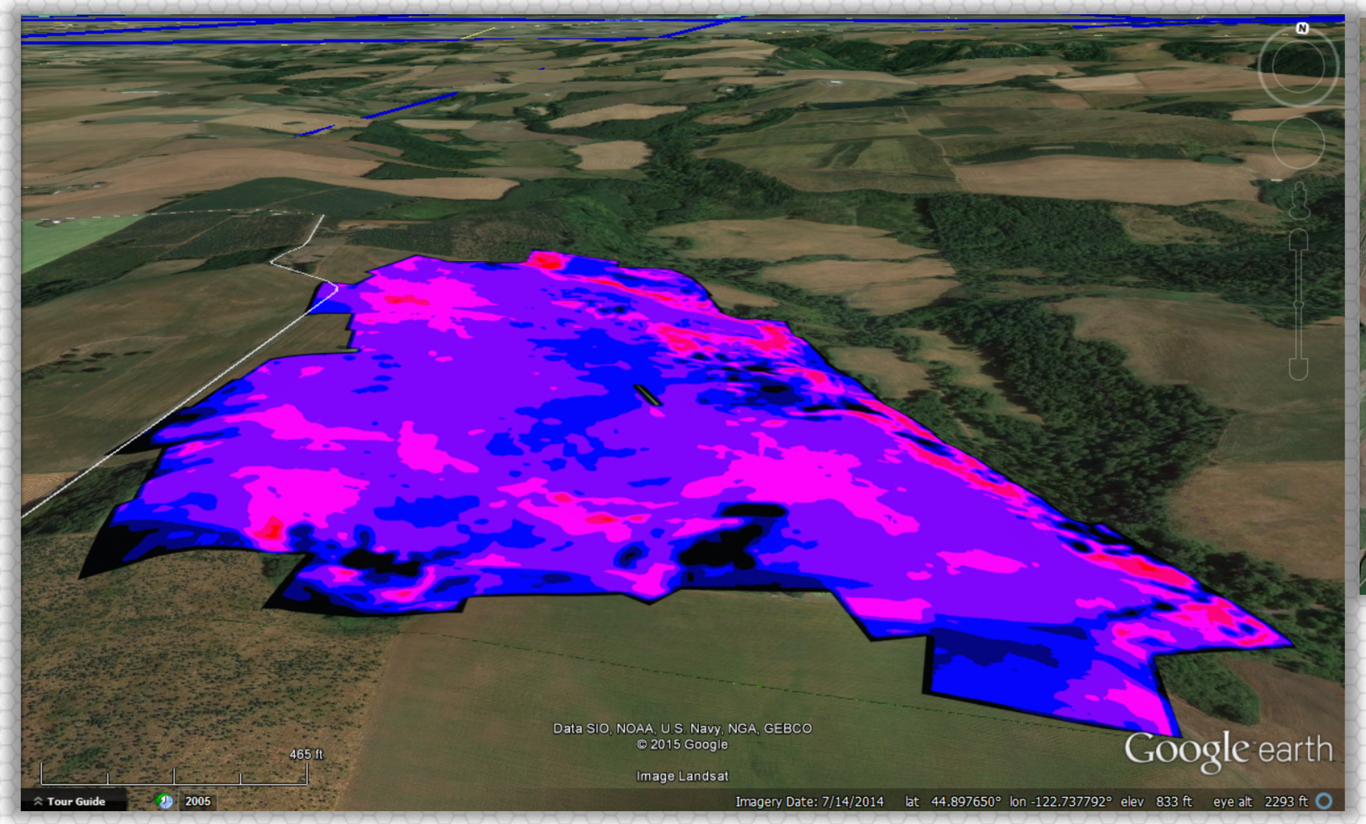
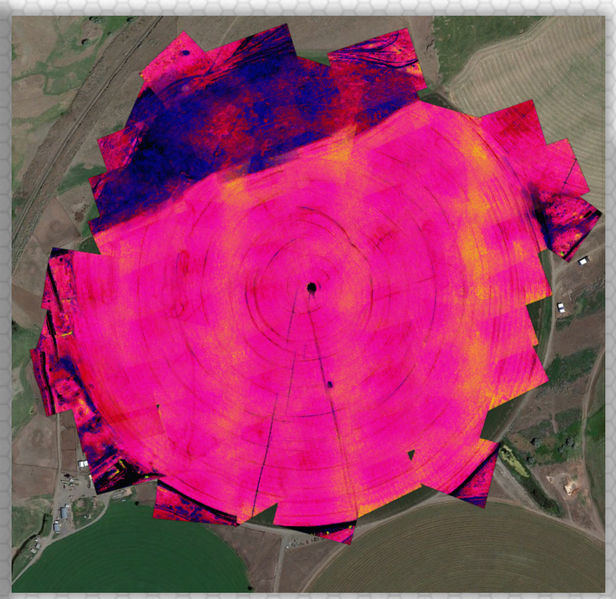
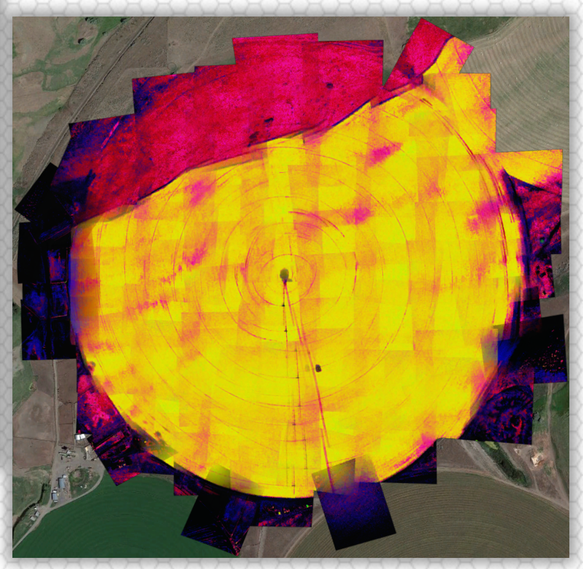


Figure 1: NDVI zone map of an Alfalfa field. Stressed areas were identified using aerial imagery from the AgDrone™ System.



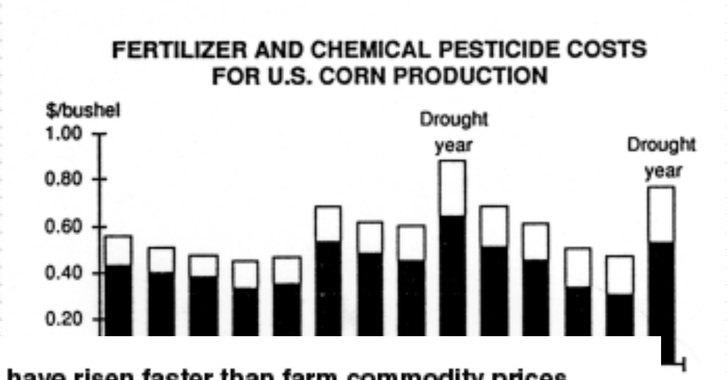


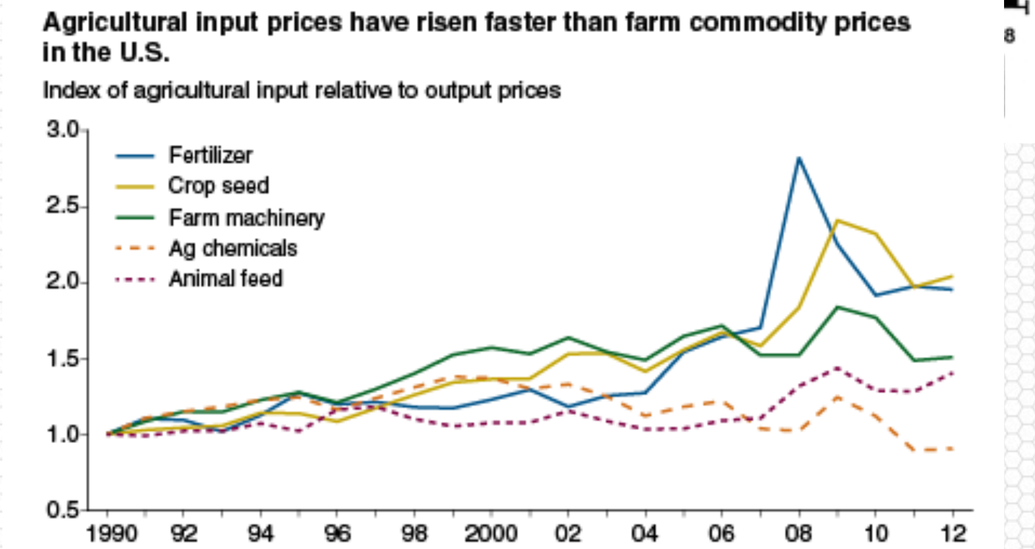
NDVI Color Legend

Figure 2: NDVI imagery used to show growth difference one month later. Image on the left was a March flight, while the image on the right is the same field in April.

Why Farmers Care

- Spray 25% to 50% less
- Chemical costs drop
- Labor & Fuel costs drop





Healthier Crops - Yield Improvement

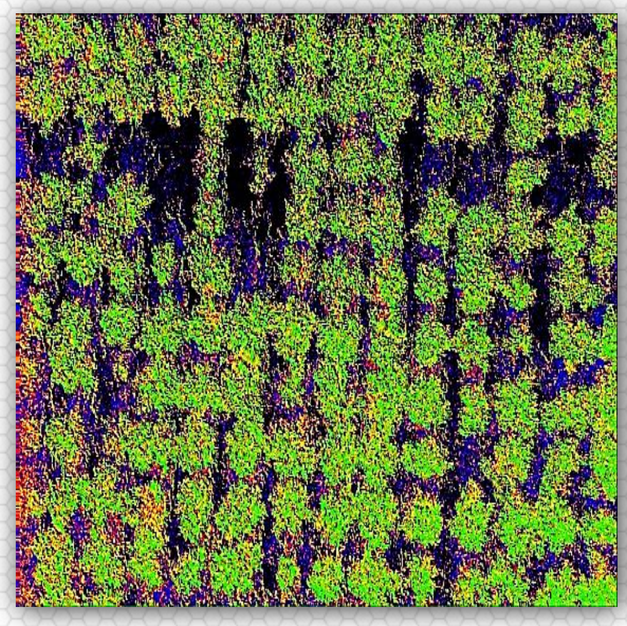


Figure 1: NDVI image of a Hazelnut orchard. Stressed trees were identified using aerial imagery from the AgDrone™ System.

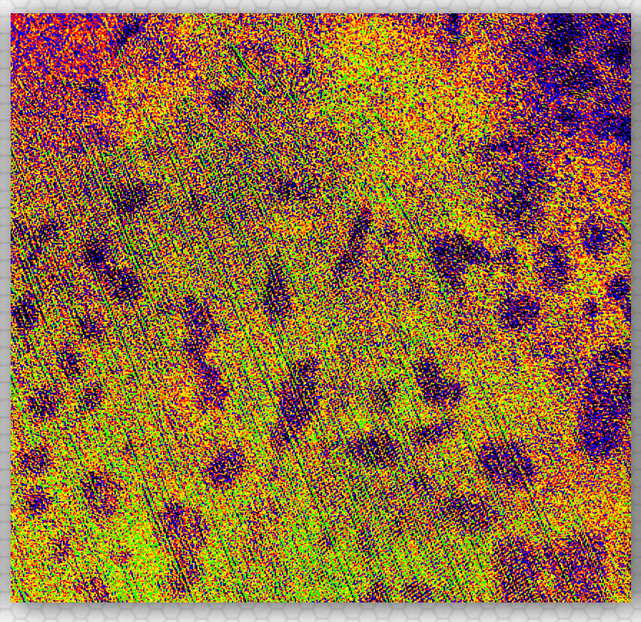


Figure 2: NDVI aerial image of a wheat field. Our system was able to detect the presence of a wireworm problem in the field.

Figure 3: Visible imagery used to check sprinkler line for adequate performance. The entire line was imaged during the flight.

Figure 4: A farmer used this imagery to get an estimated count of his squash in this particular field.

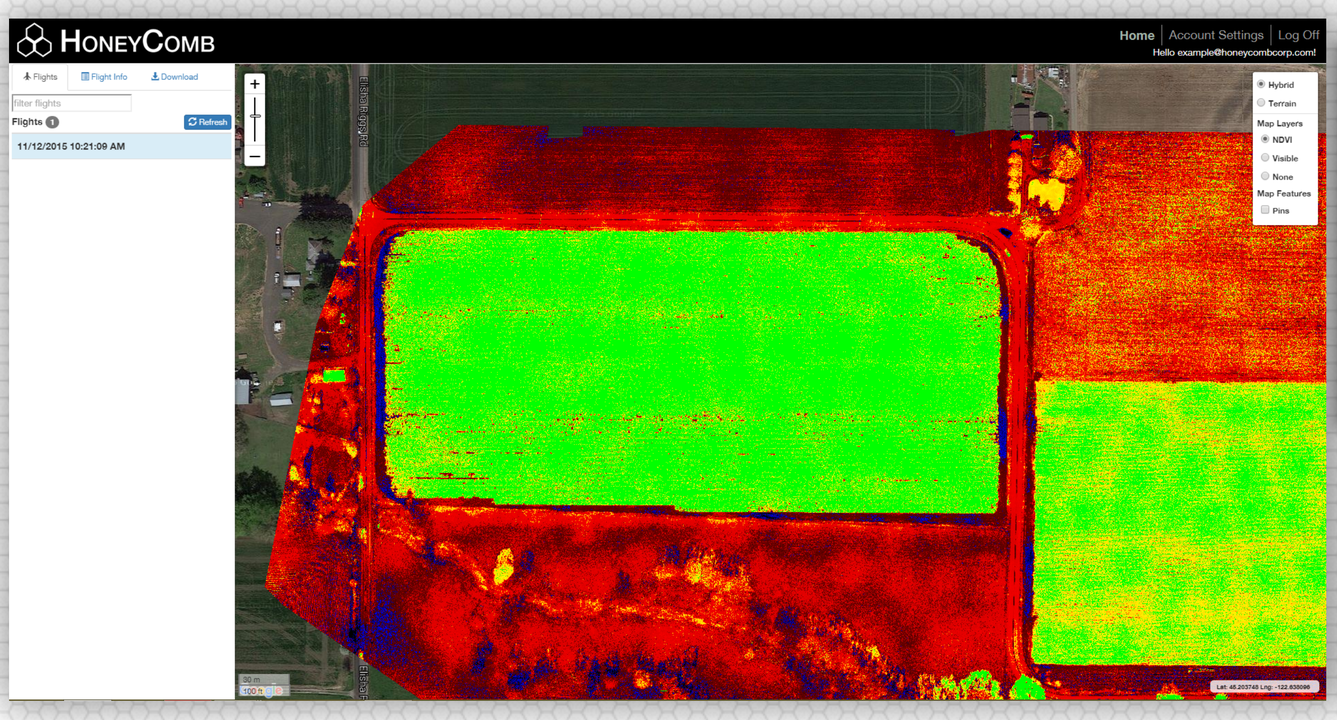
Identify Stress, Irrigation Problems, Damage & More…
Scouting on foot is slow and covers limited ground

UAS adds to your current data sources

- Capture and use data today
- You do not have to wait for anyone else to capture and act on the data
- Compare and contrast to airplane and/or satellite data

Exporting UAS Data

This is what the data viewer looks like.



Flight Data: weather, field size, flight time

Exports to Georeferenced files

TIFF, JPEG, KMZ…

Data goes into your variable rate systems.

Our data files will work with your system.

We do not use a proprietary file formats.

UAS Data and Variable Rate Equipment

More Knowledge

Know more faster

Simplifies Decision Making

Reduces Input Costs
(water, chemicals, etc.)

Import to Sprayers

Zone Maps for Variable Rate

Upcoming Shape Files

Measuring Yields

Tune up yields

Reduce irrigation costs

Diagnostic Speed & Efficiency

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Questions

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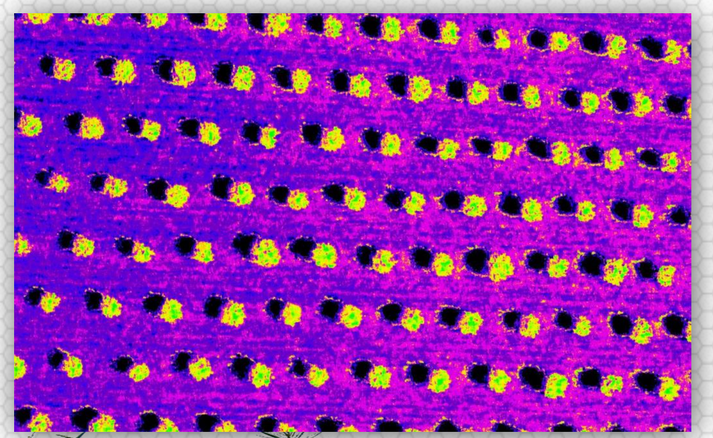
AgDrone™ System

Precision Agriculture



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