Managing Vegetables with Aerial Imagery

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Take Home Points

- Plane-Based Imagery Produces Geo-Referenced Scans of Fields Using Different Types of Imagery
- Aerial Imagery of Bare Soil Can Map Tile Lines, Poorly Drained Areas, Soil Erosion, and Soil Properties
- Aerial Imagery of Vegetable Fields Can Count Crop Populations, Detect Crop Damage, Pest Outbreaks, and Monitor Crop Growth & Development

Mapping Fields

- Step 1: Load or Draw SHP file into Flight Plan
- Flight Plans
- Step 2: Fly the Fields At the Right Time Of Day and Weather Conditions
- Number of Pictures, Overlap, & Resolution
Mapping Fields

Step 3: Imagery Processing Delivered the Day After Flying

Types of Imagery Used to Scan Fields

- **RGB**: Erosion, Weeds, Soil Properties
- **Enhanced Color**: Drainage, Plant Growth
- **NDVI**: Plant Health, Plant Growth, Weeds, Harvest Timing

Crop Growth Over Tile Lines - Enhanced Color
Poor Lima Bean Growth Due to Drainage-NDVI

Measuring Areas of Poor Growth in Lima Beans-NDVI

Mapping Surface Drainage Ditches-Enhanced Color

Mapping Soil Erosion-RGB
Bare Soil Properties-NDVI

Nitrogen, Drainage, & Planting Gaps in Corn-NDVI

Counting Plant Populations

Tomatoes
Color Infrared Orthomosaic (1.5 in Cessna data)
Map Accuracy Assessment

Based on 25 accuracy sample sites:

96% classification accuracy
(9,219 of 9,602 plants were delineated)

96% plant count accuracy
The estimated number of plants in the field is 806,656.
This estimate is within 0.8% of the estimate subsequently provided by the grower.
Growth & Development in Lima Beans-NDVI

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Why not use Thermal Imagery?
- Too sensitive to interference & shadows
- Cannot orthorectify, difficult to geo-reference, coarser resolution
- If interference is minimized, the thermal imagery is highly correlated to NDVI
NDVI map on the left vs. thermal image on the right. Both datasets were acquired at the same time on August 1, 2014 over a corn field in southwest Nebraska. Notice the thermal image does not cover the entire field because the entire field was not captured in the single acquisition where the spectral imagery can be compiled into a mosaic for the entire field. Notice the similar patterns in both images, suggesting that the information obtained using the two measurement methods is very similar between the two datasets.

Hail Damage in Soybeans-NDVI

Impact of Cover Crops on Lima Beans-NDVI