Program 4PA-2

Potential Uses Of Unmanned Aerial Systems (UASs) In Precision Agriculture

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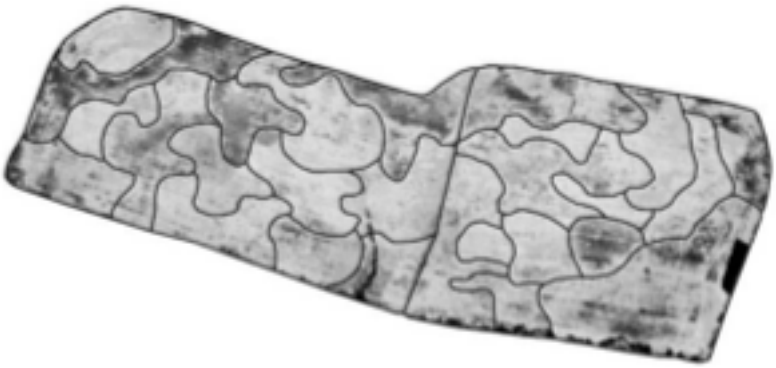
Precision agriculture data provides Tennessee producers various management opportunities to increase production, reduce input costs, and manage farmland more efficiently. Unmanned Aerial Systems (UASs) may be the next tool to improve precision agriculture data collection. Mapping with Unmanned Aerial Vehicles (UAVs) has the potential to provide imagery at an unprecedented spatial resolution. The highest spatial resolution data available from conventional platforms such as satellites and manned aircraft is typically in the range of 20-100 cm/pixel. UAVs are capable of flying at altitudes below 400 feet and hence can collect imagery at a much higher resolution, even as detailed as 1 cm/pixel. UAVs can be launched in narrow windows of good weather, fly large fields in preplanned flight patterns, and deliver the data rapidly to the producer at a lower cost than conventional platforms. Cameras mounted beneath UAVs gather images with normal light, infrared or thermal imaging, still photos or video formats. These images are digitized, geo-referenced and mapped. Producers and crop consultants can use this information to scout crops for weeds, insects and disease; detect nutrient deficiencies; variable rate apply crop inputs; assess flood or drought damage; and monitor wildlife damage.

This presentation will discuss some of the many potential applications for UASs in row crop production systems. One major application that will have immediate benefits will be directed crop scouting. With a UAS, producers or crop consultants can stand on the edge of the field with a ground station and see what a camera mounted on a UAV sees as it flies over the field. UASs won't replace scouting a field on foot, but they can direct scouts to specific areas in the field where problems exist. UASs will enable you to more effectively scout the entire field in a fraction of the time it takes to do it on foot.

Another application that has great potential is using UASs as a remote sensing tool to acquire high-resolution spatial data. Cameras attached to a UAV will enable producers to monitor the condition of their fields throughout the growing season. UASs are capable of collecting hyper resolution visible, multispectral, and thermal imagery for application in precision agriculture management. Visible imagery can be digitally processed into maps that give an indication of stand count, weed infestation or damage from floods and wildlife. Thermal imagery can be used to map soil moisture and plant canopy temperature, enabling assessment of irrigation management and efficiency. Multispectral imagery enables the calculation of vegetation indices that relate to vegetation vigor and plant health which can be used for yield prediction mapping and management zone development, as well as precision fertilizer, herbicide, pesticide, and seeding applications – all of which can boost crop health, reduce

Quadcopter



Management zones created from NDVI image

input costs and increase yields by improving management decisions.

Although collecting good data is the most challenging part, the most time consuming and costly part can be processing the data to a point where it can be integrated into precision agriculture systems. The raw data will usually be images (up to several hundred – think gigabytes) and the challenge for data processing is to stitch these images together to generate one homogenous data set. This presentation will also discuss some of the image processing technologies that are currently on the market to process the data collected from a UAS.

Notes: