AGRICULTURAL REMOTE SENSING STUDIES - 1999

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Remote sensing can be a valuable tool to assess field spatial variability and if flown on a regular schedule can also show patterns in crop development during the season. Various wavelengths of light are important in the detection of crop parameters, including visible, near infrared, and thermal. Image processing and computer enhancement can display areas within a field that relate to certain growing conditions before they would become obvious to an observer on the ground.

During 1998-1999 the Shafter remote sensing group investigated: 1) Early detection of mites in cotton, 2) water stress in cotton, and 3) correlations of mid-season remotely sensed images to final yield. This is the second year that these studies have been conducted allowing researchers to understand year to year variation in the measured parameters and validate agronomic models.

The Shafter Airborne Multispectral Remote Sensing System (SAMRSS) was flown in a light aircraft over 30 times in 1999 to characterize cotton dynamics in research plots and cooperating growers fields. The three digital cameras have special filters that allow specific narrow wavelengths of light into the camera. These bands, in the red, green, and near infrared, were complemented by the addition of a thermal infrared camera. This camera is especially suited to recording canopy temperature which is indicative of water stress and will add greatly to the on-going research into early water stress detection by remote sensing. The addition of this fourth frequency band should allow even better detection of mite damage since early infestations could change the water characteristics of leaves leading to variations in leaf surface temperature.

A computer-based imaging processing technique was developed that successfully allowed detection of mite infestations and distinguished them from water stressed canopy. Additionally, it was found that mid-season images had the highest correlations to final yield and that this corresponded to boll initiation, a time when the maximum amount of canopy would be available for boll production which relates to final yield.

<u>Plans for the future include</u>:
1) Development of a mite spectral "signature" that will allow detection of mites in any field from remotely sensed imagery.
2) Continued development of a water stress model allowing estimation of water stress from remotely sensed images.
3) Continued project funding by Cotton Incorporated allowing mid-season estimation of final yield through the use of a yield monitor and remotely sensed imagery.
4) The second year of a project funded by NASA to acquire hyperspectral imagery of fields for early mite detection.