Progress Report

Sensor-based Sidedressing for Cotton

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Objectives:

Develop reliable sensor interpretations as a basis for on-the-go variable-rate N sidedressing of cotton.

- Extend promising results from 2006.
- Determine sensor model, wavelength, and height that give the best prediction of sidedress N need.
- Determine the best growth stage for sensor-based sidedressing; depends on:
    - Accuracy of prediction (probably will be better later)
    - Ability to produce full yield (need to be careful not to wait too long).

Accomplishments for 2007:

- The 2007 experiments were conducted at the University of Missouri Delta Center and Rhodes farm on fields with 3 soil textures: sandy loam, silt loam, and clay.
- The N treatments consisted of:
    - Check plot received no N.
    - One treatment received a high N rate at planting (reference plot).
    - Most treatments received 50lbs N /acre at planting.
    - At the early square stage, treatments received 0 to 150 lbs of N/acre.
    - Some treatments received N applications at early flower.
- Sensors used: Cropscan passive sensor (Cropscan), Crop Circle active light sensor (Holland Scientific), and Greenseeker active light sensor (N-Tech).
- Sensor Readings taken at 3 growth stages: early square, mid square and early bloom.
- Chlorophyll meter readings and samples for leaf N and petiole tests were taken for the three growth stages.
- Sensor readings taken at 10, 20, and 30 inches height above the cotton canopy.
- Analysis to relate optimal N rate to sensor readings are currently being done on the 2007 data:
    - Quadratic-plateau regression used to describe yield response to N rate.
    - Optimal N rate calculated from the response functions.
    - Optimal N rate regressed against sensor readings to determine the sensor type, wavelength, and growth stage that give the best prediction of optimal N rate.

Expected Results for 2007

Since we are still working on the 2007 analysis to relate optimal N rate to sensor readings, we can only comment on what we are expecting the results to be based on the 2006 results.

- Reflectance sensor readings will probably relate well to optimum N rate.
    - Potential for accurate on-the-go prediction.
    - All three sensor types will be potentially useful.
    - All three heights will be suited for N sidedressing, but 20" will seem more reliable.
- Visible/NIR ratios or NIR alone (relative to values from high-N plots) will have the strongest relationship to optimal N rate.
- Early square sensor readings might be too early to use and will generally not be well correlated to optimal N rate.
- Mid square or early flower sensor readings will produce more accurate N rate predictions on the go.

Objectives for 2008:

- Repeat the experiments from 2006 and 2007.
- Relate optimal N rate to sensor readings for the 2007 and 2008 data.
- Determine the best growth stage, sensor height, model, and wavelength for sensor-based sidedressing for both 2007 and 2008.
- Develop accurate on-the-go sidedress N rate recommendations based on sensor readings for 2006, 2007, and 2008 results.

Proposed Budget for 2008:

Graduate student stipend + benefits	$15,550
Lab analyses	$3,000
Travel	$2,000
Fertilizer and other supplies	$500
Total request for 2008	**$21,050**