

# NEWS & VIEWS

A regional newsletter published by the  
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Dr. C.S. (Cliff) Snyder,  
Southeast Director  
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## Summary of the 2001 Research Programs — Southeast Region

### PPI Regions Reorganized in 2002

Several changes in the make-up of some North American Program Regions of the Potash & Phosphate Institute (PPI) were announced recently.

#### Southeast Region:

**Dr. Noble R. Usherwood** has retired as PPI Southeast Director. **Dr. Cliff Snyder**, whose title was formerly Midsouth Director, now has the title of Southeast Director, with an expanded region. States in the newly formed Southeast Region include: Alabama, Arkansas, Florida, Georgia, Mississippi, Missouri-Bootheel, Louisiana, North Carolina, South Carolina, and Tennessee.

#### Eastern Canada and Northeastern U.S.:

**Dr. Tom W. Bruulsema** continues as Director of this region, which now includes these provinces and states: New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec, Connecticut, Delaware, Maine, Maryland, Michigan, New Jersey, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.

#### Midwest Region:

**Dr. Harold F. Reetz, Jr.** continues as Midwest Director. However, the five states in the Midwest Region now are Illinois, Indiana, Kentucky, Missouri (except Bootheel), and Ohio.

**THE** Potash & Phosphate Institute (PPI) and the Foundation for Agronomic Research (FAR) provide both financial and technical support for many agronomic research and education programs. The results of the 2001 projects reported here address current production questions and environmental concerns in high-yielding agronomic systems.

More information is available on these studies via the Internet: [www.ppi-ppic.org](http://www.ppi-ppic.org) or [www.ppi-far.org](http://www.ppi-far.org). If any project is of special interest, consider contacting the project leader for more details.

We are pleased to be part of programs that advance efficient production for enhanced profitability in an environmentally responsible manner.

### Alabama



#### Evaluation of Drip Irrigation and Fertigation in Northern Alabama

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*Cooperating Scientist: Dr. Larry Curtis*

Insufficient soil moisture is a major yield-limiting factor for cotton in the Southeast. Limited water for irrigation is also a concern for many growers. The objective of this study is to determine the longevity of drip irrigation tubing and cotton yield as affected by different potassium (K) treatments applied through the subsurface drip irrigation tubing. All plots received 30 lb of nitrogen (N)/A preplant using ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ). Dry plots received 40 lb/A of N applied as 32 percent urea-ammonium nitrate (UAN) solution on June 20th. In 2001, potassium nitrate ( $\text{KNO}_3$ ; 13.5-0-46) and urea (U, 46-0-0) were dissolved in water to produce a fertilizer with a 6.25-0-4.14 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) analysis. Fertigation injections were made weekly for eight consecutive weeks to provide 90 lb of N and 72 lb of K<sub>2</sub>O per acre. The non-fertigated drip



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plots received the same N and K rates, but surface applied as a sidedress treatment on June 19th by dribbling the fertilizer 10 in. to the side of each row and cultivating it in.

Timely rains fell during the 2001 growing season, which produced cotton yields above 1,100 lb lint/A in the non-irrigated plots. All drip irrigation treatments performed similarly and increased cotton yields by 200 to 300 lb lint/A over the non-irrigated treatments. Fertigation treatments in 2001 did not improve cotton yields as compared to all fertilizer materials surface applied. The project scientists speculate that this could be due to the excellent weather or because fertigation treatments were initiated too late in the growing season. Earlier fertigation treatments will be tested in 2002.

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## Arkansas



### **Yield Response of Dryland and Irrigated Cotton to Soil and Foliar Potassium Fertilization**

*Project Leader: Dr. Derrick M. Oosterhuis, 115 Plant Science Bldg., Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville, AR 72701 (479-575-3979), oosterhu@sysb.uark.edu.*

*Cooperating Scientist: Dennis Coker*

Cotton lint yield response to high (with recommended soil-applied K) and low K regimes (without recommended K) was determined—under irrigated and dryland conditions, with and without foliar-applied K treatments at Clarkedale (250 lb/A Mehlich 3 soil K) and Rohwer (> 300 lb/A Mehlich 3 soil K)—in eastern Arkansas. Foliar KNO<sub>3</sub> treatments involved four consecutive weekly applications, starting one week after first flower, using 10 lb of KNO<sub>3</sub> in 10 gallons of water/A/application. Lint yields and yield components were measured, and plant water status, growth, photosynthesis rate, and K concentration in organ tissues were monitored at pinhead square, first flower, three weeks after first flower, and five weeks after first flower.

The average (across sites and years) annual yield response to soil-applied K was 68 lb of lint/A under irrigation. Under dryland conditions, across both sites for two years, there was no measurable response to soil-applied K. Annual lint yields (across sites, years, and water regimes) were increased by 49 lb/A with foliar K, but only under low soil K (no pre-plant soil-applied K) conditions. Foliar-applied K in this study, increased lint yields by 21 to 24 lb of lint/A under either dryland or irrigated conditions, averaged across soil K regimes.

These results reinforce the benefits of providing adequate soil K fertility for cotton and the conditions necessary for a foliar K response.



### **Influence of Nitrogen Fertilizer Source, Application Rate, and Timing on Grain Yields of Rice**

*Project Leader: Dr. Rick Norman, 115 Plant Science Bldg., Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville, AR 72701 (479-575-5738), rnorman@comp.uark.edu.*

*Cooperating Scientists: Dr. N.A. Slaton and Dr. C.E. Wilson, Jr.*

Many rice farmers have a difficult time getting fields flooded in less than five to 10 days after the pre-flood N application. This study was conducted to determine if ammonium sulfate [(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>] is a better N source than U when applied to the soil surface a week or more prior to flooding. Rice was grown on a Calloway silt loam (pH 7.3 to 8.3) to compare U and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> at five fertilizer N rates (0, 60, 90, 120, and 150 lb of N/A), applied at four different timings: all pre-flood N either 21, 14, or 7 days before flooding, or one day prior to flooding.

As in 2000, there was a three-way interaction among N source, rate, and timing. The highest yields were achieved when the flood was established the day of pre-flood N application. When all the pre-flood N was applied within one day before flooding, there was no yield difference between (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> or U at any N rate. The highest yields in 2001 (164 to 171 bu/A) were achieved with 150 lb of N/A using this N and flood timing. Ammonium sulfate was superior to U (18 to 30 bu/A higher yield) if the N was applied two weeks before flooding on this high pH soil. Application of either (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> or U 21 days prior to flooding results in too much time for nitrification, even for the (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, and appreciable N can be lost via denitrification after flooding.

The 2001 results coupled with results from 1999 and 2000 show that if a farmer can not flood a field in a timely manner (less than 14 days) after the pre-flood N application, it would be prudent to use (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> in place of U, even if the N rate has to be increased by 30 lb/A, because it takes too long to establish a flood.



### **Evaluation of Precision Agriculture Technology Incorporated into an On-Going Statewide Soybean Technology Transfer Program**

*Project Leader: Dr. Lanny O. Ashlock, Extension Agronomist-Soybeans, University of Arkansas, Cooperative Extension Service, P.O. Box 391, Little Rock, AR 72203 (501-671-2278), lashlock@uaex.edu.*

The Arkansas Soybean Research Verification Program (SRVP) incorporated site-specific or precision agriculture (PA) technology in 2001 to better understand the variables that impact both soybean grain yield and production economics in on-farm, whole-field, production

environments. Global positioning, yield monitors, remote sensing, Veris® machine soil electrical conductivity mapping, and other technology tools were used to identify factors restricting efficient production in this ongoing, statewide technology transfer project. Variable rate and/or grid based (2.5-A or 1.0-A grid) fertilizer applications were made in four irrigated soybean fields in 2001.

Soybean yields exceeded 50 bu/A in only one of the four fields, and the overall average for the irrigated SRVP/PA effort was a somewhat disappointing 49 bu/A. Initial analysis of 2001 data suggests that foliar diseases and insects were major yield inhibitors in Chicot County. Surface drainage continued to plague the Lincoln County field. Late-season insect activity, diseases, and soybean cyst nematode may have contributed to the somewhat disappointing yields for Prairie County. Excellent yields were obtained in the Faulkner County field, and site-specific variety selection for the different soil textures in the field may have contributed to this success.

Remote sensing images and yield monitor data appear to be useful in determining areas within these fields with significant grain yield variation. Additional efforts were made to determine the cause of severe stunting of soybeans in several counties (Woodruff, Cross, Poinsett, etc.) in northeast Arkansas. Problem soybean fields in these counties are in a rice-soybean rotation on similar soils. Plant tissue analyses suggest a possible boron (B) deficiency, but in many instances plant K was also low.

\*See note on last page.



### **Fertilizing Rice-Based Cropping Systems to Achieve Maximum Yields while Maintaining the Natural Resource Base**

*Project Leader: Dr. Merle Anders, University of Arkansas, Rice Research and Extension Center, P.O. Box 351, Stuttgart, AR 72160 (870-673-2661), rrec\_manders@futura.net.*

A long-term cropping systems study was initiated in 1999 on a silt loam soil near Stuttgart, Arkansas. The field was leveled, and 10 cropping systems (rice, corn, soybean, wheat in different combinations/rotations) were established using conventional tillage practices with four replications. In 2000, the plots within each cropping system were split into conventional tillage and no-tillage treatments. Each tillage treatment was split into two fertilizer treatments: 1) standard recommended fertilizer according to soil tests and 2) an enhanced treatment, consisting of approximately 20 percent more N, phosphorus (P), and K than the standard.

There were visual differences between the two fertility treatments in 2000, but no significant effects on yield. Grain yields for rice and soybeans declined in 2001, compared to yields in 2000, while those for corn increased. Enhanced soil fertility caused rice yields to increase 6 bu/A and corn yields to increase by 5 bu/A in 2001, but provided no advantage for soybeans. Soil samples collected

from each plot in 1999 before the study, and again in 2000, showed large variations in some soil properties because of the land leveling. There were small but inconsistent increases in tissue nutrient levels with the conventional till treatments compared to no-till. Nutrient uptake by rice was slightly increased in the enhanced fertility treatment compared to the standard treatment, but resulted in no yield differences.

This study will provide a basis for evaluating nutrient requirements in different tillage and rotation systems for corn, rice, wheat, and soybeans in Arkansas.



### **Rice Response to Zinc Application Rate of Four Granular Fertilizer Sources Differing in Water Soluble Zinc Content**

*Project Leader: Dr. Nathan A. Slaton, 115 Plant Science Bldg., Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville, AR 72701 (479-575-3910), Nslaton@uark.edu.*

This study was a continuation of work initiated in 2000 at two locations in Arkansas with high soil pH (>7.4) and low soil test zinc [Zn; Mehlich 3 Zn < 1.5 parts per million (ppm)] to evaluate the effect of four Zn sources (CoZinco 31 percent Zn, RSA MicroTech 10 percent Zn, Frit 20 percent Zn, and Frit 36 percent Zn) and six Zn application rates (0, 2, 4, 8, 12, and 16 lb Zn/A) on growth, Zn nutrition, and yield of rice.

In 2001, this project evaluated the residual effect of these Zn sources and rates on a second consecutive rice crop and the Mehlich 3 extractable soil Zn. Rice dry matter, tissue Zn concentration, and tissue Zn content were measured at about 14 days after flooding during the midtillering growth stage to assess the residual effect of the previously applied Zn fertilizer treatments.

One year after Zn fertilizer application, Mehlich 3 soil Zn increased by about 0.40 lb Zn/A/lb Zn applied at each location, with only minor differences among sources. The second year results indicate that Zn application rate is the most dominant factor influencing rice response to previously applied Zn fertilizers. All Zn sources, averaged across application rates, significantly increased (by 21 to 73 bu/A) rice grain yields compared to the untreated control. Grain yields among the four Zn sources were not different at either location in 2001. Similar results were found for total dry matter, tissue Zn concentration, and tissue Zn content at the midtillering growth stage during the second year of this study.

Despite some differences among these granular Zn fertilizers in providing Zn to seedling rice during the first year after application, these products tend to produce similar yields when applied at the recommended rate (10 lb Zn/A), and they provide similar Zn nutrition to the second rice crop.



### **Time and Rate of Phosphorus Fertilizer Application on Rice Growth and Phosphorus Uptake**

*Project Leader: Dr. Nathan A. Slaton, 115 Plant Science Bldg., Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville, AR 72701 (479-575-3910), Nslaton@uark.edu.*

Phosphorus (P) fertilizer applied near the time of flooding has proved to be equal and sometimes superior to preemergence applications on alkaline silt loam soils in producing maximum rice yields. The objectives of this research were to: 1) measure rice biomass and P uptake during the growing season and 2) measure rice grain yield response to P fertilizer application time and rate.

A single field study was established on a high pH (> 8.0) silt loam soil to evaluate P fertilizer rates at 0, 25, 50, and 100 lb P<sub>2</sub>O<sub>5</sub>/A, applied before emergence, pre-flood at the 5-leaf stage, at 1.25-in. internode elongation, or after the flag leaf was fully emerged. Biomass production and tissue P concentrations were monitored during the growing season, and grain yield was measured at maturity. The time of P fertilizer application was the dominant factor affecting rice biomass production, tissue P concentration, and grain yield. Phosphorus fertilizer applied before flooding at the 5-leaf stage resulted in consistently higher biomass production, tissue P concentration, and grain yield than the untreated check and numerically higher values for these growth parameters than all other times of P application.

Data from this study strongly suggest that the time of P fertilizer application has a profound influence on fertilizer use efficiency on alkaline silt loam soils. Phosphorus fertilizer applied before rice emergence is apparently fixed into forms that are not immediately available for rice uptake after flooding.

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### **Florida**



### **Phosphorus/Potassium Soil Test Calibration and Effects on Fresh Citrus Fruit Quality**

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In autumn 1997, Flame grapefruit and Hamlin orange trees were planted at the SWFREC. Three-tree plots were fertilized with four rates each of P and K to establish a range of soil test values. To assess fertilizer effects in 2000-01, soil and leaves were sampled in July 2000, canopy volume was measured in September 2000, and the first grapefruit yield was measured in February 2001.

Mehlich 1 soil test P increased from very low to very high as the P fertilizer rate increased from 0 to 200 lb P<sub>2</sub>O<sub>5</sub>/A. Since P had accumulated in the soil, P fertilization was discontinued for the 2001-02 season. Soil test K only slightly increased (from very low to low) as the K fertilizer rate increased from 0 to 400 lb K<sub>2</sub>O/A. Increasing the P or K fertilizer rate resulted in progressively higher leaf tissue P and K concentrations. This effect was much stronger for K than for P. Grapefruit tree canopy volume increased from 230 to 319 ft<sup>3</sup> as K rate increased from 0 to 200 lb K<sub>2</sub>O/A, while yield increased by 3 to 15 lb/tree as K fertilizer increased from 0 to 400 lb K<sub>2</sub>O/A. Fertilization with P did not positively affect tree canopy volume or grapefruit yield. The continued failure of K to accumulate in the soil will support the current practice of annually applying K fertilizer at rates similar to N. The lack of tree response to P fertilizer is surprising considering the very low soil test P in the control plots.

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### **Georgia**



### **Using Aerial Imagery to Aid Site-Specific Management of Fields**

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This study explored the potential of aerial imagery in identifying fields which might benefit from variable-rate management of inputs. Sixteen dryland production fields were chosen for study in two Georgia counties, without prior knowledge of soil characteristics and within-field variability. Aerial photographs were taken 10 times during the season. Good, medium and poor areas within each field were classed, based on the imagery. In each area, deep soil cores were taken to characterize soil texture and soil fertility. Some fields showed greater variability in the imagery than others. Within fields, where there were large differences in imagery reflectance values, there were large differences in soil properties. Wide differences in soil texture and organic matter were measured. In spite of large differences in soil properties, no general conclusions could be drawn over all the fields. When there were no significant differences in crop growth within a field, there were no significant differences in nutrient patterns. These results are consistent with the site-specific nature of field variability.



**Evaluation of Potassium-Magnesium Sulfate at Varying pH Levels for Providing Magnesium Nutrition to Cotton**

*Project Leader: Dr. Gary Gascho, Coastal Plain Station, P. O. Box 748, University of Georgia, Tifton, GA 31793 (912-386-3360), gascho@tifton.CPES.Peachnet.edu.*

Long-term lime plots on two Coastal Plain soils were used to determine if strip-tilled cotton could respond to the surface applications of potassium-magnesium sulfate (K-Mag) across soil pH levels. The established pH levels range from very low to higher than recommended by the University of Georgia (4.8 to >6.1). The low pH levels have been very yield-limiting in the past several years. In 2001, cotton lint yield responded significantly (142 lb lint/A) to the K-Mag applied at the Pelham sandy loam site. There were no significant interactions between pH level and subtreatments [calcium (Ca), magnesium (Mg), or Ca + Mg] on either soil, which indicated that there were responses to K-Mag at all lime levels.



**Enhancing Pine Straw Production, Wood Volume, and Product Class Distribution with Fertilization of Old-Field Planted Slash and Loblolly Pine Stands**

*Project Leader: Dr. E. David Dickens, University of Georgia Warnell School of Forest Resources, P. O. Box 8112 GSU, Statesboro, GA 30460 (912-681-5653), ddickens@arches.uga.edu.*

Private non-industrial forest landowners are interested in fertilization of Conservation Reserve Program (CRP) planted pine trees. The objectives of this five-year study include an in-depth evaluation of slash and loblolly pine growth response to fertility treatments [no fertilizer, N+P, N+P+K, N+P+K+Mg+sulfur (S)+copper (Cu)+B] when grown under intensive management at three locations (Dodge, Toombs, and Washington counties) in Georgia. The one-time fertilizer application levels were 155-160 lb N/A for slash pine and 200 lb N/A for loblolly + 25-40 lb P<sub>2</sub>O<sub>5</sub> + 75 lb K<sub>2</sub>O + 25 lb Mg + 50 lb S + 4 lb Cu + 2 lb B/A (Cu and B to be applied in the spring of 2002). The study sites were located in 10- to 12-year old stands and thinned prior to treatment application. Baseline data for each treatment replication were collected before fertilizer treatments were applied in either the spring of 2000 or 2001. All living crop trees in each plot were aluminum tree tagged, numbered, and measured for diameter at breast height (DBH), total height, height to base of live crown, and height to a fork (if present) prior to treatment.

Live crown ratios of all trees/plot were determined prior to treatment. Mean DBH, basal area, height, live crown ratio, volume/tree, and volume/A pre-application values are currently being summarized. The collected baseline

data include: soil and foliage sample analyses, soil characterization, leaf area index (LAI), and individual tree merchandised value. Tree growth will be assessed each year to determine the influence of treatments on tree growth rate, LAI, needle production, and other properties. Wood quality and an economic assessment will be determined later in the five-year study.

**Louisiana**



**Effect of Copper and Potassium Fertilization on Yield and Plant Nutrient Status of Sugarcane**

*Project Leader: Dr. W. B. Hallmark, Iberia Research Station, LSU Agricultural Center, P.O. Box 466, Jeanerette, LA 70544 (337-276-5527), whallmark@agctr.lsu.edu.*

A three-year experiment was planted in the high-yielding sugarcane variety LCP 85-384 in the fall of 1999 on a Loreauville silt loam soil near Lafayette, Louisiana. The objectives were to evaluate potassium chloride (KCl) at 0, 80, 160, and 240 lb K<sub>2</sub>O/A with foliar applications of copper sulfate (CuSO<sub>4</sub>) at 0, 1, and 2 quarts/A. All plots received a blanket application of 120 lb N/A as NH<sub>4</sub>NO<sub>3</sub>, 60 lb P<sub>2</sub>O<sub>5</sub>/A as ammonium polyphosphate, and 24 lb S/A as gypsum in 2000. Because of severe drought and the farmer's concern about potential leaf burn, the CuSO<sub>4</sub> was not applied in 2000 or 2001. Potassium application rates did not affect sugarcane stalk weights, commercially recoverable sugar, cane yield, or sugar yield in 2000 or 2001.



**Incorporating Precision Agriculture Technologies in a Soybean Research Verification Program**

*Project Leader: Dr. Walter Morrison, LSU Agricultural Center, 257 Knapp Hall, Baton Rouge, LA 70803 (225-388-4070), wmmorrison@agctr.lsu.edu.*

*Cooperating Scientists: Darryl Rester, M. Wolcott, and C. Riche.*

In an effort to enhance the production efficiency of soybeans in Louisiana, three fields in Acadia, Concordia, and St. Landry parishes were selected from the SRVP in Louisiana in 2000 and 2001. Factors contributing to yield differences within each field were evaluated using weekly scouting and precision agriculture tools (yield mapping, grid soil sampling, soil electrical conductivity maps). Problem areas were geo-referenced in each field.

In the St. Landry parish field, no significant correlations have been observed between soil test levels and yield, between soil test levels and soil conductivity, nor between yield and soil conductivity. All 14 soybean research verification fields were mapped to obtain exact acreages,

and in some cases elevation and hard pan depth were determined.

Difficulties in getting yield monitors on farmer combines, and in getting them to function properly, have hindered the analysis of yield and profit-limiting factors. Inaccessibility of variable-rate fertilizer applicators has prevented variable-rate fertilizer application in many of the fields. There is interest in remote sensing to better identify problems in-season, but no affordable vendor has been identified. \*See note on last page.



### Effect of Potassium Sulfate vs. Potassium Chloride on Sugarcane Yields

*Project Leader: Dr. W. B. Hallmark, Iberia Research Station, LSU Agricultural Center, P.O. Box 466, Jeanerette, LA 70544 (337-276-5527), whallmark@agctr.lsu.edu.*

Some sustainable agriculture advocates malign KCl as an acceptable K source for sugarcane and suggest that potassium sulfate ( $K_2SO_4$ ) is a better agronomic K source. In September of 1999, sugarcane variety HoCP 85-845 was planted on a Baldwin silty clay loam soil near Lafayette, Louisiana. The soil had a pH of 5.9, 0.67 percent organic matter, 23, 42, 113, 406, and 1865 ppm of extractable P, sodium (Na), K, Mg, and Ca, respectively.

In May of 2000, K rates of 0, 70, 140, and 210 lb  $K_2O/A$  were established in a Latin square design with eight replications to compare  $K_2SO_4$  and KCl as K sources. There has been no sugarcane yield or yield parameter response to K rates, nor has there been any difference in response between K sources. These results fail to support the theory that KCl is a harmful source of K that should not be used in sugarcane production.



### Potassium Requirements of Cotton Cultivars

*Project Leader: Dr. Steve Hague, LSU Agricultural Center-Northeast Research Station, P.O. Box 438, St. Joseph, LA 71366 (318-766-3769), shague@agctr.lsu.edu.*

Many soils in Louisiana are too low in available K for optimum cotton production. This situation may be exacerbated by drought, which limits the availability of soil K, and by management practices that compress the growing season. In 2001, a trial was initiated to determine if K recommendations needed updating to account for early-season cultivars and cultural practices. Eight cultivars were planted in plots with four rates of K (0, 50, 100, and 150 lb  $K_2O/A$ ).

There were no significant differences for lint yield among K rates and no significant interactions among cultivars and K rates. Most fiber properties were

unaffected by K rate. Plants at first bloom and at final harvest generally were taller in plots with high rates of K. Lack of differences among economically important traits was probably due to abundant rainfall during the growing season and possibly excessive rainfall at the end of the growing season before harvest. Plants were never drought stressed, and soil K was probably more available to plant roots than if soil moisture had been deficient.

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## Mississippi



### Evaluating Site-Specific Soybean Management within the Mississippi Soybean Verification Program (SMART—Soybean Management through Application of Research and Technology)

*Project Leader: Dr. Alan Blaine, Department of Plant and Soil Sciences, Dorman Hall, Room 153, Box 9555, Mississippi State, MS 39762 (662-325-2311), ablaine@pss.msstate.edu.*

*Cooperating Scientists: Dr. Jim Thomas and Mitt Wardlaw*

Thirty-four fields were involved in an on-going SMART program, intended to demonstrate implementation of research based technology to improve production efficiency and farm profitability. Soil textures ranged from silt loam to clay. Using Global Positioning Satellite (GPS) technology, soil samples were pulled on 10-acre grids in 28 fields and on 2.5-acre grids in six fields and analyzed for pH, P, K, cation exchange capacity (CEC), and organic matter. Field boundaries were defined to determine the true field acreage. Problem areas were geo-referenced in 2000.

Manganese (Mn) deficiency was confirmed in one Mississippi Delta field (2000) and Mn toxicity was confirmed in a loess hill field (2001) which had been land formed. Nematode populations were also determined from the collected soil samples. Field maps were generated using a Geographic Information System (GIS), and fertilizer applications were made from the GPS grid sample maps. All fields were scouted for weeds, insects, and diseases. Irrigated fields were scouted twice a week to determine irrigation needs. Foliar fungicide tests were conducted in several fields to evaluate varying combinations, rates, and timing for control of *Phomopsis spp.* These tests were harvested with yield monitors.

In the Montgomery County test, Quadris was put out extremely late (after R5) to control foliar diseases, but still produced a 10.8 bu/A yield increase. These tests, evaluated using yield monitored data, allowed researchers to recognize that the current recommendations for foliar fungicides are too early for effective control of some diseases. Traditional scouting techniques were compared to scouting with remotely sensed data with GPS coordinates. Compari-

son of these two scouting techniques will be compared for efficiency and accuracy. \*See note on last page.



### **On-Farm Rice Research 2001— Phosphorus Rate Studies**

*Project Leader: Dr. William L. Kingery, Department of Plant and Soil Sciences, Box 9555, Mississippi State University, Mississippi State, Mississippi 39762 (662-325-2748), wkingery@PSS.MsState.edu.*

*Cooperating Scientists: T.W. Walker and J.E. Street*

Arkansas, Louisiana and Mississippi have all reported possible inadequacies in soil tests for making phosphorus (P) recommendations for rice. Each state laboratory uses a different soil test extractant. Recent research in Arkansas has focused on silt loam soils.

Eight studies were conducted in 2000 on precision-leveled clay loam and clay soils in the Mississippi River Delta of western Mississippi to determine if rice responds to P fertilization at high to very high (60 to 120 lb/A) Lancaster soil test P levels. Two studies were conducted on cut areas of different fields in 2001. Tests were established in both cut areas and filled areas of leveled fields, using a range of pre-flood P rates: 0, 20, 40, 60 and 80 lb P<sub>2</sub>O<sub>5</sub>/A. Soil pH in plot areas ranged from 5.0 to 6.2 in 2000 and 5.5 to 6.5 in 2001.

No differences in rice yield were observed among the P treatments at any of the sites in either year. The Y-leaf tissue P concentrations at ½-inch internode elongation were higher than 0.24 percent, well above the sufficiency levels of 0.18 percent P. Relationships between the Lancaster-extractable nutrient levels and Mehlich 3 levels are being determined to extend the results to soils beyond Mississippi.

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## **North Carolina**



### **Pest Management Systems in a Precision Agriculture Environment**

*Project Leader: Dr. Gail Wilkerson, North Carolina State University, Crop Science Department, P.O. Box 7620, Raleigh, NC 27695 (919-515-5816), Gail\_Wilkerson@ncsu.edu.*

*Cooperating scientists: Dr. G. Roberson, A. Bennett, A. Price, and D. Krueger*

A computer software program was developed to utilize weed scouting data, using grid cell sampling, to determine variable rate herbicide applications based on threshold levels. In 2001, two field trials were conducted on research stations in North Carolina. Full-season and double-

cropped soybean plots at the main study site in Port Royal, VA were also scouted in order to determine the potential for site-specific weed management of these plots. The project leader successfully demonstrated that the custom software, which was developed to collect weed population information, generate weed distribution maps, evaluate the situation in each portion of the field, generate a treatment recommendation for each area, and produce a geo-referenced treatment map to direct the variable-rate sprayer, can be used for site-specific weed management. A six-row variable-rate herbicide applicator, developed by Dr. G. Roberson, successfully applied the recommended herbicides at the recommended rates to each section of the two fields in North Carolina.

Estimated gains in net return from variable rate application were fairly low for these research station fields, partially because of the weedy nature of these fields, low productivity at one site, and the availability of Roundup Ready soybeans. These trials have demonstrated that: 1) weed populations can be quite variable across a field; 2) scouting can reveal the presence of weeds in portions of a field that are not well-controlled by Roundup; 3) the best whole-field treatment may be optimal for only a small portion of the field; 4) better levels of weed control are possible with variable-rate application; and 5) variable-rate application can substantially reduce herbicide amounts applied.

It should be noted that according to the decision model, the optimal whole-field treatment was optimal for only 10 percent of one field and for 12 percent of the second field in North Carolina. \*See note on last page.



### **Comparison of Nitrogen Sources for Corn Production in North Carolina**

*Project Leader: Dr. Robert Mikkelsen, Department of Soil Science, North Carolina State University, P.O. Box 7619, Raleigh, NC 27695-7619 (919-513-3033), Robert\_Mikkelsen@ncsu.edu.*

This was the second year of a study to compare corn response to five nitrogen (N) sources [ammonium sulfate (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, NH<sub>4</sub>NO<sub>3</sub>, U, UAN, and poultry litter], at four rates (0, 50, 100 and 150 lb N/A) on a no-tilled clay loam soil in the Piedmont region and on a sandy loam Coastal Plain site using conventional tillage. Corn received 10 lb N/A at planting at both sites. The N treatments were surface applied after the crop reached the V2 (second leaf) growth stage. Plant tissue samples were collected prior to silking, leaf chlorophyll levels were measured, grain was harvested, and soil samples were collected after harvest to a three-foot depth to measure residual inorganic N. Measurements of ammonia (NH<sub>3</sub>) volatilization were attempted in 2001, but were unsuccessful because of technical problems.

Yields increased with increasing N rate at both sites

and reached 113 bu/A and 123 bu/A at the Piedmont and Coastal Plain sites, respectively. The plant-available N in the poultry litter was overestimated, which resulted in the lowest yields among N sources. When surface applied without incorporation, the N availability coefficient may be less than 20 percent. Ammonium sulfate tended to provide the highest yield among N sources, within each N rate at each site, followed closely by  $\text{NH}_4\text{NO}_3$ , and then U, which performed comparably with UAN. There was a close relationship between leaf chlorophyll levels and N rates. Leaf tissue analyses have not been completed, but will be compared with chlorophyll measurements.

Inorganic N levels in the soil were lower in 2001 compared to 2000 because of a better growing season. There was no large accumulation of inorganic N in the root zone of any treatment compared to the nonfertilized control at the Coastal Plain site (<30 lb N/A). Residual inorganic soil N at the Piedmont site exhibited relatively high variability with no clear relationship among N sources and rates.

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## Tennessee



### Plant Nutrition and Tillage Effects on Bronze Wilt of Cotton

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*Cooperating Scientists: Dr. D.D. Howard, Dr. C.E. Michaud, and Dr. E.F. Robinson*

Bronze wilt (BW) is characterized by a bronze discoloration and wilting of the upper foliage of cotton, which can result in significant yield loss. This malady may be associated with an unidentified pathogen, and it may also

be associated with plant nutrition and tillage. This study was conducted to: 1) determine the influence of plant nutrition and tillage system on the incidence and severity of BW symptoms, 2) quantify the extent of boll loss associated with BW, and 3) measure the impact on yield. A BW susceptible cultivar (PM 1218 BG/RR) was planted with different N and K fertility treatment regimes in contrasting field environments: conventional and no-tillage at Ames Plantation and no-tillage at Jackson, TN. Plots were monitored weekly for BW symptoms, flagged, and plant mapped.

A few plants exhibited BW between early and late bloom, but incidences remained extremely low at Ames (0.33 percent) and Jackson (0.08 percent) in 2001. Neither fertility nor tillage treatments affected BW incidence or severity. Yield loss was greatest when symptoms appeared early and less when symptoms appeared later during fruiting, as had occurred in the 2000 study. Tissue analysis showed that leaves and petioles of BW plants averaged 12 percent less K at Ames and 42 percent less K at Jackson than those of normal plants in the same fertility regimes. This finding supports the hypothesis of impaired uptake and/or translocation of K in plants with BW. The relatively low incidence of BW throughout Tennessee in 2001 suggests that necessary environmental conditions for symptom expression may not have occurred. ■

**For information on other FAR-supported projects, please visit the PPI website at [www.ppi-far.org](http://www.ppi-far.org).**

\*Note: More information can be obtained via the website (<http://www.farmresearch.com>) on four projects which were coordinated through FAR and funded by the United Soybean Board (USB). Details on the projects in Arkansas, Louisiana, Mississippi, and North Carolina are posted under each state name, under the USB Summary Report.

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# NEWS & VIEWS

Southeast  
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