

NEWS & VIEWS

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Dr. C.S. (Cliff) Snyder,
Southeast Director
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2002 Research Program Summaries—Southeast Region Soybeans, Forages, Citrus, Pine, Sugarcane, and more

The Potash & Phosphate Institute (PPI) and the Foundation for Agronomic Research (FAR) provide financial and technical support for agronomic research and education projects across North America. These studies are designed to answer production agriculture questions and to provide guidance for site-specific, sustainable, high-yield management.

The summaries that follow provide a brief overview of each project. For more details, please consider contacting the research project leader. You can also view the full annual reports of each project (current and past), when available, at the website:



><http://www.ppi-far.org/research><.

Once at this website, click on “Continue” then click on “Expand” under North American Programs and look for projects by state abbreviation and title.

Arkansas



Evaluation of Precision Agriculture Technology Incorporated into an Ongoing Statewide Technology Transfer Program

Project Leader: Dr. Leo Espinoza, Cooperative Extension Service, University of Arkansas, P.O. Box 391, Little Rock, AR 72203, Telephone: 501-671-2168, E-mail: lespinoza@uaex.edu

In 2002, four soybean fields were included in the Precision Ag (PA) efforts of the Arkansas Soybean Research Verification Program (SRVP). Selected PA fields were located in Arkansas, Faulkner, Lincoln, and Prairie counties, under full season irrigation, with rice and/or

wheat in the rotation. Soil samples were collected on a grid fashion, typically every 2.5 acres, for nematode analysis and fertilizer recommendations. Tissue samples were also collected on a grid fashion, but at the beginning of the reproductive stage. Fertilizers were applied using variable rate (VR) technology at one site, and a zone management approach was followed at the PA fields in Faulkner and Lincoln counties. Due to the low degree of variability in the levels of soil P and K at the Arkansas County PA field, a uniform application was recommended for the field.

The Arkansas County field produced the highest grain yield at 68 bu/A. Aerial web blight was identified in three of the four sites within the field, but no significant effect on yields was observed. Nematode levels at two of the sites, however, were above threshold levels in 30% of the grids, even after two years in rice production. This situation probably limited some yield potential at the sites. Two sets of remote sensing images were taken, the first at the early reproductive soybean growth stage, and the second at mid-late reproduction. No definite patterns were observed after analyzing the images.

Since the implementation of the Soybean Precision Ag program in Arkansas through funding from the United Soybean Board, 20 fields have been enrolled. Electrical conductivity information, together with yield maps, indicate drainage as the primary yield-limiting factor under most conditions. Nematode sampling on a grid fashion may allow for the eventual precise application of control chemicals, with a potential reduction in costs. At the PA site in Chicot County in southeast Arkansas, significant savings were obtained from VR lime application. A recommendation for 120 tons of lime was generated based on a composite soil sample, but when a VR lime map was generated the rate was reduced to 56 tons; a potential savings of nearly \$1,000 for that particular location.

The development of production practices that will reduce soybean yield variability within fields and increase productivity depends on a greater understanding of the factors that contribute to such wide variations in yield within a field or among years. *AR-19F*

* See note on last page.



Agronomic market development information provided by:
Dr. C.S. (Cliff) Snyder, Southeast Director
Potash & Phosphate Institute (PPI)
P.O. Drawer 2440, Conway, AR 72033-2440
Phone: (501) 336-8110; Fax (501) 336-8110
E-mail: csnyder@ppi-far.org
Website: www.ppi-ppic.org/southeast

Florida



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

Project Leader: Dr. Thomas A. Obreza, University of Florida/IFAS, 2169 McCarty Hall, Box 110290, Gainesville, FL 32611, Telephone: 352-392-1951 ext. 243, Fax: 352-392-3902, E-mail: taob@mail.ifas.ufl.edu

Project Cooperator: Robert Rouse

Phosphorus movement to surface water and nutritional effects on fruit quality emphasize judicious use of P fertilizer. To help guide fertilization, a soil test calibration experiment was initiated in 1998 in a newly planted citrus grove that was very low in soil-test P and potassium (K). Three-tree plots were fertilized with four rates each of P and K to establish a range of soil test values. To assess nutritional effects in 2001-02, soil and leaves were sampled in July, canopy volume was measured in September, and the yield and fruit quality were measured in December 2001.

Phosphorus fertilizer retention by the soil was reflected by an increase in soil test P to the high range at the highest P rate, but soil test K increased only to the low range at the highest K rate. Citrus leaf P increased from 0.12 to 0.16% as Mehlich 1 P increased from 5 to 60 parts per million (ppm), and leaf K increased from 0.5 to 1.7% as K fertilizer rate increased from 0 to 400 lb K₂O/A. As K fertilizer rate increased from 0 to 200 lb K₂O/A, grapefruit tree canopy volume increased from 380 to 540 ft³, yield increased from 18 to 118 lb/tree, fruit diameter increased from 3.6 to 3.9 in., juice brix increased from 7.8 to 8.3°, and peel thickness increased from 0.19 to 0.21 in. For oranges, as the K fertilizer rate increased from 0 to 200 lb/A/year, tree canopy volume and yield were not affected, fruit diameter increased from 2.4 to 2.6 in., and juice brix increased from 7.6 to 7.7°. Grapefruit canopy volume, fruit yield, and external/internal fruit quality evaluations failed to respond to P, even though numerous plots had soil test P less than 10 ppm (very low).

The continued failure of K to accumulate in the soil supports the practice of annual application of K fertilizer. The lack of tree response to P was surprising considering the very low extractable P in the control plots. *FL-19F*

Georgia



Childhood Phosphorus, Potassium, and Plant Nutrient Education

Project Leader: Dr. Jerry Johnson, University of Georgia, Griffin Campus, Griffin, GA 30223, Telephone: 770-228-7321, Fax: 770-229-3215, E-mail: jjohnso@gaes.griffin.peachnet.edu

Support from the Foundation for Agronomic Research (FAR) was used in part to allow an additional teacher to participate in the pilot phase of the "Reach to Teach" program. The goal of the program is to link the University of Georgia College of Agricultural and Environmental Sciences (CAES) faculty and staff with K-12 teachers. During the initial four weeks of the program (June 3 to June 28, 2002), the teachers were working with the faculty and staff on the Griffin Campus to develop grade appropriate lesson plans and activities. The lesson plans and activities were focused on programs that are most often requested for tours by school groups, especially in the Research and Education Garden. During the second two weeks of the program, the "Reach to Teach" participants were given the option of attending the "Summer Course for Science Teachers." This is a graduate level course offered by the University of Georgia College of Education and CAES. The course was also approved for the staff development unit or as a graduate credit. Another part of the K-12 education program was the Young Scholars Program for high school students. Eighteen high school students participated in the program during the summer on the Griffin Campus. Lesson plans that were initiated during the summer are being field tested at this time. These plans will be made available when they are completed. *GA-12D*



Using Aerial Imagery to Guide Differential Nutrient Management of Fields

Project Leader: Dr. Craig Kvien, Coastal Plain Experiment Station, University of Georgia, P.O. Box 748, Tifton, GA 31793-0748, Telephone: 912-386-7274, E-mail: ckvien@tifton.uga.edu

Project Cooperator: Stuart Pocknee

This study explored the potential of aerial imagery in identifying fields which might benefit from variable-rate management of inputs. A variability index was developed to quantitatively rank aerial imagery in relation to the ability to show field variability. The results determined that the best time to acquire aerial images for dryland fields was between 7.5 to 11.5 weeks (700-1,250 heat units) after planting. By using crop and soil reflectance, field regions

were classified as “good”, “medium”, and “poor” growth for 16 fields. The relationships between soil and crop parameters and image variability were complicated and site-specific. This study showed that every field is a unique case, and although images can be used to detect variability, ground-truthing, sampling, farmer knowledge, and other factors are necessary to determine the causes of this variability. In complex biological systems, technologies are often a poor substitute for educated and experienced farm managers and their advisers. *GA-16F*



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, Warnell School of Forest Resources, University of Georgia, P.O. Box 8112 GSU, Statesboro, GA 30460, Telephone: 912-681-5653, Fax: 912-681-0180, E-mail: ddickens@arches.uga.edu

Project Cooperator: David Moorhead

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+S+Cu+B) when grown under intensive management at three locations (Dodge, Toombs, and Washington counties) in Georgia.

In 2002, pine straw (litter layer or recently fallen undecayed needles) production was increased with fertilization at both the Montgomery and Dodge county sites. The Washington County site pine straw was collected in January 2003 for the first time. Pine straw raking rights generated \$15.5 million in 2000 for forest landowners in Georgia. Pine straw production was increased by 12% to 33% or 22 to 90 bales/A at the Montgomery County site and by 39% to 46% or 28 to 33 bales/A at the Dodge County site. Using an average raking price of \$0.50/bale, pine straw revenues in a single year were increased by \$11 to \$14/A with fertilization on these old-field sites.

In 2003, plot trees (44 plots) will be re-measured. Samples of the litter layer (the equivalent of pine straw raked) will also be collected to determine the continued benefit of fertilization on pine straw production. In subsequent years, forest floor litter layer, soil and foliage sampling will occur each subsequent winter following treatment, and leaf area index (LAI) will be estimated at peak expression in midsummer following treatment. Total height and diameter at breast height (dbh) will be remeasured every other winter to determine diameter class distribution, volume/tree, and volume/A by product class. Live crown ratio of all trees/plot will also be measured every other winter. Litter layer dry weights by treatment will be determined annually. Plots will be raked after litter

layer samples have been collected, or if litterfall traps are used, they will be emptied. The age class spread (age 8 to 17 year), species included (loblolly and slash pine), thinned vs. unthinned stands, and soils represented (Typic, Arenic, and Grossarenic Udults, all common soils of the Coastal Plain) make this study relatively comprehensive. *GA-21F*

Louisiana



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

Project Leader: Dr. W.B. Hallmark, Iberia Research Station, Louisiana State University, P.O. Box 466, Jeanerette, LA 70544, Telephone: 318-276-5527, E-mail: whallmark@agctr.lsu.edu

Project Cooperators: G.J. Williams, G.L. Hawkins

Four rates of KCl (0, 80, 160, and 240 lb K₂O/A) and three rates of copper sulfate (CuSO₄; 0, 1, and 2 qt/A. [0, 0.14 and 0.28 lb Cu/A]) were applied to variety LCP 85-384 second-stubble cane on a Jeanerette silt loam soil near Parks, Louisiana in 2002. Highest sugar yields were obtained with 160 lb K₂O/A, which had higher (p = 0.10) yields than the 0 and 80 lb K₂O/A rates. The CuSO₄ treatments did not significantly (p = 0.10) increase sugar yields. However, there was a trend (p = 0.25) towards higher yields with the 2 qt/A rate compared to the 0 and 1 qt/A application rate. *LA-16F*



Incorporating Precision Agriculture Technologies in a Soybean Research Verification Program

Project Leader: Mr. Darryl Rester, Agricultural Center, Louisiana State University, 104 E.B. Doran Hall, Baton Rouge, LA 70803, Telephone: 225-578-2229, E-mail: dvester@agctr.lsu.edu

Project Cooperators: David Lanclous, Curt Riche, Maurice Wolcott

The primary objective of this 2002 precision ag (PA) project was to demonstrate procedures for using grain yield monitors to harvest demonstration plots and then use geographic information system (GIS) software for data analysis. A secondary objective was to determine the benefits of P and K in soybean production. The 36 acre Southwest Louisiana demonstration field was in Acadia Parish. The 58 acre central Louisiana field was located in Concordia Parish. The third field is a 77 acre field in East Carroll Parish in Northeast Louisiana. All three fields are in a rice and soybean rotation. Soil electrical conductivity data were collected and used as a guide in establishing a soil sampling grid. Soil test data indicated a need for additional P in the Acadia and Concordia Parish fields. Potassium was

recommended for the Acadia Parish field. Prior to planting, P and K were applied in three strips, perpendicular to the rows in each field. In addition, three replicated seeding rates were used in the East Carroll Parish field. Plant population and plant height data were collected a few weeks after planting. There were no significant differences in plant population or plant height in the fertilized and non-fertilized areas. There was a significant difference in plant populations for the three seeding rates in the East Carroll Parish field.

In the Concordia Parish field, harvested on October 17, 2002, the yield in the three fertilized strips was 42 bu/A. In the adjacent non-fertilized areas, the yield was 41 bu/A. A combine equipped with a grain yield monitor was used to harvest the Acadia and East Carroll Parish fields. The combine ran perpendicular to the three fertilized strips. Based on a visual evaluation of the yield maps, the yields appear to be identical in the fertilized and non-fertilized areas. In the East Carroll Parish field, it appears that yields were slightly higher in the areas with the higher seeding rates. More detailed data on yields will be available when the analysis with GIS software has been completed. *LA-17F*
* See note on last page

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, Mississippi State, Dorman Hall, Room 153, Box 9555, Mississippi State, MS 39762, Telephone: 662-325-2311, E-mail: ablaine@pss.msstate.edu

Project Cooperators: Jim Thomas, Mitt Wardlaw, Brian Ward

Mississippi's verification program—Soybean Management by Application of Research and Technology (SMART)—consisted of 30 producer fields in 2002. This program utilizes research-based technology and on farm experiences to aid in improving production efficiency and overall farm profitability. A global positioning system (GPS) was used to identify problem areas for site-specific management. All field boundaries were mapped using a GPS equipped Geographic Information System (GIS) mapping program to calculate exact planted and harvested acres. These maps were used to generate evenly distributed soil sample points within the field. The GIS maps were also used in planning for crop inputs such as fertilizer, seed, and chemicals. Topographic contour maps were developed in selected fields using an RTK (Real Time Kinematics) GPS unit. These data were used in identifying high and low elevation areas within fields.

Elevation in the field areas was correlated with stressed areas during the growing season. In an above-average rainfall year, higher elevations exhibit less stress than lower elevations. The exact opposite has been observed in below average rainfall years. Over the past couple of seasons we observed some differences in growth and development that were not easily explained. However, when elevation was measured, the problem was identified as drainage. This could be compounded due to planting method, soil texture, soil tilth, and stage of growth. Based on preliminary research, management practices need to be refined to maintain profitability. Practices such as: evaluation of new materials, timely application of insecticides/fungicides, low use rates, and method of application and volume are examples of a few management practices that are currently being used in the Mississippi verification program. Voids exist in the evaluation of new management options and Mississippi's verification program is currently the only avenue for evaluation. *MS-08F* * See note on last page.

North Carolina



Weed Management Systems in a Precision Agriculture Environment

Project Leader: Dr. Gail Wilkerson, Crop Science Department, North Carolina State University, P.O. Box 7620, Raleigh, NC 27695, Telephone: 919-515-5816, E-mail: gail_wilkerson@ncsu.edu

Project Cooperators: G. Roberson, A. Bennett, A. Price, D. Krueger

Numerous studies have shown that weed populations vary across a field and that weeds tend to be clumped together in patches. This project has investigated the potential for increasing grower profit and improving efficiency of herbicide use through variable-rate (VR) herbicide application. In the first years of the project, procedures and tools were developed to facilitate VR herbicide application, to assess practicality and potential profitability of this technology. During 1999, 2000, and 2001, trials were conducted at the Center for Environmental Farming Systems in Goldsboro, and at the Caswell Research Farm in Kinston, North Carolina. During 2002, three field trials were conducted in farmers' fields in Wilson, Lenoir, and Wayne counties in North Carolina. Full-season and double-cropped soybean plots at the main study site in Port Royal, Virginia, were also scouted each year in order to determine the potential for site-specific weed management of these plots. We successfully demonstrated that the custom software 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 VR sprayer can be used for site-specific weed management. During 2001 and 2002,

the six-row VR herbicide applicator developed by Dr. Roberson successfully applied the recommended herbicides at the recommended rates to each section of four fields in North Carolina. Estimated gains in net return from VR application were fairly low for these trials. This is in part due to the weedy nature of these fields, low productivity at one site, and the availability of Roundup Ready soybeans. VR application could have reduced herbicide application from 25 to 70% at the study site in Virginia. It should be noted that according to the decision model, the whole-field treatment may be optimal for only a small portion of the field. The VR application may well provide better overall weed control than whole-field treatment. *NC-15F*

* See note on last page.

Tennessee



Effect of Soil Phosphorus Level on Magnesium Content in Tall Fescue Forage

Project Leader: Dr. Gary Bates, Plant Sciences and Landscape Systems, University of Tennessee, 2431 Center Dr, Knoxville, TN 37996-4561, Telephone: (865) 972-7208, E-mail: gbates@utk.edu

Project Cooperators: Gaylon Morgan, Hugh Savoy, Lee Ellis, Sally Mueller

Research in Missouri has indicated that adequate soil P levels may improve the Mg content of tall fescue forage. To investigate this in Tennessee, a 33 acre field was divided into 100 ft² grids. Due to an inadequate stand of tall fescue, the field was sprayed with glyphosate at the rate of 2 qt/A in late August 2002. In September, the field was seeded with 'Kentucky 31' tall fescue. In October, due to heavy weed pressure, 2, 4-D ester was applied at the rate of 2 pt/A. The stand of grass is establishing nicely. Soil samples were taken from each grid in late November/early December. They are currently at The University of Tennessee Soil Testing Laboratory for analysis. Once the results are obtained, approximately 40 grids will be selected to provide a range of soil P and pH. Previous samples have shown that soil Mg is not limiting in this field. Forage samples will be taken in mid-March from all grids for Mg tissue testing. *TN-16F*



Soil Potassium Requirements for Hybrid Bermudagrass Production

Project Leader: Dr. Hubert Savoy, Biosystems Engineerings and Environmental Sciences, University of Tennessee, 2506 EJ Chapman Dr., Knoxville, TN 37996-4531, Telephone: (865) 974-8840, E-mail: hsavoy@utk.edu

Project Cooperators: Gary Bates, Rick Carlisle, Marshall Smith, Debbie Joines

An experiment to evaluate K needs for production of Tifton 44 hybrid bermudagrass hay was initiated in April 2002 on a Loring silt loam soil at Ames Plantation Experiment Station in west Tennessee. The Tifton 44 had been established for several years and was used for hay production. The soil pH was 5.6, the Mehlich 1 P was very high, and K was medium at the start of the experiment. There are six K rates...0, 50, 100, 150, 200, 250 lb K₂O/A spring applied as KCl. Plots were limed and fertilized according to University of Tennessee soil test recommendations and 100 lb N/A were applied initially and after each harvest (total of 400 lb N/A for the season) as ammonium nitrate. Four harvests were made during 2002 (May 6, June 7, August 5 and 28). There were no significant differences in yields on this medium testing soil, due to applied K at any of the individual harvest dates, or for the total harvested dry matter during 2002. The experiment will be continued to fully evaluate soil test K critical values and fertilizer maintenance requirements. *TN-17F* ■

Note: Additional summaries with information on cotton and rice research projects in the Southeast Region appear in *News & Views: 2002 Research Summaries—Cotton and Rice*.

*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). More details about the projects in Arkansas, Louisiana, Mississippi, and North Carolina are posted under each state name, under the USB Summary Report.

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Potash & Phosphate Institute (PPI)
655 Engineering Drive, Suite 110
Norcross, GA 30092-2837

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