NEWS & VIEWS

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Dr. N.R. Usherwood, Southeast Director

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Science-based Research and Education...Essential for a Productive, Profitable and Environmentally Sound Agriculture in the Southeast

THE Potash & Phosphate Institute (PPI) and the Foundation for Agronomic Research (FAR) provide both financial and technical support for a broad spectrum of agricultural research and education programs. The following research and extension education projects received support from PPI/FAR during the 2000 cropping season. A brief description of each project is provided.

Alabama

Potassium Requirements for Ultra Narrow-Row Cotton

Project Leader: Dr. Wayne Reeves, USDA-ARS National Soil Dynamics Laboratory and Department of Agronomy and Soils, 411 S. Donahue Drive, Auburn University, AL 36832 (334-844-4666), wreeves@acesag.auburn.edu

A field study was conducted at the Prattville Experiment Field in Alabama. Potassium (K) rates of 0, 30 and 60 lb K_2O/A were evaluated with cotton planted in 36 and 7.5 inch-rows using conventional and no-till systems.

Seed cotton yields were higher for no-tillage (1,897 lb/A) compared with conventional tillage (1,638 lb/A). However, during the second season, seedling disease reduced the stand in the no-till treatments. The no-till plots averaged 1,858 lb/A seed cotton as compared with 2,965 lb/A from conventional till plots. Potash (60 lb K_2O/A) increased the yield of no-tillage and conventional tilled ultra narrow-row (UNR) cotton for the second straight year. In 1998, seed cotton yield was increased from 1,407 to 2,278 lb/A under no-till and 1,248 to 2,043 under conventional till. During the 1999 season, K boosted yield from 2,291 to 2,876 lb/A or 585 lb under no-till. Conventional tillage yields were 3,038 to 3,946 lb/A seed cotton or a response of 908 lb/A due to 60 lb K_2O/A.

In 2000, under the worst drought in 50 years, highest yields were obtained with K-fertilized, no-till UNR cotton (716 lb/A). Conventional tilled UNR averaged 445 lb/A. The 36-inch cotton yielded 358 lb/A under no-till and 196 lb/A with conventional. Potassium increased lint yields from 362 lb/A with no K to 471 and 479 lb/A for 0, 30 and 60 lb K_2O/A rates, respectively.

In summary, UNR cotton consistently resulted in substantial yield increases compared to conventional row spacing. The UNR cotton yield response to K is similar to that of conventional row cotton, and UNR cotton with the high rate of K consistently produced the highest yield. High volume instrumentation (HVI) analysis, soil test results, and K levels in plant tissue are being conducted and will be available.

Evaluation of Drip Irrigation and Fertigation in Northern Alabama

Project Leader: Mr. Charles Burmester, Auburn University, Tennessee Valley Substation, P.O. Box 158, Belle Mina, AL 35615 (205-353-8702, fax: 205-353-8883).

Moisture stress is a major yield-limiting factor for cotton grown in the Southeast. Availability of irrigation water is limited for most growers. Thus, interest exists in the use of drip irrigation to deliver both water and nutrients to the growing crop. This study evaluates the longevity of drip irrigation tubing and cotton yield as affected by different K treatments applied through the irrigation tubing.

In 2000, all subsurface drip treatments produced cotton lint yields in excess of 1,300 lb/A. Non-irrigated cotton yielded 592 lb/A. No yield differences were noted between surface applied and drip fertigated cotton. The better early season cotton growth with fertigation did not translate into higher cotton yields. Cotton lint yields determined by a

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cotton yield monitor were comparable with conventional procedures for measuring cotton lint yield.

Florida

Evaluation of Ammonium Sulfate and Ammonium Nitrate Fertilization on Beef Cattle Stocking Rate, Animal Performance, and Bahiagrass Forage Production and Quality

Project Leader: Dr. Jack Rechcigl, Ona Agricultural Research and Education Center, University of Florida, Route 1, P. O. Box 62, Ona, FL 33865-9706 (941-735-1314)

The objectives are to evaluate bahiagrass response to N and sulfur (S) fertilization and to determine the influence of these nutrients on pasture forage quality. Cattle growth rate and body condition as well as forage yield and quality will be determined for each fertilization treatment.

In 2000, bahiagrass yield, S content and protein percentage were increased with $(NH_4)_2SO_4$ compared with NH_4NO_3. The percent protein increased from 10.1 to 12.5 to 14.3, and the percent S increased from 0.13 to 0.15 to 0.30 for the treatment control, NH_4NO_3-N, and N from $(NH_4)_2SO_4$, respectively. The study demonstrates that when S is limiting, the use of $(NH_4)_2SO_4$ increases forage production and quality, allowing an increase in the stocking rate of cattle and increased animal performance.

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

Project Leader: Dr. Tom Obreza, University of Florida/ IFAS, SW Florida Research and Education Center 2686 State Road 29 North, Immokalee, FL 34142-9515 (941-658-3400, fax: 941-658-3469), taob@gnv.ifas.ufl.edu

Project objectives are to: 1) calibrate a citrus soil test for P (and possibly K); 2) evaluate yield and quality response to P and K; and 3) develop fertilization recommendations to produce quality fresh fruit. The study includes a factorial combination of four P rates (0, 50, 100, and 200 lb P_2O_5/A) and four K rates (0, 100, 200, 400 lb K_2O/A) to generate a wide range in soil test values. Both "Flame" grapefruit and "Hamlin" round orange yield and fruit quality will be determined.

In 2000, as in previous years, the application of P fertilizer increased soil test levels while K application rates up to 400 lb K_2O/A had no effect on soil test levels. Unfertilized soil tested 8 ppm P (Mehlich 1) in July 2000 while soils receiving 50, 100 or 200 lb P_2O_5/A in each of the three previous years tested 31 ppm (medium), 53 ppm (high), and 90 ppm (very high), respectively.

Tree canopy volume did not increase with higher P rates, but did increase as K fertilizer rate increased from 0 to 200 lb K_2O/A. Leaf tissue concentration for both P and K increased as the rate of applied nutrient increased. The continued failure of K to build up in the soil supports the current practice of annually applying K fertilizer at rates similar to N applications.

Georgia

Teacher's Internship Program

Project Leader: Dr. Jerry Johnson, University of Georgia, Department of Crop and Soil Sciences, 1109 Experiment Street, Griffin, GA 30223-1797 (770-228-7273, fax: 770-229-3215), agrngrf@gaes.griffin.peachnet.edu

This cooperative effort provides support for elementary and middle school teachers to participate in the Summer Teacher Internship program. It helps teachers to become familiar with agricultural programs conducted by University of Georgia scientists and to develop lesson plans for career opportunities in agriculture. The objective is to increase teacher awareness of agriculture and to introduce agriculture-based activities in the classroom.

A partnership among PPI/FAR, the Spalding County School System and the University of Georgia has created a variety of activities. A learn and serve grant for middle grade students provides an outdoor agricultural garden program which serves as a classroom to provide educational activities involving vegetables and agronomic crops such as corn, cotton, and peanuts. The program also increases teacher awareness of genetic engineering, molecular biology, digital imaging, and plant nutrition, and demonstrates that agriculture is truly high-tech. As reported in *Better Crops with Plant Food*, 84, No. 4, 2000, student involvement with the garden also provided a boost in their math and science scores.

Ms. Katherine Griffin, PPI Assistant Editor, continues to work with Georgia scientists and teachers to provide this unique educational experience for students while also providing them a new perspective on agriculture and food production.

Precision Farming Systems for Southeast Agriculture

Project Leader: Dr. Craig Kvien, University of Georgia, Coastal Plain Experiment Station, NESPAL Program Director, P. O. Box 748, University of Georgia, Tifton, GA 31793-0748 (912-386-7274), nespal@tifton.cpes.peachnet.edu or stu@agrisurf.com

Objectives include 1) the development of a technology and information based system for growers to better manage resources while optimizing yields and profit, 2) monitoring crop yield variability and studying site specific soil and/or crop physical and chemical characteristics contributing to ultra high yield areas, and 3) the dissemination of research based facts through an annual precision agriculture conference for growers and agribusiness. All research is conducted on-farm with top grower partners who pay attention to details, including nutrient management.

Nutrient management decisions improve when soil texture, water holding capacity, topography, and subsurface drainage characteristics of the field are used in the decision process. For example, P continues to show more spacial stability in the field than K. Sandy areas tend to be higher in P and lower in K while the opposite is true for heavier textured soils.

The Precision Agriculture 2000 Road Trip was created to take conference participants into the field to view ongoing projects, interact with innovative farmers and experience precision farming in the real world. Growers cautioned: "Precision agriculture is not a spectator sport. Instead, it is an essential ingredient for staying in business and preparing for the future."

Use of Enhanced Soil Survey to Optimize Fertilizer Application in Precision Farming

Project Leader: Dr. David Kissel, Department of Crop and Soil Sciences, University of Georgia, Athens, GA (706-542-5350), dkissel@arches.uga.edu

The objective of this project is to identify and quantify physical and chemical soil characteristics responsible for variability in cotton yield and quality. Soil type, landscape position, soil water relationships, soil organic matter and cation exchange capacity (CEC) are being evaluated in relation to cotton yield variability.

Results from 1998, 1999 and 2000 confirmed that water extraction by cotton was inhibited by acid subsoil below pH 5.0 and that a yield reduction would occur. Correction of subsoil acidity is being evaluated in a replicated study receiving 4,500 lb/A of gypsum incorporated into the top 12 inches of soil. Due to drought conditions during the 2000 growing season, the gypsum did not move into the subsoil and thus had no effect upon cotton yield. The subsoil pH, which ranged from 4.3 to 5.4, prevented root growth and utilization of subsoil moisture.

Soil organic C mapping using remote sensing continues. NASA provided bare field images in May of 1999. The Veris, an instrument used primarily in site-specific agriculture to measure electrical conductivity, is being utilized for mapping clay. Nitrogen mineralization from soil organic matter was determined to range from 12 to 69 lb/A. This reflects the range in N release in a field cropped to cotton the previous season.

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, fax: 912-386-7293), gascho@tifton.CPES.Peachnet.edu

The objective of this study is to determine if cotton will respond to applied Mg and S on soils varying in soil pH, using $KMgSO_4$ as the Mg and S source. In 2000, neither Ca nor Mg had a significant influence on cotton lint yield even though soil tests indicated low soil test levels for these nutrients.

In a greenhouse study, the influence of Ca and Mg on cotton growth and yield is being evaluated. In the field, neither Ca nor Mg affected the dry weight of the bolls.

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, fax: 912-681-0180), ddickens@arches.uga.edu

Private non-industrial forest landowners are interested in fertilization of Conservation Reserve Program (CRP) planted pine trees. The objectives include an in-depth evaluation of slash and loblolly pine growth response to fertility treatments of: no fertilizer, NP, NPK, NPKMgSCuB when grown under intensive management and at four locations in Georgia.

During the first year, four sites for the study were located, and the 10- to 12-year old stands were thinned prior to treatment application. Baseline data for each treatment replication are being collected. These include soil characterization, soil/litter/needle analysis, tree height

and volume measurements, leaf area index, tree labeling, etc. Tree growth will be assessed each year to determine the influence of treatments on tree growth rate, needle production, and certain physiological activities of the trees. Wood quality and an economic assessment will be determined later in the five-year study.

Maryland

Building a Maximum Yield Cropping System for Corn, Wheat, and Double-Cropped Soybeans

Project Leader: Mr. Ron Mulford, Poplar Hill Research Center, Rt. 1, 61A, Quantico, MD 21856 (410-548-7051), fm18@umail.umd.edu

A four crop/three-year cropping system consists of no-till soybeans in corn stubble, followed by minimum till wheat, no-till soybeans, and then no-till corn the third year. The goal of this study is to develop a management program that increases crop yield level, input efficiency, and profit potential in such a system.

The 2000 growing season was ideal from planting through harvest. When $(NH_4)_2SO_4$ was blended with urea, N use efficiency was improved. Corn yield improved from 30 bu/A without fertilizer N to 153 bu/A for the blend and 142 bu/A when the same rate of N was applied as NH_4NO_3. With adequate N, little difference in yield was noted for corn planted in 20- or 30-inch rows.

To Determine the Most Efficient and Cost Effective Row Spacing for Full Season Soybean on Droughty Soils

Project Leaders: Mr. Ron Mulford and Dr. William J. Kenworthy, University of Maryland, Poplar Hill Research Center, Rt. 1, 61A, Quantico, MD 21856 (410-548-7051), fm18@umail.umd.edu

The objectives of these studies are to improve soybean yields under dryland conditions by evaluating row width (7, 15, 20, and 30-inch), tillage practices (no-till and minimum till), variety response, seeding rate, and fertility levels.

In 2000, the 15-inch beans tended to out yield the 30-inch soybeans. As row width increased from seven to 30 inches, soybean grain yield was progressively higher for no-till over minimum tillage.

Soybean seeding rate tended to interact with fertility level. In 1999, the higher fertility level tended to improve yields by an average of slightly over 3 bu/A. In 2000, soybeans at both low and high seeding rates yielded better on the higher fertility soils.

Optimum Corn Management Practices for the Eastern Shore of Maryland [Optimizing Corn Management Systems Utilizing Narrow Rows, No-till, and Fertility Practices to Achieve Yield Efficiency on Drought Prone Soils in Maryland (Multi-Regional Project)]

Project Leader: Mr. Ron Mulford, Poplar Hill Research Center, Rt. 1, 61A, Quantico, MD 21856 (410-548-7051), fm18@umail.umd.edu

Six corn studies were established in 1999 to evaluate row spacing, variety response, tillage practices, N rates, and input efficiency for corn grown under dry land conditions.

During 2000, no-till corn was compared with minimum tillage treatments on a Norfolk loamy sand. Grain yields were higher for N treatments under minimum tillage. Regardless of tillage practice, corn yields were increased when $(NH_4)_2SO_4$ was blended with urea or NH_4NO_3 as compared with all of the N (120 lb/A) applied as either urea or as NH_4NO_3. A field study with corn at Poplar Hill, Maryland. evaluated sources of N (urea and NH_4NO_3) applied at a rate of 120 lb/A as compared with these sources blended with $(NH_4)_2SO_4$ to give the same total N applied on a per-acre basis. Grain yield was increased from 109 bu/A to 143 bu/A when $(NH_4)_2SO_4$ was blended with urea. Yield increased from 150 to 163 bu/A when $(NH_4)_2SO_4$ was blended with NH_4NO_3.

Starter fertilizer methods in no-till corn evaluated N, K and/or S broadcast pre-plant in combination with 2x2 placement of 10-34-0 or 30-20-50-24S starter fertilizers. Yields ranged from 102 to a high of 123 bu/A. The top yield was obtained when 0-0-30 and 90-0-0-27S (a blend of 30 percent UAN and 8-0-0-9S) were broadcast pre-plant and a starter fertilizer (30-20-50-24S) was banded 2x2.

Evaluation of Fertilizer Nitrogen Applications with and without Ammonium Sulfate in Selected Vegetable Crops

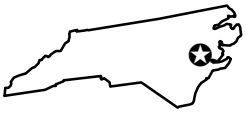
Project Leader: Mr. Ron Mulford, Poplar Hill Research Center, Rt. 1, 61A, Quantico, MD 21856 (410-548-7051), fm18@umail.umd.edu

The objective of this study is to measure the influence of $(NH_4)_2SO_4$ blended with NH_4NO_3 on the yield of various vegetable crops.

During the 2000 season, the no-till sweet corn yielded 8.4 tons/A when 212 lb N/A was applied. Under minimum tillage, sweet corn yields topped out at 7.1 tons/A and response to N reached a plateau at 107 lb/A. When a blend of $(NH_4)_2SO_4$ / NH_4NO_3 was compared with NH_4NO_3 alone

(each at 160 lb N/A) the yield of sweet corn was 7.6 and 7.2 tons/A, respectively. Yield was increased to 8.3 tons/A when some of the $(NH_4)_2SO_4$ was applied at row closure. The apparent response at row closure will be studied further in 2001.

North Carolina



Variable Rate Nitrogen Management for Corn-Wheat-Soybean Cropping Systems

Project Leader: Dr. Ronnie W. Heiniger, North Carolina State University, Vernon James Center, 207 Research Station Road, Plymouth, NC 27962

The long range goal of these studies is to develop nutrient management practices that maintain or enhance cropping system productivity, environmental quality, and the natural resource base.

In 1999 and 2000, yield response to added N differed for each soil type at each location. It fit well with historical yield records, but not with the Natural Resources Conservation Service (NRCS) predicted yields. As might be expected, soils with the highest recorded yields also had the highest N use efficiency. In 2000, the site with a realistic yield expectation (RYE) of 130 bu/A yielded 212 bu/A with an optimum N rate of 181 lbs/A N. A second site with a RYE of 75 yielded 168 bu/A, and the optimum N rate was 190 lbs N/A.

Studies at three sites in 2000 evaluated digitized red-green-blue (RGB) color and infrared photographs for use with ground truthing by a differential global positioning system (DGPS) data system to inexpensively map tiller densities in wheat fields. The studies show that a strong relationship exists between tiller numbers in soft red winter wheat fields and several photographic measures recorded in an infrared photograph of the field. Across all locations, the digitized RGB system for counting tillers captured 89 percent of the variability within the field. Further studies are designed to develop a relationship between percent tissue N and the green color band and plant N uptake and the ratio between the green and infrared bands of an infrared photograph (GNDVI). The GNDVI was strongly related to plant uptake of N at all sites, and the green color band was related to percent tissue N at two of the four sites.

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)

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.

Average weed densities were determined in 2000 through scouting, and variable rate treatments were applied accordingly. The software decision model (HADSS) estimated that variable rate application would improve profit potential by $7/A as compared with the whole-field treatment and taking scouting costs into account.

Analysis of data from variable rate field studies at the Center for Environmental Farming Systems at Goldsboro, North Carolina and at a main study at Port Royal, Virginia indicates that variable-rate herbicide applications may improve weed management and increase net returns enough to more than cover the additional scouting costs. Even in fields that are very weedy, variable-rate applications may be appropriate if weed distributions are uneven and different treatments are more effective against the weed populations in different areas of the field.

Cotton Intensive Management with Ammonium Sulfate

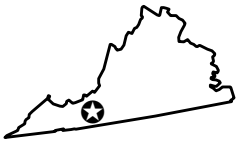
Project Leader: Dr. Steve Hodges, Department of Soil Science, North Carolina State University, P.O. Box 7619, Raleigh, NC 27695-7619 (919-515-7307), steve-hodges@ncsu.edu

The objectives are to attain high yield and quality of seed cotton and to evaluate cotton response to applied S as $(NH_4)_2SO_4$. This study tests the influence of fertilizer sources, timing and placement of S to cotton grown on a sandy soil of the North Carolina Coastal Plain.

During the 2000 season, rainfall distribution was uniform with no prolonged periods of drought during boll fill and with little nutrient loss due to leaching. Cotton response to 80 lb N/A was significant, with lint yields of 453 lb/A for the no N treatment compared with 863 lb/A of lint as an average of all N treatments.

Plant tissue analysis showed K levels below the 2 percent critical level even though soil analysis results indicated a small likelihood of response to K. Side-dress K (60 lb K_2O/A) enhanced K tissue levels at first bloom, but they were still below the critical level. Closer examination of K needs of recently introduced cotton cultivars may be required, based on research findings such as these and experiences noted in several closely monitored fields.

Virginia



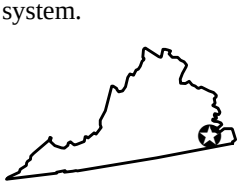
Cropping Systems Evaluation: The Main Study Location for a Mid-Atlantic Regional Interdisciplinary Cropping Systems Project

Project Leader: Dr. Mark Alley, Virginia Tech, Department of Crop, Soil and Environmental Sciences, 416 Smyth Hall, Blacksburg, VA 24061-0403 (540-231-9777), malley@vt.edu or jroygard@vt.edu

A team of more than 20 scientists from four states (MD, NC, PA, and VA) is cooperating in a regional project to improve yield, profitability, and environmental integrity of rain-fed corn, small grain, and soybean production systems. The primary objective of the main study is to evaluate the profitability and sustainability of 1) a standard rotation of three crops in two years, 2) four crops in three years, all with no-till, and 3) four crops in two years, all with no-till. The main study will use team-identified best management practices (BMPs) in field-scale plots utilizing the latest technology for variable rate and precision input applications.

In 2000, barley yields ranged from 88 to 123 bu/A as compared with 71 to 132 bu/A the previous year. Yields of both barley and wheat continue to be strongly correlated to a soil type's water holding capacity. Conventionally tilled wheat out-yielded no-till by 9 and 3 bu/A for the two soil types, respectively. The importance of soil type is indicated by an average yield of 87 bu/A for the Wickham soil as compared with 51 bu/A for the lower water holding Bojac soil. The influence of moisture stress on wheat during grain fill was measured by a grain test weight over 58 lb/bu for the Wickham, but less than 56 for the Bojac soil.

Crop yield data collected during the three years of this study clearly indicate the necessity for evaluating cropping systems over numerous years. Total grain produced is not the most effective measure for selecting a cropping system. Economic analysis, the influence of rotations on soil properties, and year to year yield fluctuations must also be considered before selecting the most appropriate cropping system.



Cultural Practices to Improve Yield Potential of Early Soybean Production Systems

Project Leader: Dr. David L. Holshouser, Tidewater Agricultural Research & Education Center, 6321 Holland Road, Suffolk, VA 23437 (757-657-6450 Ext. 123), dholshou@vt.edu

The study evaluates the effects of row spacing, population, and variety selection on early, full, and double-cropped soybeans.

During the 2000 season, leaf area index (LAI) measurements indicate that the later maturing soybean variety was able to achieve a higher LAI value. Increases in LAI for the maturity group III soybeans ceased after the R4 stage while majority group V continued to increase LAI through the R5 stage. Field studies showed that at higher plant populations (250,000 to 300,000 plants/A) soybeans were able to achieve early canopy closure, and subsequently a higher LAI value, which led to increased yields.

It is believed that infrared photography should be able to estimate the LAI and thus improve site-specific management decisions such as population and row width for soybeans. Yields are strongly correlated with LAI when the LAI is less than 3.5 to 4.0.

Criteria for Determining Late Season Input Applications to Soybean

Project Leader: Dr. David L. Holshouser, Tidewater Agricultural Research & Education Center. 6321 Holland Road, Suffolk, VA 23437 (757-657-6450 Ext. 123), dholshou@vt.edu

This study evaluates the influence of late season N and B on soybean yield under an irrigated, high yield environment. In 1998, under high yield conditions (75 to 80 bu/A), 0.25 to 0.5 lb/B/A tended to increase grain yield over the control (about 5 bu/A) when applied at the R3 growth stage. Similar yield increases were noted when 50 lb N/A was applied at the R5 stage of growth. Overall soybean yields averaged in the 75 to 80 bu/A range.

In 2000, the three-year study was completed and the data summarized. Applications of N or B at the R3 or R5 stage did not increase soybean yield, nor did variety selection or row spacing affect crop response. Soil samples to a three-foot depth revealed low levels N and B while plant analysis revealed sufficient concentrations in the leaves. Native soil N and B appeared to be adequate for high yields in non-drought stressed soybean production systems in the coastal plain soils of the Mid-Atlantic region. ■

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