

NEWS & VIEWS

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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 1999 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 & 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. Rates of 0, 30, and 60 lb K_2O/A were evaluated with cotton planted in 36 and 7.5 inch rows (UNR) using conventional and no-till systems.

Seed cotton yields were higher for no-till (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 seed cotton per acre as compared with 2,965 lb/A from conventional till plots.

The 60 lb K_2O/A rate increased the yield of no-till and conventional tilled 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 for a response of 871 and 585 lb/A, respectively. During the 1999 season, potash 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 of seed cotton or a response of 908 lb/A due to K.

Florida



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

Project Leader: Dr. Tom Obreza, University of Florida/IFAS, SW Florida Research & 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, 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.

About 275 young trees of each citrus type were planted in 1997 in previously unfertilized Immokalee fine sand testing low in both P and K. Fertilizer treatments were applied in late 1998. Fruit harvest for yield and quality evaluation will be initiated during the harvest season of 2001. Until then, tree growth rates will be measured and soil test levels monitored.

Applying P fertilizer increased soil test levels while K application rates up to 400 lb K_2O/A had no effect on soil test levels. Increasing P increased the Mehlich test from 3 to 8, 11, and 15 ppm for the 50, 100, and 200 lb P_2O_5/A rates, respectively. The continued failure of K to build up in these sandy soils supports the current practice of annually applying K fertilizer at rates similar to N.



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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 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 1999, all cows experienced increased body weight and body condition throughout the grazing period. As the stocking rate decreased from one cow per 2.5 acres to one per 3.3 acres to one per 5.0 acres, beef production per acre also decreased. The effect of pasture fertilization on animal body weight gain during the grazing period was 132 lb/animal. Sixty pounds of N from $(\text{NH}_4)_2\text{SO}_4$ provided animal gain of 164 lb as compared with 145 lb for the same rate of N from NH_4NO_3 .

Both yield and protein content of bahiagrass were increased by fertilization with $(\text{NH}_4)_2\text{SO}_4$ being superior in performance to NH_4NO_3 . The increased S content of the grass indicates the need for S to be used with N for best yield and forage quality. The critical response level for S in bahiagrass is 0.25 percent. Without S, the S content of bahiagrass was slightly below 0.15 percent. Where S was added as $(\text{NH}_4)_2\text{SO}_4$, S content of the plant tissue increased to about 0.28 percent S.

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).

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 created a variety of activities during 1999. 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, plant nutrition, and that agriculture is truly high-tech.

During 1999, Ms. Katherine Griffin of PPI teamed with Griffin-Spalding County, Georgia teachers to explain their cooperative programs during a Division A-1 Symposium titled "K through 12 Agronomic Science Education." This symposium was conducted during the American Society of Agronomy annual convention in Salt Lake City, Utah.



The Impact of Nutrient-Insecticide Sprays on Yield and Insect Population in Soybeans

Project Leader: Dr. Gary Gascho, Dept. of Agronomy Coastal Plain Experiment Station, University of Georgia, P.O. Box 748, Tifton, GA 31793-0748 (912-386-3329, fax: 912-386-7293), gascho@tifton.cpes.peachnet.edu

The insecticide and growth enhancer, Dimilin, was foliar applied with 0.25 lb B/A to eight varieties of soybeans (maturity groups 4 to 8) at the R2, R3, R4, and R5 stages of growth. The objective was to determine soybean variety response to B and the optimum growth stage to apply the foliar insecticide/fertilizer treatment.

Soybean response to late-season foliar applications of N and B occur most often on deep sands (about 5 bu/A) and to a lesser extent on heavier textured loam soils (about 2 bu/A). Field studies support the hypothesis that response is due to supplying late-season nutrition for pod fill which is not being provided by the soil. Recommendations are established in Georgia and South Carolina to spray soybeans with 0.25 lb B with Dimilin when treating for the velvet bean caterpillar.

Research conducted in 1999 indicated that the combination spray resulted in the greatest yield response when it was applied at bloom or shortly thereafter rather than waiting until the beans begin developing in the pod. Adding 0.25 lb B to Dimilin resulted in 11 bu/A more yield than when Dimilin was applied as a spray at bloom (R2). Leaf B prior to application was 34 ppm, a level above which response was not believed likely.

During the 1999 season, three studies on cotton evaluated foliar N and B. No improvements in lint yield were measured due to foliar fertilization. Absorption of nutrients appears less efficient for cotton than for soybeans. Attention should be directed to surfactants to increase absorption in any future work with cotton.



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).

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.

Nutrient management decisions improved when soil texture, water holding capacity, topography, and subsurface drainage characteristics of the field were used in the decision process. For example, P continues to show more spatial 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.

Research findings continue to favor the “management zone” approach to soil sampling and the development of site-specific nutrient management programs. Strengths of the zone approach include making it easier to change seeding rates or varieties, and to target a scouting program, irrigation water application, variable rate nutrient and aglime application, etc. A precision agriculture web-based learning program has been developed to improve the transfer of knowledge to the farmer and agribusiness.



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 (706-542-9072, fax: 706-542-0914).

The objective 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 and soil organic matter/CEC are being evaluated in relation to cotton yield variability.

A non-irrigated study field of 280 acres was soil mapped in 1997 prior to planting D&PL 90 cotton. Severe moisture stress allowed a measure of the affect of soil physical properties on cotton lint yield. Yield variability was determined to be due to differences in soil water holding capacity, subsoils having an acidic layer high in manganese (Mn) that restricted root growth, and where K was inadequate in very sandy soils for high yield cotton.

Dry weight of cotton plants grown on the different soil types was proportional to lint yield.

Results from 1998 and 1999 confirmed that water extraction by cotton was inhibited by acid subsoils below pH 5.0 and that a yield reduction would occur.

Soil organic C mapping using remote sensing continues. NASA provided bare field images in May of 1999. The Veris electrical conductivity sensor is being utilized for mapping clay.

Nitrogen mineralization from soil organic matter was determined to range from 12 to 69 lb/A/yr. This reflects the range in N release in a field cropped to cotton the previous season.

Maryland



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

Project Leader: Mr. F. Ronald 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 goals of this study are to develop a systems management program that increases crop yield level, input efficiency, and profit potential.

In the first year, the rotation improved corn yield by 14 bu/A and soybean yield by 5 bu/A. Specifically, full season soybeans in the new rotation yielded 37 bu/A. Corn yielded 174 bu/A in the new rotation system, while the conventional corn/soybean rotation yielded 144 bu/A.

A record yield of wheat for the region was harvested during 1997...151 bu/A as compared with the Maryland state average of 60, the highest farmer yield of 85 bu/A, and the highest previous research yield of 125 bu/A.

In 1999, as in 1995-97, the top corn grain yields resulted from no-till corn in various rotation patterns with wheat and soybeans. Grain yields ranged from 151 to 158 bu/A. The goal for wheat yields in 2000 is 100 bu/A hard red winter wheat with a good test level and protein levels above 13 percent.



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

Project Leader: Mr. F. Ronald 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 1998, the 15- and 20-inch row spaced soybeans yielded in the 45 bu/A range, or about 12 bu/A better than 30-inch row beans. In 1999 results were similar. The 15-inch row spacing yielded an average (for six varieties) of 46 and 48 bu/A for the no-till and conventional till soybeans, respectively. The 20-inch row beans averaged 48 bu/A with conventional tillage, but only 39 bu/A when grown under no-till conditions. Overall, the six varieties averaged 46 bu/A under conventional and 42 bu/A under no-till management.

In 1999, some visual benefits were noted from the application of foliar nutrients. In five out of six treatments evaluating soybean seeding rate interaction with fertility level, the higher fertility level tended to improve yields by an average of slightly over 3 bu/A.



Optimum Corn Management Practices for the Eastern Shore of Maryland

Project Leader: Mr. F. Ronald 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 dryland conditions. Extremely dry conditions at planting and until about silking time resulted in plant stand problems and lower than desired grain yields. Overall grain yields averaged 95 bu/A on drought prone sandy soils. As in 1998, the longer season corn hybrids, 115 to 120 day, consistently yielded best on these droughty soil types. Corn grain yields from minimum tillage plots outyielded varieties planted no-till.

North Carolina



Cotton Intensive Management with Ammonium Sulfate

Project Leader: Dr. Steve Hodges, Dept. of Soil Science, North Carolina State University, Raleigh, NC 27695 (919-515-7307).

The objectives are to attain high yield and quality of seed cotton and to evaluate cotton response to applied S as $(\text{NH}_4)_2\text{SO}_4$. In 1998, the project experienced severe establishment problems due to moisture stress brought on by El Nino and La Nina. In 1999, excess rain from a hurricane inflicted damage to the test plots but did not result in crop loss or prevent crop response to the applied $(\text{NH}_4)_2\text{SO}_4$.



Ammonium Sulfate and Micronutrient Formulations in Greenhouse Comparisons

Project Leader: Dr. Charles Peacock, Dept. of Crop Science, North Carolina State University, 1215 Williams Hall, Box 7620, Raleigh, NC 27695 (919-515-7615, fax: 919-515-7959).

A variety of fertilizer materials was evaluated on creeping bentgrass maintained under putting green height to determine turf performance and N release. An experimental putting green with a U.S. Golfers Association (USGA) soil profile planted as a blend of the cultivars Cato and Crenshaw was used. The green was mowed at 5/32 inches three times a week. Irrigation was applied to supplement rainfall to prevent moisture stress. Ammonium sulfate, combinations of $(\text{NH}_4)_2\text{SO}_4$ plus NH_4NO_3 , urea, a natural organic, UAN, and complete NPK materials were compared at a rate of 1.5 lb/1,000 sq ft. Data collection included turf quality, clipping weight, and N uptake based upon N content of the clippings.



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

Project Leader: Dr. Ronnie W. Heiniger, North Carolina State University, Vernon James Center, 207 Research Station Road, Plymouth, NC 27962 (252-793-4428, fax 252-793-5142), rheinig@plymouth.cen.ncsu.edu

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

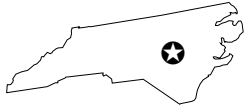
In 1998, variable rate fertilization of soybeans increased yield by more than 10 bu/A. The yield increase for the whole field covered the increased costs from soil sampling, fertilizer and application costs, and still netted nearly \$10/A more than the uniform application program.

In 1999, yield response to added N differed for each soil type at each location. Soils with the highest recorded yields also had the highest N use efficiency. The site with a realistic yield expectation (RYE) of 130 bu/A yielded 204 bu/A with an optimum N rate of 184 lb/A. A second site with a RYE of 75 yielded 143 bu/A, and the optimum N rate was 144 lb/A.

Two years of data show that variable rate application of P to low testing soils increased corn yield from about 65 to 90 bu/A. After three years of soil sampling, the P soil test level is not increasing on high organic matter soils. This suggests that variable rate application of P will need to be continued to assure that P is not a yield limiting factor.

Studies at two sites in 1999 evaluated digitized red-green-blue (RGB) color and infrared photographs for use

with ground truthing by a differential global positioning system (DGPS) to inexpensively map tiller densities in wheat fields. Raw digital counts in the IR-1 band, normalized difference vegetation index, and normalized digital counts are strongly and consistently correlated to tiller number. Unfortunately, the strong linear relationship varies from field to field and from year to year due in part to bare soil reflectance, film process settings, and intensity of incoming solar radiation. Thus, ground truthing using portable DGPS receivers and data recorders will be needed. This technique could be useful in determining tiller counts for N use decisions.



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

A computer program has been developed to utilize weed scouting data based on grid sampling to determine variable rate herbicide applications based on threshold levels. Trial runs indicated that herbicide applications in soybean fields could be reduced and returns increased due to the use of this technology.

In one field, the amount of herbicide applied could be reduced by nearly 60 percent if the herbicide was applied only to field sectors with weed populations above the treatment threshold. However, not all fields are as well suited to VRT. By using the scouting and decision making programs developed in this project, a grower could determine whether VRT is appropriate for specific fields before investing in new equipment.

Virginia



Cropping Systems Evaluation: Main Study

Project Leader: Dr. Mark Alley, Department of Crop & Soil Environmental Sciences, Virginia Tech, 420 Smyth Hall, Blacksburg, VA 24061 (540-231-9777), malley@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-tillage, and (3) four crops in two years all with no-tillage.

In 1999, barley yields ranged from 71 to 132 bu/A, with yield strongly correlated to a soil type's water holding capacity. Conventionally tilled wheat yielded between 81 and 86 bu/A depending upon the soil type. Yields on no-till plots were slightly lower due to stand establishment problems. Full season soybean yields ranged from 40 to 66 bu/A. Double crop soybeans yielded between 36 and 48 bu/A with soil moisture being a major limiting factor that differed by soil type. Full season corn yields were low and ranged from 92 to 124 bu/A. Low rainfall (62 percent of normal) during the season and the extended dry period at pollination time took a heavy toll on yield. Double crop corn yields were severely suppressed by drought while ear fill and grain quality were affected by a severe infestation of common smut.

Annualized grain yield data show that grain production is highest on the four crop in two years rotation because barley and wheat yields were high, and the double crop corn yields were about the same as full season corn yields.



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), cholshou@vt.edu

The study evaluates the effects of row spacing, population, and variety selection on early, full and double-cropped soybeans. During the 1998 season, no significant responses were obtained for the various growth factors. However, vegetative growth factors such as leaf area index (LAI) and light interception were increased as row spacing declined and population increased.

During the 1999 season, leaf area index measurements showed the ability of indeterminate soybeans to rapidly add needed leaf area and recover from drought stress when rainfall is received. Minimum leaf area requirements were met in most of the field studies, thus little response was noted from plant population adjustments. However, at the Suffolk location, early drought stress did reduce LAI, and some response was recorded from higher populations. Yield increases due to decreasing row width from 18 to 9 inches was not always due to increasing the LAI of the soybean canopy, but might be a result of more efficient use of inputs such as soil moisture.

It is believed that infrared photography can be used to estimate the LAI. Yields are strongly correlated with LAI when the LAI is less than 3.5 to 4.0. Also, soil type, productivity, environmental characteristics, etc. represented on maps generated by GPS and GIS technology should correlate with LAI. The potential exists for integrating precision farming techniques with crop growth models to predict and manage soybeans.



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), cholshou@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/A B 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/A N was applied at the R5 stage of growth.

In 1999, the overall yield level was much lower (range from 30 to 50 bu/A). Seed yield tended to be improved by more than 5 bu/A when 0.25 to 0.5 lb/A B was applied at R3. Yields were not improved by the late season application of N. Neither row spacing (9- vs. 18-inch) nor variety had a meaningful impact on soybean yield during the 1998 high yield environment or in 1999 (an excess rainfall season).



Evaluation of Grain Sorghum and Corn Planted Double-Crop behind Small Grain

Project Leader: Dr. Dan Brann, Dept. of Crop & Soil Environmental Sciences, Virginia Tech, 420 Smyth Hall, Blacksburg, VA 24061 (540-231-9800), dbrann@vt.edu

These studies will help determine the best crops and cropping practices to use in an intensive cropping system where four crops are harvested over a two year period. Management decisions involving variety selection, row width, plant population, and genetic insect resistance (Bt) will be evaluated for their impact on yield and quality of corn.

During 1998, short season corn hybrids yielded up to 138 bu/A with irrigation as compared with 45 to 56 bu/A without irrigation. Corn planted in mid-June in eastern Virginia has a yield potential greater than 150 bu/A.

In 1999, corn yields were suppressed (65 bu/A) by severe drought stress during late vegetative growth. Then, quality of grain declined due to molding, rotting and sprouting caused by excess moisture from the hurricanes prior to harvest. Most of the hybrids having the Bt gene for insect resistance were the higher yielding varieties with the best grain quality. Corn ear smut is more likely to be present in doublecrop corn and thus should be evaluated in variety trials.



Late Season Nitrogen for Corn

Project Leader: Dr. Mark M. Alley, Dept. of Crop & Soil Environmental Sciences, Virginia Tech, 420 Smyth Hall, Blacksburg, VA 24061-0404 (540-231-9777), malley@vt.edu

The primary objective of these studies is to improve corn grain yield and profit by improving the utilization of soil moisture by fertilizing with N and K just prior to tassel. A second objective is to develop a soil-specific method to predict the need for late season N and K fertilization.

Corn grain yields of 180 and 209 bu/A were obtained at the two locations. Nearly 30 bu/A of the 180 bu/A yield was due to N applied prior to the silking stage of growth. No response to applied K was measured during the first year of the study. Soil moisture measurements were made throughout the growing season. Data analysis reveals that the potential exists for profitable yield increases to late season N fertilizer application to corn when adequate moisture is available. ■