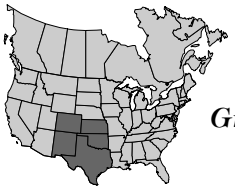
# NEWS & VIEWS

*A regional newsletter published by the Potash & Phosphate Institute (PPI) and the Potash & Phosphate Institute of Canada (PPIC)*


*Dr. W.M. Stewart, Great Plains Director*

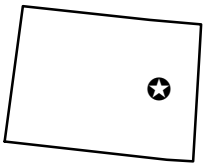


*July 1998*


# Research Programs in the Great Plains Region

**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 programs received support from PPI/FAR during the 1997 cropping season. A brief description of each project is provided.

## Colorado



### Soil Test Calibration Using Spatial Variability of Landscapes in Eastern Colorado

*Project Leader: Dr. D.G. Westfall, Department of Soil and Crop Science, Colorado State University, Ft. Collins, CO 80523. (970-491-6149).*

This was the second year of a site-specific management study on phosphorus (P) fertilizer relationships on dryland winter wheat in eastern Colorado. Unfortunately, the stand was lost during the winter of 1996-97, and the study was abandoned for the year. However, other aspects of site-specific management in dryland cropping systems were studied. The spatial relationship between nitrogen (N) availability and dryland corn yield was investigated on four landscapes.

Corn yields varied along the landscape from 16 to 111 bu/A. The highest yields were observed on the toeslope and summit positions and lowest yields on the eroded side slopes. Soil profile N showed tremendous diversity over these landscapes, varying by as much as 1,000 percent. Soil indexes were developed to determine the impact of other factors on yield.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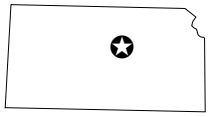
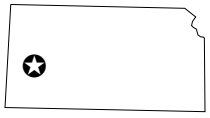
## Kansas



### Effects of Chloride Rates and Sources on Winter Wheat in Kansas

*Project Leader: Dr. R.E. Lamond, Department of Agronomy, Kansas State University, 2014 Throckmorton Hall, Manhattan , KS 66506-5504. (913-532-5776).*

The objective of this study was to evaluate the effects of Cl fertilization on yields of hard red winter wheat. Grain yields were excellent in 1997. Chloride significantly increased wheat grain yields at both study sites, although not all Cl treatments increased yields. Sources evaluated included potassium chloride (KCl), magnesium chloride ($MgCl_2$), sodium chloride (NaCl), and slow release NaCl, each at 10 and 20 lb Cl/A rates. All sources performed similarly.

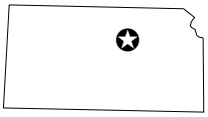


### Effect of Long Term Nitrogen, Phosphorus, and Potassium Fertilization of Irrigated Corn and Grain Sorghum

*Project Leader: Dr. Alan Schlegel, Kansas State University Tribune Unit-Southwest Kansas Research-Extension Center, Rt. 1, Box 148, Tribune, KS 67879. (316-376-4761).*

The objectives of this study were to determine the optimum rate of N, P, and potassium (K) fertilizer for irrigated corn and grain sorghum and to determine the effect of long-term N and P applications on $NO_3$ accumulation in the soil profile. Although there are some year to year variations, the optimum N rate (with P) for corn remained relatively constant at about 160 lb N/A. Fertilizer P at 40 lb $P_2O_5$/A appeared to be adequate for producing optimum grain yield of corn. For grain sorghum, the optimal N rate varies considerably from year-to-year, ranging from 40 to over 100 lb N/A. Phosphorus fertilization increased grain sorghum yields much less than corn yields. Corn yields are routinely increased by 75 bu/A from P fertilization when applied with adequate N, compared to about 20 bu/A for grain sorghum. Phosphorus

fertilization has reduced soil $NO_3$ levels due to increased N use efficiency, reducing the likelihood of $NO_3$ leaching into groundwater.



### Evaluation of Chloride Fertilization/Wheat Cultivar Interactions

*Project Leader: Dr. R.E. Lamond, Department of Agronomy, Kansas State University, 2014 Throckmorton Hall, Manhattan, KS 66506-5504. (913-532-5776).*

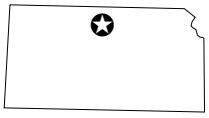
Previous work in Kansas indicated that wheat cultivars may respond differently to Cl fertilization. Research in 1996 and 1997 indicated that some wheat cultivars seem to respond consistently to Cl fertilization, whereas others do not, even when soil test Cl levels are low.

Significant yield increases were observed in 12 of the 16 cultivars tested at the site with the lowest soil Cl level (<20 lb Cl/A, 0-24 inches). Chloride deficiency symptoms were noted on "Cimarron" at this site and were corrected by Cl fertilization. This cultivar showed a 23 bu/A increase in yield when Cl was applied. "Ogallala" was a consistent non-responder. Both soil and plant analyses appear to be good predictors of potential Cl responses.

### Precision Application of Phosphorus to Winter Wheat

*Project Leader: Dr. Alan Schlegel, Kansas State University Tribune Unit-Southwest Kansas Research-Extension Center, Rt. 1, Box 148, Tribune, KS 67879. (316-376-4761).*

The objectives of this study are to characterize the spatial variability of soil properties that influence P availability and to quantify the influence of variable rate P applications on wheat productivity and profitability. Intensive (grid) soil sampling was performed on the site. Soil test P varied from 7 to 38 ppm Bray-1 P and was weakly correlated with soil organic matter content. Fertilizer P was uniformly and variably band-injected prior to planting of winter wheat. The rate of fertilizer P was 20 lb $P_2O_5$/A for the uniform application and ranged from 0 to 37 lb $P_2O_5$/A for the variable rate application. Equipment malfunction has delayed the processing of yield data.

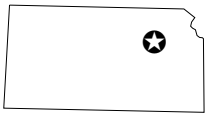


### Effects of Placement, Rate and Source of Starter Fertilizer Containing Potassium on Corn and Soybean Production

*Project Leader: Dr. W.B. Gordon and Dr. R.E. Lamond, Department of Agronomy, Kansas State University, 2014 Throckmorton Hall, Manhattan, KS 66506-5504. (913-335-2836).*

Field studies were conducted to evaluate the effects of potassium sulfate ($K_2SO_4$) and KCl starter fertilizer applications on corn and soybeans. Starter fertilizer (7-21-7) was prepared using both K sources.

When starter fertilizer containing KCl was placed in-furrow, grain yield, plant stand, V6 stage dry matter, and K uptake were reduced in both corn and soybeans. When fertilizer containing $K_2SO_4$ was placed in-furrow with corn seed, no yield or population reduction was seen except at the 200 lb/A rate, where an 11 bu/A decrease was observed compared to the 2x2 placement. Yields and population of soybean declined when in-furrow rates of starter fertilizer containing $K_2SO_4$ exceeded 100 lb/A.



### Effects of Chloride Fertilization on Corn and Grain Sorghum

*Project Leader: Dr. R.E. Lamond, Department of Agronomy, Kansas State University, 2014 Throckmorton Hall, Manhattan, KS 66506-5504. (913-532-5776).*

In light of consistent wheat response to Cl in Kansas research, work was continued in 1997 to evaluate Cl fertilization on dryland corn and grain sorghum. Results indicate that Cl fertilization often can increase corn and grain sorghum yields and leaf tissue Cl concentrations.

Yields were average to excellent. Chloride fertilization significantly increased leaf tissue Cl concentrations. Two Cl sources were evaluated: An experimental slow release NaCl source and KCl. The slow release NaCl often produced higher leaf Cl concentrations than KCl, particularly at the tassel/boot sampling time. Yield responses were most consistent when leaf Cl concentrations of the check treatments were below 0.10 to 0.15 percent Cl.

## Oklahoma

### Field Element Size for Soil Phosphorus and Potassium in Continuous Production Systems

*Project Leader: Dr. W.R. Raun, Associate Professor, Agronomy Department, Oklahoma State University, Stillwater, OK 74078. (405-744-6425).*

This study was conducted to determine if large differences in soil test and forage yield parameters were present within small areas. Plots were selected for intensive forage and soil sampling from two bermudagrass pasture sites. Each plot was partitioned into small subplots (1 ft. x 1 ft.). Composite soil samples were collected, and bermudagrass forage was harvested at ground level from each subplot. Spectral radiance readings were also recorded from each subplot prior to forage harvest. Significant differences in

soil test analyses were found when samples were less than 3 ft. apart for both mobile and immobile nutrients. Bermudagrass forage yield harvested from subplots varied from 1,160 to 8,930 lb/A.

## Texas

### Wheat Response to Chloride Fertilizer

*Project Leader: Dr. Travis D. Miller, Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474. (409-845-0884).*

Three trials were conducted to evaluate the response of winter wheat to Cl fertilization. Significant yield responses to applied Cl were measured in each trial, and Cl treatments significantly suppressed the development of leaf rust, leaving the flag leaf with more effective leaf area later into grain fill. In two of the trials, effective flag leaf area was 90 and 100 percent greater in wheat treated with Cl than in untreated wheat at bloom or early grain fill. In a separate trial, significant interactions were observed between Cl treatment and foliar fungicide applications. Leaf rust infection was reduced and wheat yield was increased by using Cl and fungicide together compared to fungicide alone.

### The Role of Chloride in Maximizing Wheat Variety Performance

*Project Leader: Dr. Travis D. Miller, Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474. (409-845-0884).*

The objective of this study was to quantify wheat response to Cl by variety. A hard spring freeze April 10-12 adversely affected this study. Most of the varieties of early and mid- maturity were at or close to bloom at the time of the freeze. More than 90 percent head sterility was observed in these varieties. Late varieties produced moderate yields, but excessive variation prevented meaningful yield observations. However, before the freeze visual differences were observed in Cl response. Varieties most susceptible to leaf rust appeared greener in Cl treated plots than in untreated areas, while varieties with good genetic resistance to leaf rust showed little visual difference between treated and untreated plots.

### Effect of Nitrogen and Phosphorus Fertilization on Forage Yield and Quality of Annual Ryegrass Grown in Southwest Texas

*Project Leader: Dr. Hagen Lippke, Texas A&M University Agricultural Research Extension Center, 1619 Garner Field Road, Uvalde, TX 78801-6205. (830-278-9151).*

The goal of this study was to evaluate ryegrass response to several rates of N and P fertilization. Dry matter yield response to N and P during the 1996-97 growing season was excellent. The maximum response observed was almost 7,000 lb dry matter per acre. Increases in P rates increased dry matter yield across all N treatments. A major increase in yield occurred with split applications of N at the rate of 120 lb/A, provided at least 40 lb/A of $P_2O_5$ was also applied. A further increase in yield was obtained with 240 lb/A of N and 80 lb/A of $P_2O_5$. Fertilizer applications above these levels gave no economic increases in yield.

### Effect of Boron on Ryegrass, Bermudagrass, and Alfalfa at Varying Soil Acidity Levels

*Project Leader: Dr. Vincent Haby, Texas A&M University Agricultural Research & Extension Center, P.O. Box E, Overton, TX 75684-0290. (903-834-6191).*

The objectives of this project were to evaluate the effect of applied boron (B) on the production of ryegrass and Coastal bermudagrass in east Texas and to monitor alfalfa root growth and yield response to B in a greenhouse study. Ryegrass and bermudagrass were grown under a variety of soil pH and B levels that resulted from the residual effects of treatments from a past experiment. Ryegrass was overseeded into established Coastal bermudagrass, and both forages were fertilized and harvested throughout their respective growing seasons. Results from the 1996-1997 season indicate that yields were not significantly affected by B fertilization.

### Comparison of Alternative Indices for Determination of Soil Test Phosphorus in Texas

*Project Leader: Dr. Tony Provin, Department of Soil & Crop Sciences, Texas A&M University, College Station, TX 77843. (409) 862-4955.*

The objective of this project was to evaluate three multi-element soil nutrient extractants. The extractants evaluated were the Texas A&M (TAMU), ammonium bicarbonate-DTPA (AB-DTPA), and Mehlich III.

From initial reviews, it appears that the weak extracting ability of the Mehlich III solution likely reduces the utility of this extractant in determining available P under alkaline conditions. The AB-DTPA and Mehlich III extractants are true multi-nutrient extractants. The TAMU method is not designed to evaluate micronutrients; thus, a second DTPA extract is employed. A preliminary evaluation of the micronutrient levels extracted with the DTPA and AB-DTPA methods indicated that the DTPA extraction procedure recovered approximately 2 to 3 times more iron (Fe), zinc (Zn), copper (Cu) and manganese (Mn) than the AB-DTPA method. These differences will require significant attention, as micronutrient deficiencies are common in the high pH soils of Texas.

## Dalhart Yield Potential Evaluation Study

*Project Leader: S. Searcy, Department of Agricultural Engineering, Texas A&M University, College Station, TX 77843. (409) 845-3668.*

The goal of this project was to examine the ability of apparent soil conductivity to predict soil physical characteristics related to moisture holding capacity and yield. The Geonics EM-38 used to measure apparent conductivity is sensitive to soil moisture content and ionic concentration. The hypothesis of the study was that apparent soil conductivity could be used to indicate areas of low yield potential by identifying regions of low moisture holding capacity. Correlation was measured between apparent soil conductivity and several soil parameters. Only saturated paste conductivity was highly correlated with apparent conductivity. Percent sand and yield were weakly correlated. Results indicate that measuring apparent soil conductivity is not a promising method for estimating yield potential in the Texas Panhandle.

## Cotton Response to Multiple Applications of Nitrogen and Phosphorus Fertilizer

*Project Leader: Dr. Dan Krieg, Department of Plant and Soil Science, Texas Tech University, Lubbock, TX 79409-2122. (806-742-1631).*

The objectives of this study were to determine the effect of P application method, timing, and N:$P_2O_5$ ratio on cotton yield, quality, and water use efficiency. Methods and timing of P application included delivery of all P in split applications through a low-pressure drop nozzle type irrigation system, three equal applications split into preplant, first square, and first flower timings, and all preplant chiseled into the seedbed on a 4x4 spacing from the planted row.

Lint yield responded to P application compared to N alone across all P application methods. Within the P treatments, application with irrigation water was superior to soil applications. Applying three split applications was slightly better than all preplant applied. Lint yield also increased with increasing N:$P_2O_5$ ratio up to the maximum ratio of 2.5:1.5.

## Managing Potassium Fertility to Reduce Susceptibility of Cotton to Infection by Alternaria macrospora

*Project Leader: Dr. M.L. McFarland, Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843. (409) 845-5366.*

The objectives of this study were to evaluate the effects of K fertilization on cotton fiber quality and susceptibility to infection by Alternaria leaf spot. Field plots were established in the spring of 1997 at two locations in Collin County in the northern Blackland Prairie of Texas. The replicated treatments consisted of three rates of surface broadcast KCl. The soil at one site tested very high in available K and the other tested medium. No significant differences in yield response or leaf tissue K level were observed among treatments at either of the two locations.

## Nitrogen Fertilizer Source and Rate Comparisons on South Texas Cotton

*Project Leader: J.E. Matocha, Texas A&M University, Research and Extension Center, Rt. 2, Box 589, Corpus Christi, TX 78406. (512) 265-9201.*

Efforts to evaluate and improve the N use efficiency of cotton are important from both agronomic and environmental perspectives. The purpose of this experiment was to compare the effects various rates of ammonium sulfate (AS; 21-0-0) and UAN solution (32-0-0) on cotton lint yield and ginning percentage (turnout). Comparisons also involved the standard granular AS and a treated AS (AST). The AST was a granular material produced by compacting AS fines. The AST granules were coated with an anti-caking/dust compound that was thought to have an impact on plant growth. All N fertilizers were evaluated at 0, 30, 60 and 90 lb N/A rates. There was no consistent trend in the performance of UAN compared to the two AS sources across N rates. ■