IPNI INSIGHTS
INTERNATIONAL PLANT NUTRITION INSTITUTE

Research for Managing Crop Nutrients

October 2007

CHANGE is the theme of this issue of *INSIGHTS*. Effective January 1, 2007, the Potash & Phosphate Institute changed its name to the International Plant Nutrition Institute (IPNI) and we changed the name of this publication from *News & Views* to *INSIGHTS*.

This issue of *INSIGHTS* features the brief Interpretive Summaries related to research projects supported by IPNI in the Northeast Region. This information and even more detail on each project can be found at the research database at our website: >**www.ipni.net/research**<.

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Delaware

Potassium Fertilizer Requirements of Corn and Soybean on Delaware Soils

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This study was initiated in 2006 in response to producer concerns of whether current recommendations maintain soil K. Objectives were to evaluate corn and soybean yield responses, K removal, and soil test K changes over time. Corn responses were evaluated at three sites with low to medium K fertility. Soybean responses were evaluated at two sites—one high and one low in soil K. Neither corn nor soybeans responded to applied K in the first year of this study. Work is planned to continue on these same plots to monitor the longer-term effect of K on both yield and soil test K levels. *DE-04F*

Maryland

Building a Maximum Yield Cropping System for Corn, Wheat, and Doublecropped Soybeans

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Project Cooperator: William Kenworthy

The goal of this study is to develop a management program that increases crop yield, input efficiency, and profit potential in a predominantly no-till cropping system. This cropping system consists of four crops planted over 3 years: no-till soybeans in corn stubble, followed by minimum-till wheat doublecropped with no-till soybeans, and then no-till corn.

The rotation clearly improved corn and soybean yields compared to continuous cropping. Starting in 2000, N use efficiency has appeared to improve when ammonium sulfate (AS) was blended with either urea or ammonium nitrate (AN). In 2003, with AS supplying one-third of the N, no-till and strip-till corn yield increased by 30 bu/A, particularly with split application, compared to broadcast urea. In 2004, doublecrop soybeans responded to N applied to the preceding winter wheat crop. Soybean yields were 4 to 5 bu/A higher where 120 lb N/A had been applied to wheat, regardless of whether the N had been supplied as urea or a urea-AS blend. The same N sources applied directly to single-crop soybeans produced no yield response at all. In 2004, N applied to winter wheat increased yields by 26% in no-till and by 53% in tilled soil, with an advantage of 3% to 6% from including AS in the blend. Urea plus Agrotain® boosted wheat yields by 5% compared to urea alone. Blends of fertilizers containing AS tended to produce higher wheat yields than either urea or AN alone. In contrast, a 2004 trial evaluating dry and liquid N sources for corn found little benefit to including AS in the blend, but showed some promise for several inhibitors and efficiency enhancers. In 2005, various N sources were broadcast-applied to corn at the 4-leaf stage. AN produced the highest corn yield as each pound of added N boosted yield by a bushel. Yields under urea were only 62% as high, but blending in AS or a urease inhibitor boosted yields by 30 to 50%. Liquid urea-ammonium-nitrate (UAN) produced yields about 45% higher than those with urea, but little benefit was observed from blending UAN with either AS or a urease inhibitor.

In 2006, yield responses were not as large, but two N

combinations stood out in terms of their positive influence on corn yields: a granular blend of 75% urea and 25% AS, and liquid UAN with Agrotain. In wheat, granular blends of AN or urea with AS and a liquid blend of UAN with AS produced peak yields close to 90 bu/A. *MD-06F*

Nitrogen Source Study on Potatoes

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Project Cooperator: David Armentrout

This project was carried out in the 2006 growing season, with potatoes in no-till and minimum tillage cropping systems. The objective was to compare N sources varying in proportion of ammonium sulfate. No yield benefit was observed as a result of including ammonium sulfate in a blend of ammonium nitrate and calcium nitrate as an N source. *MD-12F*

Michigan

Sulfur and Nitrogen Starter Fertilizer in Michigan Corn

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Project Cooperator: Kurt Thelen

Deposition of sulfur (S) from the atmosphere has been cut in half over the past 20 years in Michigan. Growers are showing interest in improving their starter fertilizer blends for corn. The objective of this project was to test combinations of N, P, and S. Studies were conducted at 11 sites over the 2005 and 2006 crop seasons. Starter S fertilizer improved the S content of whole corn plants at growth stages up to silking. Grain yield, however, was improved by S at only one of 11 site years. The most likely benefit from ammonium sulfate, as a component of starter fertilizer, appears to occur with no-till corn grown on sandy, low organic matter soils. *MI-11F*

New York

Development and Implementation of a Fertilizer BMP Guide for Northeastern Dairy-based Cropping Systems

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Dairy farms in the Northeast U.S. have made a lot of progress in adopting best management practices (BMPs) for managing their impacts on the environment. Many of these BMPs emphasize manure management. This project focuses on fertilizer BMPs appropriate to the cropping systems that support dairy farms.

Nutrient cycling on dairy farms is intensive. Large amounts of nutrients are both removed from the field in the harvest of forages, and returned in the form of manure. Nutrients also flow onto the farm in the form of purchased feed inputs, and they leave the farm in the form of milk, animals, and other materials sold. Fertilizers still play an important role on dairy farms. Applying them at the right rate, the right time, and in the right place optimizes profitability and resource use efficiency, and minimizes impact on the environment.

This project is supported by a Conservation Innovation Grant from USDA-NRCS. Since January 2006, a team consisting of participants from Cornell University, Cornell Cooperative Extension, USDA-NRCS-NY, IPNI, Soil and Water Conservation Districts, crop consultants, and producers has been meeting to discuss critical development needs for fertilizer management information. An assessment of fertilizer management for over two dozen selected farms has shown considerable diversity among farms, but also that producers are conscientious in their fertilizer use. The team has agreed that the most important information need is on fertilizer credits when cover crops are included in the crop rotation. Field demonstrations have focused on conservation tillage, cover crops, and the integration of fertilizer management to suit those practices. Participating producers have made presentations on their tillage and nutrient management practices at field meetings in New York and at the InfoAg 2007 conference in Springfield, Illinois. A literature review to determine the effect of cover crops on the nutrient needs of following crops is under way. The first draft of the BMP guide is to be discussed by the team in December 2007. *NY-08F*

Ohio

Impact of Rotation, Phosphorus, and Potassium Fertilization on Soil Productivity and Profitability

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Project Cooperator: Edwin Lentz

Growers in the eastern Corn Belt often fertilize the whole rotation rather than the individual crops within the rotation. Typically, in the fall prior to corn planting, farmers supply enough P and K to satisfy the nutrient needs of both corn and the following soybean crop. This practice is probably a viable option for fields with more than adequate soil nutrient levels, but on marginal fields it may be limiting production, specifically with regard to low K soils. In addition, soybean K requirements may be increasing owing to the trend toward earlier planting dates. Studies in 2005 found that K boosted yield in only one of four soil types, and by only 3%. At the northwestern station, early planting pushed yields over 55 bu/A. However, the crop did not respond to K, likely because soil test was very high. Earlier planting did not affect the need for K.

In 2006, studies assessing P and K fertilization strategies were started in three locations. Two rotations were compared: corn/corn/soybean, and corn/soybean. These rotations were fertilized following soybeans, at P and K rates corresponding to zero, once and twice the crop removal for the rotation.

Corn yield was increased at one location by application of both P and K fertilizer. Optimum fertilization boosted yields from the 213 to 215 bu/A range to 223 to 225 bu/A. The other two locations did not show consistent yield increases. Continuation of this crop rotation experiment will be essential to determining the cumulative impacts. *OH-16F*

Ontario

Yield Response of Intensively Managed Corn and Soybean to Potassium Fertilizer Rate and Placement

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Project Cooperators: John Lauzon and Greg Stewart

The goal of this project is to examine the variation in corn and soybean yield response to varied input intensity applied across a field landscape. The objectives are to identify parts of the landscape that are most responsive to increased input levels, and to determine the particular constraints to crop growth at these locations during various stages of crop development. Seven strips of high-input treatments... comparing normal and high rates of K across normal and deep placement, and normal and high inputs of N, P, and plant density...were applied in the fall of 2001 along the full length of a large field in preparation for corn and soybeans. The treatments were repeated in 2003 and 2004 under a corn-soybean rotation. Starting in the fall of 2004, tillage and fertility treatments were applied only to corn, with soybeans relying on residual fertility.

The 2005 season featured some of the highest corn yields achieved to date. The intensively-managed high K treatment yielded a field average of 190 bu/A. Yields responded well to K rates above provincial recommendations. Deep placement of K also boosted yield by 4% in contrast to little response in the first 3 years. The 2006 season saw continued high yields under intensive management, while those under conventional management declined to only 90% as high. Postharvest soil nitrate levels ranged from 4 to 7 ppm and did not differ between intensive and conventional management. Soil test levels for P and K are showing differences in response to rates applied.

The project's 5 years of yield data are beginning to supply valuable information demonstrating the econ-omic and environmental viability of intensive crop management. The project is continuing in 2007. *ON-24F* ■

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