NEWS & VIEWS

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Dr. T.W. Bruulsema, Eastern Canada and Northeast U.S. Director
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The Fertilizer Industry Supports Research

THE fertilizer industry is committed to improving agricultural food production, in terms of quantity, quality, and a clean environment. This brief review of research projects in the Eastern Canada and Northeast U.S. region is a reflection of that commitment. These projects are supported by the Foundation for Agronomic Research (FAR), the Potash & Phosphate Institute (PPI) and the Potash & Phosphate Institute of Canada (PPIC), through financial and professional involvement.

Maryland

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

Project Leader: Mr. F. Ronald Mulford and Dr. William Kenworthy, Poplar Hill Research Center, University of Maryland, Rt 1 61 A, Quantico, MD 21856, Telephone: 410-548-7051, E-mail: fm18@umail.umd.edu

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 system consists of four crops in three years: no-till soybeans in corn stubble, followed by minimum till wheat double-cropped with no-till soybeans, and then no-till corn.

Soybean yields in 2002 did not benefit from strip tillage applied to corn the previous year, but yields were 2 to 4 bu/A higher where nitrogen (N) had been applied to corn the previous year, particularly with the ammonium sulfate (AS) form. Wheat yields in 2002 were boosted by an average of 7 bu/A with application of sulfur (S) in the form of AS. Wheat yields with 100 lb N/A in a split application averaged 87 bu/A compared to 69 bu/A with 60 lb N/A applied all at once. Agrotain was more effective used with blends of urea and AS than when used with urea alone. *MD-06F*

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

Project Leaders: Mr. F. Ronald Mulford and Dr. William Kenworthy, Poplar Hill Research Center, University of Maryland, Rt 1 61 A, Quantico, MD 21856, Telephone: 410-548-7051, E-mail: fm18@mmail.umd.edu

Soybean producers are constantly evaluating new tillage and production practices for higher yields and profits. The objective of this project is to improve soybean yields under dryland conditions by evaluating row width, tillage practice, variety, seeding rate, and soil fertility. The goal is to identify management practices that can be combined into a system for high yield soybean production.

In 2001, a higher seeding rate boosted yield by 13%, and 15 in. rows produced 15% higher yield than 30 in. rows. The response to higher seeding rate was stronger at the narrower row spacing. In 2002, soybeans yielded well—47 bu/A despite drought conditions—but yield did not respond to seeding rate or additional fertility supplied by poultry litter and foliar fertilizer. Corn fared poorly in the drought, but 20 in. rows produced 61 bu/A compared to 54 bu/A with 30 in. rows. *MD-09F*

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

Project Leader: Mr. F. Ronald Mulford, Poplar Hill Research Center, University of Maryland, Rt 1 61 A, Quantico, MD 21856, Telephone: 410-548-7051, E-mail: fm18@umail.umd.edu

The objective of this study is to measure the influence of AS, blended with ammonium nitrate, on the yield of irrigated sweet corn. In 1999, sweet corn yields increased from 1.6 to 6.5 tons/A in response to application of 120 lb of N/A. During the 2000 season, blending AS into the N supply increased the yield of sweet corn by 5%. Yields as high as 8.3 tons/A were achieved when AS was applied at

Agronomic market development information provided by:
Dr. Tom W. Bruulsema, Eastern Canada and Northeast U.S. Director
Potash & Phosphate Institute (PPI)
18 Maplewood Drive
Guelph, Ontario, Canada N1G 1L8
Phone: (519) 821-5519
Fax: (519) 821-6302
E-mail: tbruulsema@ppi-far.org

row closure. In 2002, top yields were about 5.8 tons/A and were unaffected by N source. *MD-11F*

Michigan

Site-Specific Management of Soybeans

Project Leader: Dr. Darryl Warncke, Crop & Soil Science, Michigan State University, East Lansing, MI 48824, Telephone: 517-355-0210, E-mail: warncke@msu.edu

The primary objectives of this project have been to evaluate site-specific management of nutrients in soybean production and to develop an understanding of site-specific soil and field properties and attributes that affect soybean yield. From 1998 through 2001, the focus was evaluating site-specific and whole field phosphorus (P) and potassium (K) management. The primary focus of the project in 2002 was calcium management in fields being used for soybean production. Gypsum was surface-applied to measure the impact of improved water infiltration and reduced surface crusting. However, owing to dry weather conditions, gypsum did not affect soybean yield in the year of application. Yields averaged near 42 bu/A. In this field, there was a linear relationship between yield and cation exchange capacity (CEC) of the soil. Average yield increased from 38 bu/A up to 52 bu/A as the CEC increased from 5 to near 18 meq/100 g. *MI-08F*

Impact of Nitrogen and Sulfur Fertilization on Yield of Kidney Beans

Project Leader: Dr. Carrie Laboski, Department of Crop and Soil Science, Michigan State University, 580 Plant & Soil Science, East Lansing, MI 48824, Telephone: 517-353-4594, E-mail: laboski@msu.edu

Beans are less efficient at fixing N than are other legumes. Sulfur fertilization can impact their ability to fix and utilize N. This study aimed to determine the response of kidney beans to N and S and their combination as supplied in AS. On a very sandy site with low organic matter, beans grown in 2002 with N fertilizer produced 36% higher yields than those without. Yields did not differ whether the source was urea alone, with AS, or with elemental S, but manganese (Mn) in leaf tissue was 30% higher when AS was included, compared to all other treatments. The highest N and S rate, 70 and 40 lb/A, respectively, supplied by AS and urea, produced the highest yield, 17 cwt/A. On another soil with higher organic matter, bean yields did not respond to fertilizer. *MI-10F*

New Brunswick

Nitrogen, Phosphorus, and Potassium Needs of Forages in New Brunswick

Project Leader: Dr. Charles Karemangingo, NB Dept. of Agriculture, Fredericton, NB, E3B 5H1, Telephone: 506-453-8311, E-mail: charles.karemangingo@gnb.ca

Fertilizer recommendations for forages are lower in New Brunswick than anywhere in the Atlantic region. Since there is little recent data on soil test calibration, this study is examining forage responses to N, P, and K at three sites with established forage. In 2002, the first year of the trials, first-cut forage yield responded to N at all three sites, even though one site had more than 50% legume in the stand. At that high-legume site, which had medium soil tests for P and K, yield also increased in response to P and K applications. Owing to drought, none of the sites produced a second cut, and overall yields were low. The trial is continuing in 2003. *NB-01*

New Jersey

Corn Response to Point Placement of Nutrients in a No-till Maximum Yield Environment

Project Leader: Dr. Joseph Heckman, Rutgers University, New Brunswick, NJ 08903, Telephone: 732-932-9711, E-mail: heckman@aesop.rutgers.edu

Concentrating nutrients such as K in a small zone of soil overcomes soil fixation and enhances availability. In addition, localizing the chloride (Cl^-) supplied in muriate of potash (KCl) with ammonium may slow nitrification. In environments with high yield potential, a higher ratio of ammonium to nitrate may facilitate higher yields. The objective was to use an extreme form of localizing…point placement…to test the benefit of combining KCl with a blend of AS and monoammonium phosphate (MAP).

The point placement was at a depth of 4 in., midway between four corn plants in a 12 in. square spacing. The first two treatments comprised the two fertilizers applied in two ways: either at separate points 12 in. apart, or together at the same point. The third treatment added the nitrification inhibitor N-Serve to the fertilizers applied together.

Corn yield averaged 266 bu/A across treatments over the two years. The treatments had no significant effect on grain or stover yield. N-Serve reduced stalk rot, but only in 2001 when it also increased Cl in the stover. Separating the K placement from the rest of the fertilizer resulted in more P, but less K and Cl in the stover at maturity. N-Serve increased zinc (Zn) in the stover. At high rates, it appears that localizing N and P with K enhances K and Cl^- uptake, but a large amount of KCl applied with the N and P reduces P uptake. *NJ-20F*

New York

Managing Nitrogen and Potassium in Brown Midrib Sorghum-Sudangrass

Project Leader: Dr. Quirine Ketterings, Department of Soil and Crop Sciences, Cornell University, 817 Bradfield Hall, Ithaca, NY, 14853, Telephone: 607-255-3061, E-mail: qmk2@cornell.edu

Brown midrib sorghum-sudangrass (BMRSS) forage compares favorably with corn silage in terms of milk production per acre, particularly in late-planted or droughty situations. While it has been shown to respond well to N, little is known about its K requirements. This project aims to find the optimum rate of N and K for optimum yield and quality of BMRSS. In 2002, N applied at 150 lb/A increased yield three-fold to 12 tons/A (at 35% dry matter) despite drought conditions. Applied K did not impact yield. Milk production per acre was calculated to be optimized at the N rate for optimum forage yield, 150 lb/A. The project is to continue in 2003. *NY-05F*

Nova Scotia

Optimizing Nitrogen, Phosphorus, and Potassium Fertilizer Use in Wild Blueberry Production

Project Leader: Dr. David Percival, Department of Environmental Sciences, Nova Scotia Agricultural College, P.O. Box 550, Truro, NS B2N 5E3, Telephone: 902-893-7852, E-mail: dpercival@nsac.ns.ca

Consumer demand for wild blueberries is being driven by the health benefits associated with their functional food characteristics. Growers in eastern Canada and Maine produce over 190 million lb annually. They have used commercial fertilizer to increase yields, but little attention has been paid to its effects on quality. The objective of this project is to determine the impact of N, P, and K on nutraceuticals including anthocyanins and phenolics in wild blueberries. Fruit harvested in 2002 have shown positive results. The project is continuing in 2003. *NS-02*

Ontario

Potassium Sources for Soybeans

Project Leader: Dr. T.Q. Zhang, Agriculture and Agri-Food Canada, Greenhouse and Processing Crops Res Ctr, Harrow, ON, N0R 1G0, Telephone: 519-738-2251 ext. 476, E-mail: zhangt@em.agr.ca

Project Cooperator: Tom Welacky

This project was conducted to determine whether Cl or magnesium (Mg) applied with K fertilizers influence soybean yield and quality, and to determine whether Ontario soybean cultivars differ in response to sources of K. The experiment was conducted over four years beginning in 1999. In 2000 and 2002, soybeans were planted following soybeans, with treatments applied to the same plots as the previous year. In each case, soybeans responded more strongly to applied K in the second year than in the first year. In 2000, all sources of K increased yield by about 12%.

In 2001 and 2002, cultivar by K source interactions occurred, with some varieties responding more positively than others to K, and some varieties showing sensitivity to KCl. In 2000 and 2001, K also increased seed size and sugar, and slightly decreased protein. Potassium decreased disease in 1999 and 2001, but had little effect in 2000. Results indicate that soybeans following soybeans need substantially more K than following corn. *ON-18*

Effect of Phosphorus Fertilization on the Levels of Functional Food Ingredients in Fruits and Vegetables

Project Leader: Dr. Gopi Paliyath, Department of Food Science, Guelph, University of Guelph, ON N1G 2W1, Telephone: 519-824-4120, ext. 4856, E-mail: gpaliyat@evbhort.uoguelph.ca

In recent years, public interest in the disease-preventive and health-promoting roles of fruits and vegetables has grown dramatically. The components that support these roles are termed functional food ingredients or phytochemicals. The purpose of this project was to determine the effect of P nutrition on a range of phytochemicals in apples and tomatoes.

Phosphorus fertilization increased the red color in both apple varieties in 1999. In 2000, owing to more cloudy conditions during maturation, apples did not show color differences at harvest. However, after four months of cold storage, apples from some P treatments developed more red color and showed less superficial scald.

In tomato, antioxidant enzymes in the 2001 crop

appeared to have been made more active by P fertilization. However, P had little effect on lycopene and initial quality characteristics in 2002. The enzyme activities for 2002 are yet to be analyzed. *ON-22*

Integrating Zone Tillage and Fertility Placement in Corn

Project Leader: Dr. Bill Deen, Department of Plant Agriculture, University of Guelph, Guelph, ON, N1G 2W1, Telephone: 519-824-4120, ext. 3397, E-mail: bdeen@uoguelph.ca

Project Cooperator: Greg Stewart

Adoption of no-till management in corn production remains very low on soils of heavier texture. Many growers view fall zone tillage as an alternative soil conservation practice on these soils. The project examined two objectives: first, the impact of fall zone tillage on corn growth, and second, corn response to fall and spring applications of P and K in these systems.

Over three years ending in 2002, replicated experiments on small on-farm plots and field-length strip trials showed corn with fall zone tillage yielded midway between no-till and conventional fall tillage. Fall applications of P and K increased yields by 2 to 3%, while spring applications boosted them by an average of 5%, regardless of fall fertilizer and tillage. The results suggest that while fall-applied P and K can enhance corn yields, it does not replace the need for spring-applied starter P and K. *ON-23*

Yield Response of Intensively Managed Corn and Soybeans to Potassium

Project Leader: Dr. Bill Deen, University of Guelph, Department of Plant Agriculture, Guelph, ON, N1G 2W1, Telephone: 519-824-4120, ext. 3397, E-mail: bdeen@uoguelph.ca

The goal of this project is to examine the variation across a field landscape in corn and soybean yield response to input intensity. The objectives are to identify parts of the landscape 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 (N, P, and plant density) were applied in the fall of 2001 across the full length of a large field, in preparation for corn and soybeans. Despite a midsummer storm that induced lodging in 2002, the most intensive treatment produced the highest corn yield (160 bu/A), 4% higher than with normal input levels. Response to high rates of K was stronger with deep placement of P and K. In upper slope positions, soybean biomass increased 14% in response to high inputs, and 11% in response to high rates of K. The project is continuing in 2003. *ON-24F*

National Conference on Agricultural Nutrients and Their Impact on Rural Water Quality

Project Leader: Ms. Jean Sullivan, Agricultural Institute of Canada Foundation, Ottawa, Ontario, Telephone: 613-232-9459, E-mail: news@aic.ca

This conference, hosted by the Agricultural Institute of Canada Foundation (AICF) in April 2002, in Waterloo, Ontario, was attended by over 300 people from agricultural organizations, municipal governments, conservation authorities, and government officials from ministries of the environment. It was intended to provide a forum for presentation of the latest scientific research, technological advancements, and science-based agricultural practices related to the use of agricultural nutrients.

In a presentation at the opening plenary session, Dr. Bruulsema used nutrient balances for Canadian agriculture to show that nutrients were key to maintaining productive soils and producing nutritious food. He also outlined the fertilizer industry's contributions to soil fertility research and support for increased accountability and professionalism in nutrient management planning, via the Certified Crop Adviser program. The plenary sessions received press coverage in a major farm weekly and a local television broadcast. Proceedings are available at http://www.aic.ca/aicf/conference/. *ON-26*

Quebec

Sampling Strategies for Site-Specific Management

Project Leader: Dr. J.W. Fyles, Department of Natural Sciences, McGill University, Macdonald Campus, Ste-Anne-de-Bellevue, QC H9X 3V9, Telephone: 514-398-7943, E-mail: fylesj@nrs.mcgill.ca

The heavy clay soils of Quebec, while level and uniform in appearance, are unique in their distinctive patterns of variability. These patterns were produced by a system of traditional tillage management used in the past to facilitate surface drainage.

We analyzed the spatial structure of variation in soil fertility within a large producer-managed field. This analysis has revealed complex scale-dependent correlations that are relevant to the practical use of precision agriculture technologies.

Corn yields in 2002 ranged from 65 to 190 bu/A. In spite of relatively high soil test K levels, yields were positively correlated with both soil test K and K:Mg ratio, particularly at short-range scales. The effects of scale on the interpretation of such correlations are still being analyzed. *QC-05*

Virginia

Cropping Systems Evaluation

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

This project compared crop rotations for profitability and sustainability. The three rotations are: 1) a standard rotation of three crops in two years, 2) four no-till crops in three years, and 3) four no-till crops in two years. The crops are corn, soybeans, wheat, and barley.

An economic assessment of the rotations over the first four years of the project (1998-2001) found that rotation 2, with the lowest cropping intensity, produced the lowest gross but highest net return. Net returns for rotation 2 were 9 and 71% higher than those for rotations 1 and 3, respectively. The three rotations ranked similarly on each of the four soil types. Soil quality analysis indicates the build up of soil carbon (C) in the top 4 in. of soil increased with increasing cropping system intensity and residue inputs, but was not related to tillage practice. This increase in C may constitute an environmental benefit from intensive cropping systems that demand higher levels of P and K inputs. *VA-15F*

Site-Specific Strategies to Attain and Maintain Adequate Soybean Leaf Area

Project Leader: Dr. David Holshouser, Tidewater Agricultural Research & Extension Center, Virginia Tech, 6321 Holand Road, Suffolk, VA 23437, Telephone: 757-657-6450, E-mail: dholshou@vt.edu

This study evaluated row spacing, population, and variety selection on early, full season, and double-cropped soybean. The strategy was to identify the economically optimum leaf area for each soil type and cropping pattern. Small plot experiments and field-scale measurements confirmed that a leaf area index of 3.5 to 4.0 was needed at flowering to maximize yield potential, regardless of soil type and regardless of whether the soybeans were grown full-season or double-cropped. This was found to be true for drought years as well, indicated by positive response to increasing seeding rates in 2002. Across the field, soils with lower water-holding capacity were less able to produce the minimum leaf area required. Remote-sensed NDVI (normalized difference vegetation index) was most strongly correlated to leaf area index and yield in mid-August at the pod development stage. Further work in 2002 confirmed a strong relationship between NDVI and leaf area index, particularly for leaf areas below the critical limit of 3.5 to 4.0. The study revealed that increased yields on soils with low water-holding capacity would require higher leaf areas, but these would be difficult to obtain by increasing seeding rate alone. *VA-20F* ■

Coming events:

June 29 to July 2, 2003 — **Northeast Branch Annual Meeting, American Society of Agronomy & Soil Science Society of America**. Radisson Conference Center, Burlington, Vermont. Check out the CCA program at http://pss.uvm.edu/nebasa/.

July 30 to August 1, 2003 — **InfoAg 2003**, Adam's Mark Hotel at the Indianapolis Airport. Program and registration at http://www.farmresearch.com/infoag/.

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655 Engineering Drive, Suite 110
Norcross, GA 30092-2837