NEWS & VIEWS

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Northeast Director
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Research for a Sustainable Crop Nutrient Industry

Crop nutrients are under increasing scrutiny. While their positive role in boosting yield and quality is known, it is also often taken for granted when the discussion turns to managing impacts on the environment. This brief review of research projects in the Northeast region reflects the industry's commitment to exploring the frontiers of further improvement in crop yield and health-functional food quality, and to increasing the use efficiency of fertilizer nutrients. 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

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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 in 3 years: no-till soybeans in corn stubble, followed by minimum-till wheat double-cropped with no-till soybeans, and then no-till corn.

The rotation clearly improved corn and soybean yields compared to continuous cropping. Starting in 2000, nitrogen (N) use efficiency has appeared to improve when ammonium sulfate (AS) was blended into the N source, either urea or ammonium nitrate. In 2003, in no-till and strip-till corn with AS supplying one-third of the N, corn yield increased by 30 bu/A, particularly with split application, compared to broadcast urea. In experiments comparing starter and broadcast fertilizers, AS and phosphorus (P) appeared to be the ingredients associated with the highest corn yields, despite high soil test P. *MD-06F*

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

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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 t/A in response to application of 120 lb N/A. During the 2000 season, blending AS with N increased the yield of sweet corn by 5%. Yields as high as 8.3 t/A were achieved when AS was applied at row closure. In 2002, top yields were about 5.8 t/A and were unaffected by N source. In 2003, strip-tilled sweet corn yielded as high as 9 t/A with a blend including AS; yield was 16% higher than when fertilized with urea alone. *MD-11F*

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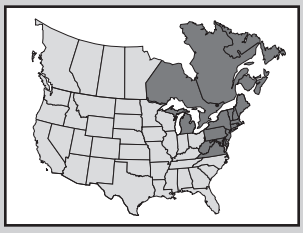

New Brunswick

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

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

Project Cooperator: Mike Price

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 aims to examine forage responses to N, phosphorus (P), and potassium (K) at three sites with established forage. In the first two years, responses to all three nutrients have been observed, but have varied from site to site, despite poor yields. In 2003, optimum levels of N were 90 lb/A at two sites and 45 lb/A at the third. Optimum levels of P_2O_5 and K_2O were 45 and 55 lb/A, respectively, regardless of soil test level. Results indicate the need to continue the study to establish appropriate soil test-based recommendations. *NB-01*

New York

Managing Nitrogen and Potassium in Brown Midrib Sorghum-Sudangrass

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

Project Coordinators: Jerome Cherney, Tawainga Katsvairo

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 and 2003, N applied at 100 lb/A for each cut increased yield 3-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. Further analysis of quality components is continuing. *NY-05F*

Nova Scotia

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

Project Leader: Dr. David Percival, Nova Scotia Agricultural College, Department of Environmental Sciences, PO Box 550, Truro, NS B2N 5E3. Telephone: 902-893-7852, Fax: 902-893-1404, E-mail: dpercival@nsac.ns.ca

Consumer demand for wild blueberries is being driven by the health benefits associated with functional food characteristics. Growers in Eastern Canada and Maine produce over 190 million pounds annually. They have used commercial fertilizer to increase yields, but little attention has been given 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. Potassium increased anthocyanins and polyphenols, particularly when applied in the sprout year. Nitrogen and P varied in their impact on anthocyanins. The results so far suggest that N, P, and K fertilizers have a more significant effect on the growth, development, berry composition, and yield of the wild blueberry than originally anticipated. Further analysis is continuing. *NS-02*

Ohio

Evaluating Site-Specific Soybean/Corn Management Systems in Ohio

Project Leader: Mr. Nathan Watermeier, Ohio State University, 26 Ag Admin Bldg., Columbus, OH 43210-1010. Telephone: (614) 688-3442, E-mail: watermeier.2@osu.edu

This project is evaluating application of site-specific technologies in a corn-soybean rotation system. In 2003, the study field was in soybeans. The educational objective of this project is to enhance the decision-making abilities of crop producers relative to the incorporation of precision agriculture practices into their operations. Data and information gathered from this project serve as the basis of an expanded educational program for precision agriculture in Ohio. *OH-15F*

Ontario

Kenneth M. Pretty Graduate Scholarship

Project Leader: University of Guelph, OAC Awards Committee, Ontario Agricultural College, Guelph, ON N1G 2W1.

On October 3, 2003, the Kenneth M. Pretty Graduate Scholarship was awarded to Mr. Pedro Antunes, whose thesis topic is exploring interactions of mycorrhizal fungi and rhizobium bacteria. *ON-13F*

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

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

Phytochemicals—compounds made uniquely by plants—capture considerable media attention today, because many are linked to health benefits. Sometimes these health-functional compounds go by names such as nutraceuticals or functional food ingredients. Consumers are searching for foods rich in these compounds, but the production practices that directly influence their levels in plants are not well known. We conducted research to determine the influence of adding more P than usual on the levels of phytochemicals in tomatoes and apples.

We applied P fertilizer to apple trees in an orchard with soil rich in P, where the grower did not normally apply P fertilizer. In 1999, red color in the apples increased in response to applied P. The P also increased sweetness (Brix) in both McIntosh and Red Delicious varieties, and farnesene (an aromatic flavor volatile) in Red Delicious only. However, in McIntosh apples grown in 2000, there was no response in terms of color, anthocyanins, farnesene, or any other flavor volatiles. We concluded that applying high levels of P may increase the health functionality of apples in some, but not all weather conditions.

We grew tomatoes in soils testing rich in P from 2000 to 2002. Lycopene levels responded differently to added P each year, but increased more often than they decreased. We also measured quality parameters in the juice and processed sauce, including Brix, acidity, vitamin C, viscosity, and flavor volatiles. Most of these were not affected significantly by applied P, but Brix followed a pattern similar to lycopene. We also found that applied P increased the levels of several anti-oxidant enzymes. Even in soils with high P fertility, optimum levels of P are important for tomato quality, but vary depending on the growing season. *ON-22*

Spatial/Temporal Yield Response of Intensively Managed Corn and Soybean to Variations in Potassium Fertilizer Rate and Placement

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

Project Cooperators: John Lauzon, Greg Stewart

Intensive management aims to narrow the gap between potential and current yields of corn and soybeans. 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 (nitrogen, phosphorus, and plant density)—were applied in the fall of 2001 across the full length of a large field, in preparation for corn and soybeans. The treatments were repeated in the fall of 2002, rotating the corn and soybeans.

Over the past 2 years, intensive management has boosted crop biomass more than yields. High inputs have boosted yields by about 4% each year. Potassium reduced corn lodging at high input levels in 2003. Responses to high rates of K have been stronger in upper slope positions than in middle and lower slope positions. The project is continuing in 2004. *ON-24F*

Nitrogen and Phosphorus Needs for Tomatoes and Green Peppers

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

Project Cooperators: C.S. Tan, A. Liptay, J. Warner, C.F. Drury and D. Reynolds

Processing tomatoes and green peppers are examples of high-value food crops whose production may be impacted by the regulation of nutrient management. This experiment, initiated in 2002, aimed to determine the effects of N and P on yield and quality of the two crops, and on risk of nutrient losses. Drip fertigation was used for intensive management.

Results of the past 2 years show the inadequacy of

current recommendations for optimum yield and quality. Optimum rates of N were found to be 180 to 190 lb/A, approximately double the current recommendations. Phosphorus fertilizer increased the marketable yield of peppers both years, despite soil test levels so high that no P would have been recommended.

Results from the 2003 season also showed the importance of balanced nutrition for protection of groundwater quality. Increasing levels of P fertilizer decreased the residual nitrate in the soil following harvest. The trial is continuing in 2004. *ON-27F*

Coming events:

August 16-17, 2004 — InfoAg Ohio Valley, Clark State Community College, Springfield, Ohio, U.S.A. >**http://www.farmresearch.com/infoag/**<.

September 1-2, 2004 — Eastern Canada Agronomy Workshop, Cornwall, Ontario, Canada >**http://www.cfi.ca/**<.

Quebec

Sampling Strategies for Site-Specific Management

Project Leader: Dr. J.W. Fyles, McGill University, Department of Natural Sciences, Macdonald Campus, Ste-Anne-de-Bellevue, QC H9X 3V9
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Project Cooperators: Caroline Begg, Guy Mehuys, Guillaume Larocque

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. Preliminary assessments indicated that this variability may be manageable.

We have sampled nine producer-managed fields, and have analyzed in detail the spatial structure of variation in soil fertility. This analysis has revealed complex scale-dependent correlations that are relevant to the practical use of precision agriculture technologies for assessing the impacts of management choices. These impacts include economics and nutrient use efficiency as well as effects on water quality. The analysis is highly technical, but important for genuine progress in site-specific fertilizer application. Analysis of the relationship of soil properties to yield variation is continuing and expected to be completed by June 2004. *QC-05* ■

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