

What do CCAs need to know?

■ By Betsy Ahner, CCA marketing manager

round two for SOYBEAN RUST

Concern over soybean rust during the 2005 growing season, dominated agronomic news almost to the exclusion of other topics. CCAs who advised their growers to sit tight and not spray were generally the heroes of the day. Is a “wait and see” approach good advice for 2006 as well?

CCA Kevin Black, GROWMARK, Inc, thinks it is. “I would recommend that CCAs become familiar with the optimum conditions for the development of the soybean rust pathogen. When those conditions are present, then it is time to watch the wind patterns, monitor tracking systems and scout fields.”

Location of the pathogen is also important. Don Hershman, University of Kentucky, believes that once rust is found overwintering in Texas, Louisiana and Mexico, wind currents will carry it up the Mississippi Valley into the Midwest faster than it traveled from Florida and Georgia.

What do CCAs really need to know? Hershman says, “Farmers rely on the CCA to have a good handle on the risk for their area. CCAs should make sure they have some primary resources in their information chain. They should be re-evaluating information sources for immediacy and accuracy.”

In 2005, a thirst for knowledge prompted the creation of a variety of Web sites and information sources and CCAs wondered where the primary resources were and which experts to trust. Researchers and CCAs agree, the most authoritative Web site is



www.sbrusa.net. Managers of more than 950 sentinel plots will be entering their data directly into the site, as soon as tests confirm the presence or absence of rust.

The USDA, United Soybean Board, and state soybean check-off programs are working closely with researchers. “We have probably seen more cooperation amongst groups of people working on soybean rust, than we have on any other agronomic issue,” says Jim Dunphy, a CCA and professor at North Carolina State University. “This is a national problem, but the South is the first line of defense.”

“Even though soybean rust has been in Asia for decades, there is a lot we don’t know about the pathogen found in this country,” says David Sleper, University of Missouri. “We don’t know if the genetics are the same or if there have been mutations that will cause it to behave differently. University of Illinois researcher, Glen Hartman accompanied a group of our researchers to Vietnam

to screen rust lines there. Glen probably knows more than anyone about rust resistance in soybeans.”

Other experts include Roger Boerma, Center for Applied Genetic Technology, University of Georgia who has a screening nursery in that state. Reid Frederick, USDA-ARS, is conducting research at the Fort Dietrick, Md., quarantine center. Laura Sweets at the University of Missouri has been tracking the rust pathogen. Ann Dorrance, a pathologist at Ohio State University has posted information at <http://agcrops.osu.edu/soybean>.

When the growing season begins, NCSU will post regular notices at www.ces.ncsu.edu/depts/pp/soybeanrust. The site contains a prediction model based on weather patterns.

Syngenta plans to continue monitoring rust with about 100 spore traps. Result summaries can be found on its FarmAssist site at www.soybeanrust.com, and CCAs can register for regular e-mail updates. Vance Publishing and Bayer CropScience feature a rust tracking map and information updates at www.stopsoybeanrust.com.

Despite these rich sources of information, much remains to be learned and done. Dunphy says, “The majority of our research is being done on soybeans, and while some scouting is being done in western states, we don’t know how rust will affect forage legumes and edible beans.” Black agrees and says, “This pathogen is so complex and our climate is so variable, that it will take years for us to understand it.” **AG**



The value of professionalism

Certification is the process of assuring that an individual has the experience, education and qualifications to do a good job. The marketplace will decide whether they do a good job on a day-to-day basis.

We have spent countless hours on the process of certification. Developing exams. Verifying CEUs. Codifying ethics. Debating qualifications. These activities will never stop as we constantly strive to improve and streamline.

There is limited value in certification alone. Professionalism is doing a good job. If the CCA is to have value, we need to focus increasingly on professionalism.

Interfacing with other organizations is one facet of professionalism. The CCA founders elected to make their first home within the American Society of Agronomy. This was a logical choice because good science is (and always will be) the rock-solid foundation for crop advisors.

As our organization matures, we see the need for finding common ground with other organizations, some which may seem diverse.

We recently met with the Ag Retailers Association, The Fertilizer Institute, National Council of Farm Cooperatives, Crop Life, and Potash and Phosphate Institute. Their member businesses employ more than 75 percent of our CCAs, but we may have different agendas. Together we plan to evaluate our respective roles in the upcoming

Farm Bill, looking for mutual benefits.

We are meeting with the National Alliance of Independent Crop Consultants and the American Society of Farm Managers and Rural Appraisers to discuss common ground. Although delivery method and approach may be different, we fundamentally share the same profession—providing advice to producers. We can learn from each other—sharing ideas, expertise and educational opportunities.

We are meeting with federal and state agencies, like the NRCS, USDA-Risk Management Agency, US-EPA, Farm Service Agency, and others to help assure the CCA has a place at every table.

We are talking to the American National Standards Institute to evaluate the ISO 17024 quality improvement process. ISO compliance could allow the Department of Commerce to view CCA as a “product,” potentially opening CCA opportunities.

None of these ventures is assured. They may or may not be a short-term benefit to an individual CCA. By enhancing the professionalism of our entire organization, each CCA enhances their own professionalism.

Our goal in all of these activities is to be the most valuable certification a professional crop adviser can hold by establishing the CCA’s essential role in agricultural, production, food safety and environmental stewardship. **AG**

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Farm Bill: four issues at the fore

Discussions about a new farm bill will echo across the country between now and whenever a resolution finds its way to the President. The implications for farmers, as well as those who service and supply them are enormous.

Just as certain as the fact that there will be another package of assistance put forth for agriculture, is the tireless debate that will accompany its journey. I believe that the debate will center on four major issues.

First is where the money for the program will come from. Most believe that when the new program is finally approved, while ultimately a product of endless tinkering, it will be much the same as the current program, with a shift away from counter cyclical payments to something the WTO will find more palatable. In the end, there will be a program that moves dollars to farmers, and it will soothe consternation among trading partners.

Subsidies won't be cut, just modified in the way they get to a farmer's account. There are several reasons for this, but most importantly, farmers vote, and 2007 is an election year. Members of Congress, while spouting determination to cut spending, won't starve rural America, and especially the nation's farmers, because they know how valuable the "red" heartland states are to their campaigns.

In addition, even environmentalists are concerned about the "family" farm and rural development. Allowing small towns to dry up across the prairie is not acceptable to anyone.

The second major issue is the shade of green the new effort will embrace. Many believe that this program will be the "greenest" in history. This time, look for the Conservation Security Program to be fully funded (an example of how to get money to farmers acceptable to the WTO), for essentially doing many of the things they already do.

NRCS will be charged with providing assistance to livestock producers to assist in managing, applying, or mining (for energy) their manure. Nutrient management will become the new boogeyman of production agriculture—maximizing

yields, while minimizing the use of fertilizer.

Third, the calls for more assistance for small farms will be heard. But large farmers will not be shunned by the government. It might require better accounting and more ingenuity in establishing operating entities. To maintain the food supply, both in terms of cost and quantity, everyone knows that we need large farmers to be successful.

Renewable fuels subsidies or incentives, under the guise of rural development will also be a major part of the package.

Finally, probably the greatest challenge to Michigan and other states with a diverse agriculture is the effort to move producers away from traditional commodities, or divert acres from such money-grabbing crops as tobacco, cotton and rice. This effort, having been beat back in every farm program since 1980, involves allowing so-called nonprogram crops, or specialty crops to be planted on base acres without penalty, while farmers either continue to receive full or at least partial payments attached to those diverted acres.

This is a major concern among many smaller commodity groups, states on the fringe of the Midwest and others that don't believe farmers should be subsidized to plant crops they never have.

As the debate swirls on the Farm Bill, these issues will be at the fore, but in the end, farmers will receive payments, there will be noise about "penalizing" larger farmers in favor of smaller operations, green will be the color of the program and rural development and renewable fuel subsidies and incentives will be a factor in the program.

For certified crop advisers and agronomy suppliers, manure management will present either an opportunity or challenge in many areas of the country, as it impacts fertilizer movement. The overall effort to institutionalize "sustainability," (whatever that is) will receive attention. Maximizing yields with minimal inputs, managing bugs and disease with IPM will get more federal emphasis.

In the end, however, not much will change. **AG**



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Continuing Education
Self-Study Course

BY R.L. MULVANEY, S.A. KHAN,
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managing nitrogen fertil CORN P

Since the 1970s, N fertilizer recommendations for Midwestern corn production have relied on a yield-based system, whereby an expected yield goal is multiplied by a constant factor, with adjustments to account for N credits from previous cropping or the recent use of manure. This system uses a mass balance approach that assumes constant efficiency in crop uptake of fertilizer and soil N. Yield-based systems were originally intended as a first approximation in making generalized fertilizer N recommendations for long-term periods on a regional scale, but have been applied indiscriminately to fertilize individual fields in a particular growing season.

Implicit to yield-based N recommendations is the presumption that mineralization is a negligible source for crop N uptake, which would necessarily imply that yield in the absence of applied N supplies a fixed proportion of crop N uptake that is substantially less than that from fertilizer. Yet unfertilized (check) plot yields in N-response studies often exceed the yield increase obtained with fertilization, and in many of these studies, sites have been detected where corn is completely nonresponsive to fertilizer N. Such sites have often been excluded in averaging response data to evaluate yield-based N recommendations, but even so, the recommended rates tend to be excessive. This was the case, for example, with 96 percent of 193 responsive site-years analyzed by Lory and Scharf (2003), for which the recommended N rate exceeded the economically optimum N rate (EONR) by up to 227 kg ha⁻¹ (200 lb/A), or by 90 kg ha⁻¹ (80 lb/A) on average. More importantly, recommended and optimum N rates were not correlated significantly ($r = 0.04$) in the latter study, suggesting that yield-based N recommendations lack predictive value.

The only hope for improving fertilizer N recommendations for corn production in a humid region such as Illinois is to account for a soil's capacity to supply plant-available N through mineralization. The usual approach has been to measure soil NO₃⁻, either before or after planting.

A better approach would focus on the soil's N-supplying capacity by estimating mineralizable organic N, which is subject to fewer N-cycle processes than NO₃⁻ and should thus be less dynamic. Research since the 1950s has supported the concept that soil organic matter is not uniformly mineralizable, but consists primarily of a passive fraction accompanied by a less extensive pool of biologically active organic N associated with microbial biomass. The latter constituents are identified largely as -amino N and (amide + amino sugar)-N, both of which have been linked to net mineralization and/or crop N uptake in pot experiments.

The objective of this study was to evaluate the effectiveness of the ISNT in differentiating responsive from nonresponsive site-years under a wide range of soil and cropping conditions. The generated database was used to assess (i) how these conditions might influence a quantitative relationship between Illinois Soil N Test values and crop responsiveness to N fertilization; and (ii) the accuracy and economic consequences of N recommendations by the PY method, primarily on a site-by-site basis. Little peer-reviewed information is available on the latter issue.

FIELD PLOT MANAGEMENT

The work reported herein involved 102 N-response experiments located throughout Illinois, largely on farmer fields. Of these experiments, 51 were reported by Brown (1996), including

11 conducted in 1990, 18 in 1991, and 22 in 1992. An additional 51 experiments included 14 in 2001, 16 in 2002, and 21 in 2003. In each case, N rates were applied according to a randomized complete block design with four replicates, by sidedressing urea-NH₄NO₃ solution (360 g N L⁻¹) when corn was 15 to 30 cm (6 to 12 in) tall.

SOIL SAMPLES

Soil samples were collected from the experimental area at each site in late March or early April, including surface (0–18 cm, or 0–7 in) samples for routine soil fertility assessment (pH, P, and K) and profile samples for NO₃⁻ testing (1990–1992) or the ISNT (2001–2003).

EXPERIMENTAL SITE-YEARS

The 102 site-years studied show the soil series; the year when N response was studied; the previous crop; the tillage system in use; the source and amount of manure N applied for the growing season studied, as well as residual manuring within the previous 2 to 5 yr; plant population estimated from stand counts; a site-average ISNT value and the standard deviation (SD) computed from four (1990–1992) or 12 (2001–2003) replicate values; check-plot corn yield data; and the magnitude of the error in the PY recommendation and the corresponding economic cost.

EVALUATION OF YIELD-BASED NITROGEN MANAGEMENT

The importance of fertilizer N management in corn production is evident from the economic costs that often exceed \$100 per hectare (\$40/A). The rationale for this investment resides in the PY method, whereby crop N uptake is ascribed largely

izers for ROFITS



The need for a soil-based approach to managing nitrogen fertilizers for profitable corn production

to N fertilization. The resulting recommendations have been adopted on the premise that yield must not be limited by inadequate N supply, yet have seldom been evaluated relative to grain yield with a lower (or higher) rate of N fertilization, or for accuracy in fertilizing individual sites where N-response studies have been conducted to determine an EONR.

In 22 of the N-response experiments reported, manure had been applied for the growing season studied, so the PY recommendation was adjusted to incorporate standardized credits for manure N. The adjustment proved inadequate, except for identifying three nonresponsive site-years where the manure credit exceeded the N requirement estimated for the yield goal. Of the 19 remaining currently manured site-years, 15 were completely nonresponsive to N fertilization, but would have received 38–159 kg N ha⁻¹ (34–142 lb/A) by the PY method at a cost of \$21 to \$88 ha⁻¹ (\$8 to \$36/A). Fertilization also would have been recommended for the four additional site-years where a yield response was observed. Three of the latter cases involved a corn–soybean rotation, and the combined N credits would have led to underfertilization. In contrast, the PY method would have overfertilized a responsive site-year under continuous corn, for which the manure credit was inadequate. A credit approach cannot provide a reliable basis for quantifying manure N availability, as has been reported previously.

A further problem arises because the PY method does not account for residual availability of manure N, which can persist for several years. Residual manure was more common when corn was grown continuously than in rotation with soybean. The latter difference is particularly apparent for nonresponsive site-years that were not currently manured, among which were all seven of those under continuous corn but only two of four that were in a corn–soybean rotation. The PY recommendations were always excessive for continuous corn (by 49–235 kg N ha⁻¹, or 44–210 lb/A, at a cost of \$27–\$130 ha⁻¹, or \$11–\$53/A), with or without a response to N fertilization, whereas either under- or over-fertilization occurred when there was a manure history for corn in rotation with soybean.

As with current manuring, fixed N credits are used in PY recommendations when corn is grown after a legume. The present project involved 54 such site-years that had not been manured for at least 1 year before the growing season studied, including 49 in a corn–soybean rotation and five where first-year corn followed alfalfa. Of the latter group, four site-years were nonresponsive to N fertilization, but would have been fertilized with 105 to 123 kg N ha⁻¹ (94 to 110 lb/A) by the PY method at a cost of \$58 to \$68 ha⁻¹ (\$23 to \$28/A), even after maximizing the alfalfa credit (112 kg N ha⁻¹, or 100 lb/A). The error was more extensive in magnitude (162–193 kg N ha⁻¹, or 145–172 lb/A) and cost (\$89–\$106 ha⁻¹, or \$36–43/A) for

four nonresponsive site-years where corn followed soybean, involving either no-till (site-years 6 and 22) or residual manuring (site-years 15 and 33). In contrast, under-fertilization often occurred when a yield response was obtained with soybean as the previous crop, whereas no such occurrences were observed with continuous corn, suggesting a greater need for N fertilization when corn follows soybean. The latter difference was substantiated, after excluding manure and tillage effects, by an ANOVA that showed significant increases in EONR and delta yield when the previous crop was soybean rather than corn. The EONR estimated for corn after soybean was significantly greater for 2001–2003 (153 kg N ha⁻¹, or 137 lb/A) than for 1990–1992 (96 kg N ha⁻¹, or 86 lb/A) site-years, suggesting that current production practices have increased the fertilizer N requirement of corn within this rotation. Such an increase is likely attributable to greater nutrient demand by improved hybrids selected for maximal yields with high planting rates.

These findings raise serious questions about the use of standardized credits for estimating the fertilizer value of legume-derived N, which ranges widely with species and environmental conditions. In the present project, a soybean credit was inappropriate for nonmanured site-years under a corn–soybean rotation, as one-third of this group would have been underfertilized by the PY method, at an average cost of \$57 ha⁻¹, or \$23/A.

Lacking any N credit for management history, PY recommendations were

excessive for all but one of the 23 site-years under continuous corn that had not received manure for the growing season studied (although in almost 50 percent of these cases, manure had been applied within the previous 2–5 yr). Almost one-third of this group was nonresponsive to N fertilization, as compared with 10 percent of the 49 site-years in a corn–soybean rotation with no manure credit. While on average both groups were overfertilized by the PY method, the error was much more extensive (128 versus 46 kg N ha⁻¹, or 114 vs. 41 lb/A) as calculated using actual errors rather than the magnitudes reported when corn was the previous crop ($P < 0.01$), with no instances of underfertilization.

EVALUATION OF SOIL-BASED NITROGEN MANAGEMENT

The recurring evidence of serious inaccuracy in fertilizer N recommendations by the PY method has obvious economic implications for individual farmers, and also raises concern about environmental pollution. Extrapolating from the average error in these recommendations for the site-years studied (\$50 ha⁻¹, or \$20/A), the annual cost to Illinois agriculture would exceed \$220 million, which does not include expenses associated with excessive N fertilization, such as the loss of Ca²⁺, Mg²⁺, and K⁺ that serve as counter-ions during the leaching of NO₃. Such estimates emphasize the need to account for a soil's capacity to supply plant-available N through mineralization, which is the key to improving fertilizer N management in a humid region such as Illinois.

In order for the ISNT to be successful, conditions must be conducive to soil N mineralization, as well as crop N uptake and utilization. This requirement was not satisfied with four of the 19 site-years incorrectly identified as nonresponsive by the ISNT, owing to serious moisture stress that occurred for most (site-years 101 and 102) or some (site-years 76 and 79) of

the growing season. The effect of this stress on interpretation of the ISNT is clearly demonstrated from a comparison of yield data for site-years 22 and 76, which involved the same location with ISNT values above the critical level, but different growing conditions.

The data leave little doubt about the need for soil-based N management, as fertilizer N requirement decreased with increase in the ISNT, while an increase occurred with plant population, reflecting higher crop N demand. The latter trend adds a new dimension to fertilizer N management with the ISNT, whereby planting rate can be adjusted to exploit soil N availability, provided that productivity is not limited by other soil properties (e.g., moisture).

CONCLUSIONS

Nitrogen fertilizers contribute substantially to the cost of corn production. These recommendations are called into question by a new study published in the January–February 2006 issue of the *Soil Science Society of America Journal* (SSSAJ), which offers a soil-based alternative that will benefit crop yields, the environment, and the bottom line for farmers.

“We evaluated the proven-yield (PY) method on a site-by-site basis for 102 on-farm N-response trials conducted throughout Illinois in six growing seasons from 1990 to 2003. It was disturbing to see how poorly this method performed, considering that it has been so widely advocated for the past three decades. In fact, on average the error itself was greater than the economically optimum N rate,” said Richard Mulvaney, University of Illinois professor of soil fertility.

The PY method was developed in an era when N fertilizer was relatively inexpensive and environmental concerns were less pressing, and has often been advocated as insurance against a yield limitation due to N deficiency. Yet even with an increasingly unrealistic corn

to N price ratio of 10:1, the insurance policy failed to avoid under-fertilization about one time out of six, by 46 kg ha⁻¹ (41 lb/A) on average and mostly when corn followed soybean.

Saeed Khan, co-author and research specialist, said “These findings are not that surprising when you consider the ‘one-size-fits-all’ philosophy behind the PY method. Besides invoking standardized credits to account for N derived from legumes or manure, it assumes a constant fertilizer efficiency, regardless of timing, formulation, and method of application, weather conditions, landscape position, soil type, planting rate, and perhaps most importantly, the inherent differences that exist in soil N-supplying power.”

Those differences have a crucial effect on the need for supplemental N fertilization, according to new insight provided by the Illinois soil N test (ISNT), a simple Mason-jar technique developed to identify sites where corn does not respond to N fertilization. There were 33 such sites in the SSSAJ study, and all except two were predicted correctly, assuming a critical test level of 230 mg kg⁻¹ (230 ppm) as originally established. This level was less effective in identifying 50 of the 69 responsive sites, but the remaining 19 have important implications for fertilizer N management with the ISNT. More commonly, the critical level proved inadequate in applying the ISNT to sites where corn followed soybean with high plant populations. Not only would crop N demand have been increased by the presence of more plants, so would the input of C in the resulting residues, thereby promoting microbial competition for available soil N.

Yields were greatest when high planting rates were combined with N fertilization, for sites that tested high by the ISNT, suggesting that this test has potential applications for variable-rate planting as well as site-specific N management.



The need for a soil-based approach to managing nitrogen fertilizers for profitable corn production

March Self-Study Examination

- 1. Assumptions of traditional yield-based nitrogen fertilizer recommendations include all of the following EXCEPT**
- soil mineralization is a minor source for crop N.
 - fertilizer efficiency is constant.
 - standard credits to account for N from legumes.
 - differences in the ability of soils to supply nitrogen.
- 2. An objective of this study was to**
- evaluate the effectiveness of the Illinois Soil Nitrogen Test in differentiating response in a wide range of conditions.
 - determine the most cost-effective form of nitrogen to apply in corn fields.
 - establish the amount of nitrogen that carries over from season to season.
 - assess the consequences of excessive nitrogen application on the environment.
- 3. It is common for nitrogen fertilizer costs for a corn grower to be around**
- \$20/A
 - \$40/A
 - \$60/A
 - \$80/A
- 4. Soil samples for nitrogen determination by the Illinois Soil Nitrogen Test were collected at each site in this study**
- in late March/early April.
 - at planting time.
 - at the V6 stage in early June.
 - just prior to sidedressing.
- 5. Under-fertilization of nitrogen in this study occurred most often when**
- the previous crop was corn.
 - the previous crop was soybeans.
 - soils were heavy clay.
 - manure had been applied.
- 6. From the data collected in this study, the annual cost to Illinois agriculture from inaccurate nitrogen recommendations is**
- \$55 million.
 - \$110 million.
 - \$220 million.
 - \$500 million.
- 7. A characteristic of this study includes all of the following EXCEPT**
- 102 N-response studies located in Illinois.
 - randomized complete block study design.
 - a mixture of previous crops, tillage, and manure application at each site.
 - urea/ammonium nitrate solution applied to N plots.
- 8. When using the PY method, nitrogen credits are utilized in determining recommendations for corn when**
- following another corn crop.
 - manure was applied in a previous year.
 - following a legume crop.
 - planting in no-till fields.
- 9. The greater demand of nitrogen noted in this study when corn follows soybeans can be attributed to**
- improved hybrids and higher planting rates.
 - greater nitrogen loss in areas where soybeans are grown.
 - a higher ratio of soybean grain to stover with higher soybean yields.
 - nutrient cycling in soybean residue.
- 10. Costs of excessive nitrogen applications in addition to the unnecessary expense include**
- luxury consumption of P and K.
 - poor grain quality.
 - leaching of basic cations with nitrate loss.
 - decreased earthworm populations.

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- 2. Answer the questions by clearly marking an "X" in the box next to the best answer for each question.
- 3. Complete the self-study exam registration form on the back of this page.
- 4. Clip out this self-study examination page, fold and place in envelope.
- 5. Enclose a check for \$10.00 made payable to the

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Signature of Registrant as it appears on Code of Ethics

I certify that I alone completed this self-study course and recognize that an ethics violation may revoke my CCA status.

This exam issued March 2006 expires March 2009.

SELF-STUDY EXAM EVALUATION FORM

Rating Scale: 1=Poor 5=Excellent

Information presented will be useful in my daily crop advising activities: 1 2 3 4 5
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 I was stimulated to think how to use and apply the information presented: 1 2 3 4 5
 This article addressed the stated competency area and performance objective(s): 1 2 3 4 5
 Briefly explain any "1" ratings: _____
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