



EARN CEUs at the Indianapolis meeting

Certified Crop Advisers have the opportunity to earn Continuing Education Units (CEUs) during the American Society of Agronomy International Annual Meeting, Nov. 12-16, 2006, in Indianapolis at the Indiana Convention Center.

The A-9 Professional Practitioners Division features sessions specifically targeted toward certified individuals (the schedule for these sessions is pending).

Additionally, all states and provinces now allow CCAs to self-report up to 20 CEUs. CCAs may only receive CEUs for structured oral presentations. Open poster sessions do not qualify for CCA CEUs.

More than 2,000 poster and oral papers will be presented in sessions throughout the week, covering such topics as nutrient management, soil and water management, pest management, crop management and professional development, among others.

REGISTRATION INFO

Registration for the Annual Meeting opens on Aug. 1. Pre-registration by Oct. 10 for the full week of meetings is \$365 for ASA members and \$535 for non-members. After Oct. 10, the registration fee increases to \$445 for ASA members and \$595 for non-members. A one-



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Indianapolis will host the 2006 American Society of Agronomy's International Annual Meeting, Nov. 12-16.

day rate is available if registering on site at the convention center. Certified professionals can become ASA members for less than the difference between registration fees, and the membership in ASA will be good through all of 2007. To learn more, go to www.agronomy.org/member_services.html or call (608) 273-8080.

For the session topics and times, or to register for the meetings go to: www.acsmeetings.org **AG**

Transportation information

■ Air Transportation

The Indianapolis International Airport is located 10 miles from Downtown Indianapolis and is serviced by 20 airlines.

■ Carey Indiana Airport Shuttle

Roundtrip shuttle service transportation from Indianapolis International Airport to downtown Indianapolis is available through Carey Indiana. Both private shuttle service and share-a-ride service are available through Carey Indiana.

The one-way fee for Share-A-Ride shuttle service between the airport and downtown Indianapolis is \$11 per person. ASA-CSSA-SSSA will provide a discount coupon for the Share-A-Ride shuttle service that is good for \$1 off the one-way fee. Please note that the page contains two coupons. The right side contains the coupon you use when you arrive in Indianapolis.

Additional Transportation is available through taxi services and public transportation.

Is 'expert' status always advantageous?

BY JEFF A. MASSON, an attorney at the law firm of Frilot Partridge LC in New Orleans. Masson is a certified crop consultant in Louisiana and his law practice focuses on agricultural law, intellectual property and agricultural products liability litigation.

In June of 2005, the USDA declared that Certified Crop Advisers (CCA's) and Certified Professional Agronomists (CPA's) would be considered "agricultural experts." This change arguably strengthened the CCA/Crop Consultant status as it added significant weight to opinion testimony provided by such professionals in Agricultural Risk Management proceedings. (These proceedings include the Federal Crop Insurance Program and the Crop Disaster Assistance Program.) This change allows for a CCA who is testifying as a fact witness to also provide expert 'opinion' testimony. Despite the USDA's declaration of CCA "agricultural experts" status for these administrative hearings, it does not confer expert status in judicial proceedings outside of USDA programs.

In order to better understand this change, it may be useful to cover a few important points about classification of witnesses. Most individuals that testify in proceedings are fact witnesses, i.e., witnesses who have first-hand observations involving the issues under consideration. Fact witnesses are typically not permitted to provide opinion testimony; only expert witnesses are allowed to give opinions in a proceeding. In federal courts, the federal evidentiary rules set out a framework that governs the admission of expert testimony. Rule 702 of the Federal Rules of Evidence provides:

If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliable to the facts of the case.

This current version of Rule 702 was enacted in response to the U.S. Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* in

1993. At the heart of this rule is the standard by which a witness may qualify as an expert in federal court. The standard required for a witness to qualify as an expert in federal court is for him/her to have sufficient knowledge, skill, experience, training, or education in the subject area which they will testify.

Undoubtedly, most CCA's will not have a problem satisfying this federal court standard.

Although this rule change strengthens the 'CCA' status, it can also create unwilling witnesses out of a CCA that appears to provide fact testimony. Regardless of whether a CCA appears as a fact witness willingly or through compulsory process, the cause for concern is whether the CCA is asked to provide opinion testimony (as an expert) once called to testify.

Given the possibility of being asked for an expert opinion, a CCA should remain cautious of agreeing to testify without compulsory process in some circumstances. These questionable circumstances will mostly involve situations where "good farming practices" may be an issue. In order to protect against the possibility of providing testimony that could damage or destroy their relationship with the client, the CCA should discover as much information about a pending hearing as possible. The CCA should be mindful that opinion testimony may be requested that could require them to scrutinize their client's farming practices. To that end, a CCA may review the known facts and determine whether the matter warrants their involvement. If a CCA chooses not to participate, they should be mindful they could still receive a subpoena. Regardless of whether a CCA appears voluntarily or not, the optimal position is always for the CCA to serve as an expert defending their recommendations, not attacking other causes that may have affected a crop (such as inputs, weather, farming practices). This will allow a CCA to serve his/her client without raising doubt against the client's farming practices. **AG**



Looking to hire top-notch candidates?

If you are looking to hire and want to gain exposure to hundreds of agronomy, crop and soil students and professionals, then look no further than the ASA Annual Meeting in Indianapolis, Nov. 12-16. As an employer, post your job announcements and even sign-up to conduct job interviews on-site. As a meeting attendee, you can use the Career Placement Center free of charge, and we are open for business throughout the entire convention week.

The event will feature these benefits:

- Searchable resumes
- Post job and internship announcements
- Staff assistance with scheduling interviews
- Reserved interview tables
- Meet qualified candidates from around the U.S. and around the world

NEW FOR 2006

Internship Interviews. Do you offer opportunities for undergraduates to intern at your organization? If you do, we are reserving

an afternoon to conduct informal interviews with more than 300 students attending our meetings. Meet with our early career professionals from schools around the U.S. to talk about your specific internship opportunities or provide general information about your organization.

YEAR-ROUND SERVICES

The Career Placement Center promotes and encourages career opportunities in the agronomic, crop, soil and environmental sciences and serves as a clearinghouse for resumes and personnel listings year-round. Jobs can be posted through our Web site and the monthly CSA News, and advertising information is available. Employers can also search our online resumes.

For more information about the Annual Meeting or year-round career services, visit: www.careerplacement.org, or contact Leann Malison at (608) 268-4948 or lmalison@agronomy.org. **AG**



If you're looking to hire an employee, here's a list of interview times.

Schedule of hiring events

Sunday, Nov. 12

Employer check-in 1:00-6:00 pm

Monday, Nov. 13

Employer and applicant check-in 8:00 am-5:00 pm
 Open job interviews 1:30-4:00 pm
 Internship interviews 1:30-4:00 pm

Tuesday, Nov. 14

Scheduled job interviews 8:00 am-5:00 pm

Wednesday, Nov. 15

Scheduled job interviews 8:00 am-5:00 pm

Thursday, Nov. 16

Open job interviews 8:00 am-11:00 am



CCA
ADVANTAGE

Continuing Education
Self-Study Course

MANAGEMENT

ON SOIL PHYSICAL PROPERTIES

BY K. A. MCVAY, J. A. BUDDE, K. FABRIZZI, M. M. MIKHA, C. W. RICE, A. J. SCHLEGEL, D. E.

The physical properties of any soil are a function of climate, vegetation, parent material, topography and time. Most soils of the Great Plains have formed from parent material, such as Wisconsin loess that was deposited about 20,000 years ago. Consequently, the soils have evolved into a balanced, stable resource capable of producing several Mg ha^{-1} (a few tons/A) of native biomass each year. Yet, in a very short period of time, management by man has altered this balance. For example, at Sidney, NE, breaking sod into a wheat (*Triticum aestivum* L.) to fallow rotation reduced soil organic matter content by 20 percent for no-till (NT), 25 percent for mulch till, and 37 percent for plow-till in just 16 years. In the United States, the majority of land now in production agriculture was initially cleared and plowed to facilitate annual row crop and cereal grain production. Depending on location, plowing was common through most of the 20th century. As a consequence, by 1960 soil organic carbon (SOC) levels across the Great Plains were about 52 percent of their original content. In the late 1960s, improvements in planting equipment made it possible to plant crops without tillage, and NT agriculture was born.

Since the 1960s, many studies have been conducted comparing NT and conventional tillage (CT) practices, as well as documenting the effect they have on soil physical, chemical, and biological properties. Use of NT systems to conserve water for crop production has made it possible to crop more frequently in the central Great Plains. Efficiency of water use has obviously improved, but

questions remain as to the cause: improved infiltration, improved water holding capacity (WHC), or lower evaporation.

Soil water status between periods of saturation and drought can be described by the soil water characteristic curve. As water content decreases, water is held in tension by incrementally smaller pores as tension levels increase. The distribution of soil pores is a function of soil particle size and structure. Soil particle size for a site will not change due to management, but soil structure can be influenced by soil management that may modify the shape of the soil water characteristic curve. Although this property has been extensively studied for characterizing chemical transport, the impact of tillage choice on soil water characteristic has not been well documented. Fuentes et al. (2004) showed that temporal changes of the soil water characteristic in the top 3 cm were greatest in CT ($0.07 \text{ m}^3 \text{ m}^{-3}$, or 7 percent), with less change occurring in NT ($0.036 \text{ m}^3 \text{ m}^{-3}$) and natural prairie ($0.019 \text{ m}^3 \text{ m}^{-3}$). These authors stated that temporal changes in the soil water characteristic were more affected by seasonal moisture levels than by tillage, although their study was limited to a 1.5-year period.

Soil degradation can occur quickly because of improper or excessive tillage, but improvements in soil structure caused by tillage selection are slow to occur, and require long-term tillage comparisons to quantify. Intensity of crop production may indirectly affect soil water characteristic by modifying SOC and increasing the turnover of SOC. Nitrogen fertilization for cereal crops

typically increases stover and grain production. Greater returns of organic C to the soil as crop residue provides the potential to influence SOC levels. The resulting impact of cropping intensity on soil water characteristic needs to be assessed. The objective of this study was to quantify changes in soil physical properties due to agricultural management practices commonly thought to increase SOC.

MATERIALS AND METHODS

Five long-term study sites were selected across Kansas. The sites were chosen because of their long-term tillage histories. They were managed by different researchers with various short-term objectives to address local questions of yield and crop rotation within their respective region of the state. Each of these sites had been farmed previous to the establishment of these experiments, with the exception of the Tribune site. At that location, native sod (short-grass prairie) was incorporated into tillage treatments, retaining native sod as a treatment. Yield data were reported elsewhere. We evaluated changes in soil physical properties and C status that occurred as a consequence of common management practices.

What is considered CT varied by location. In fact, CT at Tribune was a V-blade sweep plow, which is the same tillage system considered as reduced tillage (RT) at Hays. At Hays, CT included a disk and mulch treader. Both Hays and Tribune had a fallow sequence, which increased the number of tillage operations as compared with the eastern Kansas locations. The eastern Kansas locations used more aggressive tillage implements such as

ENT EFFECTS

IN LONG-TERM TILLAGE STUDIES IN KANSAS

PETERSON, D. W. SWEENEY, AND C. THOMPSON

chisel plows as CT, with a disk or field cultivator considered RT. In all locations NT was defined as chemical weed control, and direct seed placement without prior soil disturbance. For the purposes of this study, tillage type is less important than tillage intensity. So even though tillage types are not the same, at each location tillage intensity existed at either two or three levels.

RESULTS

There were treatment effects on soil properties at the 0- to 5-cm (0-2 in) depth primarily, with few exceptions of effects at deeper depths. This fact itself was quite surprising and significant, as the many years of differential management would have led us to predict changes in soil properties throughout the rooting depth. The results of this study suggest that measurable changes occurred only near to the soil surface; therefore, all further discussion will focus on this 0- to 5-cm depth increment unless stated otherwise.

Soil organic C changes were apparent at all sites, with SOC concentration and mass greater as a function of less tillage and greater nitrogen input. Tillage affected SOC mass at all sites except Tribune, with NT management resulting in greater accumulation of SOC than other tillage practices. Nitrogen management also impacted SOC accumulation with a difference at two of three sites where nitrogen rate was a treatment. At Ashland Bottoms, where crop rotation was evaluated, treatments that included grain sorghum [*Sorghum bicolor* (L.) Moench] resulted in a greater accumulation of SOC.

At this site SOC followed the same statistical patterns in the 5- to 15-cm (2-6 in) depth. Manhattan was the site with the greatest mass of SOC, which may be a function of manure applications at that site resulting in greater C input as compared with other sites. Although concentration of SOC at Tribune was higher in the sod as compared with the rest of the treatments, when SOC mass was calculated, there was no difference in SOC mass across all treatments. At Tribune, sod retained greater SOC mass in the 15- to 30-cm (6-12 in) depth than RT with other tillage types intermediate (data not shown).

Soil organic carbon concentration was highest in the native sod 14 years after establishment compared with any of the annual crop treatments. Estimates of total SOC mass indicated no differences due to tillage treatment, although the trend was apparent that SOC concentration declined as annual cropping was imposed, with a greater rate of decline as tillage intensified.

Only one of five sites showed a change in WHC. At Ashland Bottoms, WHC of NT was 0.03 m³ m⁻³ greater than CT. This difference represented an increase in water storage of approximately 0.15 cm in the soil profile. Crop rotation also influenced WHC at Ashland Bottoms where continuous soybean [*Glycine max* (L.) Merr.] resulted in a 0.024 m³ m⁻³ reduction in WHC as compared with rotations that included grain sorghum. At the time of sampling, the Ashland Bottoms site had been managed in this fashion for 29 years. Although slight changes in the soil water characteristic curves were determined at other sites, these



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changes did not result in changes in WHC for these soils.

Soil bulk density was greater at Manhattan and at Ashland Bottoms in NT as compared with CT management. At Tribune, bulk density of the 30- to 40cm (12-16 in) depth was less for sod than for CT, with NT intermediate. In each case, bulk density values remained below that considered problematic for agricultural soils.

Larger diameter stable aggregates (GMWD) were noted at three of five sites when the tillage choice was NT as compared with CT. At Parsons GMWD was intermediate for RT relative to NT and CT. The trend for GMWD was similar but not

significant at Hays. At the Manhattan site, GMWD was greater with manure application. The largest GMWD aggregates were found in the sod treatment of Tribune.

DISCUSSION

At the time of sampling, these studies had been conducted for an average of 23 years, with the longest running study (Hays) spanning nearly 40 years. Yet measurable differences in some soil properties were detected only in the surface 0- to 5-cm depth, and were determined to be unchanged in the 5- to 30-cm depth. Tillage type likely played a role in diluting SOC for the three eastern locations by mixing carbon into deeper depths. At Hays and Tribune, less mixing would have occurred because of the use of sweep plows rather than chisels, so tillage induced differences in SOC were less. Still, greater levels of SOC did not consistently translate into greater WHC of the soil across sites.

Bulk density values were only minimally affected at depths below the top 3-cm of soil. At Tribune a traffic pan may have formed in CT as bulk density values at the 30- to 40-cm depth were much greater than sod or NT treatments.

At Tribune, a sweep plow was used for CT, but many tillage operations at a consistent depth and tillage in general can lead to the destruction of plant roots. Without plant roots to reinforce the soil, machine-induced compaction can occur. Soils higher in clay content or SOC are more resistant to compaction, which may help explain why so little change in bulk density occurred at the other four locations.

Only the Ashland Bottoms location provided information on the impact of crop rotation on WHC. At that site, continuous soybean had lower WHC as compared with rotations including grain sorghum. Soybean root systems consist of shallow taproots. The

fibrous root system of grain sorghum or wheat may be important for soil structure as indicated by greater WHC in the rotations including cereal crops. At this location, long-term grain sorghum yields averaged over 29 year were more than twice that of soybean. Yield differences contributed to greater carbon input in treatments that included grain sorghum, which was reflected in greater SOC. More crop rotation studies need to be evaluated for changes in WHC.

Crop response to N applications for the three locations where N rate was a factor indicated a 48 percent yield increase due to N application when the crop was a nonlegume. Increased C input to the soil as crop residue resulted in greater SOC at Manhattan and Hays, with Parsons showing a similar but nonsignificant trend.

At Parsons, soybean constituted half of the rotation. Since soybean yielded similarly on N-rate plots, carbon input for this phase of the rotation would have been similar across treatments, which helps explain the lower response seen at that location. Higher nitrogen rates resulted in greater SOC but did not affect WHC.

No-tillage resulted in greater WHC and SOC at Ashland Bottoms as compared with CT. The magnitude of the change in WHC due to tillage at Ashland Bottoms was the same as that at Tribune where the change was in the opposite direction but not significant. Several environmental factors are different between these two sites. Annual precipitation at Ashland Bottoms was twice that of Tribune.

The soil at Ashland Bottoms was located within the floodplain of the Kansas River, and was of more recent geologic deposition than that at Tribune. Tribune (as well as Hays) included a fallow sequence as part of the rotation. Fallow has been shown to result in reduced carbon input and can lead to declining SOC levels. The Tribune experimental site had been in

native grass before initiation and likely at the peak of its SOC potential, while Ashland Bottoms had been farmed for many years before experiment establishment. The potential to build SOC at Ashland Bottoms would have been greater than that at Tribune. It was also possible that WHC determination on small cores does not represent fully the water relations of the soils at each location resulting in experimental error too great to fully distinguish differences.

Components of the water balance in addition to WHC are important in overall productivity of a cropping system. Water use efficiency has been reported to be greater in RT systems as compared with CT.

In the northern Great Plains, Pikul and Aase (1995) found infiltration rates were greater under NT because of the protection of the soil surface. The impact of rainfall on a bare soil surface can result in substantial decrease in infiltration over very short periods of time. The end result on lands with any slope is runoff and less water stored in the soil profile for later use by a crop.

Management can influence measured soil properties given enough time for differences to develop. Nitrogen additions in cropping systems dominated by cereal crops increased productivity and SOC, but did not influence WHC in this study. Tillage choice is important for managing soil carbon, and can influence crop yield. It is also a factor in managing crop residue and erosion control as indicated by increased aggregate stability in NT systems.

Soil properties such as infiltration and evaporation potential are influenced by tillage and may be responsible for most productivity differences, especially in droughty years, or drier climates. But tillage choice did not affect WHC of most of the soils evaluated in this study, which represent soils from across Kansas. **AG**



Management effects on soil physical properties in long-term tillage studies in Kansas

August Self-Study Examination

1. Compared to native uncultivated soils, the soil organic carbon levels of cultivated Great Plains soils are about
- a. 50% of original content.
 - b. 60% of original content.
 - c. 70% of original content.
 - d. 80% of original content.
2. Advantages of no-till systems for crop production include all of the following EXCEPT
- a. water conservation.
 - b. the possibility of more frequent cropping.
 - c. larger diameter stable aggregates.
 - d. drier seedbeds due to less residue.
3. A factor associated with improvements in soil structure is that they
- a. depend on the use of a crop rotation.
 - b. may take many years to establish measurable differences.
 - c. occur only when soil organic matter content exceeds 4%.
 - d. are measured by incremental increases in soil loam content.
4. A feature of a soil water characteristics curve is that it
- a. charts runoff during heavy rainfall.
 - b. differentiates the water use patterns of various crops and rotations.
 - c. describes soil water status between periods of saturation and drought.
 - d. can help determine the sources of water contamination.
5. An objective of this research was to
- a. quantify changes in soil physical properties.
 - b. test different tillage systems across soil types and environments.
 - c. monitor changes in soil particle sizes.
 - d. assess the effects of tillage on key environmental quality indicators.
6. A characteristic of the study sites was that there were
- a. uniform tillage treatments across locations.
 - b. seven locations across Kansas.
 - c. native shortgrass prairie plots at one location.
 - d. four levels of tillage intensity.
7. The greatest differences among tillage treatments were noted
- a. at the 0 to 5 cm depth.
 - b. in subsoil bulk density.
 - c. for waterholding capacity.
 - d. when primary tillage occurred in fall.
8. A result of nitrogen additions to cereal crop-dominated cropping systems was
- a. changes in water-holding capacity.
 - b. lower yields.
 - c. increases in soil organic carbon.
 - d. corresponding decreases in soil phosphorus and potassium.
9. Overall study results among locations included
- a. a low correlation between soil organic carbon and water holding capacity.
 - b. the development of an E horizon with intensive tillage.
 - c. an association of stable soil aggregates and manure applications.
 - d. bulk density values that were impacting yields.
10. Productivity differences among soils in drier climates or droughty years are most influenced by
- a. infiltration and evaporation potential.
 - b. north vs. south slope aspect.
 - c. tillage depth.
 - d. soil pH differences.

DETACH HERE

GET A CEU!

This exam is worth 1 CEU in **Soil and Water Management**. An exam score of 70% or higher will earn CEU credit. The International CCA program has approved self-study CEUs for 20 of the 40 CEUs required in the two-year cycle.

DIRECTIONS

1. Read the self-study article on pages 40-42 carefully.
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 American Society of Agronomy, for processing fees.
6. **Mail your self-study exam and fee to:** ASA c/o CCA Self-Study Exam, 677 S. Segoe Road, Madison, WI 53711. *Please allow 60 days for processing.*
7. An electronic version of this test is also available at www.AgProfessional.com. Go to the Certified Crop Advisers section (left-hand column) and access the "CCA Advantage" link.

Payment in U.S. funds only.

SELF-STUDY EXAM REGISTRATION FORM

Name: _____

Address: _____

City: _____ State/Province: _____ Zip: _____

CCA Certification #: _____

Credit Card #: _____ Type of Card: Visa Mastercard Discovery Am Express

Expiration Date _____ Name on Card: _____

Enclose a \$10 check payable to American Society of Agronomy.

X _____

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 August 2006 expires August 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

Information was organized and logical: 1 2 3 4 5

Graphics/tables were appropriate and enhanced my learning: 1 2 3 4 5

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: _____

Topics you would like to see addressed in future self-study materials: _____

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