CERTIFIED CROP ADVISER

CCA ADVANTAGE

The Voice of the Certified Crop Adviser Program
www.agronomy.org/cca

CCAs Testify at House Hearing About Technical Service Provider Program

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David Harms, CCA, CPAg, CPCC-I and member of ASA-CSSA-SSSA, testified before the House Agriculture Subcommittee on Conservation, Credit and Rural Development on June 15, 2004.

His testimony was given on behalf of the Certified Crop Adviser (CCA) Program and the American Society of Agronomy (ASA) to discuss the implementation of the Technical Service Provider (TSP) program, which is part of the 2002 Farm Bill's conservation efforts.

The TSP program is implemented by the USDA's Natural Resources Conservation Service (USDA-NRCS). Since its inception, several groups, including the Societies' certification programs, have signed Memorandums of Understanding with the USDA-NRCS to allow their certified registrants to become TSPs.

Harms, president of Crop Pro-Tech, Bloomington, IL, also provided the subcommittee with written testimony containing comments from CCAs from across the country. Harms highlighted several issues with the current TSP program, including:

- There is a lack of information and misunderstanding about registering as a TSP.
- The biggest challenge for those that are TSPs is getting paid for work completed.

The submitted CCA comments were captured in a recent survey about the TSP program. When asked how they would rate their satisfaction with the overall TSP program, 60 percent were unsatisfied. Over 450 CCAs completed the survey and 237 provided comments on the program. The full survey results appear below.

Following the testimony of Harms and others, **Bruce Knight**, chief of the USDA-NRCS, indicated that his agency is committed to working with groups such as the CCA program to make the TSP program practical for producers and certified crop advisers. He said that more technical assistance funding was needed to implement the conservation programs.

To view the full written comments submitted to the subcommittee, visit the CCA homepage, *www.agronomy.org/cca*.

CCA-TECHNICAL SERVICE PROVIDER SURVEY RESULTS

1. Are you a Technical Service Provider (TSP)?

Yes	227	49%
No	240	51%

2. If you are not a TSP, do you plan on registering as one within the next 12 months?

Yes	151	58%
No	110	42%

3. If yes, have you received TSP-related payments from USDA or your customers?

Yes	35	9%
No	358	91%

4. How would you rate your satisfaction with the overall TSP program?

Extremely Satisfied	8	2%
Satisfied	145	39%
Unsatisfied	153	41%
Extremely Unsatisfied	66	18%

CCA EVENTS

August 25: Diagnostic Troubleshooting Workshop
Arlington Ag Research Stn., WI
Contact: 608/262-6491

October 24-26: CAPCA 30th Annual Conference
Anaheim, CA
Contact: 916/928-1625

December 14-15: Indiana CCA Conference
Indianapolis, IN
Contact: 800/387-1283

January 12-13: 2005 CCA Conference and Annual Meeting
Niagara Falls, Ontario
Contact: 519/669-3350

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Preparing for Asian Rust

By Bob Callanan, Communications Director
American Soybean Association

Crop protection manufacturers and industry and government agencies are educating producers about the potential devastation of soybean rust and how to detect and treat the disease. **— Photos courtesy of USDA-AHIS**

Most experts agree that an outbreak of Asian soybean rust in the United States is only a matter of time. An outbreak could cause large crop and economic losses to soybean growers and associated industries.

The American Soybean Association (ASA), a membership-driven, grassroots policy organization representing 25,000 U.S. soybean producers, continues to urge USDA to take every science-based measure to prevent the introduction of rust into the U.S., as well as to take immediate steps to ensure U.S. agriculture is fully prepared to respond to and mitigate an outbreak.

"Soybean rust has the potential to devastate the U.S. soybean industry," said ASA President **Ron Heck**, a soybean producer from Perry, IA. "With possible yield losses of up to 80 or even 90 percent, rust is one of the most pressing issues facing farmers in the future."

Asian soybean rust *(Phakopsora pachyrhizi)* attacks the foliage of a soybean plant causing the leaves to drop early, which inhibits pod setting and reduces yield. The amount of damage depends on how early in the growth of the soybean plant the infection occurs. A first-year outbreak in mid-September would probably cause minimal losses compared to an introduction in mid-July, when it could be devastating.

Asian soybean rust spreads across regions primarily by wind-borne spores, dependent upon prevailing winds and environmental conditions conducive to disease development. It is likely that once rust establishes itself in the U.S., it will remain a production problem until rust-resistant varieties can be developed. In countries where rust is a problem, fungicides have been used effectively to reduce its impact on production.

Reports indicate Asian rust has spread to almost all states in Brazil this year, and areas in Paraguay and parts of northern Argentina are also infected. Brazil's senior soybean rust specialist indicates Brazil's losses to Asian rust are greater in 2004 than in 2003 and total yield losses from Asian rust could exceed 4 million metric tons (150 million bushels), with costs of spraying fungicides likely to exceed $1 billion.

Inspection for soybean rust consists of a thorough visual examination of soybean plants in the field and of other host plants, such as kudzu, in the vicinity. Inspect the underside of lower leaves for uredinial pustules that are powdery, and buff or pale brown in color. Early symptoms are easily confused with bacterial pustule or bacterial blight, and brown spot. These diseases also occur often on the underside of soybean leaves and cause a raised light brown blister within a lesion. These leaf lesions vary from small specks to large irregular brown areas.

ASA is advising members to contact their county extension agent or crop adviser to help rule out other diseases. If other diseases are ruled out, samples must be quickly collected and submitted to the land grant university or department of agriculture in that state. Collectors should place leaf, stem and pod samples between paper towels or pieces of paper to keep them flat, put them in a self-locking plastic bag and store in cool conditions. Care should be taken to ensure outsides of bags are not contaminated by the suspected rust samples. Record the date, field location, including county and state, and collector's name and telephone number on a collection information form or paper that is included with the samples.

For more information about soybean rust, visit *www.SoyGrowers.com/rust* and *www.aphis.usda.gov/ppq/ep/soybean_rust/*.

Untreated soybeans (left) compared to treated soybeans (right). Untreated soybeans are prematurely dropping leaves. **— Photos courtesy of BASF**

This CCA Gets Politically Active

By Tim Laatsch, CCA
The Maschhoffs, Inc.

When I earned my CCA certification in 2003, little did I dream that a year later I would be in Washington, DC, testifying about the Technical Service Provider (TSP) program before the House of Representatives Ag Subcommittee on Conservation, Credit, Rural Development and Research. I admit to being a little nervous, but a meeting two months earlier with USDA's Natural Resources Conservation Service (USDA-NRCS) chief, Bruce Knight, sold me on the importance of "speaking your piece" in person.

> *"We are politically involved because we want to give our growers every possible tool for success."*
> — Tim Laatsch

SHOWING RESULTS

That meeting is already showing results with the recent inclusion in an NRCS 22-point plan of a goal to conduct at least one "Boot Camp" training workshop for newly employed field personnel. State conservationists were also informed that the revised Environmental Quality Incentives Program (EQIP) Manual will provide them with the authority to include funding for mobile equipment for manure handling and application.

I made becoming a CCA part of my professional development plan when I was employed by the University of Illinois Extension. Weeks later, my CCA credentials were a contributing factor in obtaining my current position as environmental systems manager for The Maschoffs, Inc.

The Maschoffs, Inc., is unique because it is still a family business contracting with about 100 family farms for pork production. The company concentrates on its main business, which is raising hogs, wean-to-finish. It ranks in the top five of family-owned, independent pork production enterprises in the U.S., producing a million hogs a year, marketed mostly at Excel of Beardstown, IL, and at Excel's Ottumwa, IA, plant.

I earned my B.S. degree in plant science in 1992 and an M.S. degree in crop and soil science from Michigan State University in 1998. I am a certified livestock manager with the Illinois Department of Agriculture and a Registered TSP, USDA-NRCS. Since 1999 I have also been a grain and livestock farmer in partnership with my father on his 700-acre family farm.

NEW CAREER

In addition to opening the door to a new career opportunity, I feel my CCA certification has expanded my professional network. The education sessions I attend to maintain my CEUs also provide unequaled opportunities for networking and discussion with a broad cross-section of ag and regulatory professionals.

Testifying in Washington, DC, at the TSP hearing was a result of my networking and our company's involvement in state professional organizations. I thought several of the subcommittee members had an intense interest in what we were saying and I am convinced they are genuinely committed to effective implementation of the Conservation Title. With almost 14,000 CCAs in the U.S., we can have the influence to help make it happen.

SCIENCE IN ACTION

6 + 1,000 + 15 = 1

Receive 1 e-mail of brief research summaries, culled from 6 journals and 1,000 articles. 15 keywords selected by you will customize your results.

Select from 15 keywords
- nutrient management (includes soil fertility)
- soil & water management
- integrated pest management
- crop management
- corn
- soybeans
- wheat
- cotton
- small grains
- hay, forage & grazing
- fruits, nuts & vegetables
- water quality
- environmental management
- land treatment, septic systems, bioremediation
- wetlands

Participating Journals
Agronomy Journal
Crop Science
Journal of Environmental Quality
Journal of Natural Resources & Life Sciences Education
Soil Science Society of America Journal
Vadose Zone Journal

FREE to members of American Society of Agronomy, Crop Science Society of America, Soil Science Society of America.

$95 per year for nonmember subscription.

Questions, contact:
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Continuing Education Self-Study Course

Soil and Water Management

Influence of Long-Term Cropping Systems on Soil Physical Properties Related to Soil Erodibility

By Achmad Rachman, S. H. Anderson, C. J. Gantzer and A. L . Thompson

EARN ONE CEU!

All CCAs may earn up to 20 Continuing Education Units (CEUs) per two-year cycle as board-approved self-study articles which will include CCA Advantage articles. The CCA CEU logo (above) marks all pre-approved material, with the CEU value indicated by the number in the middle. To receive one CEU in soil and water management, read this article, fill out the attached exam and mail the tear-out form, along with $10, to the American Society of Agronomy.

Soil physical properties play a critical role in creating favorable conditions for crop growth and soil quality. While annual tillage temporarily decreases soil compaction by loosening surface and subsurface soil, continuous long-term cultivation of land can have detrimental effects on soil quality.

Many practices are known to influence soil physical properties. These include crop type, cultivation and application of organic residues. Effects of cropping systems on soil physical properties are often related to changes in soil organic matter. Cultivation generally tends to break down aggregates. The stability of soil aggregates often decreases for soil under annual crops, such as wheat or corn.

Soil-aggregate stability, shear strength and soil erodibility are dynamic properties that change over time. Sanborn Field, located on the University of Missouri campus at Columbia, was established in 1888. It originally consisted of nine cropping practices using corn, oats, winter wheat, red clover and timothy under three soil fertility treatments. During the past 100 years, some plots have been managed with treatments consistent with the original with very minor alterations since 1888. It is hypothesized that soil physical properties have changed in these historical plots because of cropping systems applied continuously for more than 100 years.

The objectives of this study were to evaluate the effects of long-term crop management on bulk density, wet-aggregate stability, soil shear strength and splash detachment during one year. Aggregate stability for two shallow soil depths and correlations between soil physical properties were also evaluated.

MATERIALS AND METHODS

Eight plots were chosen as experimental units. Soil at the site is a Mexico silt loam. The plots were 30.6 by 9.5 m in size and were separated by 1.5-m wide grass borders. Plots had slopes ranging from 1.9 to 2.2 percent and have been continuously managed with the same treatments since 1888. The cropping and soil management treatments were continuous wheat unfertilized, continuous wheat with 13.5 Mg manure ha^{-1} yr^{-1}, continuous corn unfertilized, continuous corn with 13.5 Mg manure ha^{-1} yr^{-1}, continuous timothy unfertilized, continuous timothy with 13.5 Mg manure ha^{-1} yr^{-1}, 3-yr corn– wheat–red clover rotation unfertilized, and 3-yr corn–wheat–red clover rotation with 13.5 Mg manure ha^{-1} yr^{-1}. Manure was applied in August for the rotation and continuous wheat, October for continuous corn, and December for continuous timothy. Wheat plots were moldboard plowed in August and planted in October after chisel plowing. Corn plots were moldboard plowed in October, left bare until planting in April. Rotation plots were moldboard plowed in August and then planted with red clover. During this study the rotation plots were under red clover. Timothy plots were not plowed during this study, but had been plowed and replanted in 1989.

Barnyard manure was used as fertilizer. Average properties and their standard errors on a dry weight basis of the manure applied were as follows: 18.6 $\pm$ 4.3 g kg^{-1} total N, 9.9 $\pm$ 5.9 g kg^{-1} P, 12.0 $\pm$ 9.1 g kg^{-1} K, 1.9 $\pm$ 1.9 g kg^{-1} Na, 4.0 $\pm$ 2.4 g kg^{-1} Mg, and 29.4 $\pm$ 22.8 g kg^{-1} Ca.

Soil organic C ranged from 5.2 g kg^{-1} in the unfertilized corn to 23.4 g kg^{-1} in the manured timothy. Clay content ranged from 14.8 percent in the unfertilized rotation to 30.0 percent in the manured corn. This variation in surface soil texture was because of 100 years of continuous cropping and subsequent erosion for the corn treatments.

Three sampling locations were chosen in each plot. The samples were taken in the crop row between plants for corn and wheat. For the timothy and rotation treatments, samples were taken in nontrafficked areas. Two soil cores were taken from each sampling location from the 20- to 96-mm depth. One soil core was used for aggregate stability analysis and the other core for splash detachment and soil shear strength determination. Soil cores were collected on Nov. 5, 1992; Jan. 22, 1993; April 24, 1993; and July 23, 1993.

Aggregate Stability Analysis. Soil from one core at each sampling location was removed, cut in half, and spread out in a 3-mm thick layer to air dry. The air-dried samples were gently crumbled by hand and sieved to retain the 1- to 2-mm aggregates. The two depths were analyzed separately.

Soil Splash Detachment Test. Soil splash detachment was conducted using a single-drop method. Three splash determinations were collected at different locations on the surface so that the amount of splash was not affected by previous water drop impacts.

Fall-Cone Shear Strength Test. Immediately after soil splash determinations were conducted, the undrained soil shear strength was determined. The following equation was used to determine shear strength:

$$t = K(Qh^{-2}) \times 10^{-3}$$

where t is the undrained shear strength, Q is the mass of the cone, h is the depth of penetration of the cone, and K is a proportionality factor which depends on the cone angle and soil texture. Since the soil tested was silt loam, $K = 10\ ms^{-2}$ was used. Three fall-cone measurements were made on each soil core at least 20 mm from the edge of the core.

Statistical Analysis. Analysis of the soil property data indicated that fertility treatments had relatively smaller effects compared with cropping systems. Therefore, we focused on the effects of cropping treatments on soil physical properties. Analysis of variance was performed using SAS with $P = 0.05$. Statistical comparisons were not made among fertility treatments because of this decision. Single degree of freedom contrasts were developed before the study, which were used to compare differences in cropping treatments: timothy vs. others (rotation, corn, wheat); rotation vs. corn and wheat; and corn vs. wheat. Single degree of freedom contrasts were also developed before the study to compare the effect of season on the soil properties: July vs. others (April, November, January); April vs. November and January; and November vs. January. Linear regressions and correlations were also made between the measured soil physical properties.

RESULTS AND DISCUSSION

Bulk Density. No effect of cropping systems and no significant interactions among cropping systems and season were observed for bulk density. Seasonal changes in bulk density were found in this study. Higher bulk density was typically found before spring tillage. Bulk density increased gradually from November to a high in April, then decreased to a low in July. Single degree of freedom contrasts of July vs. others, and April vs. November and January were highly significant. Tillage and weather fluctuations were responsible in part for temporal variations in bulk density.

Aggregate Stability. Effects of cropping systems on aggregate stability were highly significant for both depths. Aggregate stability was very low for corn and wheat, with the wheat treatment possessing the lowest value. Increases in aggregate stability were observed for the 58- to 96-mm depth compared with the 20- to 58-mm depth for the corn, wheat and rotation treatments. It is unknown why this occurred; it may be related to aggregate disruption from more intense wetting and drying of the surface soil. The contrasts of timothy vs. others and rotation vs. corn and wheat were both significant. The timothy treatment had three times the aggregate stability compared with the other treatments. We speculate that development of mechanical binding by roots that remain intact without annual tillage in the timothy treatment played an important role in enhancing the stability of soil aggregates.

In the corn and wheat treatments, frequent tillage and exposure to raindrop impact during the fallow period from August to October for wheat and October to April for corn may have increased the disruption of soil aggregates. It is also possible that the relatively high clay content and low organic matter content of wheat and corn plots may have increased wettability of soil aggregates, causing them to suffer more slaking on sudden wetting. Raindrop impacts on bare soils and slaking may be responsible for aggregate breakdown, reducing stability of soil aggregates.

Changing the cropping systems from continuous corn or wheat to a rotation of corn–wheat–red clover increased aggregate stability by 23 to 40 percent. Two possible reasons are suggested for the increase of aggregate stability in the rotation treatment as compared with the continuous corn and wheat: (1) canopy protection during the fallow period and (2) bonding material provided by red clover. The red clover in the rotation treatment was planted directly after tillage in August. Growing red clover protects the soil surface from rain impact, which can detach soil aggregates, therefore providing protection for the aggregates. Red clover also fixes N, which can speed decomposition of soil organic matter. Microbial mediated activity of organic matter decomposition produces organic polymers that bind soil particles together and may slow the rate of aggregate wetting, decreasing the extent of slaking.

Season had a significant effect on aggregate stability for the 20- to 58-mm soil depth. This depth experienced wider variations in wetting and drying in addition to aggregate disruption from raindrop impact than the lower depth. Thus, aggregate stability at shallower depths would more likely be influenced by season.

Splash Detachment. Cropping systems, season, and their interaction significantly affected soil splash detachment. Soil from the timothy treatment had 30 to 50 percent less splash detachment than the wheat and corn treatments. The rotation treatment also had 50 to 70 percent less soil splash than the corn and wheat treatments. In general, splash detachment decreased gradually from November to a low in January for corn and wheat treatments and in April for rotation and timothy treatments. Soil splash then increased during July. Seasonal variation of splash detachment was more pronounced in timothy and rotation treatments than in corn and wheat treatments, which was statistically significant. Samples from the corn and wheat treatments experienced high splash detachment throughout the year with little change by season.

A study in 1991 estimated soil erosion using the Universal Soil Loss Equation for the corn treatment to be 14.3 to 23.0 Mg $ha^{-1}\ yr^{-1}$, and for the timothy treatment to be 0.2 to 0.4 Mg $ha^{-1}\ yr^{-1}$. The difference is mostly related to roots and aboveground plant material. These results emphasize the importance of selecting cropping systems that maintain plant material to control soil erosion. Splash detachment was more sensitive than bulk density, aggregate stability and soil strength as a parameter for evaluating soil and crop management effects as evidenced by its ability to detect significant interactions between cropping system and season. It is expected that soil splash detachment is more sensitive since it measured surface soil detachment on a very small area while bulk density and aggregate stability were measured on bulk core samples.

Soil particles resist detachment until the raindrop impact force exceeds particle resistance to movement. Two processes are involved in the detachment of soil particles by raindrop impact: (1) soil compression and cavity formation on impact and (2) lateral jetting of water across the cavity boundaries. Splash detachment tests account for these two components while fall-cone measurements only evaluate the penetration resistance of a cone and do not evaluate the effects of lateral jetting from raindrop impact. Therefore, fall-cone measurements tend to over-predict the resistance of a soil to detachment.

Soil Shear Strength. The timothy treatment had 10 to 27 percent greater soil strength and was significantly different from the other cropping treatments. Soil shear strength from the rotation treatment was significantly greater than the corn and wheat treatments.

Temporal variations in soil shear strength were also observed. In general, soil shear strength decreased from November to January, increased from January to April, and decreased again from April to July. Only the contrast of April vs. November and January was significant.

Correlations Between Soil Physical Properties. Soil shear strength increased as aggregate stability and organic C content increased. The best simple linear regression was found between soil strength and the logarithm of aggregate stability. Inclusion of clay content as a second parameter in the regression relationship improved the coefficient of determination as follows:

Soil strength = 7.61 [log (aggregate stability)] – 0.25 (clay) + 15.82 (R^2 = 0.96)

In contrast, soil shear strength was negatively correlated with bulk density (r = – 0.73). Soil shear strength usually increases with increasing bulk density. However, in this study soils with higher bulk density (corn and wheat plots) had lower soil shear strength, whereas soils with low bulk density (timothy plots) had higher soil shear strength. These results indicated that the increase or decrease of soil shear strength was related to whether soil management and cropping systems improved the stability of soil aggregates. A positive correlation between soil organic matter and aggregate stability and soil shear strength has been reported by other researchers.

A 1997 study found that the amount of dead root mass significantly affected soil shear strength, where mean soil shear strength of alfalfa and bluegrass were approximately 22 percent higher that those for corn and soybeans. These findings suggest a possible reason for the greater soil shear strength found in this study on timothy and rotation treatments compared with continuous corn and wheat treatments.

The relatively low coefficient of determination of soil splash detachment vs. aggregate stability indicates that aggregate stability alone is not a good predictor of splash detachment. The wet sieving procedure of aggregate stability analysis used in this study more closely approximates the slaking forces on a soil created by flowing runoff water rather than the forces of raindrop impact. A high correlation was found between splash detachment and the ratio of raindrop kinetic energy to soil shear strength. The results of this study also indicate that as soil shear strength increases, the detachment of soil from raindrop impact decreases.

Soil Properties Related to Erodibility. Crop and soil management practices are important factors that control erosion in row-cropped land. Management practices that tend to accumulate organic matter on the soil surface modify soil surface properties such as bulk density, wet-aggregate stability, splash detachment and soil shear strength. Soil from continuous timothy was more resistant to splash detachment and had greater soil shear strength and wet-aggregate stability compared with the 3-year rotation of corn–wheat–red clover, continuous wheat, and continuous corn.

In this study, splash detachment was more sensitive than bulk density, wet-aggregate stability and soil shear strength to the crop management treatments. This is in agreement with studies in 1986 and 1987 supporting the concept that splash detachment is a more sensitive test than other measurements for evaluating changes in soil erodibility.

SUMMARY

One hundred years of continuous corn, wheat, timothy, and a 3-year rotation of corn–wheat–red clover significantly affected soil shear strength, splash detachment, and aggregate stability. The timothy treatment had the highest values of soil shear strength and aggregate stability and the lowest levels of splash detachment. Continuous wheat and corn treatments had the lowest soil shear strength and highest splash detachment. Positive correlations were found between soil shear strength and the logarithm of aggregate stability. A negative correlation was found between splash detachment and aggregate stability. These relationships suggest that some of the changes in the resistance of soil to detachment were related to soil management and cropping systems. Soil management and cropping systems that provide protection to the soil surface from raindrop impact and accumulate organic matter increased stability of soil aggregates, soil shear strength, and resistance to splash detachment. This study also suggests that splash detachment is a more sensitive test than bulk density, aggregate stability and soil shear strength for evaluating changes in soil erodibility.

Editor's note: *Content was adapted from the paper "Influence of Long-Term Cropping Systems on Soil Physical Properties Related to Soil Erodibility," which was published in Agronomy Journal: Soil Sci. Soc. Am. J., Vol. 67, March-April 2003, and is courtesy of Achmad Rachman, S. H. Anderson, C. J. Gantzer and A. L. Thompson.*