

INTEGRATOR



USDA-ARS Northern Great Plains Research Laboratory

Mandan, ND

**Northern
Great
Plains
Research
Laboratory**

Cropping System Effects on Soil pH

Cropping systems in the Northern Great Plains are increasingly characterized by practices with greater cropping intensity under no-till management. In contrast to traditional clean-till wheat-fallow systems, no-till reduced-fallow systems improve water-use efficiency and reduce soil erosion. However, long-term use of these systems can alter the chemistry of soils, most notably by decreasing surface soil pH. Through their impact on soil pH, these management practices can affect plant nutrient availability and crop yield.

Soil pH decreased in the surface three-inch depth, it increased below six inches.

In 1983, Al Black established a cropping systems experiment at the Area IV SCD/ARS Research Farm southwest of Mandan, ND. Management variables included in the experiment were crop sequence (spring wheat-fallow and spring wheat-winter wheat-sunflower), tillage (conventional, minimum, and no-till), and N fertilization (0, 20, and 40 lb N ac⁻¹ for SW-F and 30, 60, and 90 lb N ac⁻¹ for SW-WW-SF). In 1999, all plots in the experiment were sampled to a depth of two feet to match an initial sampling conducted in 1983. Soil samples from both years were analyzed for soil pH.

Management effects on soil pH were modest from 1983 to 1999. Over the 16 year time period soil pH decreased from 6.53 to 6.23 in SW-F and 6.44 to 6.00 in SW-WW-SF in the surface 0-3 inches. At the same depth, soil pH decreased the most in the HIGH N treatment (6.53 to 5.86), followed the MED (6.44 to 6.11) and LOW (6.46 to 6.31) N treatments. Decreases in soil pH from 1983 to 1999 were primarily the result of acidification from N fertilization.

While soil pH decreased in the surface three-inch depth, it increased below six inches (see table). The exact mechanism for the increase is unclear, but may be the result of an increasing concentration of calcium ions at the lower depths over time. The relevance of this finding may have application to carbon sequestration, as calcium is a critical component of calcium carbonate, or inorganic carbon. Findings from this preliminary work have prompted evaluations of exchangeable cations as well as calcium carbonate. Results from the additional evaluations were presented by Dr. Mark Liebig (701.667.3079 or liebigm@mandan.ars.usda.gov) at the ASA-SSSA-CSSA Annual Meeting in Indianapolis, Indiana on November 13, 2002.

Our Vision:

An economically sustainable and environmentally sound agriculture.

Inside this issue:

Improving Nutrient Intake and Productivity of Cattle in Late Summer with Palatable Shrubs	2
Dr. John Berdahl is Named ASA Fellow	2
"Drought Survival" Research Results Workshop - January 21 st	3
"Super Supervisor" Bruce Rittel	3
New Faces: Cal Thorson Jason Gross	4

Mean values for soil pH across treatments in 1983 and 1999 by depth

----- Soil pH -----				
Depth (inches)	1983	1999	Soil pH change	P-value
0-3	6.48	6.09	-0.39	<0.01
3-6	6.40	6.41	0.01	NS [†]
6-12	6.70	6.84	0.14	0.03
12-18	7.18	7.31	0.13	NS
18-24	7.65	7.74	0.09	NS

[†] NS = Comparison not significantly different at P<0.1.

Information for this article was taken from 'Crop sequence, tillage, and nitrogen fertilization effects on soil pH in the Northern Great Plains' by Mark Liebig, Don Tanaka, and Al Black. In A.J. Schlegel (ed.) Great Plains Soil Fertility Conf. Proc. Vol. 9. Denver, CO. 5-6 March 2002. Kansas State. Univ.]

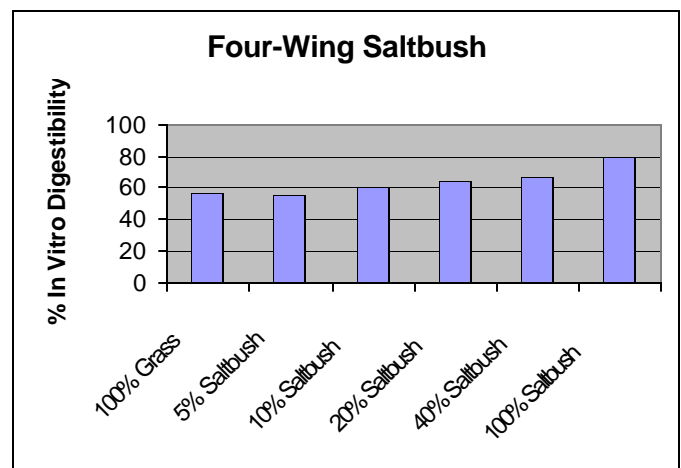
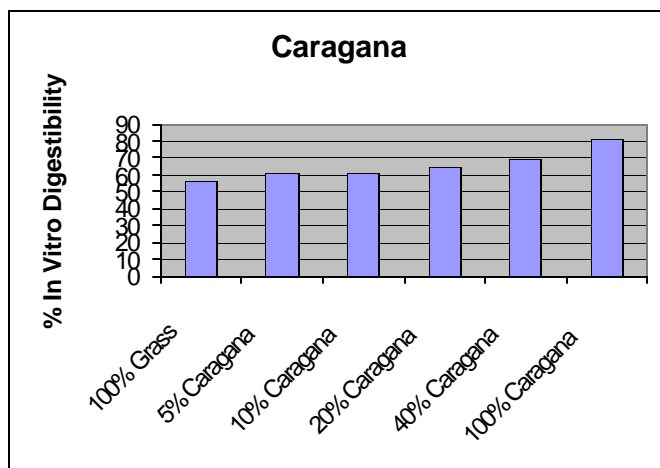


**MARK YOUR
CALENDAR TO
ATTEND**

**NGPRL Annual Friends & Neighbor's Day,
Field Tour, and Barbecue – June 26, 2003**

Improving Nutrient Intake and Productivity of Cattle in Late Summer with Palatable Shrubs

Palatable shrubs and small trees that offer better nutritional quality in late summer and store more carbon in their woody material can improve cattle productivity and possibly increase future producer income for storing carbon on their lands. Additionally, as carbon dioxide levels rise in the atmosphere, nitrogen-fixing legumes are expected to increase their growth and carbon storage more than non-nitrogen fixing plants. The small tree and legume caragana and the shrub four-wing saltbush were evaluated in respect to their ability to improve diet nutritional quality when combined with grass of typical late quality (57% digestible). In August, new caragana leaves and small stems (regrowth from trees cut back to their bases) were 82% digestible and four-wing saltbush leaves and small stems were 79% digestible. Digestibility was increased to 62, 65, and 69% when 10, 20 of 40%, respectively, of the grass/tree mixture was caragana. Digestibility was increased to 61, 64, and 67% when 10, 20, or 40%, respectively, of the grass/shrub was four-wing saltbush. Since small increases in diet digestibility typically lead to much larger improvements in energy intake and average daily gain, these improvements in digestibility over a 100% late-summer diet are very encouraging. Dr. Scott Kronberg may be contacted regarding this research at kronbergs@mandan.ars.usda.gov or 701.667.3013.



Dr. John Berdahl, a Research Geneticist at the Northern Great Plains Research Laboratory working on breeding and genetics of forage grasses and alfalfa for dryland use, has been selected for fellowship by the American Society of Agronomy. John received a Ph.D. in Plant Breeding and Genetics from the University of Minnesota in 1970. He held a post-doctoral appointment at Oregon State University and worked on wheat breeding until accepting a position at the University of Saskatchewan in 1972 where he worked on breeding and genetics of feed barley and oats. John was hired by ARS at Mandan in 1976 where he has provided expertise in breeding and genetics to a multidisciplinary team involved in developing grass and alfalfa cultivars and germplasm with improved seedling vigor, forage and seed yields, nutritional quality, drought and disease resistance, winter hardiness, and sustained productivity. The primary goal of this research is to develop improved forages for dryland crop-forage-livestock systems that will complement our native rangeland and help to provide a consistent supply of high quality forage over an extended grazing season. John led research that resulted in the recent release of 'Reliant' and 'Manska' intermediate wheatgrass and 'Mankota' Russian wildrye. He has participated in the development and release of numerous other grass cultivars and breeding populations adapted to the Northern Great Plains. Increased emphasis has been placed on alfalfa for dryland use in recent years. He is a member of the Crop Science Society of America, American Society of Agronomy, Society for Range Management, American Forage and Grassland Council, and the Soil and Water Conservation Society. Dr. Berdahl can be reached at berdahlj@mandan.ars.usda.gov or 701.667.3004.



Dr. John Berdahl is Named ASA Fellow

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The USDA-ARS Northern Great Plains Research Laboratory is holding their annual Research Results Workshop at the Mandan Seven Seas Inn and Convention Center at 8:30 am on January 21, 2003.

This year's workshop is boldly subtitled "Drought Survival". According to Cal Thorson, Technical Information Specialist at the USDA Laboratory, it was an easy topic to focus on, "Mother Nature turned her water spigot off on our research just like our neighbor's fields this year". Many of the research plots and livestock pastures at the research facility were as devastated as cropland, hay land and pastures throughout the region, but many of the research plots did very well.

This program will focus on limited moisture management lessons learned from USDA research at Mandan, North Dakota and innovative ideas for moisture management by USDA research scientists.

A great deal of attention will also be given to feeding non-traditional livestock feeds to extend over wintering feed-stuffs and reduce costs. "Livestock research at the Mandan research facility is some of the most overlooked research in the area", says Thorson, "This is the perfect opportunity to showcase innovative ideas for the cattleman."

The National Sunflower Association will sponsor a complimentary noon lunch and provide updates on weather and market opportunities on the afternoon program. A farmer panel will also share their lessons learned in maximizing the value of this past year's limited moisture.

A product trade show will also be held, with many of the products used at the USDA facility.

"DROUGHT SURVIVAL"

RESEARCH RESULTS & TECHNOLOGY CONFERENCE

January 21, 2003
Seven Seas Inn and Conference Center
Mandan, ND

Sponsored By
USDA-ARS Northern Great Plains Research Laboratory
Area IV Soil Conservation District
National Sunflower Association*
In cooperation with NDSU Experiment Stations

8:30 AM	REGISTRATION – coffee & cookies	Sponsored by Stutsman County SCD
9:00	INTRODUCTION/COMMENTS <i>Jon Hanson, Laboratory Director</i> <i>Marvin Halverson, President</i> <i>Lloyd Klein, Board Chairperson</i>	USDA-ARS NGPRL Area IV Advisory Committee National Sunflower Association
9:20	Crop Production Under Drought Conditions <i>Don Tanaka, Soil Scientist</i> Soil Water Use by Diverse Crops <i>Steve Merrill, Soil Scientist</i> Beef Cow Wintering Strategies to Control Feed Costs <i>Jim Karn, Animal Scientist</i>	USDA-ARS NGPRL USDA-ARS NGPRL USDA-ARS NGPRL
10:20	BREAK – coffee & cookies	Sponsored by Stutsman County SCD
10:45	Drought Effects on Grassland Processes <i>John Hendrickson, Rangeland Scientist</i> Non-Traditional Forages and Drought <i>Scott Kronberg, Animal Nutritionist</i>	USDA-ARS NGPRL USDA-ARS NGPRL
11:30	Balancing Cattle Rations with On-Farm Feeds <i>Vern Anderson, Animal Scientist</i>	NDSU - Carrington Research Extension Ctr.
Noon	LUNCH COMPLIMENTS OF NSA	
1:00 PM	PANEL - How We Survived the Drought 2002! <i>Steve Pfeifer, McLaughlin, SD</i> <i>Byron Richards, Belfield, ND</i> <i>Tim DeKray, Steele, ND</i> <i>Lloyd Krein, Elgin, ND</i>	
2:15	EMERGING MARKETS/ISSUES <i>Max Dietrich</i>	<i>Production Coordinator</i> <i>National Sunflower Association</i>
3:00	DOOR PRIZE DRAWINGS	Sponsored by Area IV SCD Advisory Committee/Exhibitors
3:30	AREA IV SCD MEETING	



"Super Supervisor" Bruce Rittel

Bruce Rittel, Administrative Officer for the USDA-ARS Northern Great Plains Research Laboratory, has been awarded the "2002 Super Supervisor Award" by the Association for People With Disabilities in Agriculture. The award was presented in recognition of outstanding support of employees with disabilities. Rittel was presented the award in a special ceremony in Washington D.C.

We're on the web:
www.mandan.ars.usda.gov



Cal Thorson - Technical Information Specialist

Cal Thorson joined the staff of NGPRL as Technical Information Specialist in July. Thorson brings extensive training and experience in public speaking, training, market research, technical & news writing, and organizing to this new outreach position for the Agricultural Research Service.



Growing up on a small farm near Wing North Dakota, Thorson attained degrees in Animal Science, Agricultural Education and Cooperative Extension from NDSU, and later taught high school Vocational Agriculture in the Red River Valley. While serving as a USAF Captain in Nuclear Weapons Launch Control, he earned an MBA in management and marketing from the University of North Dakota. Thorson is past-president of the North Dakota Agricultural Association (North Dakota's Agribusiness trade association) and past-president of the NGPRL Customer Focus Group. He is currently president-elect of the North Dakota Soil & Water Conservation Society.

Thorson is responsible for supporting the technology transfer of USDA-ARS search results into farm and ranch practices.



Jason Gross - Soil Scientist



Jason Gross has returned to the Northern Great Plains Research Laboratory in August after leaving the laboratory in 1997. Gross received his BS from the University of Mary in 1993. During his hiatus from NGPRL, he worked on his MS in Environmental Science and Engineering at the Colorado School of Mines. His thesis work monitored trichloroethene biodegradation by methanotrophic microbial communities in soil, and its long term effect on their populations. Gross also worked for the United States EPA helping states and tribal governments acquiesce with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). He also worked for an environmental consulting firm in Denver providing soil and ground water remediation at military installations across the country. He is currently working to determine the effects of land management practices on soil quality. His work includes field studies in both cropping and rangeland agroecosystems, as well as laboratory and greenhouse evaluations.

Feel free to pass on this issue of *Northern Great Plains Integrator* to others interested in agricultural research in the Northern Great Plains.

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Technology Transfer Product of the Northern Great Plains Research Laboratory
 United States Department of Agriculture
 Agricultural Research Service

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