Northern Great Plains Research Laboratory

USDA ARS

Northern Great Plains

INTEGRATOR

For environmentally and economically sound agro ecosystems for the northern Great Plains.

February 2010

USDA-ARS developing efficient methods to estimate switchgrass biomass supplies

Most of us have read newspaper articles or reports from the USDA forecasting national yield projections for major commodity crops like corn, soybean, and wheat. This timely information is invaluable for farmers, ranchers, commodity groups, agribusiness, and lawmakers to minimize uncertainties and risk and maintain a stable economic climate. But what about new bioenergy crops like switchgrass which is being developed as a biofuel feedstock for the United States? Federal laws have mandated that the majority of our biofuels will come from cellulosic sources like switchgrass by 2022 and an estimated 7 to 52 million acres of existing agricultural land in the U.S. is projected to be rotated into a perennial bioenergy cropping system based on theoretical market prices. Yield forecasts on energy crops will be required to maintain stability in this new bioeconomy.

A USDA student biological aide is seen taking plant height measurements to estimate switchgrass yields near Munich, ND. Simple plant height measurements were found to be one way to estimate switchgrass yield with minimal time and labor costs.

Cellulosic refineries will require substantial amounts of biomass on a year-round basis. Biomass refineries are expected to have four to five times higher capital costs than similar sized grain ethanol plants based on first generation biomass refining technology. A reliable feedstock supply will be essential in maintaining stable operational costs. Efficient and accurate methods to estimate switchgrass biomass feedstock supply prior to harvest will be required to efficiently plan a biorefinery's operation.

Methods to estimate harvestable biomass within a region could include or be a combination of remote sensing measurements, crop models, and ground based measurements. Traditionally, clipping vegetation is the most common method of measuring biomass but is time and labor consuming. Indirect measurements (plant height, remote sensing, etc.) have been developed as a replacement to clipping that saves time and labor while attempting to maintain accuracy. One such method was developed by R.J. Robel, who used visual obstruction to estimate standing cover in tallgrass prairie for wildlife nesting potential. The "Robel pole" as is it is sometimes referred to, has been used by others to estimate aboveground biomass for wildlife habitats and livestock management in a range of environments.

The visual obstruction or Robel pole method was found to be more effective in estimating aboveground biomass than simple plant height measurements because it indirectly determined both vegetation height and density. Unlike CRP land or pastures where there is heterogeneity in vegetation biomass and density, switchgrass managed as a bioenergy crop tends to be fairly uniform once established. A problem with most indirect measurements is that only standing vegetation is measured but not species composition. Developing a single tool to predict both functional group composition and early growth stage yield would be advantageous in terms of time and labor costs. Dr. Rob Mitchell (USDA-ARS, Lincoln, NE) has attached a simple ocular device to the traditional visual obstruction pole to estimate both standing crop and species composition at the same time with the same device in rangeland environments. We have used Dr. Mitchell's "grassland assessment tool" to quantify yield and plant frequency for switchgrass managed as a bioenergy crop.

A series of experiments located throughout the Great Plains were used to determine methods for estimating switchgrass biomass supplies and determining plant composition. The objective of this study was to compare the effectiveness of visual obstruction and two sward height measurements for estimating harvestable switchgrass yield. In addition, we evaluated the grassland assessment tool for estimating switchgrass and weedy plant species stands within fields.

continued on page 7

Northern Great Plains Research Laboratory researchers support science down under

Drs. Donald Tanaka, Mark Liebig, John Hendrickson, and Dave Archer traveled to Western Australia ❶ last October at the invitation of the Department of Agriculture and Food Western Australia (DAFWA). The primary objective of their visit was to establish multidisciplinary collaborative research for developing adaptive crop management practices under extended stress conditions.

During their three week stay in Western Australia, the NGPRL delegation met with scientists from DAFWA, Commonwealth Scientific and Research Organization (CSIRO), University of Western Australia, Curtin University, Murdoch University, and the Western Australia No-Till Farming Association.

The NGPRL delegation was featured at the Spring Field Days at the Wongan Hills and Katanning research stations, where DAFWA personnel had established dynamic cropping systems field trials following the 'matrix' crop sequence design developed by NGPRL scientists over a decade ago. During each field day, the delegation gave presentations about research conducted at NGPRL. Furthermore, Dr. Tanaka was the keynote speaker at the Wongan Hills Field Day dinner, and Dr. Archer was a featured presenter at a DAFWA workshop on modeling and prediction options for diverse crop sequences.

Drs. Archer, Hendrickson, Liebig, and Tanaka down under

The trip provided the NGPRL delegation an opportunity to publicize research conducted at NGPRL. Nearly 100 copies of the Crop Sequence Calculator were distributed to farmers, scientists, and agricultural professionals at the field days and workshop.

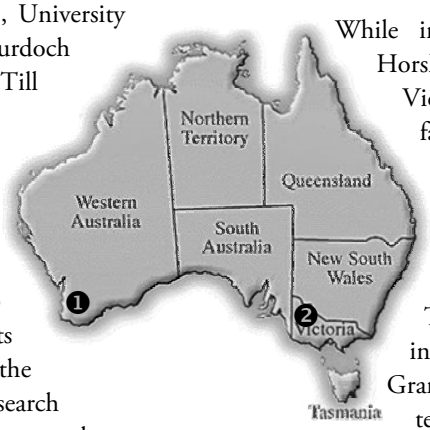
Interviews on NGPRL research were conducted by reporters from Australian Broadcast Company radio (broadcasted nationally), Golden West Network television, and Countryman magazine.

In addition to collaboration on crop sequence research, several promising areas for future work with DAFWA and CSIRO include projects on economic decision support tools, integrated crop-livestock systems, soil quality, and climate change adaptation.

Dr. Dave Archer - david.archer@ars.usda.gov - 701.667.3048
Dr. John Hendrickson - john.hendrickson@ars.usda.gov - 701.667.3015
Dr. Mark Liebig - mark.liebig@ars.usda.gov - 701.667.3079
Dr. Don Tanaka - don.tanaka@ars.usda.gov - 701.667.3063

Dr. Kris Nichols was the keynote speaker at the 7th annual Victoria No-Till Farmers Association meeting on September 9th in Horsham, Australia.

Nichols spent about two weeks from August 26th - September 11th in Victoria ❷, Australia. Victoria is the state located in the south east corner of Australia. Melbourne is the capital city. This is primarily a semi-arid state with wheat as the dominant crop followed by barley and oats.



While in Australia, she visited ten farms around Horsham in the Wimmera region of west central Victoria and presented soil health information at farm tours near Swan Hill in the Mallee region of northwest Victoria and Lake Bolac in south-west Victoria. The highlight of the farm tours was time spent in soil pits examining the unique Aussie soils.

The Wimmera region receives about 15-23 inches of rainfall with higher amounts in the Grampians (the local mountain range) and temperatures averaging 86°F in the summer to 40°F in the winter. Soils in the Wimmera are heavy grey clays with some red earths. The Mallee region is one of the hottest and driest in Australia with an average annual rainfall of 11-15 inches and temperatures averaging 90°F in the summer to 39°F in the winter and extremely sandy and infertile soils. Rainfall in South Victoria averages 20-32 inches with summer temperatures averaging 80°F in summer and 45°F in the winter with higher fertility soils.

The individual farm visits demonstrated the importance of controlled traffic and wide row spacing in both sandy and heavy clay soils. The vegetative growth of canola on 30" rows produced enough stubble to keep the soil in place during the dry, hot summers and provided protective shelter for the following grain crop while maintaining or surpassing average local yields.

No-till seeding is the predominant practice in Australia with controlled traffic as a newer practice to reduce compaction. In a controlled traffic situation, about 10% of the field has reduced production due to compaction but the remaining 90% has yields which keep pace or surpass those in fields without controlled traffic. Although this region is dominated by small grain production, crop rotation, particularly with canola and pulse crops such as lentils, faba beans, and chickpeas, is becoming more commonplace. There was major interest in the NGPRL Crop Sequence Calculators with about 150 distributed.

At the Victoria No-Till Farmers Association conference, Nichols discussed farming sunlight for soil health, research trials, and on-farm use of cover crops to enhance soil quality and water management in North Dakota. Several farmers attending the conference are planning on attempting summer cover crops to maximize soil health by extending plant growth.

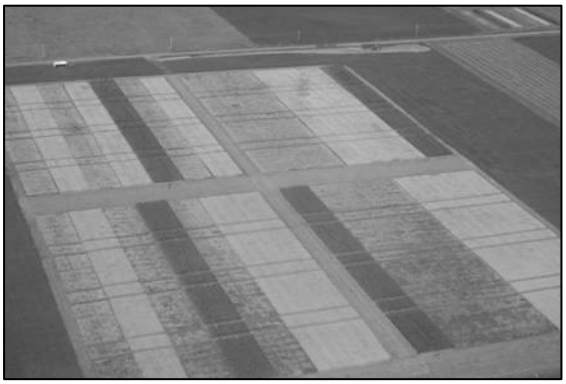
Dr. Kris Nichols - kristine.nichols@ars.usda.gov - 701.667.3008

Multiple Use Cropping Systems

The dramatic increases in energy and crop prices in 2008 illustrated the pressure to produce more in order to meet growing demand while using less energy and energy-intensive inputs. Even though prices have subsided from the 2008 highs, with growing population and the need to meet food and energy needs, these pressures are not likely to go away.

Bailing pea residue following grain harvest in 2009

Crop production can meet multiple needs including food, livestock feed, and bioenergy or biofuels. Cropping systems can be developed to focus on meeting any one of these needs, or they can be developed to simultaneously meet multiple needs. In any case, these systems must also protect the soil resource which drives current and future productivity. The question is how best to allocate crop production among food, feed, fuel, and soil uses?



Aerial view of study site

A study was initiated at the Northern Great Plains Research Laboratory in 2009 to help answer this question. The study looks at options for intensifying crop production (growing more grain and biomass) combined with options for intensifying crop utilization (using more of the grain and biomass for food, feed, fuel).

Crop production options include moving from a low-intensity wheat-dry pea rotation to a higher intensity wheat-pea-corn rotation or a wheat-pea/cover crop rotation. Crop utilization options include moving from a low-intensity option of grain harvest only to higher intensity options of: harvesting wheat straw, harvesting all crop residues, and grazing all crop residues.

The performance of these systems will be evaluated in terms of their productivity; soil resource and environmental impacts, and economic risks and returns. Productivity will be assessed in terms of the food, feed, and fuel they produce.

Soil resource impacts will be assessed over time helping identify potential tradeoffs between short-term utilization and long-term productivity or environmental effects. The economic risks and returns for each of the systems will be evaluated to determine the economic feasibility of these systems and in quantifying the value of crop residues in protecting the soil resource versus other potential uses.

Dr. Dave Archer - david.archer@ars.usda.gov - 701.667.3048

New Faces

Igathinathane (Igathi) Cannayen, joined the NDSU Department of Ag & Biosystems in October. His research and extension focus is on addressing the engineering related issues on the harvest, collection, preprocessing, storage, and transport of biomass. The solution of many of these engineering problems between the production and conversion of biomass will be critical to the use of biomass as a viable energy source.

Igathi offices at the Northern Great Plains Research Laboratory in Mandan and the National Energy Center of Excellence (NECE) on the Bismarck State College campus. Much of his research work will be done at NGPRL where he will work collaboratively with the USDA-ARS research scientists. At the NECE, he will work with faculty and students in their energy related programs.

Igathi received his Ph.D. in Agricultural and Food Engineering, and M.Tech. in Post Harvest Engineering from the Indian Institute of Technology, Kharagpur, India. He has a B.E. in Agricultural Engineering from Tamil Nadu Agricultural University, Coimbatore, India. Igathi was a Postdoctoral Research Associate with emphasis on biomass feedstock engineering with Mississippi State University, University of British Columbia, and the University of Tennessee.

Heather Dose, began work as a Biological Science Technician for Dr. Marty Schmer in November 2009. She supports cropping systems and biofuels crop development for the northern Great Plains. Heather, a native of St. Paul, MN received her undergraduate degree in Natural Resources Management and Master's degree in Soil Science from North Dakota State University.

Moffatt Kang'iri Ngugi joined the lab as a Category 3 scientist in February 2010 supporting Dr. Rebecca Phillips. He is a geospatial ecologist with training in range management, physical land resources and ecology. He undertook graduate studies at Colorado State University and has research experience in Kenya and Belgium. He also has experience in postdoctoral research at UC Davis using GIS/remote sensing to constrain biogeochemical modeling of greenhouse gases and working as a terrestrial carbon science consultant.

Tackling the challenges of feeding cows in the late fall and early winter with annual crops

In the face of poor quality forages and subarctic temperatures, cattlemen are challenged with managing cattle such that their nutrient demands are satisfied during late fall and early winter. In most cases, cattle in the northern Great Plains have their calves weaned in September or October. Depending on the summer, cows often come into the fall in poor body condition score (**BCS**; less than 5 on a 9 point scale) due to the high nutrient demands of lactation and waning forage quality. Once calves are weaned the cows nutrient requirements decrease to the lowest levels of the year. For example, a 1200 lb cow, six months after calving, has a dietary crude protein (**CP**) requirement of 7.92% and a total digestible nutrient (**TDN**) or energy requirement of 53.4%. By weaning the calf, the requirements drop to 6.0% CP and 44.9% TDN. This provides an opportunity for the stockman to improve BCS with moderate to high-quality feeds, unfortunately, native range often lacks adequate quality to accomplish this task.

Figure 1. Cow grazing swathed sorghum sudan during December

Table 1. Main effects of an integrated crops and livestock system on cow growth performance during the fall (2007-2009)

	Treatments[2]				
Item	Control	Altai	Annuals	SE[3]	*P*-value
Initial BW, lb	1240	1236	1319	27	0.19
Initial BCS	5.3	5.1	5.4	0.1	0.10
Final BW, lb	1218	1186	1310	23	0.25
Final BCS	5.2	5.0	5.3	0.1	0.11
Overall Gain, lb	-16.0	-24.8	-22.0	9.9	0.44
Overall ADG, lb/d	-0.35	-0.70	-0.15	0.26	0.43

In an effort to address this issue, Animal Scientists at the Northern Great Plains Research Laboratory have developed an integrated crops and livestock system that uses annual crops as a source of high-quality forage for fall and early winter grazing. This project was initiated in 2007 and will conclude in 2011. The experiment consists of three treatments: 1) grazing a bromegrass dominated pasture until 50% utilization after which, chopped grass hay is fed in the field (**CONTROL**); 2) grazing of an improved pasture planted to Altai wildrye (**ALTAI**); and 3) strip grazing swathed annual forages (**ANNUALS**). The ANNUAL treatment consists of a 15-acre field split into three 5-acre strips. Each of these is planted to one of three annual crops: 1) oats underseeded with alfalfa, hairy vetch and red clover; 2) corn residue; and 3) brown-midrib sorghum sudan underseeded with sweet clover and red clover. Each 5-acre strip is cross-fenced and strip grazed by moving a single electric polywire approximately 45 linear feet per day so that waste can be effectively managed. The ANNUAL treatment is the indicator group. When cows finish grazing each annual crop strip, all cattle are gathered, weighed and body condition scored and animals are returned to their respective treatment. Calves remain on cows during the period when cows graze swathed oats after which calves are weaned and cows are rotated onto corn residue and finally cows are rotated onto swathed sorghum sudan. The sequence of rotation for ANNUALS was chosen based on the impact significant snowfall might have on cattle locating the swath. The sorghum sudan provides a large windrow that is easily found through deep snow (Figure 1). There are two pastures (replicates) for each treatment and within each pasture there are seven cows and one ruminally cannulated cow for a stocking rate of 1.9, 1.5, and 0.625 acre per head for CONTROL, ALTAI, and ANNUALS, respectively. Forage on all treatments is sampled immediately before turn out and analyzed for CP and TDN. Based on published values, a supplement is provided to meet the nutrient requirements of the cows.

The overall results for 2007 through 2009 are presented in Table 1. No differences have been observed across treatments thus far for final BCS or average daily gain. (**ADG**) However, if we look at the effect of year and sampling periods within a year we see an impact of feeding program (Table 2). In 2009, CONTROLS lost 2.97 lbs per day during period 3, which corresponded to the period when cattle on the ANNUAL treatment grazed swathed sorghum sudan. This weight loss was in spite of the fact that CONROLS received 40 lbs of chopped grass hay (9.6% CP and 56.8% TDN, DM basis) plus 0.82 lb of whole corn. Cattle grazing altai wildrye lost 1.85 lb per day and ANNUALS also lost 0.79 lb per day. Both ALTAI and ANNUALS received supplement (7.0 and 6.7 lbs/head/day, respectively). The response was opposite in 2008,

Table 2. Treatment × period × year interactions of an integrated crops and livestock system on cow growth performance during the fall (2007-2009)

	Control			Altai			Annuals		
Item	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
BCS Change									
2007	0.12	-0.06	-0.15	-0.23	0.02	-0.19	-0.11	0.16	-0.07
2008	-0.11	-0.02	-0.18	0.10	-0.19	NA	0.13	-0.19	-0.23
2009	-0.35	-0.07	-0.33	-0.47	0.13	-0.19	-0.49	0.32	-0.17
Gain, lb									
2007	-2.5	-14.2	54.6	-21.5	-15.7	32.5	-14.2	36.1	39.3
2008	-17.3	-4.9	-26.0	-28.4	-21.2	NA	-9.9	0.8	-56.8
2009	45.2	-31.1	-47.5	22.7	14.1	-29.6	12	40.2	-12.7
ADG, lb/d									
2007	-0.05	-0.37	1.13	-0.47	-0.41	0.68	-0.31	0.95	0.82
2008	-0.53	-0.12	-0.90	-0.86	-0.50	NA	-0.3	0.02	-2.0
2009	1.1	-0.76	-2.97	0.54	0.34	-1.85	0.29	0.98	-0.79

continued on page 5

Research Results Conference

The Area 4 SCD Cooperative Research Farm and USDA-ARS Northern Great Plains Research Laboratory will be hosting the 26th annual Research Results Conference at the Seven Seas Inn on February 23rd beginning at 9 AM. The conference is free to the public.

The morning session will focus on three topics being presented by USDA-ARS scientists and producers who have incorporated similar practices into their family farming operation.

Sustainable Conversion of CRP will be discussed by Rocky Bateman, Ag producer from New Salem, ND and Dr. Don Tanaka, Soil Scientist.

Cover Crops will be presented by Ken Miller, Ag producer from Fort Rice, ND and Technician for the Burleigh County Soil Conservation District, and Dr. Marty Schmer, Research Agronomist.

Winter Grazing will be presented by Larry Wagner, rancher from Chamberlain, SD and Dr. Eric Scholljegerdes, Animal Scientist.

After lunch, the room will be reconfigured for producers to have an opportunity to participate in small-group discussions with each of the Mandan scientists. Discussions will include the morning topics as well as soil biology, biomass for biofuels, greenhouse gas flux, range renovation, beef feeding, agricultural economics, as well as other relevant topics.

Program sponsors will host exhibits and be available to visit with you during the coffee breaks throughout the day.

Tackling the challenges of feeding cows in the late fall and early winter with annual crops (continued from page 4)

with ANNUALS losing 2.0 lbs per day and CONTROL lost 0.9 lbs per day (Altai pastures ran short of forage in 2008, so the treatment was terminated after the corn residue grazing period). Chopped hay fed to CONTROL was similar between years yet sorghum sudan quality was higher in 2008 than 2009. This discrepancy was likely due to more effort being put forth to adjust supplement intake due to weather in 2009. In 2007 the average wind chill temps when cattle were grazing sorghum sudan was 0°F. In 2008 and 2009 it was -15 and -14°F, respectively. Due to the extremely cold temperatures in 2008 and 2009, the nutrient requirements of the cows were adjusted. For each degree below 20°F, energy requirements increased by 1%. When wind chill temperatures are -20°F, the cow's energy requirement increased from 45.8 to 64.1% TDN. Dietary intake will increase when temperatures decline, but there is a point when increased intake alone cannot meet this increased requirement for energy and diet energy density must be increased. CONTROL was fed hay a distance from shelter similar to that required to travel by the ANNUALS each day. This was done so that the energy expended walking through deep snow was similar for both treatments. Although cattle lost weight during this experiment, this loss did not equate to meaningful change in BCS (Table 1). At the conclusion of this experiment, economic analysis will be conducted to determine which system provides the greatest return on investment of money, labor, and resources.

Dr. Eric Scholljegerdes - eric.scholljegerdes@ars.usda.gov - 701.667.3056

Research Beef Taste Test

*If you would like to participate in the biannual meetings of the NGPRL Customer Focus Group, please contact the INTEGRATOR editor.

Animal scientists at the Northern Great Plains Research Laboratory have been working since 2003 to develop profitable strategies for producing tasty beef with more forage, less grain, and with higher levels of omega-3 fatty acids.

At the last meeting of the Lab's Customer Focus Group,* participants were offered the opportunity to taste and evaluate barbecue grilled ribeye steak from a trial done at the lab. Yearling Angus steers in the trial were finished with one of three regimes: a non-supplemented grass-finished control group, a flaxseed supplemented grass-finished group, and a corn-soybean meal supplemented group. Using a blind taste test, they were asked to describe their perception of the flavor of each type of steak. After they handed in their descriptions, they were asked to vote on which beef was from the flaxseed supplemented cattle.

Steak from the cattle fed the corn and soybean meal supplement was described as:

- tastes like store bought beef
- more like meat I usually eat
- traditional beef flavor
- the best flavor
- robust flavor - good with wine
- mild-normal taste
- prefer this flavor - seemed less fatty
- not as flavorful as the others
- best mix
- fuller flavor
- lean-unique in a good way
- mellow - juicier
- medium sharp taste
- somewhat flavorful
- more meat taste
- gamey
- oil taste
- nothing special
- slight aftertaste
- least tasty

Steak from the cattle fed the flaxseed supplement was described as:

- best flavor
- beefier than others
- excellent flavor, tart, wild
- could acquire the taste
- distinct different flavor-but not necessarily unpleasant
- tastes more like lamb
- unusual aftertaste
- more bland
- not much flavor
- earthy taste
- good - like venison
- would guess flax fed
- buttery flavor
- nutty
- tastes fishy - kind of sharp
- seemed to have a fish flavor
- oily flavor
- gamey
- seems to have 'salmon' taste
- I love fish, but if I want fish I'll buy it
- tasted strong - almost gamey - hint of grass or mint
- strong grassy flavor and odor
- grassy flavor - a bit rancidity
- poorest flavor
- has an off taste
- would be awful with red wine
- the layer of fat on the outside has a taste I would describe as old
- if purchased this in a store I would be disappointed
- If I bought this without knowing, I wouldn't go back again

Steak from the cattle finished while grazing grass and not supplemented was described as:

- tasted like grain finished
- tasted as expected - corn fed?
- this tastes most similar to corn-fed beef
- Good - tastes normal to my untrained palate
- Good - could be corn-fed also but not sure
- good flavor - my favorite, super taste, most flavorful
- very flavorful - #1
- first pick
- very good flavor
- very flavorful
- my favorite - best flavor
- good flavor - the best
- beefier but very good
- very good flavor
- melt in your mouth
- almost as tasty as [beef fed corn & soybean]
- similar to [beef fed corn & soybean]
- favorable taste
- best flavor
- more traditional beef flavor - rich - would guess grain fed
- most similar to steak from Butcher Block Meats in Mandan
- I kind of like this one although I can't tell you specifically why
- Mild - normal taste
- very mild
- like this the best - has a hidden taste
- mellow flavor - not as grassy flavored as [beef fed flax]
- similar to [beef fed flax]
- mid flavor
- not bad for taste
- plain taste
- boiled taste
- maybe a bit too strong - gamey
- less taste
- fatty
- off flavor - grass fed?
- has a strange after taste

What did we learn?

Many people accurately predicted which of the three types of steak was from the flaxseed supplemented steers. A trained taste panel at NDSU concluded that steak from the flaxseed supplemented and grass-only steers had a slight off-flavor. Responses from both our informal taste test and the trained taste panel suggest that beef from flaxseed-fed cattle can have a flavor that is not considered typical by American beef eaters.

If this product were to become commercially available, specific branding to differentiate it for its health benefits would need to be developed perhaps along with new recipes to make it more acceptable to health conscience consumers.

Dr. Scott Kronberg - scott.kronberg@ars.usda.gov - 701.667.3013

Feel free to pass on this issue of ***Northern Great Plains Integrator*** to others interested in agricultural research in the northern Great Plains. Northern Great Plains Integrator is published and distributed by the USDA-ARS, Northern Great Plains Research Laboratory, PO Box 459, 1701 10th Avenue S.W., Mandan, ND 58554. Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD). The United States Department of Agriculture prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status. To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice or TDD). USDA is an equal opportunity provider and employer. Mention of trade or manufacturer names is provided for information only and does not constitute endorsement by USDA-ARS. To be added to our mailing list, request a copy through our website or contact editor: Cal Thorson, Technical Information Specialist, USDA-ARS Northern Great Plains Research Laboratory, 1701 10th Ave., S.W., Mandan, ND 58554. Office:701 667-3018 FAX:701 667-3077 Email: cal.thorson@ars.usda.gov

Any material in this publication may be copied and distributed in part or whole if due credit is given to the authors.

USDA-ARS developing efficient methods to estimate switchgrass biomass supplies (continued from page 1)

Findings from this study were:

- Indirect measurement methods can be used to predict switchgrass yield harvested mechanically with a high level of accuracy.
- Plant height measurements were found to be as effective in estimating switchgrass biomass as the visual obstruction method.
- Relatively few measurement samples were required to estimate available biomass in a field setting.
- Visual obstruction (Robel pole method) would be recommended on switchgrass fields with low to variable stand densities in mixed grass plantings while plant height measurements would be recommended on switchgrass fields with high, uniform stand densities.
- Inclusion of an ocular device was an effective way to quantify switchgrass and weed composition within fields.

Sampling for yield and species frequency at different time intervals would provide useful information on switchgrass yields across the growing season, weed abundance and composition and post-herbicide effectiveness on weed populations. Switchgrass crop yield models and remote sensing estimates could be validated using ground-based indirect measurements proposed here. Indirect methods, used in this study, would be useful as a rapid yield assessment tool for bioenergy producers, biorefinery operators, and government agencies. Further model refinement will be required to accurately predict biomass potential when bioenergy specific cultivars are released with greater yield potential. More information on this study can be found at:

Schmer, M.R., R.B. Mitchell, K.P. Vogel, W.H. Schacht, D.B. Marx. (2010) Efficient methods of estimating switchgrass biomass supplies. Bioenergy Res (In Press)

Dr. Marty Schmer - marty.schmer@ars.usda.gov - 701.667.3094

Retirements

Dr. Jon Hanson retired as Laboratory Director of the Northern Great Plains Research Laboratory in January 2010. Throughout his career, Hanson championed research in support of family farming and ranching in the northern Great Plains states. He significantly contributed to the advancement of natural resource science in his 30 year career with USDA-ARS.

Hanson is a native of Fargo, North Dakota. While playing offensive guard on the Bison Football team, he received his bachelor's degree in Biology from North Dakota State University and he earned NCAA Academic All-American honors in 1973. He went on to receive his master's degree in Botany in 1976 from NDSU and his PhD in Range Science from Texas A&M in 1979. He began his scientific career with the USDA-ARS in Cheyenne, Wyoming and later moved his research to Colorado to work in both range and cropland ecosystems. Hanson assumed leadership of the Northern Great Plains Research Lab in 1998.

His life-long goal has been the development and implementation of sustainable and adaptive management systems for agriculture and natural resources. His research has lead to the creation of many important computer simulation models and decision support tools including SPUR, SPUR2, RZWQM, RZWQM98, GPFARM, and the Crop Sequence Calculator. His leadership brought the Mandan USDA-ARS research campus from the verge of closure to prominence as an example of excellence throughout the USDA Agricultural Research Service.

Judy Blank retired in January 2010 as Supply Clerk for the Northern Great Plains Research Laboratory after 32 years of Federal Service.

Blank is a native of the Bismarck/Mandan area. While completing her education, Judy began work at Northern Great Plains Research Laboratory in a job training program. Upon completion of her education, she continued in a permanent capacity. She is proud that her position of Supply Clerk was a lifelong career commitment. Judy received several USDA awards for excellence during her career.

Recognition

Dr. Kris Nichols, USDA-ARS Soil Microbiologist, was presented the*" Professional Award"* by the North Dakota Soil and Water Conservation Society for her research and outreach efforts in soil microbiology, nutrient cycling, crop rotation, soil aggregation, and the role 'glomalin' plays in the hidden world beneath our feet.

Cal Thorson, USDA-ARS Technical Information Specialist, was presented the Soil & Water Conservation Society's *"Outstanding Service"* award for support of the society. He also was presented the US *"No-Till Non-Farmer of the Year Award"* by the Manitoba-North Dakota Zero Till Farmers Association for positive impact in his professional capacity.

Get the NGPRL INTEGRATOR via email

The Northern Great Plains Research Laboratory INTEGRATOR is going digital! If you would like future issues to be delivered to your email instead of post box, please log onto **www.mandan.ars.usda.gov** and share your email address with us. Your contact information is completely confidential and cannot be shared with others without your permission.

We have been requested by readers to distribute future issues of this newsletter electronically to reduce paper consumption and the expense of mail distribution. The staff at the lab endorses conservation efforts and asks loyal readers of the INTEGRATOR to help us deliver as many by computer as possible.

For our customers who wish to continue receiving this information by mail, we will continue mailing the paper product. We hope you enjoy reading about NGPRL science and the lab's activities, and recycle if it is discarded.

If your friends, neighbors, and colleagues would be interested in receiving this free newsletter, please encourage them to log onto the website to let us know. If you no longer are interested in receiving the INTEGRATOR, we gladly will stop delivery.

Many customers of the research lab who enjoy reading the INTEGRATOR have requested a digital copy to be saved electronically for future reference. Past issues have been archived by the NGPRL webmaster on the NGPRL website.

Editor

NORTHERN GREAT PLAINS
INTEGRATOR

Northern Great Plains Research Laboratory
United States Department of Agriculture
Agricultural Research Service

USDA-ARS-NGPRL
1701 10th Avenue SW PO Box 459
Mandan, ND 58554-0459
www.mandan.ars.usda.gov
Phone: 701 667-3018 Fax: 701 667-3077