Grass Clippings

pasture research you can use

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UW Extension • UW-Madison Center for Integrated Agricultural Systems and College of Agricultural and Life Sciences • UW Agricultural Research Stations

In this issue

Dear friends:

As I write this, Canadian winds are sending cold air across Wisconsin and reminding us that we are nearing the end of the 2006 grazing season. Winter is the time for analysis, reflection, and planning for another year. Researchers will review and analyze data, write up their findings, and begin planning for future experiments. Likewise, farmers analyze their feed inventories, production records, and bank accounts to prepare financial statements for the lender, tax records for the accountant and to begin planning for another year of farming. The thing we all have in common here is that most of us would probably rather be outside on green grass in the warm

continued on page 2

Sire selection strategies for graziers

Kent Weigel and Jon Shefers, Dairy Science, UW-Madison

Several questions commonly come up among dairy producers who practice management intensive rotational grazing when the topic of sire selection arises:

- *Should I use bulls that were tested under confinement feeding conditions?*
- *Should I use bulls from countries where grazing is common, such as New Zealand?*
- *Should I consider crossbreeding? If so, which breeds should I choose?*

Hundreds of bulls from a dozen different breeds are at your disposal, and each has predicted transmitting abilities (PTA) for traits such as milk yield, milk composition, physical appearance, udder health, calving performance, fertility, and longevity. This is good news, right?

It can be good news, if you can sort through this mountain of genetic information, but it isn't an easy task. A fair amount of research has been done on grazing and sire selection in New Zealand, which is the most "extreme" managed grazing environment (in terms of the proportion of nutrients coming from pasture). Some work has been done in Ireland and Australia as well, but research on this topic in North America has been limited. Therefore, the goal of this article is to provide some background information that will help you make informed and effective decisions about your herd's breeding program.

Genotype by environment interaction occurs whenever the performance of an animal for a specific trait, such as milk yield, somatic cell count, or fertility, varies from one environment or production system to another. We usually think of this as a change in sire rankings. For example, daughters of bull A may give more milk in a confinement feeding system, whereas daughters of bull B may give more milk in a managed grazing system. Fortunately, changes in sire rankings between environments are often relatively minor, though some sire families move up a few spots on the list and others move down a few spots. Because many bulls have daughters in both confinement feeding and managed grazing systems, we can estimate the genetic correlation between milk yield in these two environments. Research

continued on page 2

sunshine instead of in the house or office looking at bookwork!!

This issue of *Grass Clippings* will provide a chance to sit back and think again about those green pastures and what we can do better to grow and feed it, as well as breed and care for the animals that enable us to convert that warm sunshine into useful products for humankind. As always, if your mind forms a question as you reflect on the year past that we can try to address in a future issue, please get in touch.

While summer has slipped by all too fast, by the same token, spring will soon be here, so get busy on those plans for next year!!

Rhonda

Grass Clippings features grazing-related research news from the University of Wisconsin and beyond.

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Sire selection strategies *... from page 1*

in Wisconsin, Indiana, Ireland, Australia, and New Zealand has shown that this correlation ranges from +0.7 to +0.9 (+1.0 would indicate perfect agreement, -1.0 would indicate complete disagreement, and 0.0 would indicate no relationship), which indicates that sire rankings for this trait change only modestly from one production system to another. This is not too surprising, given that we have basically selected for animals that can consume large quantities of feed, whether it be forage or concentrate. On the other hand, these same studies showed that the response to selection is slightly lower in managed grazing systems. On average, a 1.0 lb increase in sire PTA for milk will give 1.0 lb of additional lactation yield by each daughter. However, intensely managed confinement feeding operations often achieve 1.1 or 1.2 lb of additional milk per 1.0 lb of sire PTA, whereas managed grazing operations typically achieve only 0.8 or 0.9 lb. This means that the economic gain due to selection of superior sires will be slightly lower in a grazing system.

Differences in economic values occur whenever the importance of one trait relative to another, such as the value of fertility relative to milk yield, varies from one environment or production system to another. Such differences are quite common and can be large. For example, the economic value of milk volume is greater in a fluid market, whereas the value of fat or protein percentage is greater in a cheese yield market. In the case of managed grazing, several traits take on much greater importance. The most obvious is female fertility, which is vastly more important in herds that attempt to maintain a seasonal calving pattern. Another is longevity, as it is difficult to keep production costs low if you're constantly replacing "broken" cows with new homegrown or purchased heifers. Small frame size may be desirable, as the enormous Holstein cows that win blue ribbons at shows may be too large for your facilities. Avoiding calving problems is another key consideration, because this will reduce labor and veterinary costs. Adequate body condition (as measured by low PTA for dairy form) may be desirable, in terms of fewer health problems and enhanced reproductive performance, and mobility traits might be important if cows must walk long distances between paddocks.

To identify example bulls whose daughters would be expected to excel in a managed grazing system, we screened the list of sires available to US dairy producers using the following criteria:

- Top 20% for within-breed ranking based on Lifetime Net Merit
- Stature PTA less than 0.0 (Holsteins, Brown Swiss)
- Service Sire and Daughter Calving Ease PTA less than 8% (Holsteins, Brown Swiss)
- Dairy Form PTA less than +1.0 (Jerseys) or less than +0.50 (Holsteins)
- Udder Composite PTA greater than 0.0 (Holsteins)
- Feet and Legs Composite PTA greater than 0.0 (Holsteins)
- Minimum of 50 daughters in at least 30 herds
- Maximum retail price of $25 per unit

continued on next page

Don’t guess! Soil test your pastures

Nick Schneider, Clark County UW Extension Crops and Soils Agent

Soil sampling simply is one of the best deals in farming. If the ground is not frozen by the time you read this article, fall is a great time to soil sample since you will get your results back with plenty of time to plan for spring. Bulk field crop samples cost $7 each when submitted to the University of Wisconsin soil testing laboratory. Private sector soil testing laboratories typically are in the same price range. If you do decide to submit your soil samples to a private company, be sure that the samples are being processed by a Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) certified laboratory. Using a certified lab assures that the correct analytical procedures are being followed, and most importantly, that the appropriate fertilizer recommendations based on Wisconsin soils and climate are given. Additionally, a legal 590 standard nutrient management plan cannot be assembled without using a certified lab. (See the sidebar on page 4 for a list of certified labs.)

The basic analysis includes pH, potassium (K), phosphorus (P), and organic matter. You will receive recommendations for lime, potassium, phosphorous and nitrogen for 4 years. Micronutrient analysis costs an additional $3 per micronutrient per sample. In particular, legumes may need additional boron and sulfur to thrive. Remember that fields should be sampled at least once every 4 years and a sample should represent 5 acres; however, depending on your pasture design, you may generate more useful results by sampling at a higher density. When averaged over years, soil sampling costs

continued on next page

Sire selection strategies *... from page 2*

Then we converted all breeds to the US Holstein genetic base and applied the following criteria:

- Productive Life PTA greater than +1.5 months
- Daughter Pregnancy Rate PTA greater than +1.5%
- Somatic Cell Score PTA less than 3.20

This gave us the following list of potential bulls for a managed grazing system, along with their corresponding Lifetime Net Merit values (on their original breed-specific genetic bases):

Bull	NAAB Code	Source	Lifetime Net Merit
ISNZ BOURKES NIMROD	190JE32	New Zealand Jersey	+$434 (US Jersey base)
SUNSET CANYON MAXIMUS	7JE620	US Jersey	+$432 (US Jersey base)
ISNZ PARKWOOD CASPER	190JE12	New Zealand Jersey	+$425 (US Jersey base)
MORNINGVIEW DURHAM JINX	7HO7287	US Holstein	+$452 (US Holstein base)
CO-OP MNFRD TIGER	1HO5678	US Holstein	+$451 (US Holstein base)
ISDK Q IMPULS	236JE3	Danish Jersey	+$406 (US Jersey base)
D-K-DANDY HERCULES	1HO5518	US Holstein	+$427 (US Holstein base)
NORZ-HILL FORM WIZARD	1HO6360	US Holstein	+$410 (US Holstein base)
BOTANS	249SR3829	Swedish Red	+$538 (US Ayrshire base)
PETERSLUND	249SR1213	Swedish Red	+$420 (US Ayrshire base)

Although these bulls represent a mix of breeds and countries of origin, they were selected with one goal in mind—profitability in a managed grazing system. There are certainly other breeds or individual bulls that will do a good job, but we hope these criteria and the corresponding list can serve as a useful starting point. Remember, whether you’re crossbreeding or maintaining a pure breed, the key to effective sire selection is to determine the traits that are most important for the management conditions on your farm and to select the best available bulls from one or more breeds for those traits. There are no shortcuts or “magic pills” when it comes to breeding a good herd of cattle. It is a long-term process that requires focus, patience, and discipline.

Don't guess! *... from page 3*
around $0.35 per acre per year. Analysis and fertility recommendations for a 200-acre farm cost around $280 which will be useful until the fall of 2010. Considering how much fertilizer costs or how much yield you can lose if your fields are nutrient deficient, soil sampling is a great deal.

But I'm a grazier….
Through discussions at pasture walks, winter meetings, and other grazing education events, it became apparent that many graziers believed that they did not need to apply nutrients since the manure is deposited right back in the paddocks they came from. A detailed sampling of 10 well-established managed intensive grazing farms in north-central Wisconsin revealed some relevant trends. For potassium, 58% of samples collected fell into the "low" fertility description. Potassium is important for maintaining legume species, optimizing yield, and improving drought tolerance.

On a positive note, grazing farms tend to have desirable soil phosphorous levels. For soil samples tested from 2000 to 2004, the Wisconsin average for phosphorous was 53 parts per million (ppm). Excessive phosphorus can contribute to degraded surface water quality, and DATCP has established that fields above 50 ppm may require additional P level management. The 10 grazing farms surveyed had an average of 32 ppm with 90% of samples under 50 ppm.

While commercial fertilizer may or may not be needed across an entire farm, there likely will be paddocks that are high in fertility and others that are low in fertility on the same farm. These low fertility paddocks tend to have less forage productivity. Soil sampling can help you identify and prioritize those paddocks that are in need of additional nutrients to optimize your pasture productivity.

How do I collect soil samples on a grazing farm?
The basics of soil sampling are outlined in UW Extension publication A2100, *Sampling Soils for Testing*, available through your local Extension office. First you will need a soil probe. Some county UW-Extension, NRCS, or Land Conservation offices have soil probes available to check out. A local agronomy service may also be willing to lend/rent them out. Otherwise, a good quality model can be purchased for around $50. You will also need plenty of soil bags, a soil sample submission sheet, a bucket and field maps. Invest some time in reviewing your pasture design and then mark on a copy of field maps which samples will correlate to which paddocks. Depending on your pasture design, it may be better to collect a sample every two to three acres rather than every five, especially if you use small paddocks.

When you go out to collect a sample, remember you want 10 to 12 soil cores per sample. Walk/drive in a "W" shape pattern across the

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DATCP certified laboratories

UW Soil & Plant Analysis Laboratory
5711 Mineral Point Road
Madison, WI 53705
Ph: (608) 262-4364

UW Soil & Forage Laboratory
8396 Yellowstone Drive
Marshfield, WI 54449
Ph: (715) 387-2523

Rock River Laboratory
Route 3, N8741 River Road
Watertown, WI 53904
Ph: (920) 261-0446

Dairyland Laboratories
217 E. Main Street
Arcadia, WI 54612
Ph: (608) 323-2123

Agsource Soil & Forage Laboratory
106 N. Cecil Street
Bonduel, WI 54107
Ph: (715) 758-2178

A&L Great Lakes Laboratories
3505 Conestoga Drive
Fort Wayne, IN 46808
Ph: (219) 483-4759

Mowers Soil Testing Plus, Inc.
117 E. Main Street
Toulon, IL 61483
Ph: (309) 286-2761

Logan Labs
P.O. Box 1455
184 West Main Street
Russells Point, OH 43348
Ph: (937) 842-6100

Please note: For updates on certified soil testing labs for Wisconsin and other information on nutrient management planning, here is the DATCP link: http://datcp.state.wi.us/arm/agriculture/land-water/conservation/nutrient-mngmt/planning.jsp

Grazing research town hall meeting at Agronomy/Soils field day

Randy Jackson, Agronomy, UW-Madison

This year's Agronomy/Soils Field Day at the Arlington Agricultural Research Station included not only the traditional soils, cropping and weeds tours, but also a special session addressing grazing research. I opened the grazing research session with a review of work published in peer-reviewed journals since 1990. My review was facilitated by the efforts of Ken Barnett (UW Extension) who compiled an exhaustive list of all the grazing research in Wisconsin, peer-reviewed or otherwise. I turned his document into a database so I could sort publications into three categories: peer-reviewed, Center for Integrated Agricultural Systems (CIAS) research notes, and other reports published by UW departments and centers, the Michael Fields Institute, etc.

Peer-reviewed papers are the 'gold standard' of published literature when assessing the scientific understanding of a given topic. The process of peer-review, where experts in a scientific field screen and critique documents before they are published to filter out trivial, redundant or poorly performed experiments, is meant to minimize bias and cronyism in funding and publication decisions. This is not to say that work published in the so-called 'grey literature' (non-peer-reviewed) is not scientifically sound or useful. These types of publications play a critical role in distilling and extending research findings in a way that is accessible to the non-scientist. One might argue that this is the most important process in the publicly-funded research model. But any effort to catalog scientific research should focus on the peer-reviewed literature.

The peer-reviewed category of the grazing literature was comprised of 54 papers, which I assigned to one of five

categories: pasture management, animal nutrition, animal management, economics, or environment/nutrient management. These categories were identified as the most important research needs by over 80 grass-based farmers who were asked by GrassWorks, Inc. to create and rank research needs at the 2003 Wisconsin Grazing Conference (Table 1 on next page).

Since 1990, grazing research has been focused on pasture management (27 papers) and animal nutrition (13 papers). Significant work has been performed under the environment/nutrient management category (13 papers), but these papers primarily addressed grazing management effects on wildlife and wildlife habitat. The areas of animal management and economics have received scant attention in the peer-reviewed literature (1 and 0 papers, respectively)[1].

It was difficult to determine the funding source for most of the peer-reviewed publications. But given that most authors were scientists at UW-Madison with appointments in the College of Agricultural and Life

continued on next page

Don't guess! *... from page 4*

paddock. As you collect the cores, place them in the bucket and mix them. For each sample, fill the soil sample bag with two cups of soil for submission to the laboratory. There often is some discussion as to how deep soil samples should be collected in a pasture. At this point in time, the recommendation is to continue to sample to a depth of six to seven inches for composite samples. As in no-till, pastures may have problems with stratification where the nutrient level is greater close to the soil surface. If you are concerned about stratification, collect cores from a 0-2 inch depth in one bucket and a 2-7 inch depth in another bucket, and submit both samples.

There are many good reasons to soil sample. In addition to improving pasture productivity, soil samples are essential for developing a nutrient management plan. Courses on writing a nutrient management plan are offered across the state. For farmers with the hope of qualifying for the Conservation Security Program (CSP), soil sampling and probably a nutrient management plan that meets 590 standards will be needed for eligibility.

Grazing research *... from page 5*

Sciences (CALS), it is likely that most work was supported via Hatch formula funds that are allocated to each state's Agricultural Experiment Station, which in Wisconsin is directed by the CALS Dean.

Table 1. Research needs identified and ranked (within each category) by over 70 graziers at the 2003 Wisconsin Grazing Conference

Category	Research need
Pasture management	Grazing management practices that increase sward density
	Evaluation of common pasture varieties under actual grazing situations by region
Animal nutrition	Grazing management practices that optimize dry matter intake
	Impact of sward density on dry matter intake
	Evaluation of grain supplementation on animal performance
	Lowest cost method of feeding a dairy herd to maintain 20,000 lbs of production on pasture
	Evaluation of forage supplementation on animal performance
Animal management	Relationships between animal production, health and reproduction
	Impact and effectiveness of various methods for reducing heat stress on pasture
	Evaluation of fly control methods
	Use of grazing management techniques to reduce internal parasites
Economics	Identify top performing graziers and find their secrets of success
	Relationship between grass productivity and farm profitability
	Cost/benefit analysis of pasture renovation vs. doing nothing except grass management
	Long-term economic study of grazing-based farms
Environment/ Nutrient management	Nutrient crediting under managed grazing system
	Impact of supplemental feeding on soil nutrient levels over time
	Long-term soil ecosystem responses to grazing
	Impact of stocking rate on soil nutrient levels over time

Panel discussion

Following the introductory review an expert panel was introduced by Dick Cates (UW CIAS, Soil Science, and DATCP board member) and each panelist was asked to provide a brief statement about grazing research needs.

- UW Extension's **Rhonda Gildersleeve** began the discussion by addressing the general attitude of the grazing community towards the scientific community. She asked that graziers make a better effort to understand the motivations and constraints faced by researchers as they pose testable hypotheses and search for funding. She also emphasized the need for ongoing dialog, and encouraged farmers to contact extension agents and researchers directly with questions and research ideas. Ms. Gildersleeve concluded by inviting UW scientists to spend more time at pasture walks and grazing farms to fine tune their hypotheses resulting in more directly applicable research findings.
- **Karen Breneman**, a dairy grazier from Rio, pleaded with UW scientists to ask research questions that would provide information directly useful to the grass-based farmer. Ms. Breneman made the point that the priorities and goals of the grazier are different than other farmers, that they spend much more time and energy focused on the agroecosystem as a whole, including profit, quality of life for humans and cows and environmental quality. She posited that the traditional agricultural research model does not adequately address these issues because this model does not compel the scientists to *listen* to the farmer. She continued with a passionate plea that the UW establish and maintain an experimental dairy farm dedicated to grazing research. Only then, she concluded, would researchers be able to understand the unique issues of the dairy grazier. Ms. Breneman then offered the following specific research needs:
  - Maintaining permanent grass-clover mixtures,
  - Economic analysis for each grazing research project,
  - Beef- and dairy-specific farmer advisors for each grazing research project.
- **Mary Anderson** stated that she would represent the view of the farmers of the Coulee Grazier Network. The main questions for this group were about soil quality. Specifically, they want to know how pasture management affects soil biota–earthworms, beetles, bacteria and fungi–because this type of knowledge should lead to policies that favor perennial systems and improved environmental quality. Also, this group fears that manure and nutrient regulations developed for the livestock sector under confinement systems will be inappropriately applied to the grazed systems. Hence, improved understanding of nutrient loss from fecal pats and urine versus manure applied as slurry is desired. This group would like to know how grazing Wisconsin pastures affects carbon sequestration and whether findings that greater plant diversity is correlated with greater plant productivity is relevant to grazing management or not.
- GrassWorks, Inc. director **Paul Nehring** noted that much of the grazing research has demonstrated that managed grazing offers greater net profitability compared to confinement dairy systems, but that the grazing community should not rest. For example, if forced to compete on a global market scale (i.e., in the

continued on next page

Grazing research *... from page 6*

absence of governmental subsidies), the U.S. dairy sector, including graziers, would not fare well. Mr. Nehring called for more research whose results would help reduce costs and apply directly to the needs of grass-based dairies. He suggested that the institutional rewards within the university did not support researchers spending time on farms and with farmers to determine research projects. In light of this observation, he challenged the grazing community to provide a significant part of the financial support for such research, noting that corn and soybean research is largely financed by commodity groups. Driving this point home, Mr. Nehring suggested that a privately funded grazing research farm was overdue.

• **Dan Truttmann**, a dairy grazier from New Glarus, closed the panel discussion by listing some specific management needs that he and others in his area would like to see addressed by researchers. Namely, they need information on:

- Establishing/maintaining mixed grass-legume swards
- Fertilizer recommendations beyond nitrogen, for example, boron, sulfur, calcium
- Residual stubble height recommendations that are modified by soil type, slope, and species composition
- Weed management
- Approaches to reducing and/or reversing compaction
- Further economic analyses like return on investment per unit nitrogen applied and other financial indices for improving the bottom line of even profitable graziers.

Town Hall Meeting

Laura Paine (Grazing and Organics Coordinator, DATCP) moderated a town hall meeting where the over 70 attendees were invited to raise questions or concerns about past and present research, but mainly were asked to provide suggestions about how grazing research could move forward to address the needs identified during the panel discussion.

Discussion of specific research needs really did not focus on how this work should be accomplished, rather that it should be done. The big-picture discussion was stimulated by the observation that site-specific results of grazing research are not sufficient to address the needs of other regions of the state. For example, results found in on one soil type do not necessarily apply to another soil type. This limits the relevance of a single grazing experiment or a potential UW grazing farm, although a suggestion was made to permanently staff research stations with faculty doing grazing studies. Another approach would be to divide Wisconsin into grazing regions with producer farms serving as experimental units that were representative of each region. This research network could be more or less formalized with a complement of university, federal, and commodity financial support.

The recently appointed Dean of CALS, **Molly Jahn**, offered that a well-funded organic seed partnership[2] was a useful template for the grazier-research community because they encountered similar issues of site-specificity in plant breeding results and a decentralized political structure. Ms. Paine indicated that the Practical Farmers of Iowa[3] offered another model for on-farm research and several attendees re-emphasized the need for increasing collaboration and systems research.

Finally, Dr. Cates reminded the group that research funds, secured by **Senator Herb Kohl** and administered by CIAS, require that grass farmers be involved in each aspect of the research process to ensure relevant and timely results. This research partnership between CIAS-funded researchers and graziers should provide a solid foundation for further participatory research in Wisconsin.

In summary, the Agronomy/Soils Field Day session on managed grazing research addressed the topics *"What have we learned?," "What should we be studying?,"* and *"How should we get there?"* with many stakeholder groups present. This event was designed to facilitate multi-directional dialog rather than the traditional top-down approach taken at most university field days where researchers report results to producers and agency personnel in a more or less one-way format. It is important that we maintain this dialogue on a roughly quarterly basis to build momentum and avoid the sort of "reinventing of the wheel" that might occur with less frequent meetings.

Footnotes

[1]The grazing literature database compiled by Ken Barnett (UWEX) is available at the following website: http://agronomy.wisc.edu/jackson/grazlit.xls

[2] Organic Seed Partnership website: http://www.plbr.cornell.edu/PSI/OSPcooperators.htm

[3] Practical Farmers of Iowa website: http://www.practicalfarmers.org

Soil quality and the grass farm, part 2 of 3

Mark Kopecky, Price County UW Extension Agriculture Agent

In the last issue, we introduced the topic of soil quality and I quoted a formal definition, but I like the simplified version listed on the NRCS Soil Quality Institute's web site (http://soils.usda.gov/sqi/): "Soil quality is how well soil does what we want it to do." With that in mind, most people will probably agree on several things we'd like the soil to do in a grazing system. Naturally, we'd like the soil to produce good yields of high-quality forage, but we also want the soil to be able to physically support the livestock that graze on it, and accept their waste products while recycling them into useful nutrients. We'd also like the soil to be able to accept and store water for plant growth, and to cleanse percolating water of contaminants that could otherwise end up in surface or groundwater.

For these things to happen, soils need to be fertile, they need to have the strength to withstand traffic from livestock (and often machinery), and they need adequate drainage but good water holding capacity. If we optimize soil quality, we can optimize the ability of this resource to sustain a grazing operation.

Indicators of soil quality

There are a lot of ways to measure soil quality, and many characteristics that can be assessed. The indicators we consider can be physical, chemical, or biological properties of soils, and should measure characteristics of the soil that are important to our management system. Some indicators may be more important that others, depending on your system. Here are some soil quality indicators that people commonly consider:

- Soil fertility tests
- Soil pH
- Organic matter content and form
- Development and stability of soil aggregates
- Infiltration (water and air)
- Bulk density
- Soil respiration/biological activity

Each of these characteristics affects the way the soil behaves and how well it functions in a grass farming system. There are lots of other factors that soil scientists measure, but these are a good starting point for people who are interested in some of the more practical aspects of soil quality.

Assessing soil quality

While some soil quality indicators can only be measured quantitatively in a laboratory or with specialized equipment, most can at least be estimated using very simple equipment and the powers of observation. If you pay attention, you can keep track of some of these characteristics to see how different types of management affect soil quality across your fields and paddocks.

When we conduct our soil quality field days in Wisconsin, we try to show people a handful of simple soil quality assessments that they can do quickly and easily. Here are a few examples:

- A simple metal cylinder about the size of a coffee can, pounded into the soil about four inches deep, can serve as a simple tool to measure infiltration. Line the bottom of the cylinder with some clear plastic food wrap, and pour in about pint of water. Pull the plastic out and time how long it takes for the last visible water to disappear, and repeat this one more time. This is an easy way to see relative differences in infiltration across different areas of a field or paddock and to see how different types of management affect how air and water move into the soil.

- If you dig a hole in your fields in several places with an ordinary shovel, you can observe how well aggregated your soil is and the relative abundance of earthworms. We'd like to see most of the topsoil aggregated into small granules or crumbs, with many visible openings (macropores) in between. If you see a platy or flattened appearance to the structure, it's a sign that you have shallow compaction from hoof action or wheel traffic in the soil. Look at the path the roots follow in your sample. They should spread out as they

continued on next page

Soil quality *... from page 8*

go down in the ground and enter the subsoil freely. If they turn abruptly to the side at a certain depth, it's a sign that there is a plow pan or some subsurface compaction.

• Earthworms are the farmer's friend, because of the way they speed up nutrient cycling and the effects they have on soil porosity and structure. How many earthworms are there in a shovel full of soil? Most of the smaller species of earthworms stay in the topsoil, so you can usually find these without digging very deep. These smaller worms dig back and forth through the shallow soil and help loosen the ground as they do their job. Nightcrawlers, which are famous for making continuous tunnels from the surface of the ground way down into the subsoil, are often down deeper that you might care to dig. Can you see a lot of nightcrawler middens on the surface of the soil?

• While you're digging, collect a few aggregates from the topsoil samples you're looking at and keep track of where they came from. When you get home, put each group of aggregates in individual plastic cups and add about a cup of water. When you swirl these around, watch how cloudy the water gets, and observe the proportion of the aggregates that stay together in the water. The aggregates in a healthy soil shouldn't fall apart easily when they get wet.

• An ordinary fiberglass fence post pushed into the ground (when the soil is moist) can serve as an expedient penetrometer to help you look for subsurface compaction from heavy equipment. Ordinarily, the post will enter the ground quite easily at first, and will gradually require more pressure as you go down. If you hit a zone below the surface that is hard to penetrate but it gets easier as you go down, there may be some subsurface compaction (this is usually a result of heavy machinery). As you do this across paddocks or fields, you might also notice differences even in the top few inches of soil, which might suggest some surface compaction. Surface compaction could either be from machinery or hoof traffic.

• After a heavy rain (or in spring when the snow is melting), how much water runs off? Is it clear or muddy? Every soil has a limit to how much water it can accept in a given time, but we usually like most of the water to infiltrate. If there is runoff, we'd like it to be clear, not full of sediment and nutrients.

There are other observations you can make about your soil without having lots of fancy equipment or doing expensive tests, but you get the idea. In the next issue, we'll finish this series by discussing some objectives for managing for soil quality and how they relate to the grass farm.

Upcoming events

Wisconsin School for Beginning Dairy and Livestock Farmers (WSBDF) Offered in Wausau and in Reedsburg This November

If you or someone you know would like to own and operate a pasture-based dairy or livestock farm, the Wisconsin School for Beginning Dairy and Livestock Farmers is a great place to get started. The UW-Madison, Farm and Industry Short Course-based School began in 1995. One-third of its approximately 200 graduates have gone on to start their own farms and seventy-five percent are farming.

Now the School will be taught at two additional locations by interactive webcast this fall: the University of Wisconsin-Marathon County campus in Wausau and the Madison Area Technical College in Reedsburg. Not only will students have access to the same high quality experience as those attending the course in Madison, they can also earn credits toward a Farm and Industry Short Course Degree.

The 17-week course will begin on Tuesday, November 14, meet once a week (except for holiday breaks and field trips) and finish up on March 20, 2007. The curriculum covers a variety of topics including farm selection, design and remodeling; animal and grass management; and business planning. Tuition and fees for the course will range from $240 to $660 depending on the number of credits earned.

The deadline for applications is November 1, 2006. For more information about the School, visit http://www.cias.wisc.edu/dairysch.html. To get specifics on the course and scholarships, or to get an application, contact Tom Cadwallader for the Wausau location at 715-536-0304 or 715-261-1240, or Doug Marshall for the Reedsburg location at 608-524-7727.

Pastures have prominent place in UW-Madison Agronomy history

Edited by Dwayne Rohweder and Ken Albrecht, Agronomy, UW-Madison; excerpts from *University of Wisconsin Agronomy Department—The First 100 Years*

Visualize in the late 1920s and early 1930s, thousands of acres of 'old' unproductive bluegrass pastures having been weakened by drought, overgrazing, depleted fertility, burning, grubs and weeds. It was a sorry sight, but some UW professors saw possibilities in those pastures. Professor L.F. Graber began investigations into the potential of sweetclover for pasture renovation on thinly-sodded bluegrass. He continued to emphasize pasture fertilization and improvement in the late 1920s and into the early 1930s. Agronomy Professor George Mortimer also was conducting research in pasture improvement.

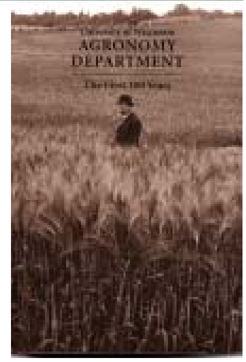
Mortimer wrote in a 1933 Extension *Special Circular* article titled 'Green Pastures from May to November' that,

> "Wisconsin has a season that permits five to six months of pasturing. Dairymen should take advantage of this, because there are sure, easy, economical ways of doing so. Every day of good pasture cuts off a day on more expensive manger feeding, and that is always worth taking into account. Homegrown feed is the cheapest; and good pasture is the cheapest home-grown feed. Milk can be made from one-half to one-third cheaper on good pasture. Dairymen are justified in giving as much attention to getting large pasture yields as they are to high harvested crop yields."

Mortimer went on to discuss alternatives to bluegrass for dairy pastures including sudangrass and sweetclover.

Professor Henry Ahlgren returned from a study trip in the mid-1930s through Europe and Scandinavia where he studied new innovations in pasture research. He taught Agronomy 100, the beginning course, and Agronomy 102, a course in pastures and pasture improvement. Ahlgren joined soil Professor E.J. Graul and Julian Sund of Agronomy in conducting extensive trials in southwest Wisconsin using pasture renovation, pasture fertilization and rotational grazing. The rotational grazing program at that time was not managed as it is today due to the lack of portable fencing technology and advances in grazing management.

Agronomy Professors L.F. Graber and Vic Burcalow continued to advocate and demonstrate the benefits of incorporating legumes into old pasture sods through the 1930s and 1940s. "Pastures were limed and fertilized, the soil disked or field-cultivated, and reseeded to deep-rooting legumes, and fenced for regulated grazing. Records showed an average of 170 cow pasture days per acre on the renovated acres compared to only 82 days on nearby untreated tracts." (*University of Wisconsin Agronomy Department—The First 100 Years,* 2003) Alfalfa also was being suggested for rotational grazing. And farmers discovered that their pastures could be made to produce abundant pasturage by establishing deep-rooted, drought resistant, grub-repellent legumes with lime and fertilizer.



The Wisconsin Grassland Farming Program

In the 1940s, the UW-Madison College of Agriculture formed the interdisciplinary Wisconsin Grassland Farming committee to attempt to make Wisconsin's grasslands into a productive and economic resource. It was a joint program involving the departments of Agronomy, Agricultural Engineering, Dairy Science and Soils. Objectives of the committee were:

1) Increasing grassland production;
2) Maintaining a prosperous dairy and livestock industry;
3) Making possible use of 10 to 12 million acres of potential grasslands;
4) Making farming attractive to young people;
5) Developing a unified and workable plan for farmers to use the latest recommended practices across agricultural disciplines; and
6) Promoting grassland throughout Wisconsin.

The committee held Grassland Field Days in the late 1940s with the theme of 'More Land in Grass More of the Time, Some Land in Grass all of the Time.' Objectives of the field days were "promoting the grassland farming program and a greater appreciation for legumes and grasses in livestock farming and encouraging improved methods of grass 'forage' farming." (*UW Agronomy—100 Years*) Faculty and agricultural agents held demonstrations of forage crop

continued on next page

Pastures have place *... from page 10*

production and harvest, pasture improvement, strip grazing and alfalfa-brome pastures. Grass was not the entire focus, as milking machine management and corn and oat cultivars were also discussed. The University held a total of 20 field days from 1946 to 1949, and some 100,000 people attended.

After a field day, one agricultural agent wrote:

> "A crowd estimated close to 5,000 visited the Walter Karnes' farm at Spring Valley on June 21st, to witness the Grassland Field Day. Business men and farmers from Pierce, St. Croix, Dunn and Pepin counties attended … the crowd in the morning witnessed a demonstration on 'pasture-renovation' and another on 'healing over a gully.'" (*1946 annual narrative report, agricultural agent, St. Croix County, Wisconsin,* 1946)

In 1950, the Grassland Committee sponsored a statewide grassland farming contest. By 1951, more than 3,000 producers competed. Several thousand projects were judged over a five-year period with emphasis on low-cost, high quality feed production from increased acreage of forage crops, efficient land use, and more efficient grazing and harvest practices. Winners of the contest received a plaque and a trip to the National Experiment farm. A 1953 announcement stated,

> "The Grassland Farming Contest is designed to promote grassland farming, a farming system that provides plenty of livestock feed for a prosperous agriculture and saves the soil for a permanent agriculture." (*The Sheboygan Press*, Nov. 13, 1953)

Times of change

A study initiated in 1955 by Agronomy Professor Henry Ahlgren and turned over to H.J. Larson of Dairy Science proved pivotal. "In 1963, Larson et al. published results of the seven-year study, which evaluated stored-feeding, green-feeding and strip-grazing of summer forage. Lactating Holstein-Friesen dairy animals were the harvesting animals. The study indicated that stored-feeding produced the most milk with 5,676 pounds per acre four percent fat corrected milk, green-feeding produced 5,051 pounds per acre, and strip-grazing produced only 4,493 pounds of milk per acre." (*UW Agronomy—100 Years*) A five-year companion study at Ashland showed milk production of 2,210 pounds per acre from rotation grazing and 3,450 pounds per acre from strip grazing. The strip grazing program used electric fences and moved the cattle each half day. Forage loss from rotation grazing was 43%, strip grazing 35%, green chop 5% and stored feeding 10%. These studies were one of the factors encouraging the shift to stored-feeding in the dairy enterprise.

Data collected from the Grassland Farming Demonstrations across the state essentially confirmed the results of the above research. The Grassland Farming Committee (in name) and the Grassland Farming Contest came to an end in the early 1960s with the advent of low moisture silage (haylage) and Burcalow's death. Professor Dwayne A. Rohweder assumed the forage extension position and committee chair. In discussions with dairy science and agricultural engineering faculty and based on declining farmer interest, it was decided to reduce emphasis on the pasture program in favor of other harvesting methods. The now named UW Forage Committee was enlarged to include faculty from the Agricultural Economics, Animal Science, Entomology and Plant Pathology departments.

Education activities were conducted to help forage, dairy and livestock producers understand new forage harvesting and feeding information and use it in balanced rations. Pasture improvement meetings also were held across the state with dairy, beef, and sheep producers to promote more effective forage production on lands not adapted to mechanized forage harvesting.

Pasture research continued in Wisconsin in the 1960's and 1970's. Professor J.M. Scholl conducted long-term studies at Lancaster, Arlington, Spooner and Marshfield. Professor Dale Smith studied the effects of environment and management on persistence and yield of grasses and legumes, thus providing a scientific foundation for management decisions.

The concepts studied by the early UW researchers "laid the groundwork for the resurgence of pasture-based livestock production or management intensive rotational grazing (MIRG) that has been adopted by growing numbers of dairy and stocker operations since the early 1990s." (*UW Agronomy—100 Years*)

University of Wisconsin Agronomy Department—The First 100 Years is available for $20 from the Agronomy Department (see http://agronomy.wisc.edu/) It can be ordered with a check made out to 'Department of Agronomy' and sent to Department of Agronomy, Attn: Sandy Bennett, 1575 Linden Drive, Madison, WI 53706. Include a shipping address with your order.

Truttmann pasture walk and discussion draws crowd

Ruth McNair, UW-Madison Center for Integrated Agricultural Systems

Fifty-one graziers, researchers and others interested in managed grazing attended a pasture walk at the Dan and Shelly Truttmann farm on September 28, 2006. The pasture walk was followed by a discussion on research.

What grazing issues merit priority attention?

1) **Develop a net merit index for crossbreds on grazing farms.** Include milk solids, cow fertility and longevity and evaluate which size of cow is most efficient. Control for factors like days in milk. The index tool would be useful both for comparing cows to their herdmates and for sire selection criteria. Researchers and graziers developing the index would assign a dollar value or relative weight to each characteristic, and look at pounds of production and cost per pound of milk produced. Some material already available (including Ag Source) can serve as a basis for this work. Kent Weigel, Ken Nordlund, Ag Source staff, Dan Truttmann and Dan Vosberg will meet before spring 2007 to start this project.

2) **Establishing and maintaining a level of legumes in pastures that will be self-sustaining without supplemental fertilization.** This includes looking closer at nitrogen cycling by the legume and by the cow. Researchers expect differences in appropriate levels of legumes for different classes of livestock, e.g. dairy versus beef cattle. The discussion included factors contributing to bloat; planting strips of grasses and legumes, rather than mixtures; how to establish legumes in permanent pastures; and needs of organic producers. Research questions include: What kind of legume? How much is it producing? How do different farms compare? Laura Paine, Ken Albrecht, Geoff Brink, Rhonda Gildersleeve, Tom Weaver, Paul Nehring, Reid Ludlow, Dan Patenaude, Bob Baehler and Dennis Cosgrove will work on this issue. Paul and Rhonda will be co-leaders.

3) **Developing recommendations on sward height to turn animals in and residual dry matter to leave behind for different farming situations**, and how turn in and residual heights affect other aspects of the grazing system. This will be hard to do with diverse pasture systems, but researchers could try to figure out an economically advantageous system. They would need on-farm research, with multiple locations across the state so that regionally appropriate recommendations can be developed. A thorough literature review is needed; researchers and producers need to identify measurement tools and implement protocols for developing new tools.

One way to get at this complex level of data is to do a huge survey as is used in wildlife ecology and rangeland studies. Researchers choose variables and use the large pool of information to see what works for management. DHI records are a similar data set. Another model is the precision farming model, where a researcher picks out plots with similar variables and compares the effects of different management. An action group of Jim Leverich, Tom Cox, Dennis Cosgrove (dairy), Jeff Lehmkuhler (beef) and Jim Munsch (beef) was formed.

Advantages and disadvantages of on-farm research

Advantage: It is more credible with farmers.
Disadvantage: The more complex research requires at least five years of study. It requires farmers to make a commitment of time and money. One model of on-farm research is CIAS reimbursing graziers for the portion of their pastures used during research.

Researchers and graziers need to distinguish between science and demonstrations. Science is usually done by the university and demonstration is normally done by farmers. Graziers need demonstrations without a commercial bias.

Other discussion

Do graziers need a grazing research station? How much time and money are graziers willing to commit to do research on their own farms? On Missouri's grass-based research station, researchers are running two different grazing systems in order to compare how they perform. The University paid less than half of the cost for the station; farmers and industry paid the rest. A representative from Missouri will be at the Wisconsin Grazing Conference.