



9th Mid-Atlantic Dairy Grazing Conference and Organic Dairy Field Day

July 25-27, 2012 Chestertown, MD



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9th Mid-Atlantic Dairy Grazing Conference and Organic Dairy Field Day

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Detailed Conference Schedule

Wednesday, July 25:

3:30- 5:00 p.m. Registration/set up exhibits (Washington College-Gibson Center)

5:00 p.m. Carpool to Fair Hill Farms - Conventional dairy with both organic and conventional crop production as well as pasture systems for heifers and dry cows.

5:30- 5:45 p.m. Overview of Fair Hill Farms – Matt Fry and Family

5:45-7:30 p.m. Tour Fair Hill Farms dairy facilities, organic grain production, nutrient management strategies, pastures for heifers and dry cows. Discussion leaders: Matt Fry, Ed Fry, Dr. Les Vough, UMD/NRCS, Jay Douthit, UMD Extension-Kent County, Nancy Metcalf, NRCS, Kent County.

7:30-7:45 p.m. Travel to Kent Museum at Turner's Creek Park (13689 Turner's Creek Road, Kennedyville, MD) for cook-out supper.

7:45 -8:40 p.m. Supper and informal discussions among participants.

8:40-9:00 p.m. Return to hotels

Thursday, July 26:

7:30-8:30 a.m. Registration/ set up & visit exhibits (Washington College- Gibson Center)

8:30-9:15 a.m. "Grazing Management using Holistic Concepts" Mr. Troy Bishopp aka "The Grass Whisperer," Madison County (NY), Soil & Water Conservation District.

9:15-10:00 a.m. "Strategic partnership to get started with my own pasture-based dairy farm." Holly Burley Moore, Graceland Dairies LLC, Dansville, NY

10:00-10:30 Break- visit exhibit areas

10:30-11:15 a.m "Virtual Tour of Horizon Organic Dairy in MD" Greg Heidemann and Julia (Sissy) Everett, Horizon Organic/Whitewave, Kennedyville, MD

11:15-12:00 Noon "Economic characteristics of pasture-based dairy farms." Jason Karszes, Senior Extension Associate, PRO Dairy, Cornell University.

Noon-1:00 Lunch at Washington College

1:00-2:00 p.m. "Economics of reduced grain inputs and effects on milk quality in an organically managed dairy with implications for other pastured herds." Dr. Cindy Daley, California State University- Chico.

2:00-3:00 p.m Value-added Dairy panel discussion, Mr. Stan Fultz, moderator.

Panelists: Bobby Prigel, Prigel Family Creamery, Glen Arm, MD, Holly Foster, Chapels Country Creamery, Easton, MD.

3:15-4:00 Bus/car pool travel to St. Brigid's Farm, Kennedyville, MD.

4:15- 4:40 p.m. Overview of St. Brigid's Farm- Judy Gifford and Dr. Bob Fry.

4:40- 5:10 p.m. Demonstration of soil runoff with use of rainfall simulator- Kevin Ogles, Grazing Lands Specialist, USDA-NRCS

Three (3) groups rotate through following stops with each presentation given 3 times:

5:15-5:40 p.m. Stop 1: “Soils, Pasture, and Cows” Troy Bishopp, aka The Grass Whisperer, Madison County (NY), Soil & Water Conservation District

5:45-6:10 p.m. Stop 2: “Managing parasitic flies in pasture-based dairy systems.” Dr. Wes Watson, Veterinary Entomologist, NC State University.

6:15-6:40 p.m. Stop 3: Forage species, nutrient management considerations, cost-share programs. Dr. Les Vough UMD/NRCS and Nancy Metcalf, local NRCS

6:40-7:00 Break and informal discussion.

7:00 - 8:00 p.m. Catered supper on the farm featuring St. Brigid’s grass-fed Jersey beef and other local foods.

8:00 p.m. Return to hotels.

Friday, July 27: (Washington College)

8:00-8:30 a.m. Visit exhibit areas

8:30-9:15: “Genetic considerations for pasture-based dairy farms.”
Dr. Steve Washburn, North Carolina State University

9:15-10:00: “The Green of Grass: Economics, tall grass grazing, and 1X milking.”
Cliff Hawbaker, dairy producer, PA

10:00-10:30 Break- Exhibit areas open

10:30-11:15: “Animal health management in pasture-based and organic dairy systems”
Dr. Hubert Karreman, VMD, PA, Consultant with Organic Valley

11:15-12:00 Closing Keynote: “Innovative adaptations in dairy grazing systems across the US”
Mr. Mike Lamborn, Consultant with DFA Grazing

12:00-1:00 Lunch

1:00-2:00: Facilitated discussion: all available speakers. Dr. Steve Washburn, moderator

2:00 p.m. Adjourn

Planning Committee and Contacts:

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Sponsorships: Platinum (\$1,000), Gold (\$500), or Silver (\$250) levels

Other planning committee members:

Judy Gifford, St. Brigid's Farm
Aly Valentine, University of Maryland Extension
Dr. Les Vough, University of Maryland and USDA-NRCS
Nancy Metcalf, USDA-NRCS, Kent County, MD
Bill Little, USDA-NRCS, Kent County, MD
Stan Fultz, University of Maryland Extension
Dr. Gordon Groover, Virginia Tech
Kim Sanders, Black Hollow Dairy, Dublin, VA
Dr. Chris Teutsch, Virginia Tech
Dr. Ed Rayburn, West Virginia University
Emily Yeiser, Center for Dairy Excellence, PA
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Marti Day, Area Dairy Extension Agent, NC
Gerry Cohn, Organic Valley Southeast Pools Coordinator
Keena Mullen, graduate student, NCSU
Ryan Sloop, Sloop Dairy Farm, Mt. Ulla, NC

Welcome to Kent County, Maryland

Jay Douthit, University of Maryland Extension

Welcome to Kent County Maryland, the host site for the 2012 Mid Atlantic Dairy Grazing Conference and Organic Dairy Field Day. Kent County is located on the Eastern Shore of Maryland. The county is a peninsula, bordered on the west by the Chesapeake Bay, the Chester River to the south, the Sassafras River to the north and by Delaware to the east. Kent has a land area of approximately 179,000 acres with about 128, 000 farmland. Land preservation is extremely important and easements protect a significant portion of the farmland.

The soils of Kent County are described by former 4-H and Agriculture agent Stanley Sutton in his book Beyond the Road Gate. “ The soils of Kent and the entire Delmarva area are of sedimentary origin and are level to gently rolling with a few rather steep slope areas....Kent soils are kind, easily worked, productive when properly managed and very responsive to good treatment.”

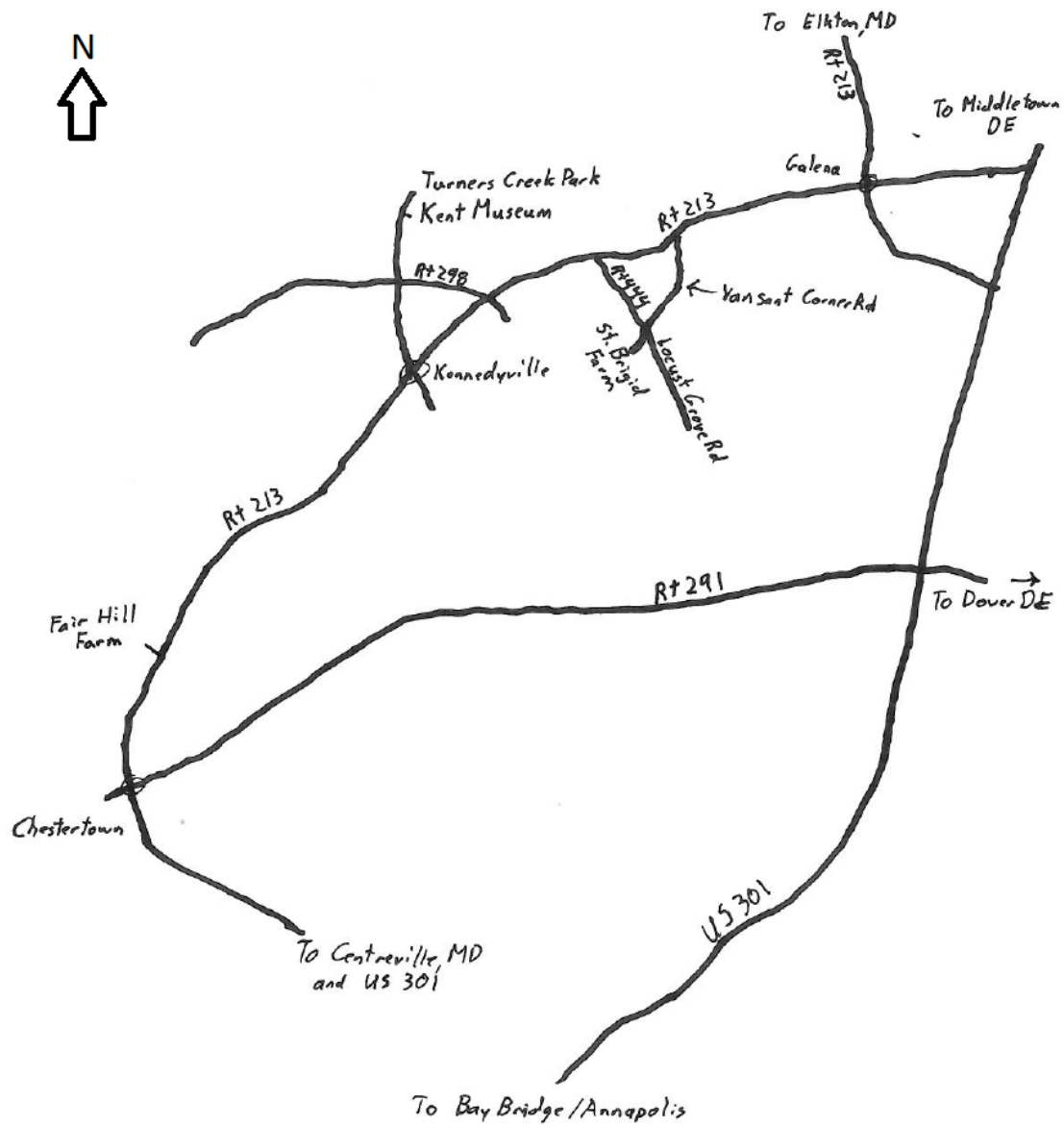
Kent County was settled in the late 1600's and quickly became an agricultural center. Crops and produce were shipped by boat to the larger port of Baltimore. The granary located at the end of Turner's Creek Rd, just past the site of Wednesday evening's meal, is one of the few remaining examples of the early shipping stations. The building once reached to the water's edge and boats could be loaded directly from the building. Fruit and produce were once prominent, with peaches being a very important crop until a blight destroyed the orchards in the early 1900's.

Corn, soybeans and wheat are currently the main commodity crops which help support the large poultry industry on the lower shore. As evidenced by the large number of silos still standing around the county, Kent was once a significant dairy area. Like the rest of the USA, the number of dairy farms has declined in Kent County. Today there are only 15 dairy farms left in the county ranging in size from 60 to 1200 cows.

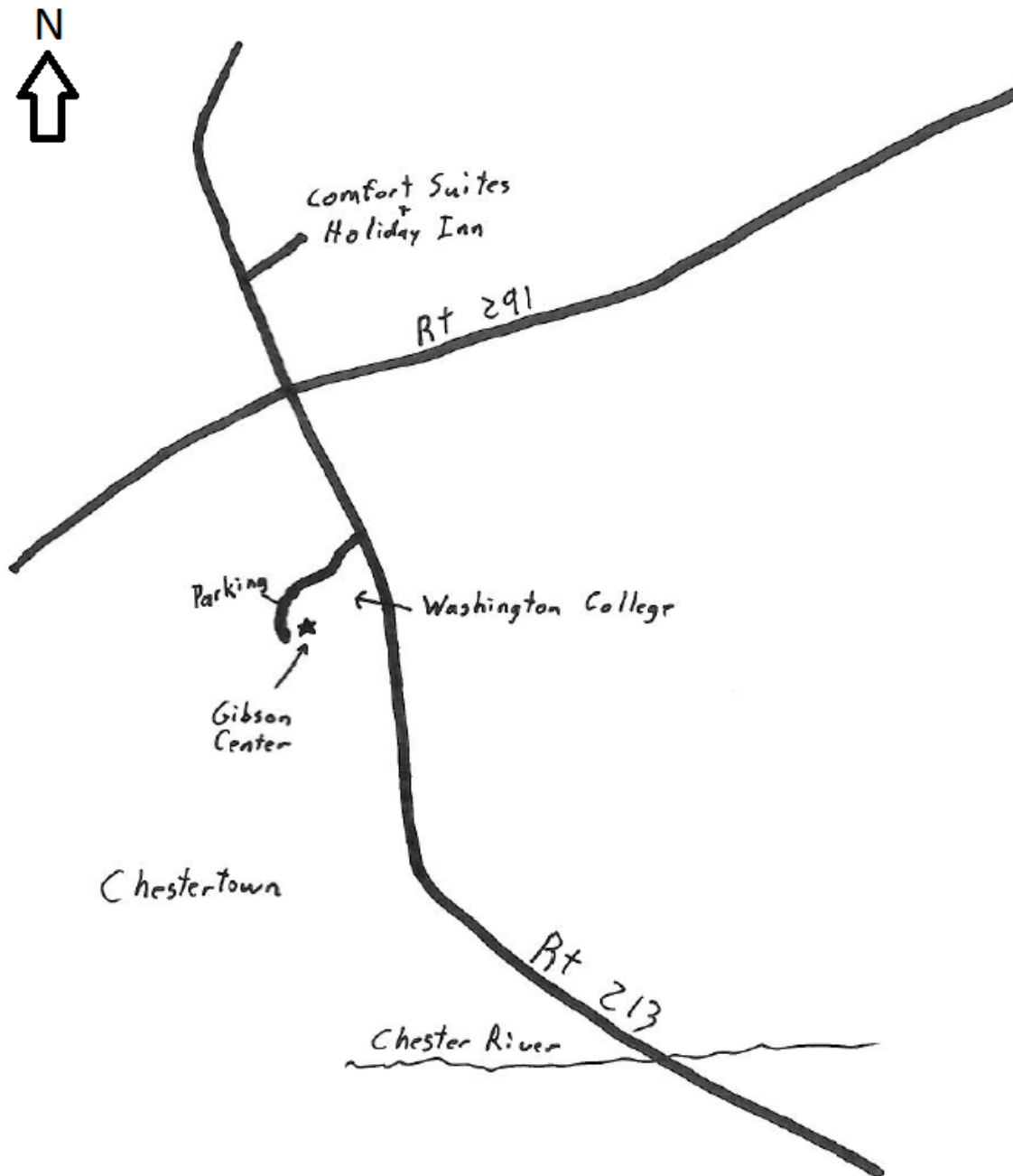
Rich in history as well as scenic in nature, Kent County draws many tourist and visitors. Several buildings in Chestertown date back to the 1700's. The town is host to the Chestertown Tea Party every Memorial Day weekend to commemorate the 1774 dumping of British tea by local patriots. The town of Rock Hall lies on the shores of the Chesapeake and is known for the seafood the local watermen catch. Many fishing charters are available there. In the winter, migratory waterfowl spend the season in the area, drawing hunters from across the country.

Conference Maps

Kent County conference activity locations:



Chestertown, MD Detail:



FAIR HILL FARMS, INC.

10118 Augustine Herman Hwy, Chestertown, MD 21620

410-778-2372



Matt, Edwin C. (deceased), Edwin R. Fry

Now in our 52nd year of operation in Kent County, MD, Fair Hill Farms encompasses a milking herd of 320 Holstein and Brown Swiss cows and a certified organic hay and grain operation on the 565 acre farm near Chestertown. Begun by Edwin C. Fry who moved from his father's farm in Montgomery County, MD, the corporation is now owned and operated by the Edwin R. Fry family. Ed and his wife, Marian, received the 2006 Northeast Region Patrick Madden Award for Sustainable Agriculture. Their son, Matt, Manager, FHF dairy, represents the third generation of family to work at this location.

Edwin R. began transitioning conventional cropland to certified organic in 1998 and now has 400 acres certified organic at the "home farm." Subsequently, he aided other landowners in Kent and Queen Anne's Counties in transitioning to organic, and tills approximately 1445 total

acres certified organic land. The business farms a total of 2050 acres and custom harvests an additional 2000 acres.

The organic enterprise focuses on the rotation of corn, small grains, such as wheat, rye, barley, and triticale, soybeans, and alfalfa. It integrates well with the Dairy, using most of the liquid manure collected in the flush cells, after passive sand separation, as the nutrient source for the organic crops. Rotary hoe and cultivator are the two main tools used to suppress weeds. Organic seed is used in this program, and yields usually reach 80-85% of our conventional crops, but with much lower input costs. Our major markets are Horizon Organic Dairy in Kennedyville, MD and 30-40 Amish dairymen in Lancaster Co. PA. In addition to the challenges of weed pressure and insects, we are challenged to meet the requirements of the MD Nutrient Management Program. Growing legumes is the only source of N that is not tied to P and K, therefore we cannot always balance our plant foods to meet the needs of the crop and satisfy the NMP guidelines.

Operating in the Chesapeake Bay watershed presents unique regulations and challenges regarding waste runoff. In anticipation of coming requirements, Matt initiated major infrastructure projects to allow us to grow the dairy herd. As a result, Matt and Ed were recipients of the Kent Soil and Water Conservation District Cooperator of the Year 2011. The Frys installed 10.4 acres of grassed waterways, 2 grade stabilization structures, 3 acres of riparian forest buffer, 270 feet of diversions, 3 waste storage structures, 3 waste storage lagoons, 1 sediment control pond, 6.2 acres of conservation cover, 0.1 acre of heavy use area and 2340 ft. of fencing last year. This is a continuation of land stewardship for which the Frys were first named Cooperator of the year in 1979.

The FHF dairy operation is comprised of over 700 head of mature cattle and replacement stock, milking 320 cows three times per day in a conventional confinement setup. A TMR comprised of corn silage, small grain silage, alfalfa haylage, oat hay, corn and soybeans is fed to the milking herd and all other classes of cattle when access to pasture is limited. For three years now, the dairy has grazed a portion of its replacement heifers and expanded the scope of the grazing operation each year. The goal of the grazing has been to cost effectively raise quality replacements for the milking herd and allow the dry cows the opportunity to get out of the barn and into the pasture for exercise and for the health of their feet and legs.

Raising replacements is a large and often overlooked expense for many operations. FHF has not only seen economic savings from lower out of pocket feed expenses, but this has also helped to stretch the ensiled feed inventory. The grazing of the of replacements extends from groups that are full fed TMR with pasture access, limit fed TMR with rotational grazing and rotationally grazed with no supplemental TMR. Groups that are rotationally grazed are moved every 12-36 hours. Cattle performance is strongly stressed in our replacement herd as heifers are bred to have their first calf at 22-23 months. FHF plans to internally grow the milking herd through the cost effective use of grazing to raise replacement stock.

MD SUNRISE FARM, LLC

a subsidiary of Fair Hill Farms, Inc.

Located in Gambrills, MD, just 15 minutes from the state capitol of Annapolis, this 857 acre certified organic farm is the largest parcel of certified organic land in the state. Building upon a rich agricultural tradition, MD Sunrise Farm offers an agricultural oasis to its suburban neighbors. The farm is fully engaged in production agriculture using organic protocols to maintain a healthy environment for people, food, and animals near major population centers. This working landscape provides a significant air and water filter, noise buffer and tranquil atmosphere, acting as respite from the pervasive hardscape of the surrounding area, while producing food and feed. Here, at the farm, we:

- grow vegetables for sale at the Anne Arundel Farmers Market
- operate a farm based CSA (Community Supported Agriculture)
- raise certified organic beef for sale in the local area
- raise certified organic dairy replacement heifers
- sell certified organic hay, straw, corn and soybeans
- board horses and offer riding lessons
- host seasonal farm events including school and group tours
- operate a fall Corn Maze and Haunted Barn
- rent farm buildings for private meetings, parties and weddings

Find us on the web at **www.mdsunrisefarm.com**



Troy Bishopp aka "The Grass Whisperer"
Bishopp Family Farm, 5th Generation Grazing Operation
Madison Co. SWCD/ Upper Susquehanna Coalition Grazing Specialist
NESARE Professional Development Grazing Training Project Leader
Freelance Writer & Professional Speaker
Farmer Communications Coach

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Bishopp Family Farm Goals

We strive for a stress-free life. We want our topsoil covered by diverse pastures harvested by animals, thus recycling solar energy and activating biological life to provide a sustainable profit. We want to regenerate our community with local food. We want to create a savannah for wildlife. We want to create a place for the next generation to thrive.

The 5th generation, 132 year old farmstead is home to a custom grazing operation that finishes beef and backgrounds feeder cattle and certified organic dairy heifers for fellow farmers on 180 acres of owned and leased native rotationally grazed pastures. The family comprises of Troy & Corrine (4th generation) with three daughters, Sarah, Lindsay and Katie (5th generation), along with Grandparents Ed & Sandy Bishopp (3rd generation). The "Sunshine in every Bite" beef that was grazed on these divine pastures have been served at President Obama's inaugural dinners, white table cloth restaurants in NYC, in Japan, at grazing conferences and to the local community.

The Bishopp Family Farm is a 2010 inductee of the prestigious Century Farm Award by the New York State Agricultural Society. The farm has been recognized as an outstanding forage producer by the NYS Forage and Grasslands Council and a Pioneer Grazier's award winner from the New York State Grazing Lands Conservation Initiative. They are New York Farm Bureau members.

The farm hosts pasture walks for farmers, wildlife watching throughout the farm and opportunities for photographers and artists to capture nature's beauty.

Biological Monitoring

Troy Bishopp

Adapted from GRAZE article 8/28/2011

Biological monitoring, or what I like to call “reading the land,” is an easy and practical annual method for studying key land health indicators and helping you move toward the goals for your operation, be it a pasture, row-crop or other land management system. Biological monitoring is much like any soil or forage test in that it provides data to help you make decisions in ration balancing, fertility placement and financial investments. As grazing consultant Jim Gerrish frequently quips, “You can’t manage what you don’t measure.”

Biological monitoring as a hands-on application was brought to the forefront in 2006 when Holistic Management International published the *Holistic Management Handbook*, authored by HM founder Allan Savory along with Jody Butterfield and Sam Bingham. It's a supplement to Savory's original book, *Holistic Management: A New Framework for Decision Making*. With many charts and grazing planning forms, the handbook is designed for people who actually manage land and livestock, along with the agency professionals who help farmers create the landscapes they want.

While I custom-graze beef cattle, it was in my collaborate work as an agency person that got me involved in this ground covering (rather than groundbreaking) process for my farm in 2008. I've been doing it once a year ever since.

Biological monitoring is essentially an effort aimed at getting you down on your hands and knees to take a really close look at what's happening at the soil's surface. As is indicated by the accompanying picture of a portion of the monitoring chart, plus actual results from my place and that of New York dairy grazer (and Graze contributor) Nathan Weaver, you are measuring, recording and ultimately monitoring a wide variety of factors indicating biological activity and plant species composition. You are making an effort to see and document the effects your management practices are having on the land.

You do this by taking random readings across your fields. At our original agency training at my place in 2008, we tossed fancy darts with colored streamers back over our shoulders to pick our spots. You can use a Frisbee, a weighted 16-penny nail or your farm cap. Just toss, go to the spot, get down on your knees, part the grass, and start recording what you see.

Did the dart hit a plant, litter or bare ground? Is there evidence of earthworms, insects, or erosion? What kinds, ages and conditions of plant species are within the six-inch radius? Our group added a category measuring manure: is there a pat within either three or six feet of the dart? To better address conditions in the Northeast U.S., we added signs of hoof action and whether legumes are present, and separated earthworm castings from the general insect category because farmers love seeing red wigglers. We also added a moss category: is moss capping the soil surface within a six-inch circle around the dart? Finally, are there any interesting tidbits you want to note, such as dung beetle counts or a mystery plant?

You can do as much or as little as you like, although it's obviously a case of the more throws of the dart (or the nail, or whatever), the more accurate the picture. In our initial agency HM training, we threw a dart every 25 feet over a five-acre paddock. For easy percentages, we try for at least 25 samples to evaluate.

Monitoring the exact same spot every year would be best, but I'm not that scientific — I just do the same five-acre fields each year. The annual monitoring can be done anytime during the growing season. I generally do my dart-throwing in September, and normally the plants are eight to 16 inches tall when I'm doing it (which aids in identifying the plants). Weather conditions certainly affect the findings, and it is important to make specific notes about the weather right along with other important factors such as rest periods, fertilizer applications and stocking rates. Since you're only doing it once a year, it's important to be as detailed as possible. Take some pictures, and be sure to write everything down.

It is really interesting and valuable to do this in a group setting, as different people process the information differently. There will be disagreements over species and whether or not something qualifies as ground cover. However, these "training" sessions can be important in helping develop the subjective "monitoring eye" that will help you make consistent interpretations down the road. (Love this paragraph)

Most important, the exercise forces you to get down on your knees to really see the soil surface environment. All of the farmers I have worked with on this data collection say it has been invaluable in forcing them to look down instead of across. One confident farmer brought us to a one-year old stand that looked like beautiful, dairy-quality pasture — at least from the barn. But when we got down on our knees, we found there was 30% bare ground because the stand lacked the plant diversity needed to fill the voids. It was an eye-opener for all of us to see how much lost solar- and water-capturing opportunity was being lost.

It has been very interesting to see what's been happening on my farm over the past four seasons. You can see the numbers in the accompanying table: earthworm numbers have increased, the percentages of bare soil has declined, plant and litter cover have increased, and the composition of my plant species has broadened. In my case, these results were achieved by taller grazing, trampling litter, longer rest periods and higher stock densities while moving towards my long term land management goals. (This fall I will be doing a whole-farm soil test to measure how this correlates to fertility and organic matter levels, and compare that with numbers from 2008.)

I have also been monitoring two fields on Nathan Weaver's farm with his strategies of spreading chicken litter, compost and rock phosphate, clipping pastures with machinery and horses, out-wintering, and over-seeding while maintaining 20- to 40-day rest periods to harvest lush, 10-inch swards. The accompanying table shows that since implementing these tools in 2009, Nathan has seen a big decline in bare ground and major changes in plant composition.

In general, the results of these two, small-scale monitoring efforts indicate that we are both trending toward what we want for our land given that we have different goals, strategies and

tools at our disposal. In the research arena this information may not be quantitative enough because we only do it annually on one field, and the information is very subjective.

However, the results can be very valuable to the individual farmer/grazier — especially if they are combined with soil tests, per-acre production figures, and costs for plant fertilizers, animal health and any number of other measures. There is more and more information coming out about the economic value of the things we're measuring through biological monitoring, so it is important to understand where we're going here.

John King, a Holistic Management Educator, from Christchurch, New Zealand (www.succession.co.nz) relates the biological capital hidden in the soil and its rates of return by using the data found in Professor David Whitehead's book *Nutrient Elements in Grassland* (2000) in comparison to the market value of commercial fertilizer. He figured one million worms per acre alone represent an asset of \$594/acre of exchangeable nutrients; Fungi, actinomycetes and bacteria contributed \$284/ton; cattle manure figured in at \$126/ton and plant roots, living and dying, added a value of \$55/ton. Mr. King summed it up well, "As farmers begin measuring biological agriculture with greater professionalism, there should be a deeper connection between biological and financial capital."

This monitoring process provides a general, practical measurement of the biological trends resulting from your management practices, thus telling you whether you're moving your farm in the right direction. Such understanding helps you make better long-term decisions. Reading your land is a valuable skill akin to growing quality forages, turning wrenches, judging grass-finished cattle or artfully managing a pasture system. This is where all the true profit begins.

To access the chart go to www.cnyrcd.org/planned-grazing-participants/ or purchase the Holistic Management Handbook by contacting HMI at (505)842-5252

GRACELAND DAIRIES LLC

Holly (Burley) Moore

I have had a love for farming and cows ever since I was a little girl helping Mom and Dad on the farm that I grew up on in western New York. When I was 13 Dad gave me the opportunity to start milking cows and earning my own paycheck. Eventually as I got older and started taking on more responsibilities and always wanting to learn as much as I could from whoever came to the farm.

I joined 4H and always went on all of the dairy workshops that they would offer. I participated in Dairy Quiz Bowl for a few years until I graduated high school. I enrolled in college at Morrisville State College for two years and got an Ag. Business degree. Even though I was a business major I thought it best to take both dairy and business courses to broaden my education as much as possible.

After graduating college I packed my bags and headed to a job opportunity in New Zealand. I started out on a 330 cow dairy and after a few months I went and worked on a 3300 cow dairy. On the big dairy I was in charge of the cow health and treatment of sick and lame cows and well as the grass block that they were on. I stayed at this farm for 12 months and then decided to return home for the possibility of running my own dairy. When I returned home in January 2006 the home farm had grown to a 550 cow seasonal intensive grazing dairy farm. After my experience on the dairies in NZ I had tons of new ideas and ways to do things on the home farm to make it better and progress into the future.

There had been lots of talk about Mom and Dad wanting to involve their children in the family business and to find the right opportunity to set up a satellite dairy for the next generation. After being on the home farm for a while I realized it wasn't big enough for me and Dad. After some extensive searching for another piece of ground we found 217 acres of very fertile topsoil in an old river valley about 26 miles away. The property was purchased in bankruptcy court so it took a lot longer to close than expected but we finally closed on the property in December of 2006.

Next was the task of setting up a business and a business agreement between partners. GRACELAND DAIRIES LLC was formed with a 3-way partnership between my parents and me. My parents own the land personally that the dairy sits on and then the business is owned by Gary Burley (49%), Holly (Burley) Moore (46%), and Betty Burley (5%). Mom is the swing vote so that everyone has a say and no one has majority rule. One of the most important parts of going into business with family is having an exit agreement in case something doesn't work out. I know, kind of a pessimistic idea but it will simplify things between members if something doesn't go right. I love my farm and what I do, but without family I am no one and losing family relationships over a business isn't worth it. The business rents the lands it sits on by paying the land mortgage at the bank as well as the loans to build the parlor and other things.

At Graceland we currently milk 410 cows and raise our own young stock as well as all of the replacement bulls used for clean up. The ground is fertile enough to support 2.2 cows to the

acre and when we are not milking all of the cows are taken to a run off block and lessen winter damage on the dairy block. We are a seasonal herd calving from March 1st to the 15th of April. This window is short because of our location and micro climate, we calve earlier than East Hill farms. Our mating window is 10 weeks. Graceland breeds AI for 23 days and then turns the bulls in for clean up. East Hill does use all natural service. The cow herd is primarily Jersey with a little Holstein and some red breeds. I only use semen from NZ as they have the type of animal I am looking for in my system to make it work. All of our calves are reared in groups of 20 to 30, then weaned at 6 wks and put out on pasture.

We have a 30-unit swing parlor and our smallest paddock is 5 acres all the rest are around 10 acres. We use a lot of temporary fences to rotate cows which gives us a better ability to use the pasture. The entire farm is seeded down to perennial rye grass which is great except for when it goes to seed. This downfall forces us to supplement with hay for at least 4 weeks every summer.

We have 3 Mexican laborers as well and John and myself. The farm is pretty much complete at that number year round. There have been many challenges with starting up and running this facility. Being a young female is one of them, working with my spouse is definitely another one, and then of course whatever Mother Nature decides to throw at us.

Our major goal right now is to find more land to buy but because we sit on some of the best soils in the state of New York, we must be patient for good opportunities to come available.

Virtual Tour of Horizon Organic's Dairy in Kennedyville, MD

Greg Heidemann, Director / Dairy Operations

About Horizon's Kennedyville, MD Farm: Horizon Organic's Maryland Farm was certified in 1998 and is a prime example of a grass-based dairy. The farm, located along Morgan Creek which flows into the Chester River and eventually into the Chesapeake Bay, provides an excellent opportunity to use organic farming practices in an ecologically sensitive area. Approximately 370 acres of pasture and a total of 973 acres are under the Maryland Farm's responsibility. 500 cows in milk is a typical yearly average for the Maryland Farm, all replacement young stock are raised on premises to ensure the organic integrity of the herd.

Horizon's Commitment to Grazing: At Horizon, we believe that grazing is about managing the complex interaction between the grass, the land and the cows. Grazing processes should emulate natural herd behaviors. Getting cows outside to graze is one of the most important things we can do. Grazing nourishes our cows, and the cows return the favor by improving the soil as they graze. Healthier soil creates healthier pastures, which in turn means healthier cows.

On our farms, dairy cows are out on organic pasture during the grazing season. We also put cows out during the dormant or closed season, contingent on Mother Nature of course, because the land benefits from the carefully planned movement of the animals. Year-round grazing, during both active and dormant seasons, is managed and timed carefully to ensure the health of the animals and the micro-environment of the soil's surface.

Working together with other organic organizations, Horizon played a key role in successfully advocating for clear and enforceable organic pasture requirements in the organic regulations. In February of 2011, the National Organic Program published the Access to Pasture rule to specify that animals must be on pasture for the entire grazing season, which cannot be less than 120 days and have a diet consisting of at least 30% dry matter intake from pasture grazed during the grazing season.

Grazing Learnings: The Eastern shore's weather is fickle but provides an excellent grazing environment, certain times during the grazing season; heat and humidity can be the most challenging aspect of grazing on the shore. Using a rotation of heat tolerant annuals provides a nice break when the temperatures soar. Irrigation mitigates dry weather providing grazing forage much needed moisture during critical periods of the plants development; irrigation has worked well for the farm and provides the needed kick during the hot and dry period which typically hits the end of June through mid to late August.

The dairy keeps daily written records of all grazing activity. We have standardized systems across farms so that we can make better decisions on current and future pasture management, analyze trends and generate reports on grazing. These records include the number of cows on pasture, their time on pasture, how much and where they grazed, the effect that grazing had on the pasture, and whether our management is producing the health for the animal and land that we are seeking. We also continually invest in the grazing infrastructure on our farms to facilitate grazing "traffic patterns" that make sense for our cows and pasture health.

Another method that has worked well on our farms is implementing a Cow Time Budget for lactating cows in a grazing environment. The idea behind this approach is to measure how much time cows need within a 24-hour period to accomplish certain natural behavioral activities that are important to the health and productivity of the cow. By developing a cow time budget, we can more effectively manage the farm while letting the cows continue to exude their natural behaviors. As a result of this approach, we've seen exceptional herd health, production and increased efficiency on our farm.

Additionally, we have worked with Holistic Management International in herd management techniques designed to improve soil health, increase forage quantity and quality, while maintaining milk production on our farms. Herd moves are planned in advance to ensure that pastures are given sufficient recovery time. The planning process also allows staff to coordinate irrigation and amendment applications.

Feed Production: Our farm provides our dairy cattle with a balanced mixture of forage, feed, minerals and fiber sources. A wholesome, organic diet is one of the most critical steps to ensure cow health, reduce the incidence of disease, extend milk production, improve calving and maintain the overall health of our dairy cows. When our cows are not grazing on pasture, they eat organic hay and feed. We grow a large percentage of our Maryland farm's feed needs through pasture, forages and grains – and all manure and liquid manure is used for feeding crops. Forages not grown on the Maryland Farm are purchased from local organic farmers.

Several different types of grass are used for pasture production, legumes, perennial rye grass, and small grains are used in a variety of ways to best support sustainable soils and grass production. Harvest is performed by local or regional harvest crews; if time permits some harvest duties are performed by farm team members. 500 four-legged harvesters take care of pasture harvest and do an excellent job making a clean field.

A Commitment to Sustainability: Our Maryland farm helps preserve and protect an intricate system of waterways. Morgan Creek, home to numerous rare plant species, meanders through the heart of the farm before it empties into the Chester River, which ultimately flows into the Chesapeake Bay. Ducks, geese, bald eagles and other water-loving birds live along the river, which is also a spawning and nursery area for many species of fish. We also maintain an active wildlife corridor through the farm. And because we're not using toxic and persistent chemical pesticides and fertilizers on the farm, it's better for insects, birds and wildlife. Additionally there are four dedicated areas of focus on our farm as it relates to sustainability: methane reduction, carbon sequestration, utility reduction and water conservation.

□ **Methane Reduction:** We continue to explore new ways to reduce greenhouse gases, such as methane, by ensuring proper manure handling and composting.

□ **Carbon Sequestration and Soil Health:** We regularly monitor soil organic matter and soil nutrient content in our pastures and croplands and use pasture management, grazing and biodiversity.

□ **Utility reduction** – Fuel efficient vehicles, solar panels / radiant heating systems and low-energy lighting fixtures, help us reduce utility usage.

□ **Water Conservation** – Our farm conserves water via a berm and dam structure along a nearby creek that minimizes erosion and captures rainwater, which is used to irrigate our pastures.

Local Relationships and Education: As a dairy business deeply embedded in the local community, we value the relationships we have with local agriculture experts who advise on key topics that help ensure our farm operations run as smoothly as possible – we can't always do it alone. For example, we work with Ed Fry, as a feed source contributor, and local veterinarians at the Chestertown Animal Hospital, to advise on feed needs and animal care beyond what we can perform ourselves on the farm.

In addition to supplying milk, our Maryland dairy also serves as an organic learning center. Operating our own farms allows Horizon to experience the issues and opportunities of organic farming firsthand, generating insights and knowledge that we can then share with our hundreds of family farmer partners. We all learn from each other as we increase the number of acres farmed organically, which is ultimately better for consumers, farmers, animals and our planet. Take a virtual tour: <http://www.youtube.com/watch?v=s9KZp662bbE>

About Horizon Organic®: Horizon believes the choice for a healthy family and a healthy planet should be an easy one and offers a delicious variety of certified organic dairy products to satisfy a broad range of consumer needs. Our commitment to a healthier planet includes offsetting the energy used to produce its products with clean, renewable wind power. We work with over 600 active and transitioning family farmers across the U.S. Founded in 1991, Horizon was a pioneer in the organic industry and the first company to supply organic milk nationally. Ninety-three percent of Horizon's USDA-certified organic milk supply comes from family-owned organic dairy farms. Seven percent of our milk supply comes from two company-owned organic dairy farms, one of which is located in Kennedyville, Md.

Organic dairy farming practices implemented on our farms have promoted the use of land and soil management techniques like no-till farming and pasture management. We also believe that organic dairy cattle should be outside as often as possible, year-round, to graze, exercise, socialize and interact with the land. We created our own [Standards of Care](#) for livestock and farm management, which we developed in collaboration with organic industry experts and reviewed by Conservation International.

Economic Characteristics of Pasture-Based Dairy Farms

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Grazing Dairy

- **Not a universal method to success**
- **Wide range in performance of grazing dairies**
- **As more farms focus on utilizing grazing**
 - More questions being generated
 - Some questions getting answered

	All Intensive Grazing Farms	Non-Grazing Farms
Number of Farms	31	104
Number of Cows	127	128
Milk Sold per Cow	16,593	21,134
Cull Rate	22%	32%
Total Tillable Acres	317	349
Forage Dry Matter Harvested per Cow	5.4	9
Cows per Worker	44	33
Milk Sold per Worker Equivalent	726,309	697,287
Investment per cow	\$8,244	\$10,037
Machinery and Equipment per Cow	\$1,504	\$1,875
Purchased grain and Conc. As % of milk receipts	31%	32%
Operating Cost of producing milk per cwt	\$14.84	\$15.74
Total Cost of Producing Milk	\$20.97	\$21.03
Gross Farm Milk Price, per Cwt.	\$19.99	\$19.28
Net Farm Income per cow, w/o apprec.	\$568	\$461
Labor and management income per operator	\$19,786	\$3,147
ROA with appreciation	2.20%	1.10%
ROE with appreciation	2.90%	2.00%

Difference From Conventional Dairies

- **Each year, compare grazing performance to non-grazing performance**
- **Key areas of difference between methods**
- **Grazing consistently equal to if not better earnings than similar size farms**

	All Intensive Grazing Farms	Non-Grazing Farms
Number of Farms	27	82
Number of Cows	144	146
Milk Sold per Cow	15,884	21,946
Cull Rate	23%	33%
Total Tillable Acres	333	391
Forage Dry Matter Harvested per Cow	4.8	8.6
Cows per Worker	45	35
Milk Sold per Worker Equivalent	709,259	758,283
Investment per cow	\$8,314	\$9,954
Machinery and Equipment per Cow	\$1,418	\$1,860
Purchased grain and Conc. As % of milk receipts	35%	39%
Operating Cost of producing milk per cwt	\$12.39	\$13.07
Total Cost of Producing Milk	\$18.79	\$17.85
Gross Farm Milk Price, per Cwt.	\$14.04	\$13.71
Net Farm Income per cow, w/o apprec.	-\$6	-\$139
Labor and management income per operator	-\$34,934	-\$49,343
ROA with appreciation	-7.30%	-9.30%
ROE with appreciation	-4.00%	-5.00%

Intensive Grazing Farms vs Non-Grazing Farms New York State Dairy Farms, 2010			
	All Intensive Grazing Farms	Non-Grazing Farms	
Number of Farms	27	72	
Number of Cows	134	138	
Milk Sold per Cow	15,231	21,697	
Cull Rate	21%	33%	
Total Tillable Acres	299	366	
Forage Dry Matter Harvested per Cow	4.5	8.8	
Cows per Worker	45	35	
Milk Sold per Worker Equivalent	689,664	752,514	
Investment per cow	\$8,316	\$11,059	
Machinery and Equipment per Cow	\$1,436	\$2,154	
Purchased grain and Conc. As % of milk receipts	30%	30%	
Operating Cost of producing milk per cwt	\$12.73	\$13.95	
Total Cost of Producing Milk	\$19.29	\$19.29	
Gross Farm Milk Price, per Cwt.	\$17.39	\$16.74	
Net Farm income per cow, w/o apprec.	\$574	\$520	
Labor and mangement income per operator	\$22,765	\$7,382	
ROA with appreciation	5.6%	3.4%	
ROE with appreciation	6.0%	3.0%	

Grazing Profits

- Large range of performance among grazing dairies
- No golden pill to farm profitability
- Management decisions regarding use of resources key to generating profits

Key Areas of Difference

- Less tillable land base
- Lower milk per cow
- Higher cows per worker
- Lower investment per cow
- Lower grain costs
- Lower total operating costs
- Higher milk price

Management Strategies

- Different ways grazing farms are making a profit
 - Annual production, high input
 - Annual production, lower input
 - Seasonal production, high input
 - Seasonal production, low input

CHARACTERISTICS OF SUCCESSFUL GRAZING DAIRIES

Profitability Equation

$$\text{Profitability} = \frac{\text{Volume} \times (\text{Price} - \text{Cost})}{\text{Investment}}$$

- Only four ways to increase profitability
 - Volume
 - Price
 - Cost
 - Investment

Keys to Profitability

- A. Milk Production
- B. Supplementation
- C. Labor Efficiency
- D. Capital Investment
- E. Cost Control
- F. Stocking Rate
- G. Size

Milk Production

- Large range
- Not a target level
- Getting the most for inputs utilized
- Making enough to cover other costs
- Not just milk, also components
 - Impact on milk price

A. Milk Production

- What milk is being generated from the resources that are being utilized
- Is it being maximized for the set of resources:
 - Per cow
 - Per acre
 - Per farm

Milk Sold per Cow

- Top 20% of all grazing farms, sorted by ROA
 - 2007 - Ranged from 11,000 to 24,500
 - 2008 - Ranged from 10,500 to 17,500
 - 2010 - Ranged from 9,500 to 22,000

1996-2010 New York Intensive Grazing Summary (pounds milk sold per cow)

Year	More Profitable		Less Profitable		Difference
1996	(21)	18,402	(09)	13,875	4,527
1997	(19)	18,288	(16)	16,155	2,133
1998	(17)	18,508	(14)	17,163	1,345
1999	(13)	18,454	(16)	17,905	549
2000	(17)	19,075	(13)	14,808	4,267
2001	(19)	16,698	(13)	13,660	3,03
2002	(10)	19,868	(11)	14,626	5,242
2003	(10)	18,728	(10)	13,768	4,960
2004	(9)	18,436	(14)	14,906	3,530
2005	(17)	18,579	(17)	17,274	1,305
2006	(10)	17,492	(23)	17,099	393
2007	(13)	17,367	(36)	16,112	1,255
2009	(14)	17,954	(14)	17,802	152
2010	(14)	16,517	(14)	18,269	-1,752

Milk Production

- Production can be too low
- Income drops faster than expenses
- Fixed costs not changing

B. Supplementation

- How is the pasture supplemented?
- What is used?
- What is being generated for components?
- How does it impact stocking rates?

Milk Production & Supplementation

- Milk output and supplementation need to be looked at together
- Net milk income over feed costs currently preferred method to track and analyze

Average Pounds of Grain Fed/Cow/Day
(During Grazing Season) – New York Grazing Dairies

Year	More Profitable	Less Profitable
1996	(21) 17.4	(09) 12.6
1997	(19) 15.25	(16) 14.0
1998	(17) 15.92	(14) 12.92
1999	(13) 13.77 (D.M.)	(16) 12.87 (D.M.)
2000	(17) 14.40 (D.M.)	(13) 12.30 (D.M.)
2001	(19) 17.9 (D.M.)	(13) 16.3 (D.M.)
2002	(10) 15.7 (D.M.)	(11) 14.3 (D.M.)
2003	(10) 17.3 (D.M.)	(10) 15.8 (D.M.)
2004	(12) 13.96 (D.M.)	(13) 15.06 (D.M.)
2005	(13) 15.6 (D.M.)	(13) 16.39 (D.M.)
2006	(9) 15.73 (D.M.)	(20) 15.05 (D.M.)
2007	(11) 15.67 (D.M.)	(11) 8.95 (D.M.)
2008	(10) 14.8 (D.M.)	(11) 13.5 (D.M.)
2009	(5) 12.2 (D.M.)	(4) 13.5 (D.M.)

Net Milk Income over Purchased Grain & Conc. Per cow

- How much money is left over per cow to cover all other expenses
- After single largest exp.
- Highest correlation to overall farm profitability
- Can also include other expense items.

Supplementation

- Individual farm experience with low to minimal input appears to have limitations
- Questions still being asked?
 - What to supplement with?
 - How much to do?
 - How to modify during the grazing season?
 - How to modify from year to year?

Net Milk Income over purchased grain and concentrates per cow per year – New York

Year	More Profitable	Less Profitable	Difference
1996	(21) \$1,847	(09) \$1,225	\$622
1997	(19) \$1,699	(16) \$1,376	\$323
1998	(17) \$2,189	(14) \$1,877	\$312
1999	(13) \$2,043	(16) \$1,918	\$125
2000	(17) \$1,767	(13) \$1,394	\$373
2001	(19) \$2,210	(13) \$1,641	\$569
2002	(10) \$1,738	(11) \$1,226	\$512
2003	(10) \$1,655	(10) \$1,244	\$411
2004	(Top 9) \$2,114	(30) \$2,079	\$35
2005	(Top 13) \$1,868	(42) \$1,927	-\$59
2006	(Top 13) \$1,625	(42) \$1,540	\$85
2007	(Top 18) \$2,607	(36) \$2,567	\$40

C. Labor Efficiency

- With cows doing more of the work, less labor needed on the farm
- More cows managed with one worker
- Increased profit per worker
- One worker = 2,760 hours
- Not the owner working longer!

Milk Sold per Worker
New York Grazing Dairies

Year	Most Profitable	Least Profitable
1996	(21) 558,583 lbs.	(09) 348,148 lbs.
1997	(19) 566,779 lbs.	(16) 419,098 lbs.
1998	(17) 604,555 lbs.	(14) 517,557 lbs.
1999	(13) 489,431 lbs.	(16) 593,231 lbs.
2000	(17) 570,391 lbs.	(13) 585,997 lbs.
2001	(19) 587,869 lbs.	(13) 519,903 lbs.
2002	(10) 540,928 lbs.	(11) 759,214 lbs.
2003	(10) 485,904 lbs.	(10) 675,822 lbs.
2004	(9) 716,852 lbs.	(30) 611,862 lbs.
2005	(13) 709,106 lbs.	(42) 587,165 lbs.
2006	(13) 711,600 lbs.	(42) 644,066 lbs.
2007	(18) 688,300 lbs.	(36) 675,657 lbs.
2009	(14) 732,134 lbs.	(14) 547,697 lbs.
2010	(14) 753,742 lbs.	(14) 535,568 lbs.

Labor Efficiency

- Not just milking the cows
- Taking care of replacements
- Winter feed production
- Managing the pastures and the cattle
- Office work (yes – sitting in the office is work!)

Milk Sold Per Worker

- Top 20% of all grazing farms sorted by labor efficiency
 - 2007, averaged 1,086,771
 - 2008, averaged 1,097,526
 - 2010, averaged 1,153,711

Cows per Worker
New York Grazing Dairies

Year	Most Profitable	Least Profitable
1996	(21) 31	(09) 25
1997	(19) 31	(16) 26
1998	(17) 33	(14) 30
1999	(13) 26	(16) 33
2000	(17) 30	(13) 39
2001	(19) 35	(13) 38
2002	(10) 27	(11) 52
2003	(10) 26	(10) 49
2004	(9) 42	(30) 36
2005	(13) 44	(42) 35
2006	(13) 43	(42) 36
2007	(18) 41	(42) 41
2009	(14) 42	(14) 32
2010	(14) 49	(14) 27

Milk Sold Per Worker

All grazing farms, sorted by earnings

	Bottom 25%	Top 25%
2009	652,216	1,116,664
2010	535,800	1,036,275
2011	452,825	1,118,871

D. Capital Investment

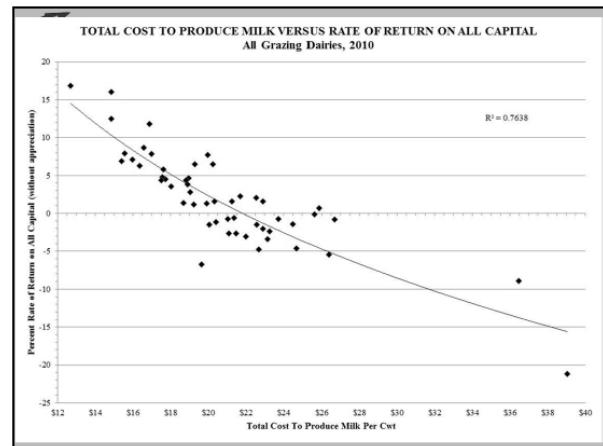
- The bottom number in the profitability equation
- How much money is invested for the dollars generated.
- Moving towards having less machinery and buildings so less total investment in the business
- Can be too low

E. Cost Control

- By utilizing pasture, try to lower costs of producing milk during the grazing season
- Spending only on those things that return revenue or save costs
- Worst case scenario – grazing milk production and conventional costs

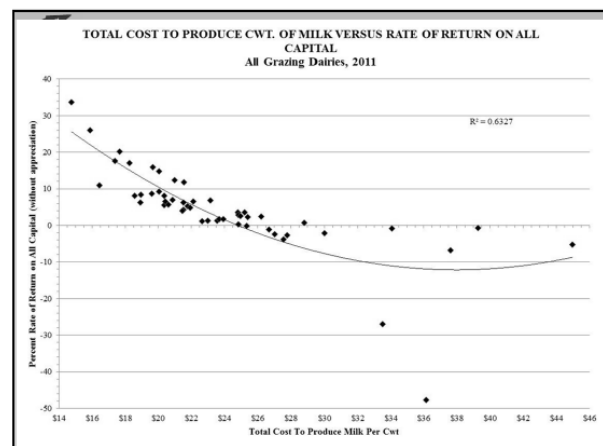
Investment Balance

- Is every area of the business operating at economic capacity
 - Land base
 - Milking center
 - Equipment
 - Family management
 - Family labor
 - Etc



Asset Turnover – All Grazing Farms, Sorted by ROA

- Top 25% of farms, ratio range
 - 2007 = .72 2008 = .54
 - 2009 = .34 2010 = .46
 - 2011 = .61
- Bottom 25% of farms
 - 2007 = .54 2008 = .34
 - 2009 = .40 2010 = .34
 - 2011 = .24



F. Stocking Rate

- Acres needed per cow
- All acres utilized by the farm for pasture and winter forage production

G. Size

- Is the farm large enough?
 - Support family goals
 - Support re-investment
- What growth potential does the farm have?
 - Offset inflation
 - Support re-investment

Stocking Rate

- Impacted by:
 - Investment levels
 - In-season forage production
 - Supplementation rates
 - Winter forage production

Average Herd Size

Top 25% All Grazing Farms

2009 = 380 cows

2010 = 262 cows

2011 = 223 cows

Bottom 25% All Grazing Farms

2009 = 127

2010 = 90

2011 = 82

Stocking Rate All Grazing Dairies

- Top 20% of farms, sorted by ROA
 - 2007 = 2.36 acres per cow
 - 2008 = 2.32
- Bottom 20% of farms, sorted by ROA
 - 2007 = 4.94 acres per cow
 - 2008 = 4.04

Progress of the Farm Same 40 Grazing Farms

	2010	2011
Average Cows	160	163
Milk per Cow	14,539	14,097
Milk Sold per Worker	812,510	799,569
Farm Capital per Cow	\$8,595	\$8,918
Net Farm Income per Cow	\$565	\$722
Return on Assets w/o Apprec.	5.2%	7.8%
Return on Equity w/o Apprec.	5.2	8.9%

Take Home Points

- What is your business doing?
- What are your trends?
- What is occurring key areas
 - Milk Production
 - Supplementation
 - Labor Efficiency
 - Capital Investment
 - Cost Control
 - Stocking Rate
 - Size

Questions?

• Contact Information:

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 - 607-255-3809, JK57@cornell.edu

Resources

• Dairy Farm Business Summary Program

- www.dfbs.cornell.edu

• Grazing DFBS Publication

- Linda Putnam, Cornell University
ldp2@cornell.edu
607-255-8429
http://aem.cornell.edu/order/pub_order_farom.pdf

• Dairy Profit Monitor

- www.dairyprofit.cornell.edu

Pasture Management Strategies to Improve the Bottom-line.

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The two primary drivers of profit on the dairy regardless of organic or conventional, is the cost of feed and the price of milk.¹ With so little influence over the price of milk, our research has been focused on controlling feed costs. Research has shown that farms with the lowest cost of production typically use fresh, high-quality pasture at a high rate. In fact, a recent economic analyses completed in New Zealand (NZ) shows the key profitability indicator for NZ grass-based dairies is lbs of dry matter harvested per cow, NOT milk production per cow. This concept cannot be over emphasized as we dialog about profitability in the dairy industry.

In fact, the most profitable dairies in NZ harvest between 6 – 7 tons of DM/acre, unfortunately the typical US grass-based dairy harvests between 2 – 3 tons DM/acre. The difference between these two countries might be explained by our love affair with the big blue Harvester and all the sophisticated mechanical equipment and gadgetry designed for the TMR. This love affair with mechanization lasted well over 50 years and in the process, we lost the “art” of grazing.

Our challenge as educators and researchers is to bring grazing back into vogue. To first recognize its value and then build a program to help producers learn how to graze cows again, and to manage their pasture resources more profitability. Fortuitously, the implementation of the “Pasture Rule” was really the first time many organic producers were made aware of their actual pasture forage intakes on a dry matter basis. As a result of these new regulations, producers established new baselines for things such as residual dry matter (RDM) and dry matter intake (DMI), a necessary first step toward monitoring grazing practices and developing sound strategies to address the deficiencies.

Within our program, we began measuring residual dry matter (RDM) with a capacitance probe to monitor relative changes in overall dry matter pre and post grazing. By taking pre and post DM readings every grazing cycle, we were able to establish just how much forage was utilized through simple subtraction. The capacitance probe is highly correlated to the traditional (and highly accurate) clipping methods with r^2 values of 0.9 when used appropriately, moreover, the probe is fast and automatically logs 200 - 300 readings per paddock in just a few quick minutes. Regardless of method used to establish DM production, the important point is that the information is collected accurately and used to track productivity and improve management.² We found that we were just as accurate with the “eyeball” method in estimating RDM once we trained ourselves using the probe, proving that one can relearn the art of pasture management with a little support and time on task.

As we transitioned from our TMR based herd at the University in 2005 to an organic grass-

¹ Horner J., et al., University of Missouri Extension. <http://www.agrisk.umn.edu/cache/ARL04755.pdf>

² Serrano, JM., et al., Calibration of a capacitance probe for measurement and mapping of dry matter yield in Mediterranean pastures. Precision Agriculture December 2011, Vol 12 (6): 860-875.

based paradigm, we learned that our pasture resources were only marginally productive, low on available energy and below average in yield. With so much low hanging fruit, we worked to implement some very basic changes while we developed an applied research program to track improvements from both a biological and economic perspective.

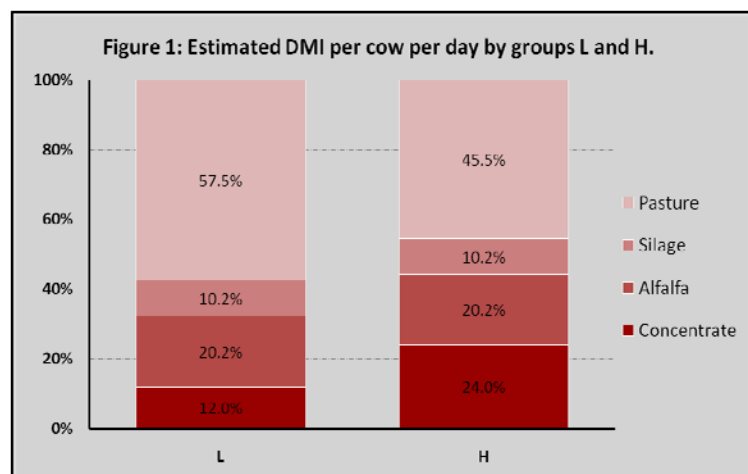
To date, we have completed several studies in our quest for improved net profit, two trials will be outlined and presented here.

High/Low Grain Study: The objective of this study was to determine the effect of two levels of grain supplementation (6 lbs vs. 12 lbs) under intensive grazing management on milk production, milk quality, and overall net profit/cow. The study was conducted over a 120-day period, commencing 60 days post calving and included seventy-three crossbred Jersey-Holstein cows from our seasonal herd. All cows were allotted one of two treatment groups based on age and milk production. Treatments included *Group L*: Low supplementation group fed 6 lbs of grain/head/day (n=36 cows), and *Group H*: High supplementation group fed 12 lbs of grain (n=37 cows).

Feeding: The average cost and composition of the ad libitum and supplementary feeds are illustrated in Figure 1. The silage used was produced on the farm while the alfalfa hay and concentrate were imported from outside sources. The pasture was producing cool season varieties including clover, rye grass and brassicas. All cows had ad libitum access to pasture and water and were rotated into a new paddock every 12 hours. Minerals were provided at equivalent amounts in the winter forage mix silage. Both treatment groups were fed equal amounts of alfalfa hay (8.9 lb DM) and winter forage mix silage (4.5 lb DM) together in a feed bunk once daily in the evening.

The concentrate used for supplementation was equal parts rolled corn and rolled barley. Grain was allocated twice daily at the time of milking utilizing the milk parlor's individual stalls and in-parlor grain feeding system.

Milk yield and composition: Individual milk yield (Dairy Comp 305) was measured at each milking and recorded as a daily value. Individual milk quality (AgriTech Analysis) measurements consisting of somatic cell count, protein, butterfat, and solids non-fat, were measured monthly.



Calculations and statistics: The treatment period was defined as 120 days. Feed costs were calculated to determine the cost differential between groups L and H. ANOVA analysis was applied to the quantity and quality components to establish income per day per cow. Milk yields were collected daily throughout the treatment period, data for quality and components

were collected from the monthly DHIA reports and analyzed by cow and by treatment. Each cow was then assessed for Income Over Feed Cost (IOFC) which was measured in dollars per cow per day, as well as establishing Feed Cost/ CWT of milk produced. ANOVA analysis was used to determine treatment effects with respect to IOFC and FC/CWT between groups L and H and will represent our evaluation of overall profitability. Both figures reflect the difference between the price of milk and the cost to produce it (Bailey, 2007).

Results and Discussion

Feed costs: The feed cost differential between groups L and H was calculated at \$0.84 per head per day or approximately \$25.20 per cow per month for Phase II of the study conducted in the spring of 2009. These figures are down 24% from one year ago due to the decline in feed prices between 2008 and 2009. The main portion of this feed savings is based on the lower supplementation rate in group L. The diet for group L consisted of 12% less concentrate and 12% more forage (from the pasture) than group H causing a cost savings because of the lower cost of pasture versus grain. Previous studies by Hanson et al. (1997) would agree, programs that utilize grazing have lowered overall feed costs.

Milk yield and quality: **There was no statistical difference between the mean pounds of milk yield for group L (48.34 ± 1.84) and group H (50.12 ± 1.82), there was on average 1.78 lbs more total milk produced per day in the H group receiving 12 lb of grain/day as compared to cows receiving 6 lb of grain/day. Interestingly, the additional 6 lbs of grain produced only 1.78 lb of milk. In rough calculations, if our milk is worth \$0.24/lb and our grain costs \$0.21/lb, we are spending \$1.26 and getting \$0.42 in return.**

McEvoy et al., (2007), with the Dairy Production Research Centre, Moorpark, Ireland, conducted a similar study where he found at higher forage intakes (17 kg DMI = 38.25 lbs) there was no difference in milk production between cows receiving 3 kg (6.75 lb) grain and those who consumed 6 kg (13.5 lb) of grain, using Holstein cows.

We did not detect differences in components including protein, fat and solids non-fat, or in somatic cell counts. Robaina et al. (1998) also found no difference in milk composition at varying levels of concentrate supplementation. Alternatively, Sehested et al. (2003) found a higher fat content in the milk from a low supplementation group. Tozer et al. (2004) found that supplementation increased milk fat yield, principally due to the increased yield because the actual percentage of milk fat decreased as concentrate supplementation increased. This high degree of variability between studies may be due to differences in how the data is reported, i.e., either as yield or as a percentage of yield. Those studies that report milk fat yield may be dealing with total milk yield as a confounding factor.

Profitability: At grain prices (\$425/T delivered), we observed significantly lowered feed costs/cwt of milk produced, indicating that the low grain feeding regime decreased feed costs significantly without a significant drop in milk production or milk components (under unlimited grazing of high quality forages).

Income over feed costs (IOFC), was not different between groups H and L (\$6.90 vs \$7.42, respectively for the High and Low grain treatments). While there is a \$0.52 cent

advantage for the low grain group, there was not adequate numbers to establish significance. Nonetheless, for a 100 cow herd, there would be a \$52/day advantage to the low grain group.

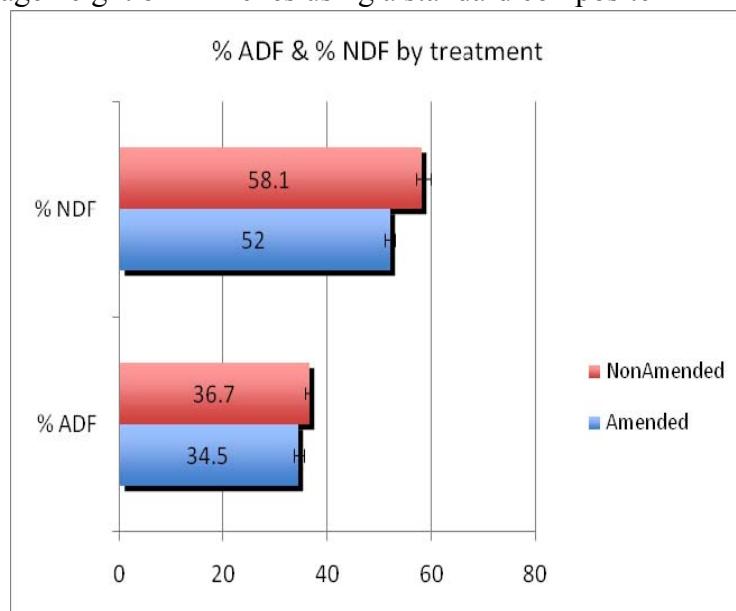
Reproductive Performance: There was no reported difference in reproductive performance, with an average of 83.6 ± 5.05 days open for the H group and 79.6 ± 4.98 days open for the L group. No significant difference body condition score was noted between groups.

Impact of Soil Amendments on Forage Quality and Projected Milk Production: This study was designed to establish the economic benefits of meeting soil deficiencies with organically approved soil amendments. Paddocks were randomized into amended and non-amended treatments with five replications of each. The soil analysis indicated that our soils were low in calcium, sulfur, boron, and nitrogen based on testing conducted by a certified laboratory A&L Laboratory, Modesto, CA. Our soils are also high in magnesium, creating a compaction issue. Working together with our agronomists and consultants, we developed a remediation plan that included mined lime, gypsum, lime, boron, zinc, manganese and compost. Non-amended paddocks received no additional supplements beyond the nutrients returned to the soil by the herd. Total cost for the amendments were \$331.75/acre.

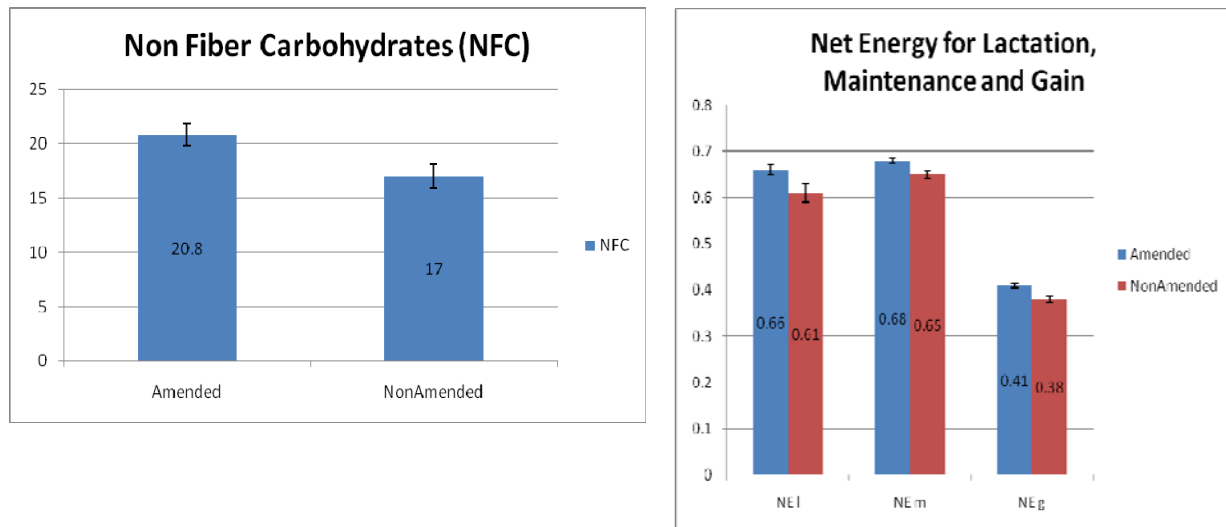
Forages were collected at an average height of 12 inches using a standard composite sampling procedure. Each sample represented 10 composite collections that were pooled for forage nutrient analysis.

Preliminary Results: Table 1 details the full statistical analysis of the cool season forage analysis by treatment. Results were highly significant. Amended paddocks produced forages that were more highly digestible as reflected by % ADF and % NDF.

Neutral Detergent Fiber (NDF) is a measure of hemicelluloses, cellulose and lignin representing the fibrous bulk of the forage. These three components are classified as cell wall or structural carbohydrates, giving the plant its rigidity. The higher the NDF value the less digestible a feed. NDF is also negatively correlated with intake. As the NDF value of a feed increases, the cow will eat less total dry matter (reduced dry matter intake: DMI). Acid Detergent Fiber (ADF) is a measure of cellulose and lignin. Cellulose varies in digestibility and is negatively influenced by the lignin content. As the lignin content increases, digestibility of the cellulose decreases, therefore, ADF is negatively correlated with overall digestibility. By amending our soils, we improved ADF and NDF and the overall digestibility of the forages.



Amending soils also improved the energy component of the forages as reflected in % Non Fiber Carbohydrates (NFC), Total Digestible Nutrients (% TDN), Net Energy for Lactation (NEL), Net Energy for Maintenance (NEM) and Net Energy for Gain (NEG). Non Fiber Carbohydrates (NFC) are the non-cell wall carbohydrates consisting of starch, sugar, pectin and fermentation acids that serve as energy sources for the animal. In the cow, NFCs are broken down by the microbial population in the rumen and used as an energy source.



Preliminary Economic Analysis: Amended paddocks yielded 331.7 more lbs of milk / ton of DM produced. When organic milk is priced at \$28/ CWT, an additional return of \$92.88/ ton of DM is expected. Each acre produces eight tons of DM/season, @ 45 acres X 8T = 360 tons of DM produced for the season. Three hundred and sixty tons of DM will return an additional \$92.88 = \$33,436.80 in additional income due to improved forage quality, realized through additional milk production. Amendments costs (including delivery) = \$331.75/acre for the season, with a total cost for 45 acres of pasture at \$14,928.75. ROI is 2.2.

Table 1. Comparison of cool season forage quality between amended and non-amended pastures reported as means and standard errors.

	% CP	% ADF	% NDF	% NFC	% TDN
Amended	22.4* (0.58)	34.5* (0.5)	52.0* (1.3)	20.8* (1.0)	67.9* (0.4)
Non-Amended	20.3* (0.84)	36.7* (0.6)	58.1* (1.8)	17.0* (1.1)	66.2* (0.5)
	NEI	NE _m	NE _g	RFV	RFQ
Amended	0.66* (0.01)	0.68* (.006)	0.41* (.005)	112.2* (3.1)	189.9* (7.0)
Non-Amended	0.61* (0.02)	0.65* (.008)	0.38* (.008)	98.1* (3.7)	158.7* (3.7)
	% Ca	% P	% Mg	% K	% Na
Amended	0.83* (0.06)	0.43 (0.01)	0.33 (0.01)	2.77 (0.09)	0.06* (.007)
Non-Amended	0.59* (.037)	0.40 (0.02)	0.37 (0.03)	2.88 (0.10)	0.04* (.002)
	Fe (ppm)	Zn (ppm)	Cu (ppm)	Mn (ppm)	Mo (ppm)
Amended	348.4 (51.2)	32.7* (1.4)	10.0 (0.3)	33.6* (0.9)	1.0 (0.06)
Non-Amended	472.5 (125.2)	28.3* (0.9)	9.4 (0.2)	40.2* (2.4)	0.89 (0.07)
	RFQ	IVTD 48 hr	NDFD 48 hr	Lbs Milk/ DM Ton	% Total Nitrogen
Amended	189.9* (7.0)	86.8* (1.0)	75.3* (1.4)	3298* (71.3)	3.3 (0.2)
Non-Amended	158.7* (3.7)	82.9* (0.3)	70.3* (0.8)	2967* (43.7)	3.2 (0.1)

* Indicates a significant difference (at least $P < 0.05$) between forage quality parameters of amended and non-amended pastures.

Bellevalle Farms, Prigel Family Creamery

<http://www.prigelfamilycreamery.com/>
Bobby and Pam Prigel

Bellevalle Farm is a sixth generation dairy farm in Baltimore County Md. The current stewards (owners) of the farm are Bobby and Pam Prigel. The farm milked Holsteins and was managed conventionally until 1990 when the switch to grazing started. By 1994 the farm was total grass and the conversion to jerseys had started. By 1998 the herd was calving seasonally and Jersey were the dominant breed. The farm was certified organic in 2007 and started shipping organic milk to Horizon. In 2006 a plan to process milk into bottled milk, butter, cheese, yogurt and ice cream started to take shape. Construction on the creamery began in spring 2008. There were five lawsuits against the creamery in the summer of 2008 brought on by a few well-funded and very determined neighbors. By the grace of God the creamery opened Sept. 25 2010, selling ice cream.

Most of the farm work and daily management is done by Bobby's son Matt and nephew Scott Childs. The processing is overseen by Bobby's son-in-law Kelvin. Bobby's sister Susan is in charge of business management. Mandy, Bobby's daughter, is in charge of retail and events. Bobby's parents help out with daily chores in the creamery as well. Other nieces, nephews, cousins and in-laws help when needed.

Today the farm consists of 185 acres of pasture, 150 acres of hay and milks 150 jerseys. Milk that is not used in the creamery is sold to Horizon. There are still two active lawsuits against the creamery and will be for the foreseeable future. Milk is processed into ice cream and bottled whole milk. In the near future the creamery should start yogurt production and add reduced fat milk as well as butter. Cheese is expected to come on line early 2013.

Chapel's Country Creamery
<http://chapelscountrycreamery.com/>
Eric and Holly Foster

Eric and Holly Foster, owners of Chapel's Country Creamery, started their adventures in 1998, 8 years after they were married, when they bought their first farm. A 45 acre piece of Talbot County joy! Holly, having no farming background, had a great deal to learn from Eric, who grew up in a multigenerational farming family and who had a bachelor's degree in Animal Science.

Shortly after purchasing the farm, Eric started buying heifers, only days old, to raise. After raising them for several years and slowly increasing their numbers, Eric decided to go into the dairy business. He knew it would be a struggle to put up a dairy farm from scratch after buying a farm, tractors, replacement heifers, skid loaders, fencing, free stall barn, and manure storage. After talking with one of his college friends, he knew that a "value added" product was the way to go. They then attended a University of Maryland extension conference on value-added dairy. After extensive research, the Fosters decided on cheese as a value-added product. Cheese's extended shelf life and variety gave some flexibility to their product.

By now the Fosters had three young children, and Holly, a stay-at-home mom and "farmer in training", knew she was going to be very involved with all aspects of the farm. She decided to take a "Farmstead Cheese Course" at California Polytechnic University in San Luis Obispo, California, in 2002. This course came with a study guide in chemistry, which Holly thankfully had some college background in. At this course, she learned basic milk components and makeup, pasteurization, taking pH, and basic cheesemaking. Along with all the classroom time, there was also lab time and cheese tasting 101. There she learned all about the hundreds of different cheeses including goat and sheep milk cheeses. By the end of the course, she was hooked on a new hobby! Since then, she hasn't been able to get enough cheese courses, books, and conferences.

Eric, seeing the passion she had for cheese, knew it was time to start the dairy phase of their project, although he still worked for his dad farming and racing horses. This was a trying time for all with financing. Holly, never having been around any milking, wanted a "family cow" so she could learn more about dairying, milk, cheese, and yogurt making. In 2003, she got one for Christmas. Rainey, a 2 ½ year old Jersey, became a family member and mascot. Having no barn or milking parlor, Eric fixed up a little place for milking in the two car garage that was attached to their house. Rainey and the family pony became friends and enjoyed grazing together in the same lot. Holly quickly learned that dairying was not a job but a lifestyle, but she also enjoyed the satisfaction of hard work whenever the family enjoyed a block of homemade "farm house" cheddar cheese.

The Fosters chose the Jersey breed for the cheese yield from higher butterfat and more efficient grazing. The cows are milked in a Swing 10 Dairy Master Parlor. When weather is unfit, there is a free stall barn, and when weather is good and grass is available, the cows are outside on a rotational system. The cows are also fed a partial TMR along with the grass. Through the years

of experience with grazing, the Fosters have learned about different aspects of grazing, such as not letting the pastures get either too tall or overgrazed.

2004 was a very busy summer of dairy and creamery construction, which was completed in the fall. Eric and Holly started milking in their new parlor in September and had their fourth child in October. After taking a few months to get used to dairying and a new babe, they decided to start making cheese. As they were shopping for used processing equipment, they were faced with a challenge. The barn where Eric and his dad kept all their racehorses burned to the ground one snowy February night, with all the horses in it! This was the biggest challenge they faced up to this point. The horses had helped with all the dairy debt and other expenses. Now there was no source of income but the new dairy. Having no true cash flow, the Fosters decided to start the cheese business anyway in the summer of 2005 by shipping milk to a Pennsylvania cheesemaker. He would make cheese from their milk and they would concentrate on marketing, creating a web site, logo, label, and business cards, and deciding on all the other aspects of running a business. That ended up being the best decision they ever made.

Their first cheese sales were to local stores in the fall of 2005. The Fosters were then able to take that profit and start purchasing used equipment one piece at a time. At a fundraiser for local politicians, there was excitement about where agriculture was heading for the Eastern Shore and all of Maryland. The discussion addressed the way that Maryland law at the time did not allow the production of raw milk cheese but did allow its sale in the state. The politicians then quickly moved to update and change the old law to align with what other states allowed—the production of raw milk cheese. After a year of preparing the creamery for production, and our final inspection was done, we started making cheese and yogurt in September 2009, the same time their youngest child entered school full time. They now make seven different cheese and three different yogurts.

St. Brigid's Farm



Robert Fry and Judy Gifford

In 1995, Bob was working for a client who had a lovely farm. During a herd check, he mentioned to the farmer, "If you ever decide to sell the farm, let us know." About a year later, we were in the lawyer's office signing papers to buy the 60 acre farm. At the time, the fields were planted in wheat and no cows had been on the premise for about a year. We decided to graze as Bob wanted to try something different from the conventional practices of his clients and because Judy's fondest memories of her family farm were those of herding the cows down the dirt road to and from pasture. Judy wanted to milk Jerseys as she had shown Jerseys in 4-H and had worked on a Jersey farm on the Western shore of Maryland for several years. In fact, Bob and Judy met at that farm during the 1991 annual meeting of the American Jersey Cattle Association. Bob's dad had also shown Jerseys as a young man and Bob was game to work with the little brown cows.

Thus, in December 1996, we established St. Brigid's Farm. St. Brigid is the patron saint of dairymaids and scholars. Since Bob is a veterinarian and Judy is essentially a dairymaid, we thought the name was a perfect fit. St. Brigid is known for her compassion, innovation and is often pictured with cows at her feet. By the end of February 1997, we had purchased 60 open Jersey heifers from several sources as the foundation of our seasonal herd to calve the next January. A majority of the heifers were registered and the average price was \$514. Calving season is from late January to June 1 with the two year olds calving first and the cows beginning to calve a month later. This gives us time to get the heifers used to milking before we have to deal with a wave of fresh cows and eases pressure on the calving pens. We raise all of the heifer calves for replacements and the bull calves are raised for either veal or beef. In early June as the grass growth slows and milking 80 cows has begun to wear, we sell between 20 and 30 animals as dairy sales. This group includes late calving dry cows and springing heifers along with some milking cows. Our business plan dictated that we milk year round so we breed animals until they become pregnant then sell them close to calving rather than as stale cows in late lactation. Depending on the success of breeding season, we will dry off 50-60% of the herd on December 24th and the remainder according to their due date in an effort to minimize unproductive dry days.

Our farm is small and our mortgage was large, so our philosophy from the beginning was to breed with an emphasis on high production, to graze excellent quality pasture and to harvest top quality hay and corn silage from high fertility land. We prefer to measure our progress in terms of profit per acre because of multiple enterprises impacting our profitability. Profit per

acre in our case is a measure of milk production, pasture management and beef & dairy marketing. The average profit per acre for the past 5 years has been \$825 per year.

The current rolling herd average is 19,557 M, 894 BF and 715 P. For the last 14 months, about 80% of our milk was sold to Roos Food, a small cheese plant in Delaware that specializes in soft Hispanic cheeses. The balance of our production is marketed by Land O' Lakes Cooperative.

We like to start our grazing wedge early in the spring and graze our grass fairly tight. Steers and dry cows are used as followers when needed. Two thirds of the farm is planted in perennial grasses and one third in annual grasses. We have experimented with many different crops and grasses and after 15 years are pretty happy with the current choices. About ten acres of the original 29 acres of mixed grasses (rye, orchard, and endophyte-free fescue and clover) are still thriving. The other 19 acres were reseeded into a monoculture of rye grass and clover three years ago in a battle to conquer an invasive and persistent perennial weed, horse nettle.

The 12 acre field in annual grasses has undergone several variations. We have tried pearl millet (huge butterfat depression), grazing maze (impossible to fence and difficult to graze without big drop in production), turnips (better for steers but still not great), and alfalfa (very labor intensive). Our favorite annuals in terms of yield and production are BMR sorghum-sudan grass planted by May 30 and grazable by late June followed by cereal rye planted in late August, ready for winter grazing in early October and productive through the following spring.

We have the capability to irrigate 29 acres of permanent pasture which keeps grass productive in early summer until the sorghum is ready. Irrigation also improves the efficiency of fertilizing and allows us to fertilize where and when we need to rather than only fertilizing when rain is imminent. Several area farmers grow forages for us. One grows corn for silage (600 tons), another 75 tons of oat hay, and finally a small rental property where we harvest orchard grass hay. The 4-Ms who live a mile away custom harvest all of our crops.

High pregnancy rates and low calf mortality provide us with the opportunity to sell 20-30 surplus dairy animals every year along with grass fed beef and meadow veal. Those three enterprises generate 27% of the farm's gross income. We have been selling grass fed and finished beef for ten years. Initially a few Jersey steers we sold primarily to family and friends. Now every bull calf born on the farm is marketed either as beef at two years of age or as veal at approximately 4 months. The veal is sold primarily to restaurants which purchase the whole animal. Beef is sold whole, as sides or as retail cuts. Customers include Brooks Tavern and Washington College in Chestertown, MD, Woodberry Kitchen in Baltimore, MD, Ricciutti's near Washington DC, a dozen families who subscribe to our monthly Medley of Meats and others who stop by the farm. In 2011, we marketed 21 steers and 37 veal calves.

In summary, we have followed Teddy Roosevelt's advice and "have done what we can, where we are with what we have." "The beauty of a grazing dairy operation is that the opportunities for success are endless. We thank the organizers of the 2012 Mid-Atlantic Dairy Grazing Conference for holding the meeting in Kent County, Maryland and welcome you all to the farm Thursday evening.

Rainfall Simulator Demonstration

Kevin Ogles, USDA-NRCS, Greensboro, NC

The 5 trays of soil/sod are displayed on the rainfall simulator. They represent a real piece of soil/sod typically with the following management variations:

1. conventionally tilled cropland,
2. long term no-till cropland OR livestock lounging area,
3. continuously grazed pasture,
4. moderately managed pasture, and
5. Very well-managed pasture.

Each tray's management and make-up is described by the demonstrator.

In interactive discussion on water quantity as a function of runoff and infiltration is carried out with the audience. The foundation of our agriculture being the soil is discussed interactively as well. Emphasis is placed on the living root enabling the soil to function at optimum with the minerals, water and nutrients cycling with few hindrances in the pasture ecosystem. The importance of feeding the soil microbes is also emphasized. The importance of managing to allow the formation of organic matter is discussed. The importance of water to the pasture plants during the hot, dry summer is demonstrated by the simulated rainfall event on the 5 different soil/sods displayed.

The simulation is equal to a 25-year storm on a 15% slope, in NRCS terms. As the simulation takes place the audience is asked several questions noting the differences management makes in each tray of soil, especially in the amount of runoff and infiltration that takes place. The demonstration is concluded by the following quote. Dr. Charles Kome stated: "The quality of our lives depends on the food we eat, the water we drink, and the air we breathe. All of those things depend on the quality of the soil."

If the demonstration goes as expected, there will be rapid runoff from the conventionally tilled soil. But we all thought where I grew up that we had to turn that soil into powder to be able to hold the rain. But the exact opposite happened. Why? There's no soil structure because there's no living roots. The force of the rain is actually sealing the surface of the soil. Look at the difference between this and the no-till. Still some runoff but more infiltration, more roots, more organic matter, more soil glues holding those soil aggregates together.

But what about those pasture trays? I was told when I started with 'SCS' we don't have to worry about pasture. It's not being tilled so it cannot degrade. Is that what you see here? The continuously grazed pasture has lots of runoff and very little infiltration. But it has roots! Why does it have so much runoff? Bare areas, short plants, yes. Why do the plants being short affect runoff? The height and density of the plants above ground in many ways reflect the length and density of the roots below ground. And it's the living roots that start everything cycling. It enables the glues to be manufactured that form the soil aggregates that make paths for infiltration.

Look at the well-managed grazing tray. Now we know why there is so little runoff and so much infiltration. But it actually has less infiltration than the moderately managed pasture tray. Why? That's right. The extra water is being held in that 3 inches of soil in the tray. Look at the organic matter in tray 5 compared to tray 4. So well-managed grazing is actually building the soil.

What is happening to nutrients (manure) in tray 5 compared to tray 3? That's right. The livestock are being moved often enough to more evenly distribute that manure throughout the whole pasture, not just in the shade, the water tank, the hay rack, or the side hill. If we fertilized the tray 3 pasture, where are the nutrients? In the top of the soil. We paid for those nutrients once, now we just lost them to the stream, ditch, or the bottom of the hill. Not where we needed them at all.

Who decides what height those pasture plants get grazed down to? We do, the manager, right? So we can have some control over how much of that rain event ran off the pasture and how much stayed on. Managed grazing will also improve our plant density and desirable plants than the management or no management that we did in the tray 3 pasture.

When we do management of the pasture by moving our livestock into smaller portions of the pasture each time we can reduce sediment and runoff leaving our pastures. We can also increase infiltration and root growth which will give us healthier plants but will also increase our days of grazing pasture instead of feeding hay.

Since The Last Soil Test

Troy Bishopp, The Grass Whisperer

When I received my 2008 soil tests and saw the stark organic matter differences between paddocks up on the hill (2.5%) and the few behind the barn (5%), it motivated me into an insatiable appetite to change my grazing and land management that would build healthier soil, plants, animals and bank account.

Ironically in this same time frame, I was also exposed to a bunch of certified HMers' (Holistic Management educators), teaching ecosystem processes, Greg Judy's tall grazing/mob style, Jim Gerrish's stockpiling techniques and NRCS's Soil Guy, Ray Archuleta who dunked soil clods in water while showing us the power of biological glue in holding soil. These targeted instances reinforced what my mentor, the late Newman Turner, was saying for sustaining natural leys: *"The only essential is organic matter and the herbal ley is itself the best builder of humus and thus fertility, in the soil, and healthy productivity in the animal. This will render the farmer, independent of the use of artificial manures and restore the capital back to the landlord."*

For better or worse, this set in motion a plan to create soil fertility with grazing management, animal impact, hay feeding, monitoring and summer fallowing paddocks with problems while not compromising weight gain or using any form of tillage. I took to heart Sir Albert Howard's edict: *"Organic matter on the soil surface has the ability to collect from the atmosphere 'aerosols' containing phosphates and calcium and it is the best means of maintaining and increasing essential available nutrients in the top soil."*

Armed with a 12 month grazing planning chart, I experimented with longer rest periods, taller residuals and the art of trampling which is no small feat when you are feeding grass-finished steers. Man, did I waste a lot of grass allowing those fatties luxury grazing, but the diversity of plants and biological activity soared as did dung beetles and wildlife goings-on. I monitored the fields by eye, camera, soil feel, recovery times and dart throws to the point of obsession.

The fallowing and subsequent spreading of bedding pack on one paddock per year until after the nesting birds had fledged (July 20th) followed by a mob grazing event incorporating prairie height forage into the substrate yielded a wickedly robust sward come September. I thought to myself how cool this will be for my OM numbers.

The planning of stockpiling forage for extended grazing is an art form in itself. This exercise is all about balancing animal numbers with needed acres plus timely rain and admittedly, luck, sixty days before the first frost. However, I was willing to bet those well-rested roots were contributing to fertility like a fall strewn forest. This stockpile technique coupled with stationary bale grazing and rolling out hay achieved what we could not in 4 generations—winter fertility transfer without the need of tractors and manure spreaders, just proactive in-season bale placement.

I must admit some trepidation in putting three real years of grazing and managing differently from the 20 years previous to the test with a soil test. Would this measure vindicate or scorn my management and the advice of some pretty passionate mentors? With this on my mind, the taking of a soil test must be as accurate as possible as not to skew results either way. On my 20 main paddocks (between 3-7 acres), I took double the recommended cores per field to a depth of 6 inches, mixed very thoroughly and let air dry before I meticulously packed them for the Dairy One Lab in Ithaca, N.Y.

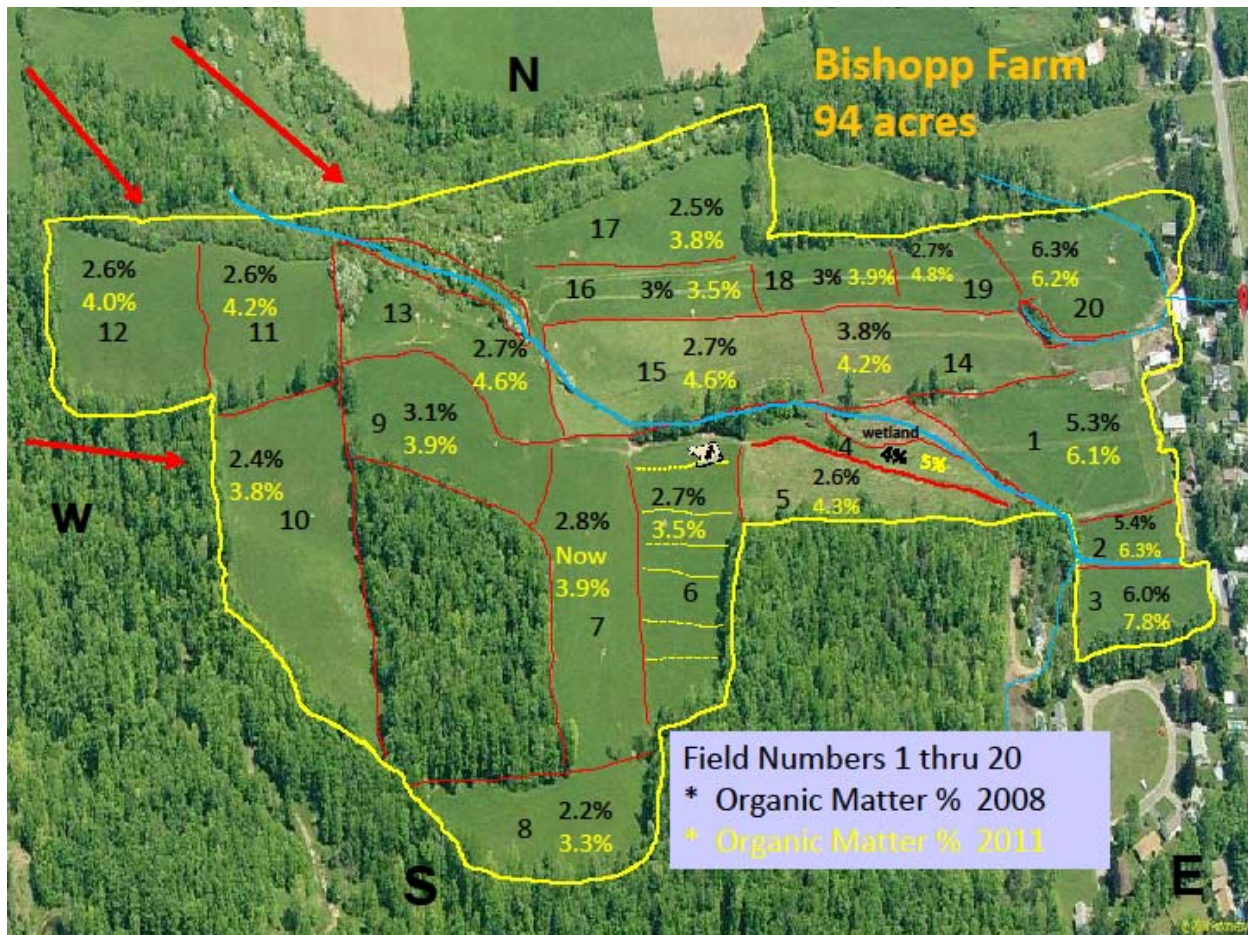
Since the 2008 samples and not suffering dementia yet, I could see and feel there was a distinct difference in soil structure especially in the heavily fallowed, mob grazed field. But would this feel translate into soil fertility?

I'm not gonna lie, back in 2008 I cheapened out on the soil test which showed me the bare bones NPK stuff, PH and organic matter levels. This time I wanted more so I paid (\$500) to get a more in-depth profile. Therefore the comparisons are somewhat mute, my bad. Here's some numbers from the 3 year trial: Total Farm Organic matter level went from 3.4% up to 4.6% with an increased CEC average of 11.5; PH levels went down slightly to 6.4. My phosphorus is very low, potassium is high, calcium is high and magnesium is high. Base saturation average values were as follows: K- 2.5%, CA- 69%, Mg- 18%, Na- .2%, H- 10%. Aluminum was 631, Sulfur was 11 and Boron levels were .8. According to Jerry Brunetti's soil report ideals, all these ppm/percentage numbers are near the ballpark. Am I going in the right direction according to my goals? I think so.

Interpreting these tests has me befuddled. My gut is telling me to spend money on amendments as are salespeople. But why, if my organic levels are increasing and my biological life is flourishing, how much do I care about all the myriad of expensive inputs and how will these help me make more money than the latter? I can appreciate that numbers establish trends, but I think there are other factors that warrant measurement too like soil carbon, targeted animal mineral feeding on the soil, nitrogen fixation from legumes, plant root/depth diversity, the dynamics of organic matter and humus and biological soil health tests.

My watershed likes these numbers especially the low phosphorus and higher organic matter and would suggest I am a decent steward by not adding too much fertility. Doing some farmer math on my 95 acres, this OM increase hypothetically added 950 tons of soil and sequesters 7.2 million gallons of rain, up from 5.3 million in 2008 not to mention other biological and nutrient benefits. So maybe my obsession with raising the all-mighty organic matter through grazing management, hay feeding and absolutely no tillage gets us closer to sustainable organic grass production.

I realize now how much I don't know about my soil. However, I am inquisitive enough to question how Mother Nature built a resilient prairie ecosystem without the advent of salt fertilizers, grain, plows, GMO seed and risk management plans. I am learning the more I replicate what works in nature the closer I can get to a truly regenerative system. Now if I can just slow down long enough to observe it happening without clouding the process by rash human decision-making.



Managing parasitic flies in pasture-based dairy systems

Dr. Wes Watson and Steve Denning, N. C. State University, Raleigh, NC

Four species of flies create problems on the dairy. The horn fly, *Haematobia irritans*, and the face fly, *Musca autumnalis*, are perennial pasture pests of cattle. Recently the stable fly, *Stomoxys calcitrans*, has significantly increased its status as a pasture pest and the house fly, *Musca domestica*, is an occasional pest in the pasture.

Horn flies are small flies commonly found on the backs and belly of cattle. Female flies oviposit in fresh dung, immediately after it has been deposited (Bruce 1964). The fly can complete development from egg to adult in 9-12 days. Horn flies overwinter as pupae beneath dung pats during the winter months. The horn fly is an obligate blood-sucking parasite of cattle as they take up to 10 or 12 blood meals daily. Horn fly feeding annoys cattle, alters their grazing habits, and decreases both milk production and weight gains. With numbers as high as 10,000 per animal reported, horn flies are considered the most important pest of pastured cattle in the US (Figure 1). Horn flies have been incriminated in the transmission of *S. aureus* mastitis. In a 2006 NC study 59 of 87 (67%) *S. aureus* positive cows on 3 dairies had *S. aureus* of the same clonal type as were found in horn flies collected from the same dairies (Anderson et al. In Press).

The face fly is the primary pest of pastured cattle in the northern tier states from coast to coast. The adult face flies is a little larger than a house fly. The face fly feeds on tears and mucus of the eyes and nose of cattle. Like the horn fly, face flies lay eggs exclusively in fresh cattle dung pats, and the life cycle can be completed in as little as 14 days. Adult face flies overwinter in attics and out-buildings and colonize cattle in the spring (Karfsur and Moon 1997). When face flies are abundant, cattle change grazing habits, which often results in poor utilization of pasture. In addition to the annoyance and irritation associated with its feeding habits, the face fly is the primary means of transmission of bacterial called infectious bovine keratoconjunctivitis (IBK), also known as pinkeye (Glass et al. 1982). Face fly infestations are estimated to cause annual losses of more than \$53 million in 1981. Action threshold levels of 10-15 flies per face were established to reduce the spread of pinkeye and maximize animal comfort. In the northeast face fly numbers often exceed 100 flies per face.

Like the horn fly, the stable fly is an obligate blood feeder that prefers the lower body and legs of the cattle for their 2-3 daily blood meals. When abundant, stable flies cause cattle to bunch in an attempt to avoid painful bites. Ovipositing stable flies prefer older dung mixed with straw, wasted hay and urine. Stable fly densities have increased in pastures with the use of round bale feeders (Broce et al. 2005). This is particularly evident in areas where cattle are fed hay outdoors and where ongoing drought forces farmers to provide hay during the summer.

House flies feed on a wide range of decaying organic matter including manure and mixtures of manure, and bodily excretions. House flies oviposit about 150 eggs in batches in a variety of media including, manure, soiled bedding, spoiled feed, and decaying organic matter similar to that preferred by the stable fly. The complete life cycle of a house fly may take as little as 7 days in warm weather. The house fly is particularly important in dairies for their ability to pick up and spread disease-causing organisms. House flies have been implicated in the spread

of over 30 bacterial diseases.

In eastern North Carolina, the horn fly is the most serious pest of cattle. Farmers have relied upon insecticides to control these flies for decades and the population has developed resistance to most insecticides approved for use on cattle. To address the horn fly problem, a uniquely designed vacuum powered walk through fly-trap was designed to remove flies from cattle as they pass through the trap (Figure 1). Weekly, horn fly densities per animal were assessed by estimating the total number of horn flies on 10 randomly selected animals in the milking herd. A second group of animals, not allowed to pass through the device, were used as the untreated controls. Mean horn fly densities were above 700 per cow when the study began. The fly vacuum was started on May 29, 2007. Within one week of operation the device removed 410,000 horn flies from the cattle passing through, and during the second week an additional 457,000 horn flies were trapped (Figure 2). Mean horn fly densities were reduced from 775 to 263 per cow the first week and by the third week fly densities were reduced to 150 flies per cow. The number of flies trapped by the third week had dropped to 216,000 and there was a 70% reduction in horn flies compared to control. By Sept. 26, 2007 over 2.4 million flies had been removed from 180 cows. Using this system, these cattle have been insecticide free for 5 years. Traps have since been placed on farms with known face fly and stable fly populations. These traps have removed over 15,000 face flies and 8,000 stable flies weekly from cattle passing through.



Figure 1. Vacuum trap mounted to exit chute at the Center for Environmental Farming Systems, Goldsboro, NC. The device may be mounted at the entrance to the parlor.

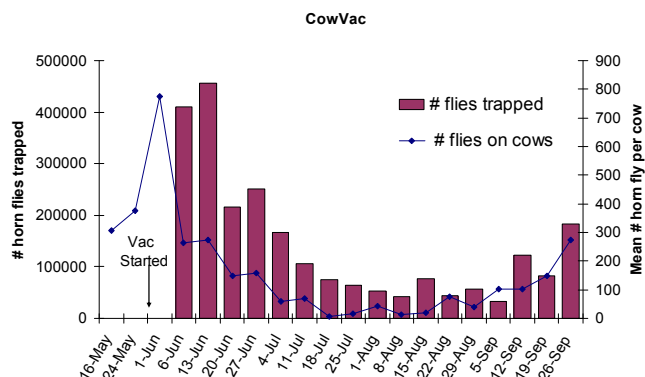


Figure 2. Total number of horn flies trapped and the mean number of horn flies per cow, CEFS farm, 16 May to 26 September 2007.

Matching Plants to Soil and Site Characteristics and Grazing System Goals and Objectives

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Learning objective: To have increased knowledge of factors to consider when choosing forage species.

Species selection based upon soil and site characteristics.

Many factors need to be taken into account when selecting suitable grass and legume species. Seed of a wide range of grasses and legumes is available in the Mid-Atlantic Region, and each species has its own particular characteristics, making it more or less suitable for a particular site and purpose. Many forage plantings fail or perform poorly simply because the species chosen for planting is not adaptive to the site or the area.

The first and foremost factor to be taken into account when selecting species is the necessity of matching grasses and legumes to the characteristics of the soil on which they are to be grown, characteristics such as soil type, drainage, moisture holding capacity, fertility and pH. But producers, farm supply personnel, advisors and consultants often select or recommend species based upon personal or industry preferences and biases without taking into account soil and site characteristics. To illustrate a rather common occurrence, I was asked several years ago to visit a newly constructed horse farm on the Eastern Shore of Maryland. It was a beautiful waterfront property fully constructed with new barns, board fences, road and laneways — pretty much everything a horse owner would want — except green pastures. A "shotgun" pasture mix of about a half dozen grasses and three or four legumes had been seeded, but a year and a half later very little of what had been seeded remained. Pastures were mostly either bare soil or crabgrass and weeds.

It was readily evident that most of the soil on the farm was very poorly drained and unsuited for the species most desired for horse pasture — orchardgrass, bluegrass and white clover. Other species in the mixture such as perennial ryegrass and timothy are not adapted to that area (hot, dry summers). The species that were adapted to the soil - tall fescue, reed canarygrass, alsike clover -were not acceptable to the owners.

The foremost consideration before purchasing the land should have been the soil and site characteristics and suitability of the land for the grass and legume species the owner desired for pasture. That thought never crossed the mind of the owner until the land had been cleared and construction of buildings, fences and facilities completed - a costly mistake. Unfortunately, this example is not an unusual occurrence, particularly with small and part-time farmers.

That is the reason so much emphasis is placed on conducting a thorough inventory of all available resources that will be utilized in the pasture and grazing program.

Among the questions to be addressed in the process of selecting adapted grass and legume species is: **What are the soil limitations of the fields in the grazing system?** Is drainage a limiting factor any place on the farm? Poorly drained soils place stresses on plant root systems. Species differ in their ability to persist on poorly drained soils. Are fertility and pH limiting factors? It is important to know not only what the fertility and pH limitations are, but also to know where they are (which fields). Old, permanent pastures typically have low pH and fertility, severe limitations especially for legume production. But keep in mind that soil pH and fertility are correctable limitations in forage systems. However, seldom can all fields be corrected to recommended pH and fertility levels at one time and it may take 2 to 3 years for surface applications of lime and fertilizer to effectively change levels in the root zone.

Tables 1 and 2 show the adaptations and characteristics of the most common grass and legume forages grown in the Mid-Atlantic Region. Note that soil characteristics (drainage, fertility and pH) are listed first, in the columns on the left, since they are the first criteria to be considered in matching forage species to soil and site characteristics. They determine whether a species is adapted to the soils on the farm. The drainage and fertility characteristics listed reflect the minimum level for adequate species adaptation. Next the appropriate species are listed, given the particular drainage, fertility, and pH characteristics of the soil. The remaining characteristics (reading to the right) are plant-related and determine which species should be selected for the intended use.

Other significant soil limitations include rooting depth and topography. Shallow soils are droughty and they will stress plants during hot, dry weather. Steep slopes limit access and operation of equipment for liming, fertilizing, clipping, etc., a criterion to consider with species requiring high pH and fertility.

Where or how can this information be obtained? It can be obtained from the local Natural Resource Conservation Service (NRCS) or Soil Conservation District (SCD) office. County soil survey books contain maps and descriptions of all the soils in the county. The descriptions include any limitations of a particular soil for agricultural production. A soils map, available free of charge from the NRCS or SCD in most areas, is a valuable tool in selecting forage species for a particular site. This information is essential, especially for land a producer who has not previously farmed and land being considered for purchase.

Soil fertility and pH status of soil is determined through soil testing. Soil testing is one of the first steps to be completed in developing a pasture improvement program.

Use Tables 1 and 2 to select species that will tolerate the soil and fertility conditions present. For example, alfalfa and orchardgrass are adapted to well-drained soils with high fertility. On somewhat poorly drained soils with medium fertility, red clover is a better legume companion with orchardgrass. On soils with poor drainage, reed canarygrass with birdsfoot trefoil or ladino clover are better adapted.

Species selection to meet grazing system goals

Once the list of species adapted to the soil conditions within the grazing system has been determined, further decisions on forage selections must be made with the ‘end user’ or grazing animal in mind. One consideration should be the nutritional needs of the species and classes of livestock which are to be grazed on each pasture field. Will the pasture support the type of animals that will be grazing?

Will it be used during early lactation and breeding (a time of maximum need for both quality and quantity as well as freedom from antinutritional constituents such as the endophyte that occurs in tall fescue)? Will it be for growth of replacement heifers or ewes or for backgrounding feeder calves? Growing animals and lactating animals require high quality forage (protein and energy) to meet production requirements.

What role will each pasture field play? Will it be part of the “backbone” of the grazing system or will it be a supplemental forage to fill a gap or low point in forage production? What will be the primary season of use? For example, tall fescue selected for fall and winter grazing will not provide grazing in August, September and October. Likewise, a productive summer grass like switchgrass will have a relatively short (but productive) growing season compared to tall fescue or orchardgrass.

What will be the frequency of grazing and the length of rest periods? Kentucky bluegrass and ladino white clover are more likely to persist under close grazing on a somewhat poorly drained soil with high fertility than are orchardgrass and red clover. What is the extent of traffic? Is the primary intended purpose of the pasture to be for an exercise lot for horses or loafing lot for dairy cows? In these cases, an endophyte-infected tall fescue is the species of choice.

Thus it is helpful to have some understanding of the forage quality of various species of forage grasses and legumes and to choose those which will best meet the nutritional requirements of the species and classes of livestock being grazed. Consider having several grass and legume mixtures to provide forage in as many months of the year as possible to reduce stored feed costs. Prepackaged “shotgun” mixtures of numerous grasses and legumes usually have no advantage over simpler mixtures that are carefully designed to match specific grasses and legumes to the soil and site characteristics and grazing system goals.

Table 1. Adaptation and characteristics of perennial cool-and warm-season forage grasses.

Soil Characteristics			Plant Characteristics							
Minimum adequate drainage	Minimum adequate fertility	Soil pH	Adapted species	Seedling vigor	Winter hardiness tolerance	Heat/drought tolerance	Palatability	Persistence	Growth habit	Frequent grazing tolerance
Cool-season grasses										
VPD ¹	M-H ²	5.8-8.2	Reed canarygrass	p ³	G	M	M-G	G	Open sod	M
PD	M	4.5-9.5	Tall fescue	G	G	G	M	G	Variable ⁴	E
			+endophyte	M	M-G	M	M-G	M	Variable ⁴	M
			-endophyte	E	P-M	P	E	P	Bunch	E
PD	M-H	5.6-6.2	Perennial ryegrass	G	G	G	G	M	Bunch	G
SPD	M	5.5-8.2	Orchardgrass	M	G	P	VG	G	Dense sod	E
SPD	M	5.8-6.5	Kentucky bluegrass	P	G	P	G	G	Bunch	P
MWD	M	5.4-6.2	Timothy	M	G	M	VG	G	Dense sod	P
MWD	H	5.8-6.5	Smooth bromegrass	G	M	VG	E	M	Bunch	M
WD	M-H	6.0-7.0	Prairie grass							
Warm-season grasses										
PD	M-H	5.0-?	Eastern gamagrass	VP	G	G	VG	G	Bunch	P
SPD	L-M	4.9-7.6	Switchgrass	VP	G	E	M	G	Bunch	P
MWD	L-M	5.4-6.2	Big bluestem	VP	G	E	G	G	Bunch	P
MWD	L-M	5.6-7.1	Indiangrass	VP	G	E	G	G	Bunch	P

1. VPD= very poorly drained, PD= poorly drained, MWD= moderately well drained, WD=well drained.

2. L= low, M= medium, H= high.

3. VP= very poor, P= poor, M= moderate (or medium), G= good, VG= very good, E=excellent.

4. Under lax cutting, tall fescue will have bunch growth; under frequent cutting or grazing it will form a sod.

Table 2. Adaptation and characteristics of perennial forage legumes.

Soil Characteristics				Plant Characteristics						
Minimum adequate drainage	Minimum adequate fertility	Soil pH	Adapted species	Seedling vigor	Winter hardiness tolerance	Heat/drought tolerance	Palatability	Persistence	Growth habit	Frequent grazing tolerance
PD ¹	M ²	6.0-6.5	White Dutch clover	G ³	G	P	VG	G	Spreading	E
PD	H	6.0-6.5	Ladino clover	G	G	P	VG	G	Spreading	E
SPD	M	6.0-6.8	Birdsfoot trefoil	P	E	M	VG	E	Bunch	M
SPD	M	6.2-6.8	Red clover	E	G	M	G	P	Bunch	G
WD	H	6.6-7.2	Alfalfa	G	E	G	VG	G	Bunch	Variable ⁴

1. VPD= very poorly drained, PD= poorly drained, MWD= moderately well drained, WD= well drained.

2. L= low, M= medium, H= high.

3. VP= very poor, P= poor, M= moderate (or medium), G= good, VG= very good, E= excellent.

4. Under lax cutting, tall fescue will have bunch growth; under frequent cutting or grazing it will form a sod.

5. Varies with variety--hay types do not tolerate frequent grazing (P), some grazing varieties have moderate to good tolerance (M-G).

Soil-Drainage Classes

0. Very poorly drained - Water is removed from the soil so slowly that the water table remains at or on the surface the greater part of the time. Soils of this drainage usually occupy level or depressed sites and are frequently ponded.

1. Poorly drained - Water is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during a considerable part of the year. Poorly drained conditions are due to a high water table, to a slowly permeable layer within the profile, to seepage, or to some combination of these conditions. The large quantities of water that remain in and on poorly drained soils prohibit the growing of field crops under natural conditions in most years. Artificial drainage is generally necessary for crop production.

2. Somewhat poorly drained - Water is removed from the soil slowly enough to keep it wet for significant periods but not all of the time. These soils commonly have a slowly permeable layer within the profile, high water table, additions through seepage, or a combination of these conditions. The growth of crops is restricted to a marked degree, unless artificial drainage is provided.

3. Moderately well drained - Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time. Moderately well drained soils commonly have a slowly permeable layer within or immediately beneath the solum (the genetic soil developed by soil-forming processes, normally includes the A and B horizons, or the upper part of the soil profile above the parent material), a relatively high water table, additions of water through seepage, or some combination of these conditions.

4. Well-drained - Water is removed from the soil readily but not rapidly. A well-drained soil has "good" drainage. These soils are commonly intermediate in texture, although soils of other textural classes may also be well drained. Well-drained soils commonly retain optimum amounts of moisture for plant growth after rains or addition of irrigation water.

5. Somewhat excessively drained - Water is removed from the soil rapidly. Many of these soils have little horizon differentiation and are sandy and very porous. Only a narrow range of crops can be grown on these soils, and yields are usually low without irrigation.

6. Excessively drained - Water is removed from the soil very rapidly. These soils may be steep, very porous, or both. Shallow soils on slopes may be excessively drained. Enough precipitation is commonly lost from these soils to make them unsuitable for ordinary crop production.

(Source: Soil Survey Manual. U.S. Dept. Agriculture Handbook No. 18,1962.

Breed and Animal Selection for Pasture-based Dairy Farms

Steven. P. Washburn³

Abstract

Pasture-based dairy systems use grazing to supply significant percentages of the dry matter intake of cows and heifers. Such systems vary from those for which pasture is used only as a supplemental feed for cows primarily fed a TMR to those in which pasture is the primary feed source. Cows that are optimal in a pasture system share many general characteristics with cows that are appropriate for a confinement system including feed efficiency, maintenance of body condition, reproductive fitness, udder health, longevity, and ability to adapt to various management systems. However, in such divergent feeding systems, the relative importance of various traits can differ. In pasture systems where cow nutrient demand intentionally coincides with seasonal forage availability, selection has been more balanced over the long term with emphasis on fertility and other fitness traits as well as on milk yield. Which breeds work best in a pasture-based system? Breeds or strains with higher percentages of protein and fat in milk typically have advantages in grazing systems that supply milk to solids-based or cheese markets. Holstein cows can work well in grazing systems that include supplemental concentrates or partial mixed rations and if seasonal calving intervals are not required. Crossbred cows can be selected for the specific grazing system to be used as well as the milk market, with the added advantage of heterosis for desirable traits. Breeds and crosses with high fertility are important for seasonal breeding and calving; ability of cattle to both milk and maintain sufficient body condition for reproduction are important in such a seasonal system. Dairy farms that depend on pasture for most of the forage intake for cows typically have lower production per cow than confinement dairies but are economically competitive because of lower operating and overhead costs and improved herd fertility. Although principles of selection are similar across a variety of pasture-based and confinement systems, optimal breeds, breed strains, and selection strategies can differ based on varying management constraints and objectives.

Why consider seasonal breeding and calving?: Seasonal breeding and calving are not required to have a successful pasture-based dairy farm but cows bred to calve in one or possibly two compact seasons can simplify animal management. Use of two calving seasons allows more consistent year-round production of milk if that is of concern for cash flow or is a requirement for marketing milk. Potential advantages for using seasonal breeding and calving in a dairy management system include matching forage availability to nutrient needs resulting in lower feeding costs; having fewer different groups of animals at any one time; being able to concentrate on specific tasks within short periods; and to vary the farm workload across the year.

A particular season of calving may be based on personal preference. One Vermont dairy producer likes for his cows to be dry in late summer so that he can go fishing. He indicated a need to feed cows in the winter anyway so milking in fall, winter, and spring and to take his

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break in summer suited him better. Certainly, if a high percentage of farms chose to be seasonal in the same season, price incentives would likely occur for calving at other times of the year.

There are also some potential disadvantages to seasonal calving. Matching the forage availability to the calving season may not result in the highest average milk prices and farm net income may not be enhanced even with lower feeding costs. Management of cash flow can be an issue with variable levels of milk income across the year. In seasonal herds, there is much more work from the start of calving through rebreeding which could add to farm family stress levels. Some dairy producers may prefer to have a more consistent workload for themselves and their employees. There is risk involved with needing to breed all the cows in a short period of time. Low conception rates (Washburn et al, 2002a), untimely disease outbreaks, or a nutritional crisis could lead to poor reproduction, thereby disrupting a seasonal calving strategy.

Making seasonal calving work. Typically seasonal dairy graziers try to have 80 to 90 % cows bred to calve in 9 to 12 wk by using a combination of AI and natural service. See Table 1 for expected pregnancy percentages at various rates of heat detection (submission) and conception for breeding seasons ranging from 3 wk to 14 wk. Note that pregnancy rates after 3 wk of breeding in a seasonal system have to be much higher than 21-day pregnancy rates typically achieved in year-round calving herds.

In New Zealand, 897 cows of which 14% were Jersey and 86% were Holstein-Friesian were evaluated for fertility in 2,594 lactations from 1986 to 2000 (Roche et al., 2007). After only 3 wk of breeding, 50 to 65% of cows were pregnant with higher proportions pregnant related to less body condition loss postpartum and to more weight gain during the breeding season. Breeding for 6 wk resulted in 69 to 85% pregnant whereas 12 wk of breeding resulted in 87 to 97% pregnancy. The high success rate by 21 days and beyond is consistent with a very high percentage of cyclic cows and very high conception rates.

In our own seasonal breeding work in North Carolina, conception rates were higher in Jerseys (60%) than Holsteins (50%) and pregnancy rates after 75 days (~11 wk) of breeding were 78% and 58%, respectively (Washburn et al., 2002b). Part of the difference was that only 86% of Holstein cows were detected in estrus whereas 96% of Jerseys were detected in estrus. No effect of season of breeding (fall vs. spring) was observed. Although not significant, pasture-fed Holsteins had numerically higher pregnancy rates than Holsteins fed a total mixed ration. More recently, fertility in a fall-calving pasture-based herd of cows with Jerseys, Holsteins, and crossbred cows has been summarized (Williams, 2007). Across the 2005 and 2006 breeding seasons, 90 days (about 13 wk) of AI breeding resulted in 90% of Jersey cows, 86% of crossbred cows, but only 70% of Holstein cows being confirmed pregnant. Fewer Holsteins were cyclic early after calving and Holsteins also had lower first service conception rates in both years.

In personal communication with several seasonal dairy graziers in the US, success rates are variable with a combination of AI and natural service breeding. Reaching 80 to 90% pregnant after 8 to 12 wk of breeding is often achieved but is not guaranteed. In many cases, such herds have mostly crossbred cows and/or a significant influence of Jersey or New Zealand Friesian genetics. I am familiar with one dairy grazer who uses 100% AI and calves 90 head of mostly Jersey/JerseyX cows in a 50-day period.

Because of potentially adverse effects of synchronization regimens on conception among cyclic cows, it is more common to use hormonal intervention only on cows that are not cyclic at the planned start of breeding (Rhodes et al., 2003). Also, New Zealand is now selecting bulls for shorter gestation length for use in breeding late in the season so that those cows will calve a few days sooner and have more recovery time in the next lactation. Daughter pregnancy rate (DPR) has been available in the US since 2003 (<http://aipl.arsusda.gov/reference/nmcalc.htm>) and dairy graziers interested in seasonal calving can now avoid using bulls whose daughters are less fertile without giving up much on Net Merit\$ (Norman et al., 2006).

Crossbreeding is a tool to consider: With changes in dairy genetics observed in the past 25 years including detrimental effects on various fitness traits associated with selection for high milk production, the possibility exists that crossbreeding may be even more economically beneficial now. Holstein dairy cattle still maintain a substantial advantage over other breeds and most crosses in fluid milk production. However, crossbreeding in dairy cattle can be economically competitive with pure breeds when multiple traits are evaluated within a production system.

Although selection within breed can address various limitations in dairy genetics across time, the possibility exists that crossbreeding may provide a more immediate solution for some traits under certain production systems and pricing structures. Jersey and Holstein crosses are the most common and are becoming well documented but many other breed combinations are of interest. Continued within-breed selection and use of crossbreeding together will likely be an optimal approach for maintaining genetic diversity and in improving future production efficiencies in various systems.

A simulation study by Lopez-Villalobos et al. (2000) in New Zealand examined economic implications of selection and breeding strategies among Holstein-Friesians (H), Jerseys (J), and Ayrshires (A). Crossbred groups were projected at equilibrium for the various 2-breed (HJ, HA, JA) and 3-breed (HJA) combinations. Relative net income per hectare or acre is a common measurement of economic efficiency for New Zealand dairy farmers and high components are valued more than milk volume. By setting projected net income per hectare at 100% for the Holstein-Friesian (H) herd, then the other breed groups ranked as follows: HJ = 127%, HJA = 124%, JA = 117%, J = 108%, HA = 108%, and A = 85%. Changing values for beef and ratios of fat and protein affected relative rankings some but in all scenarios, herds with crosses of Holsteins and Jerseys were projected to be most profitable per unit of land area (Lopez-Villalobos et al., 2000).

Under Australian conditions and pricing structures, performance data from cattle in 14 commercial herds were used in an economic model that projected a substantial operating profit advantage for a herd of Jersey x Holstein-Friesian crossbred cattle compared to a comparable herd (5.6% fewer cows because of cow size) of pure Holstein-Friesians (Pyman, 2007).

Using data available in 2000 through USDA, VanRaden and Sanders (2003) examined breed differences, heterosis, and net economic merit of various breeds and crosses. They concluded that Holsteins excelled for Fluid Merit \$ based on milk volume (low value on

components) over all other breeds or crosses. However, the average F1 crosses of Brown Swiss or Jersey with Holstein had an advantage over average Holsteins in Net Merit \$ (62% weighting on yield traits with 57% on fat and protein; 38% on other economic traits including PL) and for Cheese Merit \$ (high weighting on protein and fat). Because of the large population of Holsteins, mating of elite animals within Holstein was still an advantage over elite crossbreds in their calculations but those calculations are within a confinement type of system. Changes in the weighting of Net Merit \$ with the addition of daughter pregnancy rate and calving ability in recent years (Cole et al., 2010) may favor crossbred cattle in future evaluations, particularly in pasture-based systems.

Conclusions: Dairy graziers that depend on pasture for most of the forage intake for cows are interested in a profitable bottom line. Lower production per cow than confinement dairies is usually more than offset by lower operating and overhead costs. Improved health and reproductive efficiencies gained by seasonal breeding and calving typically result in accrued equity in replacement heifers that can be used for herd expansion or for sale as breeding stock. Optimal breeds and breed combinations and selection strategies differ based on management constraints and objectives.

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Table 1: Cumulative pregnancy rates¹ at varied rates of submission, conception, and length of breeding season.

Submission Rate²	Conception Rate³	Pregnant by 3 wk	Pregnant by 6 wk	Pregnant by 9 wk	Pregnant by 12 wk	Pregnant by 14 wk
90	60	54%	79%	90%	95%	97%
90	48	43%	68%	82%	90%	93%
90	36	32%	54%	69%	79%	83%
80	60	48%	73%	86%	93%	95%
80	48	38%	62%	77%	86%	89%
80	36	29%	49%	64%	74%	79%
70	60	42%	66%	81%	90%	94%
70	48	34%	56%	71%	81%	87%
70	36	25%	44%	58%	69%	74%

¹Pregnancy rates are the percentage of cows that conceive in a given breeding period. Pregnancy rates of 80% may be acceptable but above 90% is a good target for a total breeding period, usually between 8 and 14 wk in length.

²Submission rate is the proportion of cows that were cyclic and detected in estrus for insemination

³Conception rate is the proportion of inseminated cows that conceive.

The 'Green' of Grass

Clifford L. Hawbaker

Hamilton Heights Dairy, Chambersburg, PA and Emerald Valley Dairy, Newville, PA are owned and operated by Clifford and Maggie Hawbaker. The farms consist of 600 acres of pasture and hay ground which feeds 300 dairy cows and 150 heifers.

There's nothing greener than grass when I evaluate my experiences as a grazing dairy farmer. Along with pasturing 300 dairy cows on a grass legume mixture, we have adapted a term called 'sweet hay' for the hay harvested from our farms to complement our pasturing. The cattle are rotated daily in paddocks ranging in size from 4 acres to 8 acres.

We live in an area that in spring can be difficult to get hay dry. On day 1 we mow hay with a disk mower, uncrimped, followed by tedding, four to five hours after mowing. Day 2 in the afternoon, we rake, bale and tube wrap. The goal is to have the moisture content blow 28% dry matter with only one night of dew. This gives us the highest harvested quality of unfermented forage.

Growing of grass and legumes is what we do by grazing of livestock. High density grazing or mob grazing is what I call grazing by total body weight on a designated paddock for a short period of time. Grazing tall is not the same as grazing old. When grazing tall, the plant is allowed a rest period to achieve maximum yield of highly digestible forage. "Take half and leave half." This will give high animal performance in milk and meat. Grazing old allows the plant to mature with lower animal performance.

Pasturing and feeding unfermented hay crop and no corn silage has helped us to achieve a premium for the milk marketed as a grass based, all natural product through the Trickling Springs Creamery, a local organic and natural processor marketing in the Washington D.C. and Baltimore areas.

My grazing experience brings the greatest economic return and yield from our Class II soils by increasing the organic matter from 2.9 to a 5.6. Grazing also has lowered our dependence on fossil fuels for harvesting and feeding by 54%; 10,500 average gallons for years 2007 and 2008 to 4,800 average gallons for years 2009 to 2011. Stockpiling forage for both winter and summer reduces the energy required for baling and field renovation.

OAD – Once A Day Milking in and of itself may not be a practice for everyone. Our experience has been favorable when managing our operation as a whole, by looking at the big picture: my mission statement, the need to improve efficiency, and utilizing the best use of energy (labor, forage and fertilizer). Because we do not feed grain, milking twice a day would lower the body score. OAD does create a life style that is less demanding in labor requirements and mental energy. Our animal performance has improved in body score, breeding back is at 70 – 75% conception at first service and SCC is the same or lower when we were twice a day. Milking OAD does take longer and complete milk out is necessary.

The environment is greener by practicing grazing of livestock and hay making which improves air and water quality. It also aids in carbon sequestration and improved carbon footprint for the farms. Wildlife is enhanced with sightings of new bird varieties and animals.

The combined effect of land, grass/legumes, and livestock utilizes the solar energy for grasses to feed the livestock in return it enhances the land. It provides food and fiber for human consumption and an income and lifestyle for family and employees.

This synergy makes grass farming greener than green.

Animal Health Management in Pasture-Based and Organic Dairy Systems: The CowSignals® Evaluation Method

Hubert J Karreman, VMD
Organic Valley Staff Veterinarian

How many of us register what we see? As a farmer or advisor, what do you first notice when walking onto a pasture full of cows or when you enter a barn? What stands out to you right away? Besides what you are looking at, what do you smell, hear and sense?

Regardless of what we do in life, we can get into set routines. This is understandable and if it is a *good routine* it can be very useful in dairy farming, since cows will thrive on good routines in their daily life. But routines, if left un-checked and un-monitored, can deteriorate and a “bad” situation may become perceived as “normal”. Periodically it is good to have an outside person(s) review your system so things don’t fall between the cracks.

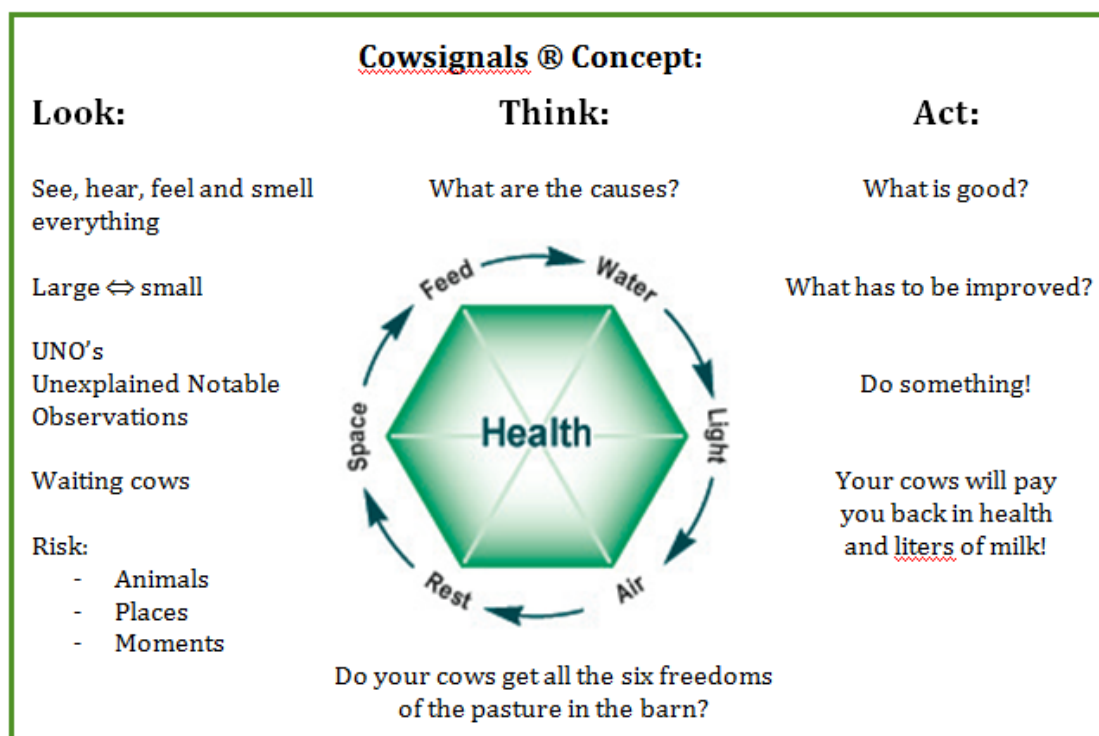
COW SIGNALS®

A Dutch group of down-to-earth, common sense veterinarians developed Cow Signals®, an evaluation method of dairy herd health which focuses on the difference between *looking and seeing* ... and about what you do with this information. It is a simple, effective method to help farmers and advisors evaluate cows and farms by utilizing checklists to see what is going well or what could be improved. The main goal is to create management systems which yield the healthiest possible cows - whether in a pasture-based system, a free-stall system, a bedded pack system, or a tie-stall system. The method was developed by the Cow Signals® Training Company (www.cowsignals.com) which is based in Holland and evaluates all kinds of dairy systems throughout the world. The evaluation system is based on two fundamental ideas: (1) cows tell it all and they never lie - the way they look and move always reveals the truth about their situation, (2) their natural behavior when eating, resting, getting up and walking while on pasture is the ideal and should be duplicated in any kind of housing system whenever the cows aren’t on pasture.

THE SIX FREEDOMS OF PASTURE

In any housing system, the six freedoms of pasture should be the standard to achieve when cows are inside. The six freedoms of pasture are proper feed, water, light, air, rest, and space. These factors create (or hinder) health. To put this into action, we first need to be aware of how cows behave in a pasture system – their natural motions when grazing and how they position themselves when lying down to rest or as they get up, as well as the space, water, air and light to let cows do the things cows do when out on pasture. For instance, watch a cow rest while on pasture – often times they will have a front leg stretched in front of them. When they graze, they also eat with one foot forward. Can they do these things in the barn – or are they hindered from doing so? These same sorts of abilities need to be provided with indoor stalls and at feed areas. Allowing good traction on walkways to allow a cow’s body to easily turn (instead of shuffle in short straight movements), allowing normal deep drinks of water at drinking areas, and having good, clean air to allow deep breathing and also proper lighting to see should closely

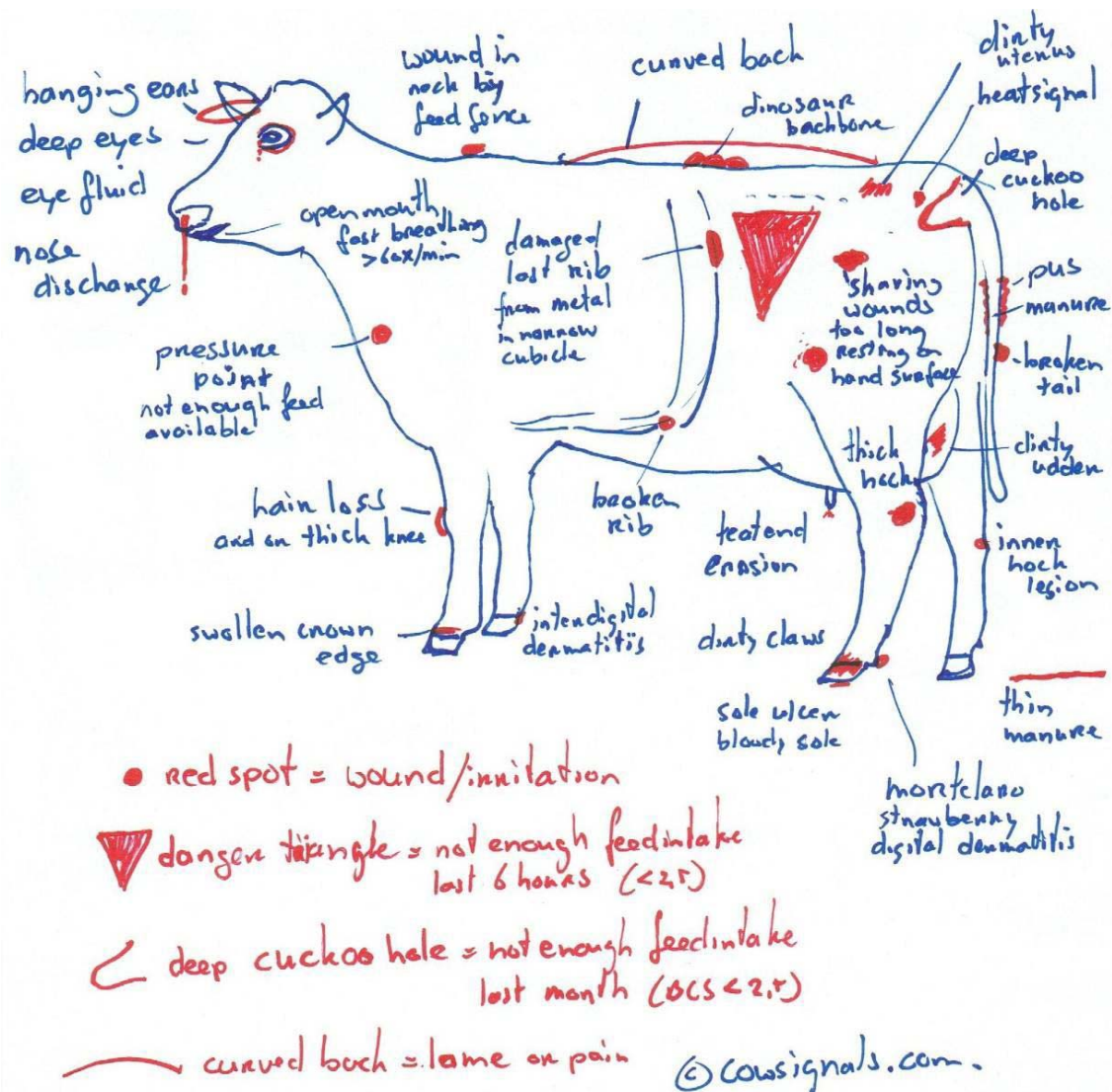
mimic life on pasture. This is because pasture is the most natural situation for a cow – and the Cow Signals® team fully realizes this. With proper pasture and barns the best possible milk production can occur because the cows are at their healthiest.



DIFFERENCE BETWEEN LOOKING AND SEEING

What do I see? How does this happen? What does this mean? Once these questions have been asked and answered, real solutions can be planned and action can be taken. By observing carefully and learning from the body-language of the cow and herd, diseases can be prevented. The Cow Signals® evaluation is essentially an exercise in looking from a different perspective at things that you are very familiar with. Are there unexplained notable observations (uno's)? How many cows are affected? For instance, seeing a bump on the front of both the shoulder blades, or a bump on the last rib or backbone, or a sore at the top of the neck, or missing fur at the hock, or a lack of fur along the rear leg muscle – what might these indicate?

Whatever we can see and take note of can help us start to think about what the cause might be. This will identify risk areas which will need improvement for the herd to perform better. In the examples given above, the problem (and solution) has to do with size of stalls and/or amount of dry bedding. Once we become attuned to why something is happening, we can take action. The goal is that your cows will pay you back with more milk in the tank, show better signs of fertility, have stress-free calving and much better starts to lactation.



COW SIGNALS®

THE CHECKLIST (3 PARTS)

1. GRAZING: Observe the Cows in the Field

1. The cows are quiet? alert? active? The cows are equally dispersed over the area? Herd behavior: all resting and ruminating or all eating? Do you see waiting cows?

2. Every cow has always unlimited access to feed and water, of good quality/quantity?

3. Is the group consistent for:

Check 10 random animals and find a percentage

	Average figure		% of extremes
Height & weight		Number of small heifers	
Color & shine		Number of dull cows	
Body position		Number of curved backs	
Body condition		Number <2.5; number >4	
Rumen fill		Number <2.5	
Hygiene (dirtiness)		Number of dirty udders:	

4. Check at least 5 of the following '*at risk cows*' for hair coat, rumen fill and body condition:

a. heifers

b. large cows

c. adult cows in first month of lactation

d. heifers in first month of lactation

5. The manure in the field is of the same consistency? Well fermented? There are no grains or fiber or gas bubbles visible?

6. What % of the cows have a dirty back/backside?

7. Any cows panting, coughing, snots in the nose?

8. Avoidance score: Walk slowly (1 yard / second) towards 3 cows while looking at their feet. You can approach them at: 5 yards – 2.5 yards - 1 yard - touch them?

9. Which places of risk do you see?

10. I see the following UNOs (unexplained notable observations):

What do these observations tell us about the herd today?

2. Herding: Bringing the Cows In

Cows walking:

1. All cows are walking at their natural pace? No heads up? No dunging? Are all the cows evenly spread out over the track?
2. I see no risk places: track, holding area, parlor, handling facility, feeding area?
3. The cows flow smoothly through tracks, holding area, parlor? I see no discomfort or upset?
4. What % of the cows walk with curved backs?
5. What % of the cows stand with curved backs? (on hard surface)

Holding area:

6. Any cow can walk from the back to the front? The rear gate has a bell and is used to reduce space, not to push cows? No heads up? No excessive dunging?
7. All cows are standing with four feet straight down? I see no leg lifting or stepping from foot to foot? There is no slipping or falling?
8. During the whole milking period, no cow is upset, anxious? (by humans, insects, and machines or backing gates)
9. The milker is not leaving the milking pit to chase cows in?
10. There is no shouting at cows? There is no hitting with a stick?
11. I see no panting, sweating or fresh air seeking behavior?

3. Milking, Handling, Feeding

Parlor:

1. Every cow walks voluntary in at her pace, head down, eagerly?
2. All udders are clean (hygiene score < 3)? There is little or no dung in the parlor? The parlor is clean?
3. Over 9 out of 10 cows stand still during preparation and attachment?
4. Over 9 out of 10 cows stand still during milking until the cluster is removed? No kicking? No stepping from foot to foot?

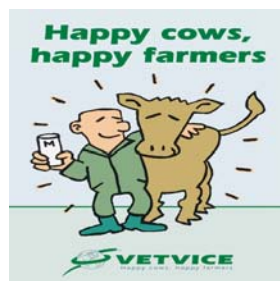
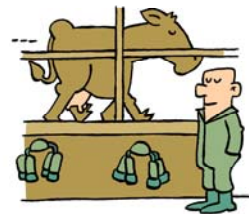
5. The milking routine is as follows: pre-dip / wipe / direct clustering / post-dip ... seconds between first touch and clustering? For every cow, every milking?
6. There is no discoloration of teats, or teat end damage (see teat score chart)?
7. There is sufficient light to see details?
8. You observe no wounds, bruises, infections, skin irritations?
9. Every cow walks out at her pace, head down, no dunging?

Feeding in the yard:

10. Every cow has unlimited access to a portion of feed of the correct quality? I see no waiting cows? All cows eat? All cows eat without sorting?
11. There is drinking water available?
12. I see no risk places?

Draw your own conclusions:

What is going well on this farm? Which critical cow signals do you see?
What can be improved, according to you?



Innovative Adaptations in Dairy Grazing Systems Across the U.S.

Mike Lamborn

Farm Consultant, DFA Grazing

The dairy farmer is an adaptable creature. In an industry ripe with fluctuating input costs and milk prices, in addition to being subject to a number of environmental factors, adaptability is a key to success. Wherever the production system is reliant on pasture, an even more generous amount of adaptability is required to maintain production, profitability, and sanity. Dairy graziers particularly have made a habit of devising unique adaptations to suit current local conditions in order to maintain simple and efficient systems that can achieve acceptable levels of profitability.

Perhaps the most significant element to which graziers must adapt is the climate. The climate differs so greatly across the country and throughout the year that I encounter a variety of techniques to mitigate the effects of a variable climate during my travels across the U.S. Your forage program, for example, must be developed with your climate in mind, taking advantage of the growing conditions you experience whenever possible to create a long and productive grazing season. Supplementary techniques such as stockpiling, fertilizing, and irrigating may be viable options for your operation. Secondly, as is the case this year in many parts of the country, you have to be prepared to withstand excessive heat and drought conditions, in addition to excessive moisture. You should also have a plan developed to deal with weather disasters. Finally, of course, we can't forget about the cows. To most efficiently produce milk from your land, in addition to your cows needing to be adapted and acclimated to your local environment, they also need to have the genetic makeup to harvest large amounts of forage and convert it into large amounts of milk.

Forage Programs

Extending the grazing season should be a high priority goal for any dairy grazer for a number of reasons. First, grazing properly managed pasture typically provides a higher quality forage than hay. It also does so at a lower cost than stored feeds. Generally, the less stored feed required, the lower the total feed costs, and the higher the profit margin realized. The labor required is also significantly less when cattle are grazed instead of fed stored feeds. Feed doesn't have to be delivered and manure doesn't have to be removed. Likewise, manure management is less of an issue. Instead of distributing concentrated manure from a feeding barn, the cows do it for you, and the forage and environment benefit. Extending the grazing season is beneficial regardless of location, although the best techniques to accomplish a longer grazing season will depend on location, type of operation, and other factors.

Utilizing Complementary Forages

The basis of a grazing platform is commonly warm or cool season perennials, or a combination of both, depending on your location in the country. Because the growth of any forage species is limited to specific conditions and times of year, utilizing multiple complementary forages can lengthen the grazing season by taking advantage of multiple growing conditions throughout the year.

In areas where cool season perennial grass pastures are predominant, a mid-summer slow-down in growth is common. This can be alleviated by adding a cool season perennial legume as a companion species, such as clover or alfalfa, resulting in better growth during the hot summer months.

Annual forages often carry higher cost than perennials, but they also often produce a higher quality forage, and at a time when perennials are dormant or very slow-growing. Their value is therefore higher, making them well worth the cost. Warm-season annual grasses such as the sorghum-sudan hybrids and millets can complement the cool season perennial forages. They provide abundant dry matter as the perennials slow down in the heat of the summer. Crabgrass can also be a valuable warm season annual. Yields may be lower than sorghum-sudangrass or pearl millet, but forage quality is good, especially for improved varieties such as Red River Crabgrass, and volunteer stands may provide multiple seasons of grazing.

There are a variety of winter annuals that can be a valuable component of any forage plan. Annual ryegrass is a common component of many forage plans, and provides great feed in the early and mid-spring when many herds begin calving and need a high quality forage. There have been great improvements made to annual ryegrass varieties that fit a wide variety of farm operations. Small grains such as rye, wheat, and oats can provide great grazing in the late fall, or even in other seasons in some cooler parts of the country. Brassica species such as turnip or kale provide a good quality annual forage in some areas in late fall and early winter if managed properly. Bloat may be an issue if Brassicas are the only feed available, and crop rotation will limit most plant disease issues.

Stockpiling

Stockpiling, or deferred grazing, involves the managed accumulation of forage for grazing into the autumn and winter. Nearly any forage could technically be stockpiled, but where tall fescue grows well, it is the most beneficial and most widely used stockpiled forage. Autumn growth of fescue is good and produces a good quality forage that maintains its quality well, and its waxy coating protects it from weathering. Aggressive grazing in the winter also does not prevent good springtime growth. These factors make tall fescue an ideal stockpiling forage.

Other cool season perennials can be stockpiled, but tend to decline in quality faster than fescue, and are less persistent under heavy winter grazing. Legumes and cool season annual grasses likewise decline quickly, but may be used for high quality grazing before and after the use of stockpiled fescue. Warm season perennials and annuals have been stockpiled with varying levels of success. They're generally thought to decline in protein too significantly, although can be utilized along with protein supplementation. Corn can be grazed in late summer and fall or allowed to mature and strip-grazed as standing corn. Corn's high energy value and high yield potential give it a lot of potential for stockpiling.

Strip grazing is the best method to maximize the economic impact of stockpiling by encouraging higher utilization rates, and maximally lengthening the grazing season. Try to offer strips as frequently as possible – every-other-day is a start, but every day or twice-a-day is even

better. Remember that cattle can graze through a decent amount of snow. A coating of ice, however, is a different story.

Grazing Management

Rotational grazing, utilizing periodic movement through multiple pastures or paddocks, can result in lengthening the grazing season on both ends, distributing forage growth over a longer period of time, and ensures forage intake is of the highest possible quality. In addition to regulating forage growth and harvest, rotational grazing also results in optimal manure distribution. Strip grazing also has its place within some systems, utilizing limited sections of high quality forage to ensure maximal utilization, or to limit forage intake when using the species as a supplement. Leader-follower systems can also be used successfully to provide different animal classes with forages of specific nutritional value.

Irrigation

Irrigation can relieve the slow growth or dormancy of pastures in mid to late-summer. Many factors must be considered to evaluate if the cost will result in sufficient gains. Availability and accessibility of an inexpensive water source is a major factor. 7-8,000 gallons per acre per day is required for effective irrigation, so you should check with a specialist to see if this quantity would be available to you at a reasonable price. The quantity and quality of forage produced from irrigation must justify the cost of setting up the system as well as running it. It typically requires many hours of use over many years to be economical. You must also consider if your farm is a good candidate for an irrigation system.

Fertilization

Well-fertilized pastures begin growth earlier and withstand stresses better than nutrient-depleted pastures. Soil testing is required to make informed fertilization decisions. Fertilizer can alter the timing of forage availability, so fertilizing can be thought of as essentially buying forage, and cheaply! Nitrogen is the most common limiting nutrient. 2-3 applications of 40-60 lbs. of Nitrogen per acre during the growing season are usually recommended for optimal response in forage growth and quality. In situations of excess spring growth, delaying the first Nitrogen application may be more beneficial.

Weather Extremes

This year, large portions of the country are experiencing a great deal of heat and various levels of drought – some quite devastating. Last year, the situation was very similar for many regions, although some areas saw destructive rains. The bottom line is, no matter where you are, you have to expect to experience weather extremes that are common to your region, and be at least reasonably prepared to handle weather events that are remotely possible, like extreme drought or hurricane rains. One weather extreme that we all need to get used to and learn how to deal with is heat.

Heat Stress

Recent research indicates that dairy cows begin to experience heat stress as temperatures reach the upper 60's (Fahrenheit). As the mercury climbs from there, dry matter intake, milk production, and reproductive efficiency suffer. Temperatures that begin to cause us discomfort are downright dangerous to cattle, and there must be systems in place to protect against heat stress in areas where summer temperatures are in the 80's and higher.

Barns outfitted with fans and sprinklers or misters are common and these systems can be retrofitted to a variety of existing structures. Manure and urine can accumulate in these areas and become problematic if the environment has inadequate air flow or excessive moisture, but advanced planning can limit these issues and maximize the cooling effect of fans and water delivery systems. In regions with high humidity, misters may be counterproductive if water droplet size is small enough to increase the humidity level in the barn without cooling the cow. Many systems in those areas are now designed to wet the cows relatively quickly and then shut off for a period of time to allow air flow to promote evaporation.

When on pasture, shade structures and cooling ponds can be used effectively. Both of these tools can also cause excessive waste accumulation that can compromise cattle health and milk quality. Mobile shade structures can better avoid this problem than stationary shade, although they are limited by size constraints. Cooling ponds can be quite effective and limit health issues when sized appropriately for the herd and water replaced on a timely schedule.

Cooling center pivots are perhaps one of the best systems I have witnessed. These systems can cool the ambient air by several degrees without causing moisture accumulation on the ground, and they keep the cows outside and able to graze.

Drought

Drought wreaks havoc on a forage plan and is probably the single biggest obstacle that showcases the adaptability of the dairy grazer. Many strategies are used to minimize the effects of drought depending on the farming system, forage plan, time of year, and of course severity of the drought. Slowing down the paddock rotation is sometimes enough to handle slight or moderate drought conditions for reasonable periods of time. In longer or more severe droughts, supplementary feed must be increased, sometimes to the point when sacrifice paddocks must be identified and utilized for feeding of stored feeds. These sacrifice paddocks are often paddocks due for renovation or otherwise able to take a lot of abuse.

If the drought cannot be counteracted by changing your feeding plans, then you'll have to reduce your herd's nutritional requirements. This can be done by a couple different routes. One would be to decrease the effective stocking rate by reducing herd size. This decision cannot be made lightly, as you'll either be reducing milk flow by selling cows, or compromising the future of your herd by selling heifers, and you'll of course be at the mercy of the cull cow or heifer market price conditions both at the time of sale and in the future when you expand the herd to previous size. Another strategy of reducing your herd's nutritional requirements is to decrease

its output. Milking once-a-day can reduce milk production sufficiently to support a lower dry matter intake. When milk production levels drop due to drought, a quick calculation of feed cost per cow can indicate the level at which cows should be converted from twice-a-day to once-a-day milking, or in extreme cases, should be dried off completely.

Excessive Rain

It may be hard for some of us to imagine, but some regions have dealt more with excessive moisture in the last couple years than they have with drought. These situations are a true test of your infrastructure. Certainly, with enough rain or flooding, any facility can be ruined, but well-planned facilities may be able to withstand good amounts of moisture that may devastate others. Key points here are appropriate elevations of your milking facility and your lane systems. Your milking facility should be situated and designed to be functional and comfortable in a wide variety of environmental conditions, including extreme heat, cold, wind, and rain. Laneways should be constructed to limit the possible damage from rain. Construction with appropriate materials is important, as is width, and adequate crowning.

The Grazing Cow

On 100 farms, there are probably 99 different definitions of the ideal grazing cow. A few basic principles, however, are well-accepted by most, and would suit a grazing dairy of any type. Gut capacity is perhaps number one. A grazing cow must be able to ingest and absorb adequate nutrients to support the production of large volumes of milk, and it takes a lot of grass to do that. I like to see cows with big, strong mouths, and wide, capacious bodies. Another important quality is strong feet and legs. We're asking our cows to go out and do a lot of work, so they've got to have the feet and leg structure to support that. A smaller-framed cow has a benefit in this area, as well as in heat dissipation, and in lower nutritional requirements for maintenance. Of course, in seasonal herds, exceptional reproductive efficiency is essential. The ideal milk production profile may differ based on how you're paid, but an acceptable milk volume is always a positive factor.

Everyone's got their favorites, but in my mind, to find a smaller-framed cow with strong feet and legs, exceptional reproductive efficiency, acceptable milk production, and that can eat a lot of grass, you have to look at Jerseys and Jersey-crosses, and you'd be doing yourself a disservice if you didn't look at the genetics coming out of New Zealand. The amount of data they've accumulated and analyzed on Holsteins, Jerseys, and Crossbreds, all compared on the same level playing field, is unmatched and extremely informative. This is a situation where emotions and prejudices need to be thrown out the window and you need to examine the facts on paper. Of course, consideration of your local environment is important. Your genetics have to be able to perform in your environment to reach the full potential. Hot climates need heat-adaptable cows. Volume-deficit areas need high volume cows. Hybrid graziers might need cows that respond well to feed supplementation.

Observations on alfalfa & alfalfa-grass mixtures for dairy grazing systems in North Carolina using organic or conventional management

Eileen Balz, Steve Washburn, and Sue Ellen Johnson¹

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Note: Observations herein were adapted from an MS thesis completed in 2011 by Eileen Balz under the direction of Drs. Washburn and Johnson. Financial support was provided through a Southern region SARE grant: *Research and educational support for organic dairy farming in the South*.

Over two years, two varieties of alfalfa (Haygrazer and Arriba) were planted in replicated grazing plots of approximately 2 acres each (Field 1, Oct 2009) or about 1.25 acres each (Field 2, Oct 2010) on sandy soils under either organic or conventional management. Both fields were planted into a prepared seedbed after appropriate fertilizer and lime were applied according to soil test recommendations and following organic guidelines for the organically managed areas except that organic seed was not used. Before planting, the herbicide Eptam® was incorporated into conventional plots whereas organically managed alfalfa was planted without any herbicide. For Field 1, Matua or Lakota prairie grasses were drilled into organic and conventional plots in late winter (Feb, 2010) whereas for Field 2, Matua was planted with the alfalfa in half of each of the organically managed plots in Oct 2010. Stands of the prairie grasses were better with fall planting. Field 1 had several years of annual ryegrass in winter and sorghum-Sudangrass hybrid in summer whereas Field 2 had been in hybrid Bermudagrass sod for several years and a smother crop of sorghum-Sudangrass was planted in May, 2010 to suppress the Bermudagrass before the field was disked and planted to alfalfa in the fall.

Because Eptam was in the conventional plots, there was more winter weed pressure in organic plots for several months after planting as well as volunteer forage grasses. This was particularly true for henbit during the first winter in Field 1. Henbit has been documented as a potential ovipositioning site for alfalfa weevil and may have contributed to higher weevil counts in organic plots earlier than in conventional plots as observed in March, 2010 (see below). Primary weed species observed in organic plots were henbit in winter and early spring, chickweed in spring, and spiny amaranth (pigweed) in late spring and summer. Forage grasses including the planted prairie grasses and volunteer ryegrass in winter and spring, and volunteer crabgrass in summer. In Field 2, there was not much residual Bermudagrass after using the summer smother crop procedure. Presence of weeds was very low for the first winter and early spring for conventional plots but by mid summer, the amount of spiny amaranth was similar in both systems. Winter weeds during the second year were also similar across management systems in Field 1. Interestingly, the different history of Field 2 resulted in very little henbit in either conventional or organically managed plots.

Each year scouting for Alfalfa weevil started in February and continued through April as

needed. For organic management, alfalfa was grazed by lactating cows at an economic threshold of 3 weevil larvae per stem regardless of the maturity of the alfalfa. Otherwise, plots were grazed when maturity reached late bud to early bloom. Alfalfa weevil counts did reach 3 larvae per stem in some of the conventional grazing plots in Field 1 on April 6th, 2010 and on March 29, 2011 but because of the 14-day withdrawal time for the insecticide, we chose not to spray. In 2012, plots in both fields were scouted a few times and as weevil larval counts began to rise, it was decided to graze both conventional and organically managed alfalfa plots relatively early when alfalfa plants averaged between 15 and 20 inches in height. Cows used for the grazing system included Jerseys, Holsteins, and Jersey-Holstein crosses and were separated into organically or conventionally managed groups.

We did observe in late April, 2011 that many pupating alfalfa weevil larvae had been parasitized with *Bathyplectes anurus*, a parasitic wasp first imported to Utah from Italy in 1911 for biological control of the alfalfa weevil. Because we managed some of the alfalfa using organic principles and managed the conventional alfalfa using scouting data rather than spraying at the first sign of feeding damage, we likely facilitated greater survival of parasitic wasps as well as other beneficial insects.

Yields of alfalfa and total forage yields were examined for both conventional and organically managed areas. In the spring of 2010 and again during the summer, we experienced periods of mild to moderate drought and the alfalfa varieties we used were nearly dormant for a while. Therefore, overall yields in Field 1 were lower than expected in the first year. Yields of alfalfa by itself were similar for both organic (2.53 vs. 2.48 +/- 0.2 tons DM/acre) and conventional (across 4 grazing periods in 2010). However, there was a tendency for yields of all forage species (alfalfa + forages grasses including ryegrass, prairie grass, and crabgrass) tended to be greater for organically managed areas vs. the conventional system (3.12 vs. 2.56 +/- 0.2 tons DM/acre, $P = 0.06$). Weed yields were only 8.9% and 8.7% of the total biomass for organically vs. conventionally managed areas, respectively and the respective proportions of those weeds were 80.9% vs. 87.9% spiny amaranth (pigweed) observed in the summer. Common chickweed was the second most common weed and in grazing systems, cows readily consume it.

For Field 1 in the second spring (2011), a grazing was done in early February in both organically and conventionally managed systems to potentially reduce egg masses of alfalfa weevil in alfalfa stems and in henbit. Two additional grazings for each plot were done in March, April, or May with timing based on alfalfa weevil pressure and/or alfalfa maturity. In this situation, collective spring alfalfa yields tended to be greater for conventionally managed alfalfa (1.43 vs. 1.21 +/- 0.06 tons DM/acre, $P = 0.09$) but yields of ryegrass and prairie grass more than offset the difference (1.43 C vs. 1.58 O +/- 0.07 tons DM/acre, N.S). Weeds made up 15.8% of the total biomass in the conventional plots but only 8.4% in the organic plots. Primary weeds were henbit in February and chickweed in March to May with over 80% of the weed biomass being chickweed.

For Field 2, winter weeds were not as much an issue nor were the alfalfa weevil the first spring after planting. Yields for one grazing period were collected in both organically and conventionally managed plots in early May. Yield of alfalfa alone was actually greater for the organic area (0.64 vs. 0.49 +/- 0.02 tons DM/acre, $P = 0.004$) suggesting that use of Eptam may

have an inhibitory effect on new alfalfa stands. When yields of total forage species (alfalfa + ryegrass + prairie grass) were included, differences were even greater in favor of organically management: 0.69 vs. 0.49 +/- 0.03 tons DM/acre, $P = 0.001$). Primary weed was chickweed which made up 3.1% of the total biomass in organic areas and 7.5% in conventional areas.

Because organically managed alfalfa was planted with or without prairie grass, those yields were compared but differences were not significant. Alfalfa yields were numerically greater for plots without prairie grass (0.65 vs. 0.61 tons DM/acre) whereas total forage yields were numerically greater (0.73 vs. 0.66 tons DM/acre) for plots with prairie grass. Weeds (mostly chickweed) were only about 3.1% of total biomass for that single spring grazing.

Summary: Conventional management generally produced more actual yields of alfalfa than organic management. However, alfalfa grass mixtures yielded as much or more useable forage without the need chemical control of weeds and insects. Interseeding prairie grass may be useful in suppressing weed production but may or may not boost total forage production. Less weed pressure (particularly henbit in fall/winter) could reduce ovipositioning sites for alfalfa weevil. Longevity of stands and productivity over time remain to be determined. However, it is clear from our initial efforts that managing organic stands of alfalfa and alfalfa-grass mixtures is a feasible option in eastern North Carolina.