30th Annual

February 25, 2014
University Plaza Hotel
Springfield, Missouri

Welcome to the 30th Annual Southwest Missouri Spring Forage Conference
February 25, 2014

Thank you for attending the 30th Annual Southwest Missouri Spring Forage Conference! We are proud that since 1984, producers have been attending this one-day conference full of education and information about forages, livestock, and other agriculture-related topics. We have a great day planned for you.

We are privileged to have Grazing Lands Consultant – Jim Gerrish as our keynote speaker this year! Mr. Gerrish is a highly respected consultant who works with ranchers across the United States and Canada. His luncheon topic will be "How do you know a change in your management will be profitable?" During a morning breakout session, Mr. Gerrish will discuss grazing management based on the four ecosystem processes. Other interesting breakout session topics include soil health and grazing, addressing misconceptions in agriculture, multi-species grazing management (cattle, sheep, and goats), using strip-grazing to manage annual and perennial pasture, pasture renovation and restoration, getting started with your grazing system (producers' experiences), opportunities in grass-based dairy production, economics – how to cut costs, poisonous plants, manage what you have – plant fence posts first, and quality hay production. Thank you to all of our speakers whose presentations will help attendees improve their operations.

During registration and between sessions, please take time to visit our trade show and enjoy refreshments. We have about 30 exhibitors available for you to view and discuss their services and products. We thank our sponsors and exhibitors for providing information and being a resource for our livestock producers; your support helps keep registration costs low for attendees.

This year we recognize and honor the Greene County Soil and Water Conservation District and their long-time District Manager Deneen Jenkins. Thank you for providing conference administration responsibilities for the last thirty years. We also thank Crowder College for helping to support the printing of this proceedings handbook.

The Spring Forage Conference Planning Committee is a partnership of the USDA Natural Resources Conservation Service, Soil and Water Conservation Districts, Missouri Department of Conservation, University of Missouri Extension, USDA Farm Service Agency, Missouri State University Darr School of Agriculture , Lincoln University Cooperative Extension, and private landowners and businesses. The planning committee is committed to making this conference a fantastic day and a great source of information for our producers, sponsors, exhibitors, and partners. Thank you for everyone's time, hard work, and involvement that help make this a quality conference.

If you have questions or comments during the conference, please feel free to contact me or any of the committee members (we are wearing tan shirts). Please fill out the questionnaire at the end of the day and give us your recommendations for future conferences. We read these carefully and make many decisions based on your insights. See the list of committee members if you would like to contact us directly.

Please make yourself familiar with this proceedings handbook – agenda for the day, planning committee members, sponsors, trade show vendors, speaker photos and biographies, speaker presentations, and sponsor advertisements.

Thank you for attending this year's Southwest Missouri Spring Forage Conference. We hope you enjoy yourself as you hear and meet with leaders and friends in the forage and livestock industry.

Sincerely,

Rita Mueller
2014 Chair, Southwest Missouri Spring Forage Conference Planning Committee

30th Annual Southwest Missouri Spring Forage Conference

Tuesday, February 25, 2014
8:00 - 8:45 am
REGISTRATION & VISIT TRADE SHOW

8:45 - 9:30 -- CONCURRENT SESSION A
(Select one of these four sessions to attend)

((A1)Grazing Management Based on the Four Ecosystem Processes
Jim Gerrish, American Grazinglands Services
Patterson, Idaho

(A2) Soil Health and Grazing (HighDensity/Short Duration)
(REPEATED at 2:45 pm)
Doug Peterson, State Soil Health Specialist
NRCS, Gallatin, MO

(A3) Addressing Misconceptions in Agriculture
Glen Cope, Producer
Barry County, MO

(A4) Multi-Species Grazing Management (Cattle, Sheep, Goats)
Randy Williams, Producer
Arkansas

9:30 - 10:15 am -- BREAK & VISIT TRADE SHOW

10:15 - 11:00 -- CONCURRENT SESSION B
(Select one of these four sessions to attend)

(B1) Using Strip-Grazing to Manage Annual and Perennial Pasture
(REPEATED at 2:45 pm)
Mark Kennedy, Producer
Texas County, MO

(B2) Pasture Renovation and Restoration
(REPEATED at 2:45 pm)
Sarah Kenyon, MU Extension Agronomy Specialist
Houston, MO

(B3) Getting Started with Your Grazing System, Producers' Experiences
Larry Israel, Producer, Stone County, MO
Ron Locke, Producer, Dallas County, MO

(B4) Opportunities in Grass-based Dairy Production
Joe Horner, MU Extension Agriculture Economist
Columbia, MO

11:00 - 11:45 am
BREAK & VISIT TRADE SHOW

11:45 -- LUNCHEON

30th Annual Southwest Missouri Spring Forage Conference

Emcee – Dr. Ansen Elliott
MSU Darr School of Agriculture

Keynote Address

"How Do You Know a Change in Your Management Will be Profitable?"

Jim Gerrish, American Grazinglands Services
Patterson, Idaho

1:00 - 1:45 pm -- BREAK and Visit Trade Show

1:45 - 2:30 -- CONCURRENT SESSION C
(Select one of these four sessions to attend)

(C1) Question & Answer time with Keynote Speaker
Jim Gerrish, Patterson, Idaho

(C2) Economics - How to Cut Costs
Wesley Tucker, MU Extension Agriculture Economist
Bolivar, MO

(C3) Poisonous Plants
Tim Evans, DVM/PhD
University of Missouri, Columbia, MO

(C4) Quality Hay Production
Tim Schnakenberg, MU Extension Agronomy Specialist
Galena, MO

2:30 - 2:45 pm -- BREAK

2:45 - 3:30 – CONCURRENT SESSION D
(Select one of these four sessions to attend)

(D1) Manage What You Have - Plant Fence Posts First
Mark Green, District Conservationist
NRCS, Springfield, MO

(D2) Soil Health and Grazing (HighDensity/Short Duration)
Doug Peterson, State Soil Health Specialist
NRCS, Gallatin, MO

(D3) Using Strip-Grazing to Manage Annual and Perennial Pasture
Mark Kennedy, Producer
Texas County, MO

(D4) Pasture Renovation and Restoration
Sarah Kenyon, MU Extension Agronomy Specialist
Houston, MO

3:30 pm ADJOURN

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February 25, 2014

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The Conference Committees would like to thank all the sponsors and vendors for their help in making the 2014 conference successful.

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Barry, Barton, Camden, Cedar, Christian, Dade, Dallas, Douglas, Greene, Hickory, Jasper, Laclede, Lawrence, Newton, Polk, St. Clair, Stone, Taney, Webster, Wright Counties

Missouri Department of Conservation

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Riverside, MO 64105
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Hamilton Native Outpost
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800-536-2683 ext. 329

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Trade Show Vendors

Legacy Farm and Lawn
208 Route A
Lockwood, MO 65602
417-232-4578

MFA Incorporated
201 Ray Young Drive
Columbia, MO 65201

MO Ag. and Small Business Development Authority
P. O. Box 630 - 1616 Missouri Blvd.
Jefferson City, MO 65102
573-526-6827

Missouri Forage and Grassland Council
PMB 225, 2000 E. Broadway
Columbia, MO 65201
mfgc@mchsi.com

Monty's Plant Food Co.
4800 Strawberry Lane
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Race Brothers Farm Supply
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S & H Farm Supply
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Lockwood, MO 65682
417-232-4700

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2850 W. Kearney
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417-664-2122

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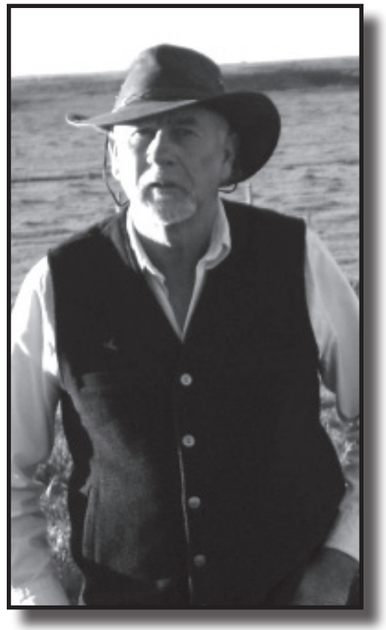
Key Note Speaker Biography



Jim Gerrish is an independent grazing lands consultant providing service to farmers and ranchers on both private and public lands across the US and Canada. He currently lives in the Pahsimeroi Valley in central Idaho and works with numerous ranchers across the US and Canada using both irrigated pastures and native rangeland as well as working in the high natural rainfall environments of the eastern US. He received a BS in Agronomy from the University of Illinois and MS in Crop Ecology from
University of Kentucky. His past experience includes over 22 years of beef-forage systems research and outreach while on the faculty of the University of Missouri. The University of Missouri-Forage Systems Research Center (FSRC) rose to national prominence as a result of his research leadership. His research encompassed many aspects of plant-soil-animal
interactions and provided foundation for many of the basic principles of Management-intensive Grazing.

He has written a regular monthly column in The Stockman Grass-Farmer magazine for over 12 years. He has authored two books on grazing and ranch management. Management-intensive Grazing: The Grassroots of Grass Farming was published in 2004 and Kick the Hay Habit: A practical guide to year-around grazing was published in 2010.

Jim was co-founder of the very popular 3-day grazing management workshop program at FSRC. These schools were attended by over 3000 producers and educators from 39 states and 4 Canadian provinces from their inception in 1990 through 2003. Fifteen other states have conducted grazing workshops based on the Missouri model and Jim has taught in eleven of these states. He is an instructor in the University of Idaho's Lost River Grazing Academy held twice annually near Salmon ID. He typically speaks at 40 to 50 producer-oriented workshops, seminars, and field days around the US and Canada each year.

For 22 of the years he spent in Missouri, he stayed in touch with the real world on a 260-acre commercial cow-calf and contract grazing operation. In this setting, he took a worn out marginal crop farm and converted it to a highly productive grass farm. After the move to Idaho, Jim keeps his day-to-day grazing tools sharp through management of a ranch unit consisting of 450 center pivot irrigated pastures, 90 acres of flood ground, and several hundred acres of rangeland.

He was deeply involved in the Green Hills Farm Project, a grassroots producer group centered in north-central Missouri and emphasizing sustainability of family farms. His research and outreach efforts have been recognized with awards from the American Forage and Grassland Council, Missouri Forage and Grassland Council, National Center for Appropriate Technology, USDA-NRCS, the Soil and Water Conservation Society,

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Speaker Biographies

Glen Cope is a fourth generation cattle rancher who lives south of Aurora, Missouri, with his wife, Leanne, and their two children, Orran and Katie.
After receiving his degree in Animal Science from Missouri State University, Glen returned home to the fourth generation cattle ranch operation that encompasses 2,500 acres of land spread throughout Barry and Stone Counties. He, in partnership with his dad and brother, manage a 550-head commercial cow-calf and backgrounding operation.

Glen serves on the Missouri Beef Industry Council Board of Directors. He is a member of the MFA, Inc. Board of Directors. He is a member of Missouri's Agricultural Leadership of Tomorrow (ALOT) Class 12 and serves on Congressman Billy Long's Agriculture Advisory Committee. He was the 2010 Missouri Farm Bureau Young Farmer and Rancher Committee Chairman and the 2012 American Farm Bureau Young Farmer and Rancher Committee Chairman.

Tim J. Evans Associate Professor

- DVM, University of California , Davis
- MS, University of Missouri-Columbia
- PhD, University of Missouri-Columbia
- Diplomate American College of Theriogenologists
- Diplomate American Board of Veterinary Toxicologists
- Section Head - VMDL Toxicology Section

Email: evanst@missouri.edu

Research Emphasis: Developmental/Reproductive Toxicology and Pathology Dr. Evans' doctoral research involved various aspects of the bioavailability and toxicokinetics of environmental contaminants, such as lead and cadmium, in porcine and cellular models. Dr. Evans' clinical research projects investigate the effects of mycotoxins on animal reproduction and the pathogenesis of reproductive disease in domestic animals. Dr. Evans' current comparative research focus is the development of porcine models to study the adverse effects of toxicants on the male reproductive tract.

Teaching: Toxicology

Dr. Evans teaches clinical and diagnostic toxicology and presents lectures on poisonous plants within the veterinary professional curriculum.

Selected Publications:

Evans TJ, James-Kracke, MR, Kleiboeker SB, Casteel SW: Lead enters Rcho-1 trophoblastic cells by calcium transport mechanisms and complexes with calcium-binding proteins. Toxicology and Applied Pharmacology 2003; 186:77. [Abstract]

Evans TJ: Endocrine alterations associated with ergopeptine alkaloid exposure during equine pregnancy. The Veterinary Clinics of North America :Equine Practice 2002; 18:371. [Abstract]

Evans TJ, Miller MA, Ganjam VK, Youngquist RS: Morphometric analysis of equine endometrial periglandular fibrosis. American Journal of Veteriary Research 1998; 59(10):1209. [Abstract]

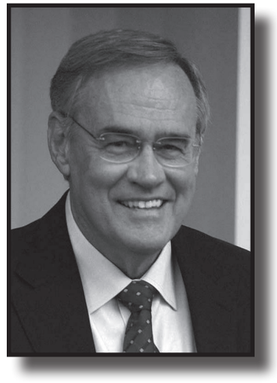
Doug Peterson has been an NRCS employee for over 25 years. He started his career as a Soil Scientist. He has been a District Conservationist in both a grassland based county in south Missouri and a large cropland county in north Missouri. Currently he is the State Soil Health Conservationist teaching NRCS staff and producers around the state about soil health, how it impacts virtually all natural resource processes, and what type of management it will take to effectively improve our soils health.

He attended college at Missouri Western State University graduating in 1986 with a B.S. degree in Agriculture with an emphasis in Economics and Agronomy.

He grew up on a crop and livestock farm near Newtown in north Missouri. Today he operates a cow/calf and contract grazing operation with his father, Steve. Currently they run about 450 cows. They utilize Management-intensive Grazing and Holistic High Density Grazing to improve soil health, eliminate the need for most purchased fertilizer and limit hay needs to about one bale per cow per winter.

Doug's NRCS training coupled with his real world hands on experience make him a unique speaker that is relatable to both agency personnel and producers.

He has been married to his wife Diane for 20 years and they have three kids, Sydney, Paige and Spencer.



Dr. Anson Elliott has been engaged in agriculture as a farm boy, high school ag teacher, researcher/plant breeder, high school and college teacher, and now Director of Missouri State University's Agriculture program. Although his training and work in plant breeding took this Texas County, Missouri-boy to the University of Minnesota for several years (where he developed and released the first of its kind: an improved variety of wild rice), he is perhaps best known as the quick-witted and almost-always-smiling administrator of the William H. Darr School of Agriculture. Under his 35 years of guidance, the School has grown to include over 580 students with ag as their major; four research, demonstration and education facilities totaling over 3800 acres of grazing, forage, equine, and forest land, as well as vineyards and orchards. His familiarity with the circumstances and needs of south Missouri make him a favorite advisor to anyone with interests in agriculture from high school students to US Senators. Dr. Elliott and his wife Betty live in Springfield, Missouri.

Sarah Kenyon is an Agronomy Specialist for the University of Missouri Extension headquartered in the Texas County Office. She completed a Bachelor's Degree from College of the Ozarks, and then continued her education earning a Master's Degree in Crop, Soil, and Environmental Sciences from the University of Arkansas. Upon completing a master's degree, she worked as a forage and crop advisor for Grassland Consultants, a New Zealand style grazing dairy operation. Sarah has been with MU Extension for four years, and is currently working toward completing a PhD in Plant Sciences.

Mark Green, District Conservationist, USDA Natural Resources Conservation Service (NRCS), Springfield, MO. Mark was born in Scottsbluff, Nebraska and was raised on a ranch southwest of Denver, CO. He received his Bachelor of Science Degree in Agronomy from Southwest Missouri State University in 1983. Mark has worked for the SCS/NRCS since 1981. He has worked as Soil Conservationist, Area Resource Conservationist and District Conservationist for SCS/NRCS. He has been serving in Greene and Webster Counties in SW Missouri since 1994. He also worked in Caldwell County in NW Missouri early in his career. Prior to working for NRCS Mark worked for Haubien Farms at Lockwood, Missouri. Other jobs prior to college included Beechwood Ranch, Joplin, MO; Corder Ranch, Avilla, MO and Limon, CO; Deer Creek Valley Ranch, Pine, CO. Mark grew up in a ranching family in Colorado. Currently Mark serves as an instructor and regional coordinator for SW Missouri Regional Management-Intensive Grazing Schools. Mark is a member of American Forage and Grassland Council and is a Board Member for Missouri Forage and Grassland Council. Mark has worked with grazing management in SW Missouri for the past 32 years. He has been married to Jill for 35 years and has three grown children and two grandchildren.

Wesley Tucker is an Agriculture Business Specialist for University of Missouri Extension. His specialties include livestock marketing, financial management, forages, beef production, rotational grazing, budgeting, fence law, and farm leases. A Southwest Missouri native, Wesley grew up on the family beef operation where he continues to farm today. He and his wife, Heather, a local veterinarian, and their daughter, Jordan, operate a crossbred cow-calf operation in Dallas County. As a University of Missouri Extension specialist, Wesley's primary educational focus is helping producers improve the profitability of their farming operation.

Mark Kennedy was raised on a diversified family beef, dairy, and catfish farm in central Arkansas and received a BS degree in animal science and forages from Arkansas State University in 1977. He was employed by USDA – SCS/NRCS from September, 1978 until January 3, 2014 when he retired. He served at various locations in Arkansas and Missouri. From 1995 until he retired, he was the State Grazingland Specialist for USDA-NRCS in Missouri, headquartered in Houston, Missouri. Mark served as an instructor at 18 to 20 grazing schools throughout Missouri each year. He speaks at 20 to 30 forage conferences, field days and workshops each year throughout Missouri. He is a Certified Forage & Grassland Professional through the American Forage and Grassland Council. In 2004 he received the Missouri Forage and Grassland Council's Grasslander of the year award. In 2006 he was awarded the NRCS National Pastureland Conservationist of the Year award. He received the Merit Award from AFGC in 2011. He is a past board member of the American Forage and Grassland Council and a past board member of the Society for Range Management Southern Section. He currently is contracted with the MFGC/GLCI to teach at grazing schools, assist with forage conferences, field days and workshops, and provide training to NRCS and SWCD employees. Mark and his wife Anita live on a small farm near Houston where they raise meat goats.

Randy Williams, rancher from Everton, Arkansas
Randy & his wife Nancy operate a 340 acre ranch. Randy was raised on a dairy farm. After graduating high school he went into the work force, helping him to quickly decide he wanted to own and operate his own farm. So he made a deal with his parents to return to the dairy farm. About 6 years later he purchased his first farm & started his own dairy. He now raises Holstein heifers on contract, as well as having sheep, goats, and beef cattle. He currently serves on the executive board of Arkansas Grazing Lands Coalition, and on the board of Boone County Conservation District. He is a past president of Grassroots Grazing Group.

Joe Horner is a Dairy Economist with the University of Missouri's Commercial Agriculture Program. Joe has worked for University of Missouri Extension since 1988 with the exception of a one year leave of absence when he served as the general manager of Dairy Grazing Services, a new farm service entity started by Dairy Farmers of America. Joe works with dairy producers in budgeting, financial planning and developing new systems leading toward enhanced farm profitability. Joe is a southwest Missouri native, with a B.S. Degree in Agricultural Economics from the University of Missouri and an M.S. Degree in Agricultural Economics from the University of California-Davis.

Tim Schnakenberg serves as Regional Agronomy Specialist based in Stone County. He is one of three Agronomy Specialists serving the Southwest Region of Missouri and is assigned to focus on programming in Stone, Barry, Lawrence, Taney, Christian and Greene counties. He has worked as an Agronomy Specialist since 1991 and conducts educational programs in pasture and hay management, crop production, pest management, pesticide training, soil fertility and soil conservation. Ongoing educational efforts include Livestock and Forage Conferences, an annual Dairy Day, regional hay production schools, regional grazing schools, farm tours, on-farm demonstrations and pesticide applicator training.

Larry Israel, Stone County Cow/Calf Producer
Israel Farms is located in Southwest Missouri in Stone County (fescue country). With wife Sheila and four daughters Brittany, Erica, Riley, and Sadie, Larry manages a 180-cow/calf operation and most years backgrounds around 100 yearlings. Israels are proud to say they operate a very low input farm. With the year to year improvements of their forage due to rotational and intensive grazing they have been able to eliminate most of their high inputs such as: grain, hay, fertilizer, and equipment cost.
Since 2008 their hay consumption has gone from 500-600 bales a year to only 36 bales in 2012. Their goal is to produce efficient, moderate framed cattle that can thrive in their environment.

Ron Locke, Dallas County Cow/Calf Producer
After a 27 year career in the Air Force, Ron returned to Dallas County in 1998 and the 40 acres he owned prior to joining the military. Since then, that 40 acres has grown to about 350 acres including the old family farm. He's very active in community organizations and has served two terms as President of the Dallas County Cattlemen's Association. As he was putting his new farm together he would soil test, lime, fertilize, overseed legumes, all the "right things". He attended a regional grazing school and started his own grazing system while seeking knowledge at any workshop or seminar offered at places such as the Southwest Research Center where he was introduced to novel endophyte fescue and the toxic effects of KY31. He took clippings and had them analyzed for the endophyte fungus and found his fields to be about as hot as they come. He converted 30 acres to novel fescue and immediately could see positive results. As Ron likes to point out, "if you put the pencil to the paper" it really pays back with added weight gain and improved animal health. Since then, he has converted about 90 acres to friendly endophyte fescues and about another 30 acres to Eastern Gamma with the intent of eventually being Kentucky 31 free.
Of course, you need to protect that investment and that is where the Management Intensive Grazing System can really pay dividends. Ron has helped mentor many new graziers and hosted several field days on his farm because he truly believes the only way to be profitable in the beef cattle industry is to properly manage your forage and the only way to accomplish that is through a grazing system.

Pasture Management based on Four Ecosystem Processes

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Do you ever stop to think how simple this business of farming and ranching can be?

There are only four necessary ingredients needed for producing meat, milk, and fiber: carbon dioxide, solar energy, water, and soil minerals. We as humans have worked for centuries to make it increasingly complicated. In the process we have made farming and ranching much more expensive and much less sustainable. All we need to do is look at the few remaining natural ecosystems around the world and the wild animals that come into our backyards.

Natural systems operate just fine without human intervention or costly inputs. The elk and deer produce high quality meat that is tasty and nutritious. The cow elk and white tail does produce milk and raise their babies. The soil is healthy and the plant community is diverse. Beef, lamb, and dairy production could be just as simple if we bring ourselves back to the idea of four basic ingredients needed to produce our products.

Those four ingredients flow and cycle within our agricultural ecosystems just as they do in natural ecosystems. The only problem is we have screwed up the processes on most of our farms and ranches through our well-intentioned interventions. Much of what we do in our day to day management is counter to healthy ecosystem processes.

What do we mean when we say 'ecosystem processes'? There are four key flows and cycles we should all be aware of and we should build our management strategies around these processes. Solar energy flow involves the capture of carbon dioxide and formation into plants sugars through the process of photosynthesis. Water is a key component in the photosynthetic process as it is drawn from the soil, cycles through the plant, and is released back to the atmosphere as water vapor. Nitrogen and soil minerals are combined with the simple plant sugars to form complex molecules of protein, enzymes, vitamins, and an almost unimaginable array of plant compounds. All of these mineral-containing plant compounds are ultimately consumed by other life forms and the minerals cycle through plants and animals in our ecosystem to ultimately be returned once again to the soil. We need a diverse plant community to through the different seasons and across the diverse landscape of our farms and ranches and we need diverse animal life to keep the flows and cycles moving along.

The remainder of this talk deals with the four key ecosystem processes: 1) solar energy flow, 2) water cycle, 3) mineral cycles, and 4) biodiversity.

1) **Build a better solar panel:** Farming and ranching is really the business of capturing solar energy and turning it into a salable product. Nowhere is this more apparent than in pasture-based agriculture. If you think of every acre you manage as a 43,560 sq-ft solar panel, you easily begin to see how to improve your operation.

First think about what makes an excellent solar panel when it comes to maximizing photosynthesis. It is green growing leaves. Bare soil does not capture solar energy. Dead, brown plants do not capture solar energy. **Only green, growing leaves take solar energy and make it into livestock feed.** If you are using permanent perennial pasture plants, look at how much of the soil surface is covered by green leaves on any day of the year. In an irrigated situation, an excellent pasture should have at least 90% of the ground covered by green growing plants. If you are raising annual pasture crops, think about how many days the soil is left bare during the year or between crops. Timeliness of farming operations and rapid establishment are the key to successful annual pasture crops.

For many farmers and ranchers, the breakdown in the solar panel comes from leaving livestock too long in the same pasture and allowing it to be grazed too short. There are a few key management strategies we can use to increase ground cover in pasture and rangeland. **The first is leave ample post-grazing residual.** This is done far more effectively by managing the time livestock are on a particular grazing unit than by reducing numbers. Reducing numbers only shifts the pattern of patch grazing. It does nothing to improve solar panel effectiveness. **The second strategy is to increase species diversity.** This is best accomplished through varying the season of use so that different species are targeted for grazing while others are allowed recovery in seasons when they were previously targeted. **Providing appropriate recovery periods is the third key.** In a high-rainfall or irrigated environment, the recovery period may be just a few weeks in the peak of the rapid growth season while it might be as long as 60-90 days in slower growth periods. In once-a-year grazing scenarios as we practice in the high desert Idaho environment, providing 14 months recovery rather than 12 months ensures each pasture will not be grazed at the same time of year for several years.

Bare soil means lost production and provides opportunity for weed invasion in both permanent and annual pastures. The most common cause of thin spotty pastures is grazing too short while staying on the same pasture too long. Leaves are the photosynthetic factory of the plant. If excessive grazing removes too many leaves too frequently, the plant cannot support itself and must either reduce its size or die out completely. All across the world, grass farmers lose significant production potential because they keep tearing down their factory. In most of North America, I believe many farmers and ranchers are losing 50% or more of their production potential due to grazing too short and not providing adequate recovery periods. **Key principle is it takes grass to grow grass.**

Letting pastures get over-mature is another significant loss of photosynthetic efficiency on irrigated pastures. While it might seem contradictory for what appear to be two opposite trends (grazing too short vs. pastures getting to tall) to be such significant problems, the two trends often occur in the same pasture side-by-side. An individual blade of grass may only have 3 to 5 weeks of effective solar capture. **Letting perennial plants in a high rainfall environment continue to grow much longer than five weeks without grazing lowers photosynthetic efficiency.** Stockpiling pasture or range for dormant season grazing is the only time we should let pasture plants reach full maturity.

Other tools for keeping your pasture an efficient solar panel include seeding only adapted pasture species, appropriate nutrient management, and timely weed control. **Choose species and varieties that are proven in your environment.** There are very few real wonder grasses. Don't expect a plant developed in a totally different climate to do well on your farm. **Take care of the fertility needs of your pasture to keep green leaves growing vigorously.** Soil testing is a critical tool for pasture management. **Take care of your pastures and weeds will not be a problem.** Remember weeds are opportunists that invade unhealthy pastures. If you do have a weed problem, deal with it promptly by changing the management that created the problem.

2) **Capture more of the water that falls on your land:** Making more efficient water use should be an objective that graziers think about every day and your daily management decisions should help create an improving water cycle. What are the key factors to be monitoring and what are the adjustments that can be made?

Keeping the ground covered is the number one consideration. Keeping the ground covered entails both the living, growing material as well as the dead plant litter on the soil surface. Obviously, the more new green material you can grow, the better the cover will be and the greater the opportunity to create plant litter. Almost every aspect of the water cycle comes back to this key point.

By leaving taller post-grazing residuals in both perennial and annual pastures, plants grow back more quickly thus creating new cover and leaving more material to ultimately become litter cover. One of the huge benefits of maintaining cover is keeping the soil cooler. Very often in midsummer, the soil

temperature at 2” depth can be 20º cooler under sod compared to adjacent bare ground. This greatly reduces evaporative water loss from the soil.

If you use annual pastures and are not already doing so, consider using no-till seedings or interseedings to establish the annuals. Every time the soil is tilled not only does it cause evaporative water loss but it also collapses soil structure resulting in reduced infiltration and increased runoff. Water that leaves your farm as runoff is missed opportunity for growing more pasture. If you follow some fairly basic guidelines, no-till pasture seedings are just as effective as conventional tilled seed beds and come at a much lower equipment and labor costs as well as being much better for the soil and water cycle.

Soils with adequate available nitrogen and mineral content make much more efficient use of water than do soils with chronic nutrient deficiencies. If soil minerals or N is limiting productivity, then each inch of water will give you less forage yield. You can also think about this conversely, applying nutrients as fertilizer, manures, or feeding hay for soil enrichment only pay if you have a healthy water cycle.

Generally I do not advocate the use of iron and oil in grazing management. One of the exceptions I will consider is what is known as keyline plowing. If you have a landscape plagued by fast runoff and water rapidly moving into draws and ravines and flushing out of the system, keyline plowing is a way to correct that problem with mechanical intervention until the natural water cycle is working more effectively. The most common keyline plow is the Yoeman Plow which is essentially a deep shank ripper. By ripping on what is known as a key line, both surface and subsurface drainage patterns can be altered to give more uniform water distribution across slopes and variable landscape. A key line is the least dropping contour line that allows water to move laterally across a slope rather than vertically downslope. It is a relatively expensive process, but the benefits can be tremendous.

3) **Maintain dynamic nitrogen and mineral cycles:** Nitrogen is usually considered to the first limiting element for growth in most grassland ecosystems. It is the most mobile nutrient with many pathways for loss so the need to have the N supply in our soil being continuously recharged. From 1950 to late in the 20th century the solution seemed to be just keep pouring on the N fertilizer and all would be well. Reliance on nitrogen fertilizer to support pasture production was found to be unaffordable as fertilizer cost increased at a much faster rate than the value of our products. Negative effects on biodiversity and nutritional value of forage also emerged. We found N needed to come from somewhere other than a bag.

Establishing and maintaining legumes in pastures is a far more cost effective means of providing N for pasture growth than is fertilizer. Almost all natural grassland systems contain N-fixing legumes. University studies from as diverse environments as Texas to Oregon to Vermont have all shown cost per lb of gain on beef animals to be lower on grass-legume mixtures than grass + N fertilizer pastures. In the 22 years on our farm in Missouri, there were only three occasions that we ever used any N fertilizer. The rest of the time we ran on legume N and an effective N cycle while carrying twice the county average stocking rate.

Almost all legumes thrive in well managed pastures. Lime, phosphorus, potassium, sulfur, and other micronutrients may need to be increased to have legumes prosper, but those tend to be nutrients that will stay put on your farm compared to highly mobile N. A phosphorus molecule applied as fertilizer today may still be working in the same pasture 20 years from now, while the majority of N applied as fertilizer will be gone from your farm in a single season.

As the organic matter content of a soil increases, the pool of N in the soil also increases. Because of the opportunity to lose N through ammonia volatilization from urine, denitrification from microbial processes, and leaching of water through the soil profile, even high organic matter soils still need the regular infusion of new N into the ecosystem.

Minerals may through animals and be excreted through either urine or dung. Mobile minerals such as N and K tend to flow predominantly through urine while immobile minerals like P and Ca are found in dung. Mobile nutrients flowing through urine tend to be readily available for plant growth as they are returned to the soil. Because most immobile minerals end up being bound in plant fiber, they are released from the dung only through microbial degradation of the dung pats or pellets. Elements like P can be held unavailable for extended periods of time if the decomposition process is slow.

Decomposition rate of manure is affected by temperature, moisture, microbial life, and degree of disturbance. Because pastures consistently left with taller residuals can maintain better litter cover on the soil surface they tend to remain cooler and wetter which help accelerate decomposition of manure. These same conditions encourage more insect and bird biodiversity which increases the likelihood of physical disturbance of the manure. All of the pieces fit together to help maintain the dynamic mineral cycle.

Biodiversity: Biodiveristy is more than just having several different plant species in your pasture. It refers to the overall breadth of life forms in your ecosystem. We see it most visibly manifested as diversity of plant species and functional groups. In ecological terms, plants perform different roles and functions in the environment. Plants performing similar roles can be grouped into a specific functional group. For example, tall fescue, orchardgrass, and redtop are all perennial cool-season grasses. They grow at a similar time in the and have similar nutrient and water requirements. They are nitrogen users and fibrous rooted. In contrast, red and white clover are perennial cool-season legumes with similar growth requirements. They are quite different from grasses in growth form but also in that they are N-fixers as well as users. Crabgrass and barnyardgrass are warm-season annual grasses so they have different growth requirements and characteristics compared to the two prior groups. Each of these categories of plants form different functional groups. When it comes to diversity in pasture, we want multiple functional groups not just different species.

Here is an example from our pastures in north Missouri describing the species and functional groups present there.

Cool-season paerennial grasses	Tall fescue,orchardgrass, timothy, Kentucky bluegrass, redtop,quack grass, smooth brome
Cool-season annual grasses	Cheatgrass, downy brome, annual ryegrass
Warm-season perennial grasses	Big bluestem, indiangrass, greasy grass, Florida paspalum, switchgrass, little bluestem
Warm-season annual grasses	Crabgrass, barnyard grass, yellow foxtail
Cool-season perennial legume	Red clover, white clover, birdsfoot trefoil, black medic, alsike clover, sweet clover, desmodum
Cool-season annual legume	Yellow hop clover
Warm-season annual legume	Common lespedeza
Perennial herbaceous forbs	Tall ironweed, dandelion, goldenrod
Annual herbaceous forbs	Common ragweed, bindweed, morningglory

Microbial, insect, avian, and mammalian diversity will all broaden and increase as plant community becomes increasingly diversified. All of these animal life forms also influence the water and mineral cycles in positive ways. Biodiversity is a reflection on the overall health of all cycles and flows.

Balancing use and recovery in the pasture is one of the strategies we use to enhance the effectiveness of each of the processes we have discussed above. Continuous use of the same area by a set number of livestock for an extended period of time will almost always results in the eventual breakdown of the ecosystem. Nature is a dynamic system and must always ebb and flow. When we begin to too tightly constrain those ebbs and flows, the system fails. Thus the need for balancing use and recovery of the plant and soil communities when we assume management of theecosystem.

We all know pastures need to be rested to restore CHO storage and plant vigor, but is that all the recovery period provides? **In reality, most forages rely on residual leaf area for regrowth, not stored CHO.** The recovery really is a time allowing new leaves to grow, which in turn supplies excess CHO for storage and helps maintain vigor and root growth. Determining appropriate recovery period length is a challenge graziers face on an ongoing basis. Animal and plant needs must always be balanced. **Longer recovery periods provide healthier plants and ample forage, but reduced forage quality. While shorter recovery periods may supply high quality forage, they may stress plants and also leave forage supply short**. Changing growing conditions dictate recovery periods need to be lengthened or shortened. One thing for sure is leaving more residual increases flexibility in recovery management while lower residual reduces management flexibility.

Soils that are severely trampled during wet conditions recover their tilth much quicker if animal pressure is removed and plant roots begin to rapidly grow back. Allowing adequate recovery period helps reduce soil compaction. A four-year study at the University of Missouri - Forage Systems Research Center found soil bulk density tended to be lower for rotationally grazed pastures compared to continuously grazed pastures for low to medium stocking rates. **At high stocking rates, compaction was equally severe for both grazing management regimes but tended to be less for rotational stocking as recovery periods were extended.**

The required recovery period may be as short as 20 to 25 days in springtime on irrigated and fertilized grasses during their peak growth period. The same species may require up to 45-60 days recovery during hotter, drier periods. Recovery requirements for tall grass prairie sites may vary from 30 to 120 days depending on growing conditions. In semi-arid rangelands, a single grazing period per year may be all that is appropriate followed by a full year's recovery. Recovery management cannot be calendar-based, but must be planned in response to growing conditions and planned use patterns.

Complete removal of grazing animals from a grassland ecosystem generally does not result in improved grassland condition. While some short term gains may be seen initially, long term livestock exclusion generally leads to downward trend in grassland condition. This is because grasslands evolved with grazing animals and almost all grass species require some degree of grazing to remain healthy. In a five-year research project in Missouri, we found stocking rates below the recommended level resulted in more rapid deterioration of grassland condition than stocking rates above the recommended range. **To be healthy, grasslands must be utilized.**

Several environmental and wildlife benefits can be attributed to providing planned recovery periods. Both stream bank stability and bird nesting habitat were improved in pasture areas when planned grazing systems were implemented according to research conducted in both Wisconsin and Oregon. Several studies in the western US have shown notable stream bank improvement where planned grazing systems have been implemented. **It is the continuous presence of livestock in riparian areas that creates problems, not the managed use of a site by livestock.** Native plant species tend to increase when appropriate recovery periods are provided. Appropriateness includes both timing and duration.

High Density Grazing Improves Soil Health

Doug Peterson

ABSTRACT: Stock Density is one of the most powerful tool we have to manage grassland resources. It can improve grass utilization, reduce spot grazing and selectivity by livestock, control unwanted plant competition, improve manure distribution, produce seed/soil contact, improve water infiltration and possibly build soil at rates never before thought possible. High Stock Density (HSD) grazing systems are the human application of ecological principles that mimic natural grazing patterns of herbivores. By aggregating and frequently moving large herds of herbivores, plants have a longer time to recover from grazing. Longer recovery periods allow for the use of more mature plants in HSD grazing systems which increase root/plant biomass, root exudates, extracts more water/nutrients from the soil, and enhances nitrogen formation through root decomposition. Higher stock densities improve manure and urine distribution which is important for increasing nutrients and food for soil organisms. Using higher stock densities is the fastest growing trend in grassland management in Missouri today.

Keywords: High density grazing, mob grazing, soil health, stock density, soil function, manure management.

What is "High Density Grazing"?

UHSD or as some call it "Mob" grazing is a management strategy that, when compared to our more common grazing systems, increases the length of the rest period, shortens the grazing period, and greatly increases the stock density. Some landowners around the country have used densities of one million pounds per acre. Stock densities of up to 500,000 lbs per acre have been used effectively in Missouri already.

Stock density is determined by measuring the amount of animal live weight in pounds that has access to any given area. Stock Density is a term and a management tool that has been a big part of management intensive grazing (MiG) for many years. If we know what stock density is and how to increase it, what does it take to be considered a "Mob" grazier? There are no specific definitions but here are some guidelines that we use. Stock density's up to 50,000 lbs has been used in some of the more intensive MiG systems here in Missouri for several years. So, if we start at 50,000 lbs of stock density and work our way up to say 250,000 lbs we could call those folks "High Density" graziers. That would make the "Ultra High Stock Density" (UHSD) anybody above 250,000 lbs of stock density per acre. "Mob" grazing could fit into either one of those pretty easily.

The photo in figure 1 is an example of animal spacing under "High Density" (130,000 lbs per acre) and figure 2 is an example of "Ultra High Stock Density" (1 million lbs per acre). There are many areas where UHSD can have a positive impact. We will try to highlight a few of these positive impacts in the paper.

Figure 1: High Density Grazing

Photo by Doug Peterson

Figure 2: Ultra High Density Grazing

Photo by Neil Dennis

Soil Health/Soil Building

One of the primary benefits to UHSD is the potential to significantly improve the soil. This type of grazing can possibly build very significant amounts of organic matter through controlled root die off and trampling of above ground plant material. Longer rest periods allow more mature plants to develop much deeper root systems, which can draw on moisture and minerals that are unavailable to shallower rooted plants. In some soils half of the available minerals are 2 feet or more below the surface. If we don't manage our

plants to go that deep or if we don't have species of plants that will go that deep we are giving up the opportunity to utilize a lot of natural fertility. At higher stock density's the livestock trample most of the forage that is not eaten into mulch on the surface of the soil. This mulch does several things. It keeps the surface of the soil cool which reduces evaporation. It improves infiltration of the water. It is the food source for the organisms and microorganisms which are the beginning of the natural mineral cycle. It is this natural mineral cycle which allowed the Midwest to build some of the most productive soils in the world.

Manure management

Manure distribution is a topic that has been studied a great deal at The University of Missouri's Forage Systems Research Center (FSRC) in Linneus, Missouri. Part of the table below shows the findings of a study completed at FSRC. They evaluated how long it would take to get one manure pile per square yard under various types of grazing management. The study showed that using continuous grazing it would take 27 years for the livestock to place a manure pile on every square yard of the pasture. In a MiG system on a two day rotation it would take 2 years for every square yard to receive a manure pile. How long do you think it would take for every square yard to receive a manure pile in a UHSD system where the cattle are moved once a day, twice a day or even more?

Table 1. Manure Distribution information from FSRC

Rotation Frequency	Years to get 1 manure pile per sq/yd
Continuous grazing	27
Every 14 days	8
Every 4 days (MiG)	4-5
Every 2 days (MiG)	2
2 times a day (UHSD)	???
4 times a day (UHSD)	???

At this point, I am not aware of any actual research that has been done to determine the answer to that question but if we were to extrapolate the data from the FSRC study we would have to assume it would be 1 year or less and there is a good possibility that every square yard would get a manure pile almost every time the field was grazed!

Weed and Brush Control

As competition for forage increases at higher livestock densities the livestock are less selective about what they eat. Many pastures are dominated by single specie of grass such as fescue. UHSD is very effective at getting livestock to eat the less desirable species of grass which will allow for a much more diverse pasture mix. At the densities associated with UHSD the livestock tend to eat everything including thistles, sumac, and other plants not normally eaten in even a MiG managed system. UHSD grazing in some cases can be a viable alternative to Prescribed Burning or chemicals for brush and weed control.

Livestock Performance

If the forage and the livestock are managed properly livestock performance can be excellent. However, forage utilization must be monitored closely to insure proper intake, nutrition and livestock health

One of the most common management problems is that the cattle are forced to eat too far down into the forage canopy or they are forced to eat too much of the forage. At very high density's it is very easy to get forage utilization too high. When this happen's individual animal performance may suffer depending on the type or class of livestock and the type of forage available. A benefit of this type of grazing on livestock performance is that most of the material the livestock are eating is new growth. The majority of the plant material available during previous grazing events was either eaten or trampled, so everything available this time is new growth.

Water and Fence

Water systems must be taken into account anytime you are thinking about changing your livestock operation. If you are going to increase stock density by concentrating your existing herd on a smaller area you can get buy with your existing water system. If you are going to combine several herds into one large herd you will have to carefully evaluate both your tank size and the delivery system itself. At higher stock densities you can typically get by on tank that is smaller than you think would be required for a large herd. Most livestock water delivery systems are just not set up to handle very large herds. Many 1 ¼ inch gravity lines just physically can't flow enough water in 12-24 hours to supply a large herd.

In order to efficiently and economically have enough fencing to create stock densities anywhere close to what we are talking about you have will probably have to use some step-in posts and a reel or two of electric polywire. Hopefully, you already have a basic grazing system of electric hi-tensile that you can use as a base to hook the polywire to. The better your basic system of water and fence is the easier it will be to implement UHSD. You will have probably have some fields that because of ditches or trees or lack of water that you just won't be able to manage in this manner. Other fields with a good water location and a perimeter of hotwire will be easily converted to UHSD.

Summary

Landowners are pushing the innovative edge with High Stock Density grazing. HSD (aka Mob grazing) grazing mimics the natural grass harvesting patterns of large groups of herbivores throughout the world. This type of grazing harness the soil-building and carbon/nutrient cycling principles that creates fertility in the perennial grasslands of the world.

Is Mob Grazing or High Stock Density grazing for everyone? Probably not, but it is a tool that can be used to significantly improve the soil. All grazing styles and grazing systems have a place as long as they are monitored and managed correctly. I do believe that HSD has the potential to benefit more of our farm resources than any other type of grassland management. Everybody should be knowledgeable enough about this type of resource management to be able to make decisions about what type of system will best suit their resources and objectives

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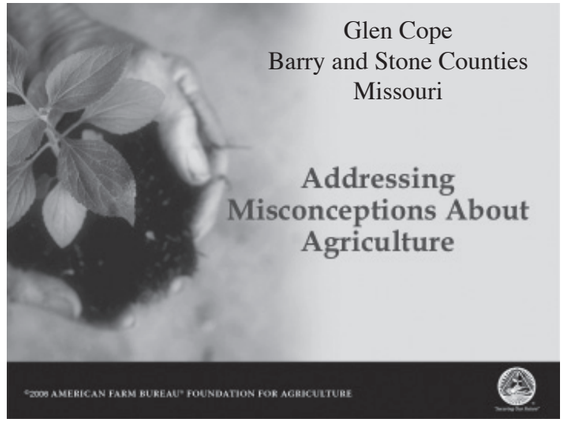

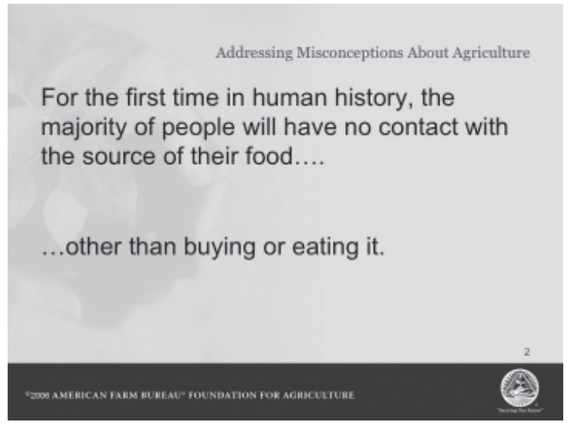

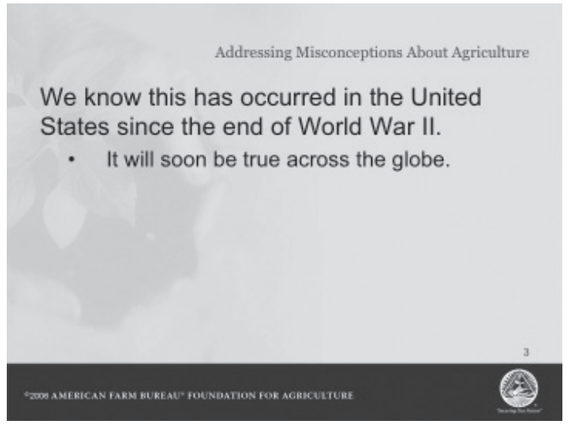

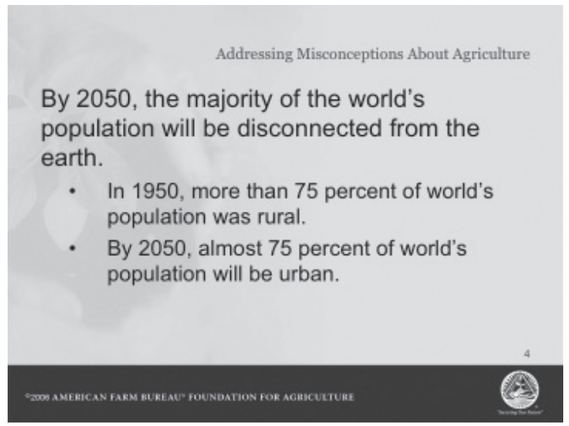

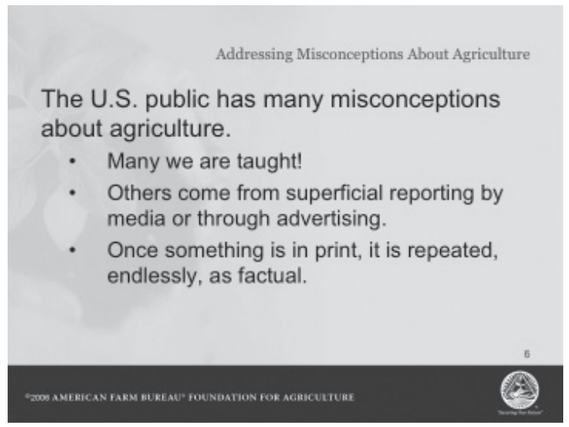

Addressing Misconceptions About Agriculture

1. Brown cows produce chocolate milk.

7

Addressing Misconceptions About Agriculture

Who produces chocolate milk?

8

Addressing Misconceptions About Agriculture

2. Vitamin D is a steroid hormone.

This is true!

9

Addressing Misconceptions About Agriculture

3. If it is natural, it is not harmful.

10

Addressing Misconceptions About Agriculture

We Don't Fear Mother Nature

- There are many naturally occurring toxins and carcinogens.
- Nicotine, opium, heroin, morphine, and cocaine all come from plant sources.
- Arsenic, radon, lead, and strychnine are all natural.
- Rattlesnakes are natural.

11

Addressing Misconceptions About Agriculture

4. The pesticide that caused eggshells of bald eagles to thin is DDT.

12

Addressing Misconceptions About Agriculture

This has never been scientifically proven!

- The Clean Water Act went into effect about the same time as the DDT ban.
  - Stopped oil, lead and mercury pollution.
- Oil, lead and mercury are proven to cause eggshell thinning or embryo death.

13

Addressing Misconceptions About Agriculture

Bald eagles were reported threatened with extinction by 1921 and vanished from New England by 1937.

- "Bald Eagle Protection Act" passed by Congress in 1940.
- The first use of DDT was in 1943.
  - In Italy
  - 500 gallons was made and used in WWII to stop typhoid fever. Typhus was spread soldier to soldier by lice.

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Addressing Misconceptions About Agriculture

- DDT was not used in the United States until after WWII.
- DDT was banned in 1972, but the eagle was already bouncing back.
- Other accusations made against DDT?
  - *Also not true.*

15

Addressing Misconceptions About Agriculture

5. Organic food production does not use pesticides or synthetic fertilizers.

16

Addressing Misconceptions About Agriculture

Organic production can use "natural" pesticides.

- Mineral salts
- Pesticides from plant materials

The largest quantity (total pounds) of chemical pesticides are being applied to organic crops as approved "natural pesticides."

17

Addressing Misconceptions About Agriculture

6. Organic farming has less impact on the environment than traditional farming.

18

Addressing Misconceptions About Agriculture

Many natural pesticides are persistent in the environment.

Many need to be applied several times or at higher rates to protect the targeted crops.

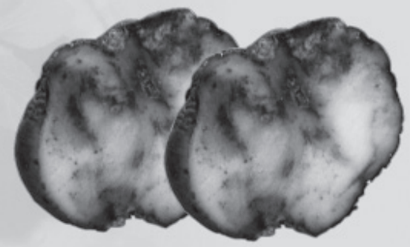
19

Addressing Misconceptions About Agriculture

7. Natural pesticides are less toxic than synthetic pesticides.

20

Addressing Misconceptions About Agriculture



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Addressing Misconceptions About Agriculture

9. To protect children from cancer, use organic peanut butter to make their peanut butter and jelly sandwiches.

26

Addressing Misconceptions About Agriculture

Several "natural pesticides" are highly toxic, even carcinogenic.

- Copper sulfate is highly toxic.
- Rotenone may cause Parkinson's disease.

21

Addressing Misconceptions About Agriculture

8. The only sustainable form of food production is organic.

22

Addressing Misconceptions About Agriculture

Facts about peanuts:

- Peanuts grow in the ground.
- Soil naturally contains many fungi.
- Some of those fungi produce aflatoxins.
- Aflatoxins are known and very potent carcinogens.

27

Addressing Misconceptions About Agriculture

Growers use fungicides on peanuts produced traditionally.

Fewer fungi mean that less aflatoxin is found in commercial peanut butter.

Organic peanut butter is often contaminated with aflatoxins.

So, traditional peanut butter is safer.

28

Addressing Misconceptions About Agriculture

Does Sustainable = Organic?

- If we were to convert to totally organic food production:
  - Yield would decline by 30 to 40%
    - Due to increased competition from weeds, insects, diseases.
  - Post-harvest losses would increase.

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To produce necessary nitrogen:

- we would either need to convert one-third of all crop acreage into green manure production.

or

- increase the number of cattle on the planet by 700 percent.

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10. Homeowners use the greatest concentration of chemical pesticides per acre.

This is true.

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Addressing Misconceptions About Agriculture

The EPA found that homeowners applied chemical pesticides at a rate eight times per acre higher than did farmers.

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11. Farmers have higher than average rates of cancer because they apply synthetic pesticides.

As a whole, farmers do not have higher rates of cancer.

There are a couple of specific cancers that are problems, none related to pesticides.

Farmers have higher rates of skin cancer, but this is due to sun exposure and not pesticides.

Viruses, bacteria, fungi, and parasites are known to be carcinogens.

Viral carcinogens

- HTLV-1
- Human Papiloma Virus
- Herpes 8
- Epstein-Barr
- HIV
- Hepatitis B Virus, Hepatitis C Virus

12. Microorganisms are now known to cause about 20 percent of all cancers.

This is true.

14. A person's genes can be changed by eating a genetically modified fruit or vegetable.

No.

If you eat corn, do you become corn?

Do your children become corn?

No, your body digests the proteins and absorbs the amino acids to use them to build proteins.

How accurately did people answer?

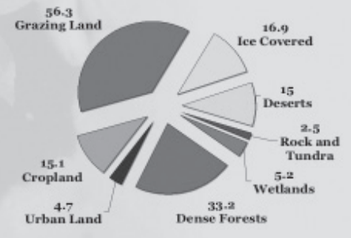
Netherlands – 74%	Italy – 58%
Canada – 62%	United Kingdom – 55%
Sweden – 62%	France – 52%
United States – 61%	Germany – 38%
Switzerland – 60%	Austria – 29%

The world produces enough food to feed everyone.

Even Africa produces enough food to feed its people.

Hunger is caused by poverty and the inability to purchase food and/or transport food in areas where drought occurs or it may be induced for political or social reasons.

The World's Land (million Km^2)



16. Globally, hunger is caused by a shortage of food.

17. The world can support more vegetarians than meat eaters.

18. It takes 16 pounds of grain to produce one pound of beef.

Addressing Misconceptions About Agriculture

16 lbs grain = 1 lb beef?

- 8 lbs of grain to produce 1 lb of gain
- 50 percent cut-out of live carcass

These two assumptions factually true, but used incorrectly.

- Simple arithmetic yielded the 16:1 grain to meat ratio.

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Assumption:

- Beef animals are consuming human-edible grain from birth.
- Beef animals consume nothing other than grain.
- But calves are mammals and consume milk from birth to weaning.

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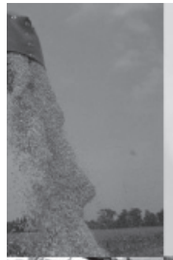

Addressing Misconceptions About Agriculture

We will need to produce as much food in the next 40 years as has been produced in all of human history!

Addressing Misconceptions About Agriculture

To accomplish this, we need:

- a public that understands the food and fiber system.
- to make decisions using research–based information, not rumor, innuendo nor the rhetoric of the self-serving.

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Diet of Cattle:

- Much of the grain milling and food processing waste is turned into feeds that cattle can eat and convert into high quality protein.
- For every 100 pounds of human food produced by processing crops, 37 pounds of waste products are produced.

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Food Processing Product Examples in Cattle Diets

oat hulls	almond hulls
carrot waste	brewer's grains
distiller's grain	cottonseed meal
soybean oil meal	corn middens
wheat bran	rice bran meal
apple pomace	tomato pomace
beet pulp	citrus pulp

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Why?

- To ensure abundance.
- Civilization is dependent on the ability to provide food, clothing and shelter in abundance.

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Director, Education and Research

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Reality Assessment From C.A.S.T.

- At weaning 600 pounds.
- 50 to 70 percent of a beef animal's feedlot diet is human inedible forages and feed.
- In U.S., 2.6 pounds of grain are used to produce 1 pound of beef.
- Globally, 0.3 pound of grain is used to produce 1 pound of beef.

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Population:

- By 2050, population will climb from current 6 billion to about 11 billion people
- We will need to feed twice today's population.

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GRAZING MANAGEMENT WITH MULTI-SPECIES

Randy and Nancy Williams Farm
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Everton, AR 72633
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God has allowed me to use 340 acres in southwest Boone County near Everton, Arkansas. 80 acres are in warm-season bermudagrass and 220 acres in cool-season mixed grasses and clover.

I raise beef cattle for 100% grass finished beef.

I raise dairy replacement heifers on contract. They weigh approximately 400 lbs when I receive them, and I send them back to the dairy at 1,150 lbs and 7 months bred.

I raise Katahdin hair sheep and sell lambs for meat.

I raise Spanish cross brush goats for meat as well.

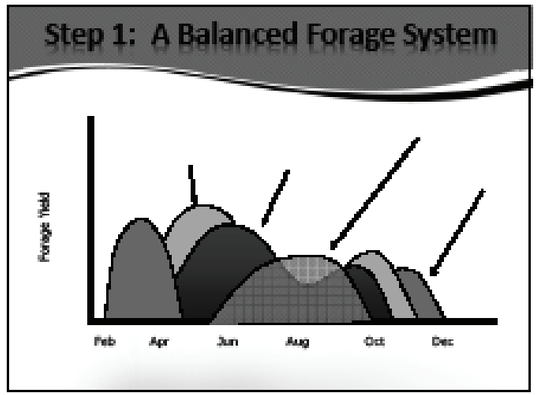
But my forage base is my top product, whether browse (brush), forbs (weeds) or grass. So my animals are my tools for harvesting and marketing my forage. Cattle love to eat grass and clovers. But they will also eat some forbs and browse. Goats love to eat browse but will eat some forbs and grass. Sheep love most forbs (weeds) but will eat some grass and browse.

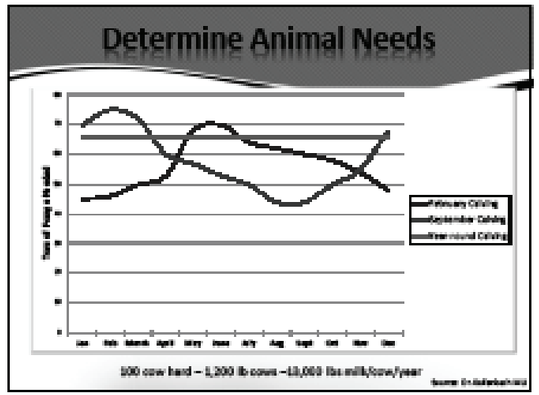
To have sheep and goats one has to have: (1) something they will eat, (2) fencing to hold them in, (3) protection from predators, and (4) a place to contain them for working them.

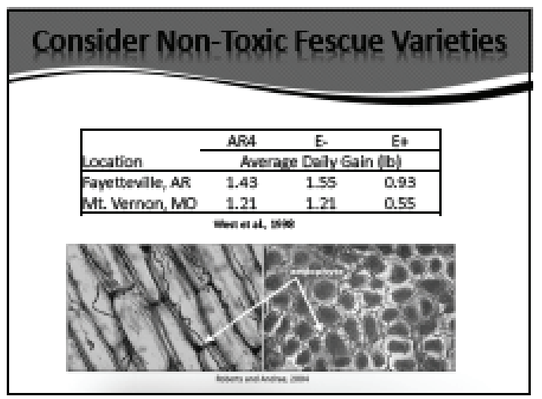
What if I could grow 1 inch of additional grass in a year, over my whole farm, by improving my management? One inch doesn't sound like much. One inch of good stand of grass is about 250 lbs of dry matter per acre. On my 300 acres of pasture, that is about 75,000 lbs of dry matter. Most animals will eat an average of 3% of their body weight a day, so a 1,100 lb cow will eat 33 lbs of dry matter a day or 12,045 lbs over 365 days. On a good stand of grass, that extra one inch of grass on my 300 acres will be more than enough dry matter to feed 6 cows for a year. Or it would feed 45 ewes that weight 150 lbs each for a year. If I needed to buy that much forage for my animals, of the quality we grow with control grazing, I would have to pay $140 per ton or more for hay. Hay is about 90% dry matter. So it would take over 41 ½ tons at a cost of about $5,750. I can put up a lot of high-tensile electric fence for $5,750. I only need to build the fence once, but the benefits will last for years.

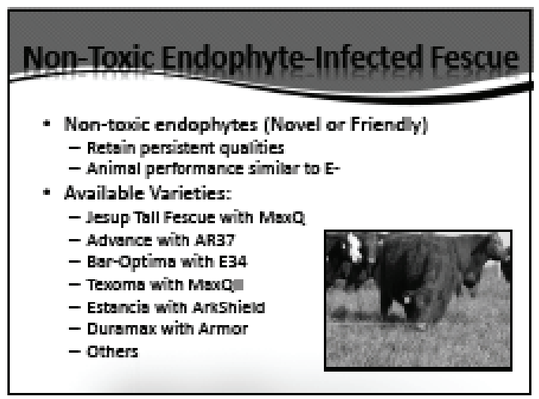
I have 113 permanent paddocks made for my cattle. I have 19 paddocks fenced for my sheep. I have buried 2 ½ miles of waterlines from 2 wells. I now have 52 tire water tanks. This allows me to recycle the nutrients where it is harvested. Most of my land has had no fertilizers in over 15 years.

Recycling nutrients and giving grass rest increases: earthworms, dung beetles, micro-organisms and organic matter, which can and do result in more forage.



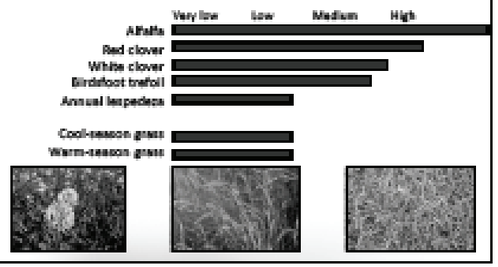






Step 2: Fertility

- Species differ in their nutrient requirements

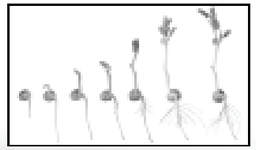


Why test your soil?

- Avoid potential nutrient deficiencies
- Identify possible causes for poor pasture or hay production
- Save money $$$
  - Apply enough plant nutrients
  - Avoid excessive expense

Step 4: Don't Plant Too Deep

- Most new seeding's fail because the seed was planted too deep
- Most forage grasses and legumes should not be planted deeper than ¾ inch



Don't Plant Too Deep

- If planting into a prepared seed bed, roll the field before planting to achieve a firm seed bed

Fertilizer Fact!!

- To produce 1 ton of forage
  - 35 - 60 lbs of Nitrogen
  - 12 - 15 lbs P_2O_5
  - 45 - 60 lbs K_2O

Step 3: Determine When to Plant

- TIMING IS EVERYTHING!
- Forages have the best chance of success when planted early
  - For cool-season grasses this is mid August through mid September

Step 5: Beware of Herbicide Carryover

- Most broadleaf herbicides can damage young grass seedlings
  - Grazon P+D
  - Cimarron
  - Chaparral
  - GrazonNext
  - 2,4-D

Step 6: Manage Correctly

- It may take 12 months before the new stand is fully developed
- A few short grazing periods followed by adequate rest will ensure a healthy stand
- Monitor grazing closely

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AGRICULTURAL

MU Guide

Seeding Rates, Dates and Depths for Common Missouri Forages

Craig Roberts and James Gerrish
Department of Agronomy

No-Till Drill vs. Broadcasting

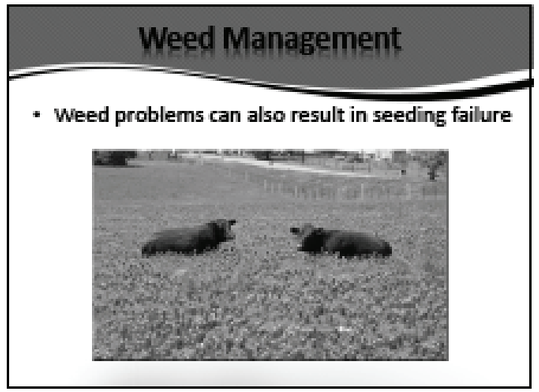
- No-Till Drill
  - Ensures proper seed-soil contact, plant spacing, and depth
  - Conserves soil moisture
- Broadcasting
  - Increased chance of failure due to poor seed placement
  - Rolling or cultipacking will improve seed to soil contact
  - Works best for frost seeding legumes

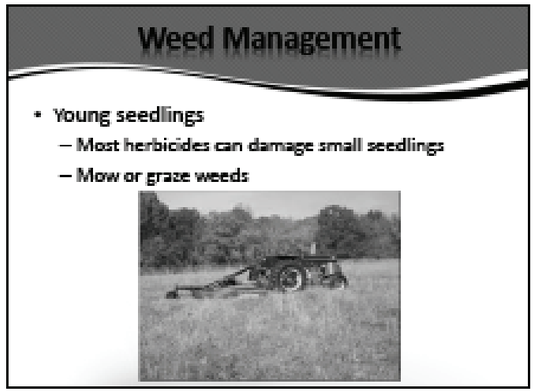
Manage Grazing

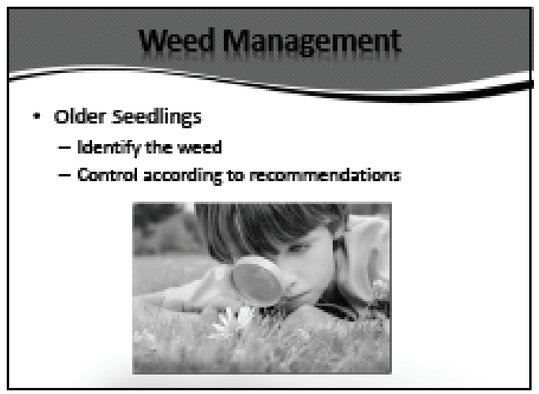
- Flash grazing may be necessary
  - Interseeding's
  - Legume establishment
  - Suppress weed competition
- Monitor grazing closely!

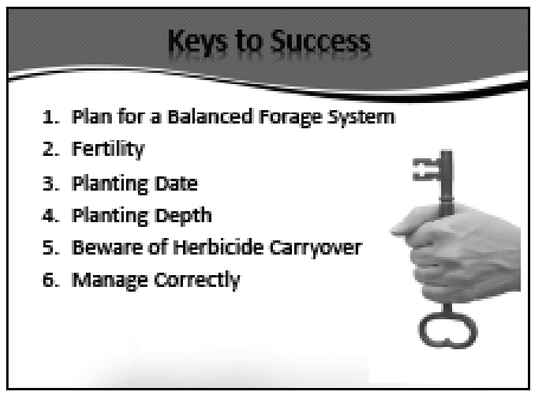
Manage Grazing

- New seedlings should only be grazed when they are able to pass the pull test
  - Grab the forage and gently pull
  - If the root comes out of the soil when you pull delay grazing









How Do I Know It Will Pay?

Jim Gerrish
American GrazingLands Services LLC
Patterson, ID

Have you ever heard the saying,'There's no such thing as a free lunch'? There are not many things that come without a cost. Many of our decisions in life revolve around the questions ' What will it cost me?' and 'Is it worth it?'. Many of you in the audience have probably pondered the same question when it comes to things like should you build more fence, should you put in a spring development and pipeline, should you replace your endophyte-infected tall fescue with a novel endophyte fescue, and the list of possibilities goes on and on.

How do you go about deciding whether you should do it or not? Do you approach the question systematically or go by gut feeling? I don't have any advice to offer you if you just go by your gut, but we have tools to help people who want a systematic approach.

Economists and farm management specialists have used enterprise and partial budgets as decision support tools for decades if not centuries. Because I'm a spreadsheet geek, I like to have easy to work with spreadsheets to help me address these questions. Once you have a basic format, just a little tweaking with a good spreadsheet can let you answer a lot of different questions.

When you're pondering that 'Is it worth it?' question, what do you really need to know? What it really comes down to is the cost of implementing the change in your business and the expected return from making the change.

We can get a pretty good idea of what the added costs are going to be for installing a couple miles of stock water pipeline and several tire tanks is going to be. Those are pretty straightforward numbers because someone out there is willing to sell their products and do the work for you. The same can be said for reseeding a pasture, building fence, or any other practice that involves goods and services.

What about something like changing your calving season or switching to a different type of bull? It is a little more difficult to come up with an estimate of the cost of making that change. Now we have to start making some assumptions regarding potential cost savings as well has having to shell out more money for a bull upgrade. There are a lot of ripple effects we might not even think of initially. But if you do think about it and talk with other people who have done similar things, we can still come up with some reasonable expectations and assumptions.

Anytime we make assumptions regarding costs and returns, we always want to overestimate the potential added costs and underestimate any cost savings or increased returns. Better to receive pleasant surprises than bitter disappointments.

Any projection of future added returns to our enterprise is purely speculative because we don't really know what tomorrow will bring. We can make reasonable projections based on what happened yesterday or last year, but change is the great constant in life. All things will change so we need to be prepared to adjust when they do change. Keeping your projection conservative will provide some protection against the shockingly unexpected changes.

While we're on the subject of time and the future, another important question is how soon do you want or need this investment to pay off. If we have our entire lifetime to consider, I can show you that almost any pasture improvement practice will ultimately pay off. The question is can your current cash flow situation allow you to shift funds from their current usage into some other pathway.

Generally I like to see capital improvement projects fully pay for themselves in five years or less. Unfortunately, that doesn't always work out and we need to plan over longer horizons. Even though we can potentially show a very good return on investment over a 10 to 20 year horizon, we really have no idea if any of our financial assumptions will be valid through that time period. The shorter the cost recovery period, the greater the likelihood of things actually working out according to plan.

Another positive aspect of achieving a quick pay back on your investment is any residual benefits occurring after the end of the pay back period become almost pure profit. That is a simplistic view from a non-economist, but my experience is you will have more money in your pocket and that is close enough to profit for me.

Let's look at the Cost-Benefit analyzer I use with my consulting clients and what are the important components for determining costs and benefits.

Since we are generally looking at management practices that will allow us to increase livestock carrying capacity and product output, we can look at benefit as increased forage dry matter production. We start from our current level of productivity so it is important to have some idea of what your land is presently producing. The next step is to project what increase in productivity might be expected from implementing this practice. Talking with producers and grazing professionals who have implemented the same practice is a good starting point. You will likely hear a range in responses. I like to go with the low end of expectations and see how the financial side looks from a conservative position. The response time line shown in this example is for stock water and fence development for MiG. We can expect increasing performance over some period of time and then perhaps a plateau.

Base forage yield		4000	lb/acre	
Comments		year	annual % yield benefit	annual dry matter yield benefit
Some improvement practices have shorter or longer response periods. Anything that provides a benefit beyond 20 years of implementation still needs to pay for any cash outlays in a much shorter period of time. Degree of response may increase or decline over time. Another pattern is increasing response for a few years with peak yield increase coming a few years after implementation followed by a declining annual response. You need to have some idea of the response pattern to effectively use this worksheet.		1	10%	400
		2	15%	600
		3	20%	800
		4	25%	1000
		5	30%	1200
		6	35%	1400
		7	40%	1600
		8	42%	1680
		9	44%	1760
		10	46%	1840
		11	48%	1920
		12	50%	2000
		13	50%	2000
		14	50%	2000
		15	50%	2000
		16	50%	2000
		17	50%	2000
		18	50%	2000
		19	50%	2000
		20	50%	2000
	Total added forage over life of the practice:			32200

When using this tool for shorter capital recovery periods, just insert zeros for any years beyond your target. For example if you were looking at 5-year payout, everything from 'year 6' on would be zeros in the 'annual benefit' column.

Once we have the response flow charted, then we can start looking at the cost and other parameters as shown below.

Base yield	4000	*expected lb/acre yield before implementing the new practice*
Added lb of forage over life of practice	32200	*Calculated in lower part of worksheet based on response expected*
Harvest efficiency for additional forage	75%	*Of the added forage production how much will the livestock harvest?*
Additional forage to be harvested	24150	*Increased forage production X seasonal utilization rate*
Additional AUD to be harvested	929	*Total additional forage ÷ 26 lb of forage / AUD*
Value of an additional AUD to your ranch	$ 0.95	*fair market value for output of one standard animal unit day*
Total value of added forage	$ 882	*added value of total additional forage produced for life of practice on 1 acre*
One time per acre cost for practice	$ 122.52	*one-time cost/acre to implement the practice*
APR	6%	*interest charged or expected return on money invested*
Capital recovery period	20	*years of benefit from the practice*
Annual cost of practice	$10.69	*annual cost + interest or standard rate of return on investments*
Total cost for the practice	$ 213.81	*recovery period X annualized cost*
Benefit of the practice above cost	$ 668	*total value - total cost*
Cost:Benefit ratio	4.13	*This is your added return per dollar invested on the practice*
Annualized return on investment	15.6%	*Annualized return on investment*

One thing to remember is you are not likely to harvest 100% of the additional forage being produced so there is a line for a target % to be harvested. Because we are going to harvest the added forage with livestock, we convert the forage yield in lb/acre to additional animal-unit days harvested. Next we assign a net income value earned for each animal unit we have on the farm. This will give us the lifetime added return due to the practice.

If we have developed a budget plan for the project (A must!), we know what implementing the practice is going to cost us over time. It is important to include additional R & M costs that will be incurred over time as well as added labor into our calculations.

From the difference between the added costs and expected returns, we calculate the lifetime return on investment for the practice. Hopefully it is positive and we are glad we made the change. If it negative, we are very happy we went through this planning exercise before laying two miles of pipeline, setting seven tire tanks, and building four miles of fence.

NO ONE PLANS TO FAIL, BUT MANY FAIL TO PLAN!

Dairy Grazing: Keys to Building a Profitable Pasture-Based Dairy

Joe Horner
Dairy Economist
Commercial Agriculture Program

Ryan Milhollin
Project Manager
Commercial Agriculture Program

Pasture-based dairy producers sometimes summarize their guiding philosophy simply as, "Grow all the pasture you can grow, and let the cows harvest every pound you grow." This statement captures their focus on operational efficiency, capital efficiency and cost control, all of which are important for a dairy to be profitable. Observations of top producers suggest the following activities are key to creating a consistently profitable pasture-based dairy farm:

- Design systems
- Focus investments
- Control costs
- Leverage carefully

This publication expands upon each of these key activities to guide producers in developing and improving the profitability of their pasture-based dairies.

Design systems

A profitable producer designs a pasture-based dairy to be an internally consistent whole farm made up of components working together to produce low-cost milk (Figure 1). The producer examines each component to see how well it fits the system. When a component doesn't fit the system, problems arise and costs emerge to correct them. Top managers see these emerging costs as symptoms of an underlying system failure rather than signs of the rising cost of doing business as usual.

Forage

The secret to profitable milk production in any dairy system is to feed lots of high-quality, low-cost forage. A grazing system that delivers high-quality, low-cost forage can be established by following these three guidelines:

- Seed pastures to a grass or grass-legume mix selected to deliver high-quality pasture.
- Seed most paddocks in the system to a forage mix selected to persist for years to avoid the high costs of reseeding and feeding during reseeding.
- Seed some paddocks with annuals to graze during seasonal growth and quality deficits to avoid feeding high-cost stored forage and supplements.

Designing pasture systems for quality, persistence and seasonal deficits is essential for low-cost dairying.

Stocking rate

Pasture-based dairy systems in Missouri can be profitable with stocking rates ranging from three cows per acre to three acres per cow as long as the total system is designed consistently for profitability. For landlocked dairy farms with limited acreage sitting on expensive land and with sunk investments in silos, freestall barns and silage systems, a hybrid grazing–confinement system with a heavy stocking rate and lots of purchased feed can improve profitability. For a dairy without those constraints and facilities, a less intensive stocking rate that enables cows to harvest about 70 percent of their annual dry matter needs through grazing can be profitable. This less intensive system can result in extremely low-cost milk production. Although stocking rates are often implicitly designed into a grazing system, few single decisions can have as many impacts upon whole-farm profitability as stocking rate. Managers of profitable dairies should be careful when changing stocking rates in pursuit of higher margins or higher returns on capital lest they find themselves upsetting the whole system.

Cows

Cows need to be selected to produce, persist and reproduce on pasture. An example of an inconsistently designed system would be one that expects purebred confinement-raised Holsteins to produce milk, rebreed in a seasonal calving window and persist for years in the herd while being fed mostly pasture with minimal supplementation. Two popular methods of top producers for obtaining appropriate cows are crossbreeding for heterosis (performance vigor often exhibited by crossbred animals) and selecting dairy cattle genetics proven to perform on pasture.

Facilities

Facilities — including lanes, holding area and parlor — must be designed so that cows can be moved quickly from the paddock, milked and then returned to the paddock in two hours or less in all kinds of weather. Poorly designed facilities impede cow flow, lower labor efficiency and lower milk production due to lost grazing time.

Labor

Labor efficiency can be designed into a dairy system. As described under Facilities, the system should include a labor-efficient parlor and holding area with crowd gate. In addition, other labor-saving techniques, such as batch breeding, can be designed into the system. Batch breeding allows tasks such as feeding calves, breeding and drying off to be done in short bursts of concentrated work. This batching of the workload allows more cows to be milked and more milk to be harvested by each worker, which lowers labor costs and contributes to profitability.

Profitability triangle

Finally, the system must be designed so that the three sides of the dairy profitability triangle (Figure 2) are in balance and support each other. Each pasture-based dairy develops a farm-specific system that balances lower milk volume, higher gross margins and reduced overhead to create attractive returns to farmers. Remember, the goal is not to achieve maximum milk production but to sustain a low cost of production and generate enough milk production to achieve profitability. The greatest potential for gain in profitability is achieved by getting the whole system right and not by fine-tuning various aspects of the operation.

U.S. dairy producers are used to receiving good technical information from vendors. These vendors typically supply helpful information about ways to improve marginal profitability via purchased inputs in conventional dairy systems focused on achieving higher milk production per cow. Few vendors supply helpful information about designing profitable dairy grazing systems, which often leaves pasture-based dairy producers to create their systems through trial and error. Top-performing pasture-based dairy producers are one of the best sources of ideas for refining grazing systems, so find opportunities to network with them for tips on developing or improving your grazing system.

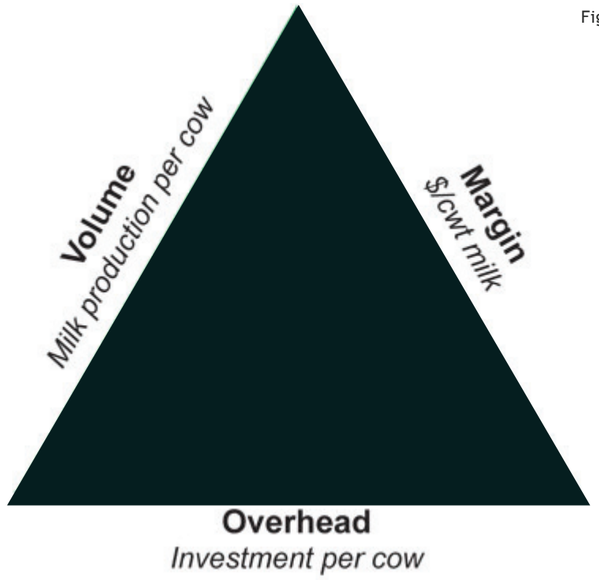


Figure 2. Dairy profitability triangle in balance.

Focus investments

Investments should be focused on land and cattle to avoid overcapitalizing the farm. Favor investments that reproduce or appreciate rather than ones that rust, rot or depreciate. Invest with discipline and only in critical assets needed for the operation.

An example of the impact of focusing investments wisely to achieve capital efficiency can be found in the comparison of two farms in Figure 3. Farm A and Farm B both have 100-cow herd sizes, but they have different initial capital investments in their operations, $850,000 versus $600,000. Both farms have identical operating expenses and debt structures (50 percent debt, 7 percent interest rate and 20-year amortization term). Farm B has a lower investment, lower total debt and, thus, less interest to pay. Farm B achieves a higher net margin due to having a lower interest-expense. Farm A and Farm B produced returns of 4.1 percent and 7.8 percent, respectively, even though the operational costs, excluding interest, were the same.

	Farm A	Farm B
Total assets	$850,000	$600,000
Gross margin before debt	$75,000	$75,000
Debt service	$40,000	$28,000
Net margin	$35,000	$47,000
Net margin/assets	4.1 percent	7.8 percent

Figure 3. Capital efficiency example.

Figure 4 depicts the huge lifetime-differences that can be achieved by small differences in profitability. In this example, two farmers inherit the same assets at age 25. Both are successful. However, by being a bit better manager, Mr. Excel attains two percent higher return on assets each year than Mr. Average. At the end of a 40-year career, Mr. Excel's net worth will have grown to twice that of Mr. Average.

Mr. Average	Mr. Excel
25 years old	25 years old
Inherits $200,000	Inherits $200,000
Invests in his own dairy	Invests in his own dairy
Earns and reinvests at a 4 percent return over the next 40 years	Earns and reinvests at a 6 percent return over the next 40 years
Retires at 65	Retires at 65
Net worth = $960,204	Net worth = $2,057,143

Figure 4. Small return on assets (ROA) differences impact on wealth accumulation

Dairy producers can become capital efficient by carefully analyzing possible capital investments to determine if they are really needed on an operation. Does the operation really need that extra tractor or three different types of forage equipment? Small dairy farms especially should have an appropriate level of machinery and not invest heavily in depreciable assets. Custom operators can be cultivated and trained to make hay or silage when needed for dairy operations, allowing for less owned harvesting equipment. Additionally, top managers are careful not to overinvest in milking parlors and instead make appropriate investments based on herd sizes. Generally, pasture-based dairies allocate one-third of the investment each to cows, buildings/equipment and land (Figure 5).

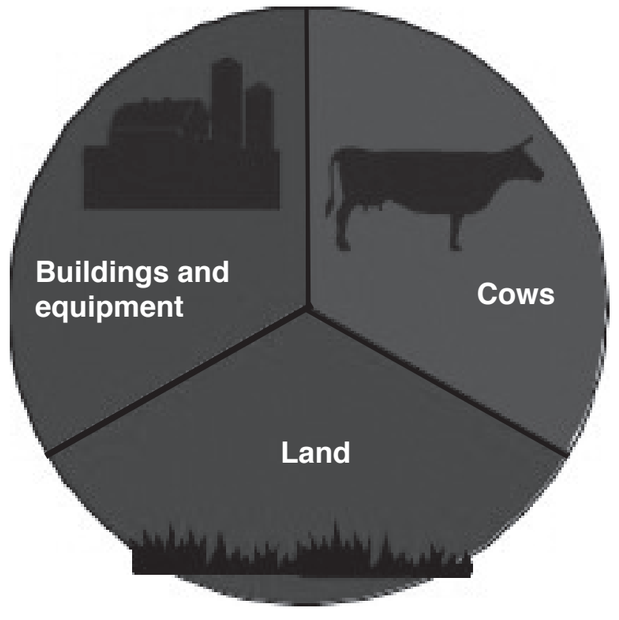


Figure 5. Allocation of investments on a pasture-based dairy.

Control costs

Cost control is important on any dairy farm, but on a grazing dairy with lower gross revenues per cow, carving every unnecessary penny out of the cost structure is crucial to profitability.
A good whole-farm measure of cost control is the operating expense ratio. The operating expense ratio

is the proportion of total revenue that is absorbed by operating expenses. It is calculated by dividing total annual operating expenses (minus depreciation) by gross revenue.
Generally on a pasture-based dairy, a strong operating expense ratio would be less than 70 percent. As the ratio decreases, more dollars are available for loan payments, family living expenses, savings and dairy improvements. The operating expense ratio is an effective indicator of a dairy farm's cost control (Figure 6).

Pasture-based dairy operating expense ratio		
Vulnerable	**Caution**	**Strong**
Greater than 80 percent	70 to 80 percent	Less than 70 percent

Figure 6. Scorecard for a pasture-based dairy: Operating expense ratio.

Leverage carefully

Leverage is the relationship between the amount of equity capital and the debt used to finance the dairy business. Financial leverage must be used carefully and only when adding debt clearly enhances long-term profitability. Seek the absolute lowest-cost financing available. Dairy producers with conservative debt levels can more easily negotiate better terms among different bankers and refinance as needed.

Debt structure is also important to the financial flexibility of a pasture-based dairy operation. Improperly structuring debt can be a critical mistake because it impedes the dairy's ability to cash flow during tough financial times. The key is to keep annual principal and interest payments as low as possible. Amortizing debt long term using the land base as collateral is one strategy that has been used by farmers. Pasture-based dairy producers need to have the discipline to pay down debt during good years to minimize total interest costs. They also need to avoid taking on short-term debt to buy cows and machinery unless absolutely necessary.

An example of the impact of different debt structures can be found in Figure 7. Consider the $2,500 debt per cow example. A dairy farmer securing this debt through 100 percent short-term (5-year) financing would pay $617.91 per cow per year. If the farmer were to secure the debt through long-term (20-year) financing, the annual payment would be only $254.63. That is 59 percent less. Borrowers can always pay down principal and prepay on farm loans. Having cash flow during tough financial years allows farmers flexibility to withstand a year or two of low milk prices or other financial hurdles that inevitably arise.

Debt per cow		$1,500	$2,000	$2,500	$3,000
Percent short-term	**Percent long-term**	**Annual principal and interest payment**			
100	0	$370.75	$494.33	$617.91	$741.49
75	25	$316.25	$421.67	$527.09	$632.51
50	50	$261.76	$349.02	$436.27	$523.53
0	100	$152.78	$203.70	$254.63	$305.56

Assumptions

1. Short-term interest rate of 7.5 percent and 5-year amortization period.
2. Long-term interest rate of 8 percent and 20-year amortization period.

Figure 7. Impact of debt structure on principal and interest payments.

As important as debt structure is, the amount of debt that a dairy can support is equally important. Operations that are too financially leveraged are more susceptible to financial problems due to loan obligations that are too great to support during challenging times. Two good debt guidelines exist for pasture-based dairy operations:

- Debt service (principal and interest payments) of less than 15 percent of gross revenue
- Maximum debt level of $3,000 per cow (unless off-farm income is generated)

Debt-to-asset ratio is another measure of financial leverage. This ratio is calculated by dividing farm debt by the total farm assets. Farms that have less than a 40 percent debt-to-asset ratio are considered to be "strong." This ratio is important to lenders because it is also a solvency measure. Solvency refers to the ability of a business to meet all debt obligations following the sale of assets. Lenders are rarely interested in financing operations that have high debt-to-asset ratios as these operations have considerably higher financial risk.

Pasture-based dairy debt-to-asset ratio		
Vulnerable	**Caution**	**Strong**
Greater than 50 percent	40 to 50 percent	Less than 40 percent

Figure 8. Scorecard for a pasture-based dairy: Debt-to-asset ratio.

Summary

Profitability needs to be embraced by employees and management of pasture-based dairy operations. Incremental improvement in profitability can dramatically increase cash or wealth accumulation over time. Creation of a profitable pasture-based operation involves four key activities: Design an appropriate system, focus the investments, control costs and leverage finances carefully. Each component of a pasture-based system (cows, forages, facilities and human resources) has to coordinate with the others to create a profitable system of production. Dairy farmers need to understand operational efficiency measures to measure and improve profitability. An effective way to monitor and evaluate operating costs is to calculate the operating expense ratio. Farmers need to understand the financial implication of each decision they make to use their capital efficiently and should use leverage only when it improves their profitability. Farmers should properly structure and not excessively leverage their operations to minimize financial risk.

Manage What You Have (Plant Fence Posts First)

Mark Green, District Conservationist
Natural Resources Conservation Service

Too many times we are all guilty of looking for the magic silver bullet that is going to cure every problem. Even in pasture and grazing management - a new grass variety, a new breed of cattle, a new mineral, etc. I guess it is human nature to hope for one thing new that will cure all. However, if we'd back up a minute and look at our operation and be truthful, maybe there are some improvements that can be made in our own management to get the most out of what we already have.

#1 - Existing Resources. The first thing to look at is what resources you have on the farm. You need to know where you are in all aspects of the farm/ranch and look at everything that has an impact on your operation. Everyone's operation is different, so looking close at yours is very important.
What is a "resource inventory and evaluation"? It's a process to determine what resources you have, their condition, and the quantity of these resources. It also helps identify resources you don't have but need. Some resources are more important than others. Identify the strengths and weaknesses. Prioritize areas to concentrate on to reach your goals. Resources include: land, soils, water, fences, plants, animals, facilities, equipment, finances, time, and labor.

Land: How much grazing land do you have? Is there enough to reach your goals? Is there an opportunity to expand? This could be leased or purchased land close by. Even if more land is close by, is it suitable? Is it too wet, too rocky, too close to town, etc? Every piece of property has different physical advantages and disadvantages. These can present challenges and opportunities.
Soils: Soil is the foundation for your plant community. You have little impact on soil, but knowing soil types present and their limitations will help in planning. Soil type determines plant species suitability and plant productivity. Soil cannot be replaced so protect it and treat it right.

Soil fertility: You also need to know the fertility level of your soils. Soil tests are needed to provide this information and should be taken at the beginning of your planning process. Without this information, you are guessing what level your soil fertility is in.

Water: Water is the most limiting factor in setting up a grazing system. Livestock need a dependable, clean source of water. Note the location of all your existing water sources. Is water available in every pasture? How accessible is the water for livestock? Is it good quality water? If you have ponds, creeks or streams, are they dependable year round? Does the water quality stay good? Will their location work with your grazing rotation? If you are using a well, is it dependable; will it handle additional water tanks? Look at your existing tanks. Where are they located? Can they be incorporated into your grazing system?

Fence: What type of fence do you have now? Barbed wire or woven wire, or is it electric fence? Are you willing to change to electric, if you are using barbed wire now? Electric fence gives you much more flexibility in your grazing system. Also note where all your existing gates are. This will help in designing your grazing system.

Plants: What types of plants are present on your farm? Have a good idea of what species of forages are in each pasture. Do you have a good stand of desirable forage species, or are they poor and weedy. Know what level your pastures are now, and then you can take inventories later to determine if your management is improving your forages. Plant types present are indicators of pasture condition and trend. Plant community's change constantly and your management can affect this greatly. Which is the weakest link: plant population (desirables versus undesirables); diversity; density of stand; vigor of plants; legumes present; severity of use;

uniformity of use; soil erosion; woody invasion; and residue on ground? These are all factors that tell you what condition your pasture is in.

Livestock: What type of livestock do you have on your farm? How many animals do you have? What is their average weight? All these questions need to be answered to balance your livestock needs with your available forage. **The goal of a good grazing system is to balance the amount of forage produced with the needs of the animals you are raising, without feeding excessive amounts of purchased or harvested feed.**

Equipment: What equipment do you have now? Do you need this equipment? Can you hire some of this work done cheaper than investing in equipment? The goal of a good grazing system is to let the animal harvest their own feed instead of you or someone else having to harvest it.
Facilities: Note where your barns, sheds, handling facilities, chutes, lots, and other facilities are located. Your grazing system should tie in with your working facilities for ease of livestock handling and movement.

#2 – What can be changed

Shut the Gates

After getting a good look at what you have on the farm now, the next step is to decide what you can improve on without major investment. One of the first things to look at is Shutting the Existing Gates. Why do we need to shut the gates? If we compare continuous grazing, where no pasture rest is provided, compared to a good rotation that provides rest periods for pasture, the grazing efficiency is greatly improved. See table below:

Grazing Efficiency (same as % utilization or harvest efficiency) Guide:
1 – 3 pastures = 25 – 30%
4 – 8 pastures = 35 – 50%
8 – 12 pastures = 50 – 65%
12 – 24+pastures = 65 – 70%

Grazing Management

This improved grazing efficiency is a result of 1) livestock in smaller pastures so they are utilizing more of the forage in that pasture. 2) pastures getting rested which result in increased forage production.
If you can increase the amount of forage you actually get into the animal just by shutting some gates, wouldn't it be worth a try?

You goal is to meet the nutritional needs of livestock from standing pasture. No matter what you produce, cattle, sheep, goats, or horses, they can always harvest the forages cheaper than you can with equipment. You want to optimize pasture yield, quality, and persistence, all three. To do this you need to understand the grass plant. 95% of what it takes to grow forage plants is free – Sunlight, Water & Air.

5% is in the form of minerals that come from the soil – either naturally or through added fertility amendments. The basic process of photosynthesis is what takes solar energy and makes livestock feed. Only green, growing leaves carry out photosynthesis. Bare soil doesn't do it. Dead, brown plants don't do it. Thus, one of the first objectives of grazing management should be to grow more leaves on more acres as many days of the year as possible. Think of the pasture as a big solar panel and try to make the solar panel as efficient as possible.

When you look at a pasture you need to think of what you see above the ground as being a reflection of what's below ground. Short, continuously grazed plants will have short weakened root systems. On the other hand, plants that have been grazed to the proper height and then allowed to rest and regrow will have a deep vigorous root system. This will affect the plants ability to pull water and nutrients from the soil and survive.

The following table gives you an idea of minimum grazing heights to keep this ground cover and healthy plants.

Pasture type (select an option that most closely reflects the one being planned) [1]	Begin Grazing (inches) End Grazing Height Continuous [2]	(inches) End Grazing Height Rotational [3]	(inches) Min – Max Rest Period [4]	(days) Min-Max Grazing Periods [5]	(days) Minimum Pastures Needed [6]
Introduced grasses	6 – 8*	4 – 5	3 – 4*	20 - 45	10 - 22
Introduced legumes	8 – 10*	4 – 5	3 – 4* 25 – 35	(45)** 5 – 7	(9)**
Native grasses	12 - 18	***	6 – 8	30 – 50	10 – 17
Introduced Grasses/legume	6 – 8	4 – 5	3 – 4	25 – 45	8 – 15
Native grass mix	12 – 18	***	6 – 8	30 – 50	8 – 12
Introduced grasses/ legumes/forbs	6 – 8	***	3 – 4	25 – 45	5 – 9
Native grass/legume/forbs	12 – 18	***	6 – 8	30 – 50	4 – 7

If you are going to plant anything new, the first thing to plant is fence posts. What this means is to add cross-fences to improve your grazing distribution and manage the pastures more efficiently. With the electric fence materials available today, this can be completed fairly inexpensively and easily.

Livestock Water

As I mentioned earlier, livestock water is the most limiting factor to improving grazing distribution and flexibility in a grazing system. You need to look at your water situation closely and see where you can improve it. Ideally, livestock should not have to travel any further than 700-900 feet from any point in a pasture to the water. This will maximize your grazing distribution. There are many options out there. One we often dismiss or overlook is above ground pipe and portable tanks to provide water during the growing season. We truly only need freeze proof water about 2 months out of the year, but that is what we spend most of our money on. With the use of above ground pipe and portable tanks, you can get water out to points needed cheaper and easier than buried line and permanent tanks. Have some permanent tanks for winter water, in key locations.

Some other areas to look at and see if you need to change some management include;

- Fertility – soil test and see what you have.
- Legumes – add legumes into existing pasture to improve quality of pasture and reduce amount of nitrogen fertilizer needed.
- Creep Grazing – if you are not familiar with this, check into it. Allowing the calves to go under the hotwire and graze ahead of the cows can result in some pretty cheap weight gain.
- Weaning Across The Fence – Another practice any cow/calf producer should check into. Reduces stress on the cow and the calf.
- Culling Non-Producers.
- Stockpiling Fescue for winter pasture.
- Brush Management – woody invasion reduces forage production. Look at ways to control brush, if it is a problem.

Monitor pastures

If you don't know where you are, how do you know you know when you get there? If you don't monitor what's going on in your pastures, you may not know what improvements or problems are happening out there. Get in a regular practice of record keeping on your pastures. Some graziers are taking pictures of each pasture at least once a year and comparing to see what's going on out there.

Bottom Line

Know where you are now and see what improvements in your management you can make. As you improve and tweak your grazing management and see the results, then you can decide if you need to try a new forage or other "silver bullets".

Notes

Save the Date!

31st Annual SW Missouri Spring Forage Conference

March 3, 2015