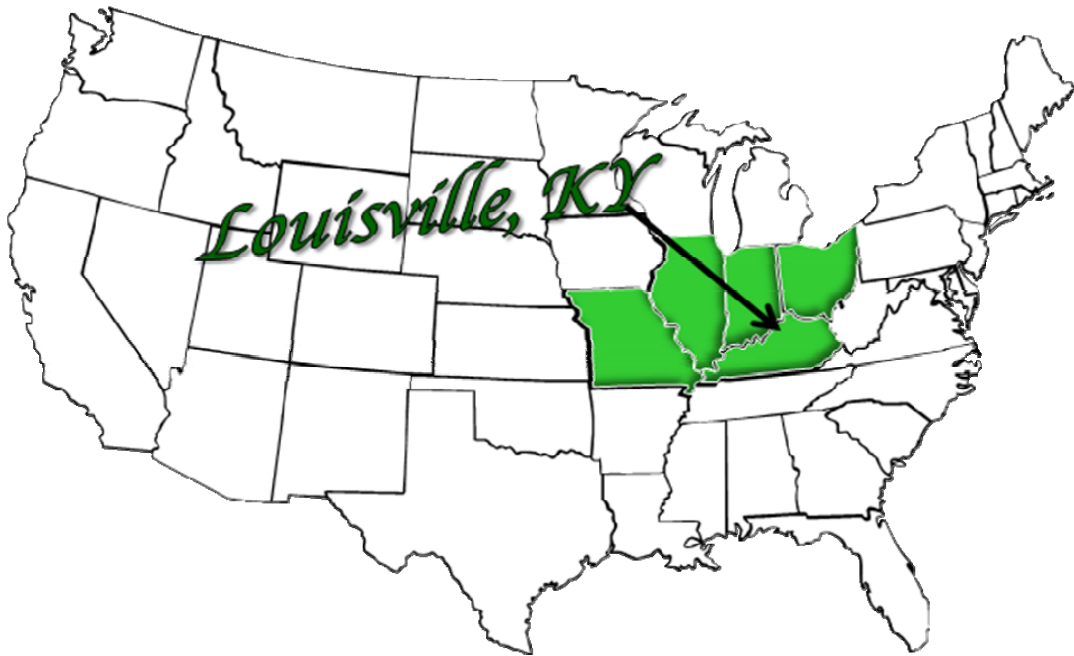


**10th Heart of America
Grazing Conference
and
11th Kentucky Grazing
Conference**



January 25-26, 2011

Holiday Inn Hurstbourne

Louisville, Kentucky

*Special publication – KFGC 2011-02
Edited by Garry Lacefield and Christi Forsythe*

F o r e w o r d

On behalf of the Heart of America Grazing Conference planning committee and the Kentucky Forage and Grassland Council, I would like to welcome you to the Tenth Heart of America Grazing Conference. This conference is organized by a committee of University, Extension and NRCS personnel from a five-state region (Ohio, Indiana, Kentucky, Illinois and Missouri).

I express special appreciation to the following organizational sponsors: Illinois Grassland Conservation Initiative Association, Illinois Forage and Grassland Council, Indiana Forage Council, Kentucky Forage and Grassland Council, Kentucky Grassland Conservation Initiative, Kentucky Department of Agriculture, Missouri Forage and Grassland Council, Missouri GLCI Coalition, Ohio Forage and Grassland Council, Ohio State University Extension, Purdue University Cooperative Extension Service, University of Kentucky Cooperative Extension Service, University of Illinois Extension, University of Missouri Extension, and the USDA Natural Resource Conservation Service.

This year we have over twenty vendors exhibiting the latest in grassland technology products and services. Not only do these vendors provide valuable information and services, they also provide significant financial support to make this conference a success. Please visit with and thank all of the vendors here today. A complete listing of vendors with contact information is located elsewhere in this publication.

I want to say a special “thanks” to Mrs. Christi Forsythe for her attention to all the details with program, proceedings, publicity and exhibitors. In addition, I want to acknowledge my colleagues Dr. Ray Smith and Mr. Tom Keene for their many contributions to the Conference.

The program should prove to be very informative and educational. We have put together a panel of speakers in grassland management representing research, extension, education and production agriculture. I would like to thank all of the speakers for taking time out of their busy schedules to share their knowledge and experience with us. I know you will enjoy and benefit from their presentations.

Lastly, but most importantly, I would like to thank each of you for attending and supporting this conference. Your continued interest and support is greatly appreciated. Join us again next year for the 11th Heart of America Grazing Conference to be held January 25-26, 2012 at the Holiday Inn in Mount Vernon, Illinois.

Garry D. Lacefield
2011 Conference Chairman

Heart of America Grazing Conference
January 25-26, 2011
Holiday Inn Hurstbourne
Louisville, Kentucky

Agenda

January 25, 2011

2:00 p.m. Exhibit Set-up

3:00 p.m. Registration, Exhibits and Silent Auction

5:30 Welcome, Invocation & Dinner – Dr. Garry Lacefield

Kentucky Agriculture – Dr. Jimmy Henning

Forages Around the World: Observations & Reflections – Dr. Garry Lacefield

January 26, 2011

7:00 a.m. Registration, Exhibits, Silent Auction

8:15 Welcome – Dr. Garry Lacefield

8:30 From Confinement to Grazing – Mr. Bill Payne

9:00 How much Pasture do I have and how long will it Feed my Cows? – Dr. Ray Smith

9:30 Tall Fescue – Endophyte – Animal Performance – Dr. Glen Aiken

10:00 Break, Exhibits & Silent Auction

10:30 Organic Dairying: Role of Grazing – Mr. Jake Schmitz

11:30 Mob Grazing, High Density Grazing, Management-intensive Grazing; What's the Difference? – Mr. Mark Kennedy

12:00 p.m. Lunch

1:00 Silent Auction Results

1:15 Integrated Weed Management for Enhancing Productivity of Grazed Pastures – Dr. J.D. Green

1:45 Grazing Goats and Cattle and Other Co-species Grazing – Mr. Jason Tower

- 2:15 Grazing Corn, Brassicas, Chicory, Eastern Gamagrass, Ryegrass, Oats and Other Non-Traditional Forages – Mr. Jeff McCutcheon
- 2:45 Extending the Grazing Season and Reducing Stored Feed Needs – Mr. Ed Ballard
- 3:15 Adjourn

HEART OF AMERICA GRAZING CONFERENCE

January 25-26, 2011
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Louisville, Kentucky

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From Confinement to Grazing

Bill Payne

Knob Lick Farm LLC
Lincoln County, Kentucky

A Tale of Two Businesses:

I would like share an account of a transition from a conventional dairy operation to our current Management Intensive Grazing (MIG) enterprise. In 1974, I joined my father who had been dairying on a 265 acre farm in Lincoln County, Kentucky for twenty five years. We fed our registered Holsteins corn silage and alfalfa haylage and purchased a manufactured feed. Our herd of 70 Holsteins spent most of their time on concrete. We did make an effort to allow access to an exercise lot when weather permitted. However, during most of the 1990's we spent a great deal of time treating various hoof problems. These problems included heel warts, abscesses and foot rot. I was spending more time trimming hooves than managing the dairy. Milk production was more than adequate, but herd health was not. We had always raised our own heifers, mostly on pasture; their health was acceptable. Foot problems were almost non-existent for these heifers.

We also had about 120 beef cows on another farm. Our beef herd was grazed as long as possible, then received alfalfa/orchardgrass baleage when pasture resources declined. They were never on concrete and their health problems were minimal.

In April 2000, I attended the Kentucky Grazing School. The grazing techniques presented there seemed to be much simpler and more in synch with nature than the drylot operation which we were employing for our dairy herd. Not only could the animals harvest their own feed, but they could spread their own manure! Perhaps the most important advantage, it seemed to me at the time was better hoof health. Additionally, our farms were rolling to steep and better suited to grazing permanent pastures than to tillage. I decided to move any future operation in the direction of MIG.

When my father retired in August 2000, I made a business decision not to purchase his interest in the dairy herd. The dairy herd went to Louisiana at that time. While the dairy business had been very good to our family, I elected to pursue a business model which would provide less stress and investment, but more free time than the dairy offered.

I continued to raise the remaining dairy heifers on pasture. The beef operation was expanded by backgrounding purchased steers. In December 2001, I had the opportunity to become involved in a network of dairy heifer growers. I purchased 100 of these heifers from Michigan and began grazing them. In January 2003, I sold the beef herd and

am now raising dairy heifers exclusively. There are about 400 of these heifers on the farm at a given time.

In order to better utilize our larger pastures, I decided that electric fencing was necessary. We had used solar chargers in the past, but realized that we needed reliable power over the entire farm. We installed high tensile wire on existing permanent fences throughout the property. This allowed us to attach temporary polywire fencing wherever we liked. Since then, we have replaced some of our woven wire interior fencing with two or three stands of charged high tensile wire supported by fiberglass posts. Wood posts provide support at the ends and at corners. This fencing is far less expensive and much easier to install.

At this point, water became the limiting factor. With the advice of Bo Renfro and Ken Johnson from NRCS, and Dr. Jimmy Henning and Dan Grigson from the CES, I drew a plan to extend waterlines around both farms. Bo Renfro, District Conservationist in Lincoln County assisted by securing cost share money that enabled me to implement that plan, which included fencing off Hanging Fork Creek. We installed 4 miles of 2 inch PVC water lines, that provided water to our pastures. We utilized portable water tubs which coupled to the water lines with quick couplers. This water is provided from a municipal water source. We do have two spring fed water tanks. We do not allow direct access to ponds. Our portable tubs have remained useful down to 0° F. during winter by allowing a continuous small flow of water into the tank.

State cost share dollars allowed me to improve our cattle handling facilities and to install feeding pads of geotextile fabric and gravel. These feeding pads have been most valuable during periods of wet and muddy weather.

Proper design of cattle handling facilities is very important in order that animals may be handled with a minimum of stress. In the past, the infrequent handling of our beef cows and purchased steers resulted in a great deal of stress for both cattle and people. Providing feed in a trough on a daily basis has allowed us to make friends with our heifers and has virtually eliminated the stress of moving and handling cattle. An alternative to daily feeding in a trough can be a "lead steer" who has been trained to come when called. Where we once conducted "roundups" with trucks and lots of whooping and hollering, we can now call our heifers when we change pastures or gather them for sorting in the corral. This is primarily a result of a major change in philosophy and attitude of the people and training of the cattle. I feel very strongly that less stress results in better herd health and production as well as a much better attitude on the part of people. Moving and working with our heifers is far less stressful for both cattle and people now.

Our current feeding program for our heifers provides pasture and 4 pounds of soyhull pellets. Two ounces of a custom mineral (which includes Rumensin™) is topdressed over the feed in the trough. I utilize cool season grasses (mostly fescue) with clover during the spring months. From June until September 15, we graze about 80 acres of alfalfa/orchardgrass pasture in

addition to the fescue/clover pastures. From September 15 until November 1, the alfalfa is allowed to regrow to provide root reserves for winter. During this time, the heifers have standing corn and fescue/clover pastures. After November 1, we offer the remaining dormant alfalfa/orchardgrass. When the alfalfa/orchardgrass is gone, the heifers get stockpiled fescue that we hope will last until green up in March. Since we will not normally have enough stockpiled fescue to provide all the feed through winter, we have wrapped alfalfa/orchardgrass baleage that we can unroll in the pasture. Since it can be muddy and cold when feeding baleage, an option to consider is feeding this in November when the ground is drier and the temperatures are warmer. My hope is that this strategy will save more of the stockpiled fescue until winter and that we will not have to feed as much of the balage in those colder months. Winter annuals such as rye or wheat can provide winter and spring grazing if planted early enough.

I utilize soil samples from all of our pastures and hay fields annually to provide direction for the application of fertilizer and lime.

In addition to grazing our dairy heifers, we produce alfalfa/orchardgrass hay for sale. There were two barns available to store that hay on the former dairy. We have converted two tobacco barns for additional storage. We raised 70 acres of alfalfa for sale this past year, while using another 80 acres for grazing and haylage. This hay for sale is baled in small square bales for the horse and dairy markets. Hay not meeting this quality is fed to our heifers. We graze

our alfalfa in November to gain pasture days and to aid in the control of weevils.

A major challenge to livestock producers is to reduce our reliance on stored feedstuffs by extending the grazing season. In order to do this, we must consider new ways of utilizing traditional crops and think about non-traditional crops. Recently we have used standing corn as fall pasture after we conclude grazing alfalfa on September 15. We have been able to produce good gains with this corn. Small grains such as oats and rye provide good fall, winter and spring grazing. We have tried turnips with the oats. There are many forage species available to producers and various ways to use these forages, but stockpiling fescue has the potential to create the largest impact on our profitability by reducing our reliance on stored feeds for winter. This practice has been proven time and again to provide low cost feed with a minimum of labor.

While I have had experience with corn silage, alfalfa hay and cool season grass/clover pastures, I have read about many new forages and new uses for traditional ones. We have drilled perennial ryegrass into a thinning stand of alfalfa. We have experimented with turnips and chicory. Our imagination may be the only limit to extending the grazing season.

A Tale of Two Seasons:

The Winter of 2004-2005 in our area was one of excess rain and saturated soils. Daily feeding became a challenge due to the mud. "They don't make boots tall enough!" Getting feed to troughs in pastures was a struggle as was feeding haylage. Higher traffic areas became

pugged. The heifers did not gain as they should have. I vowed to make changes that would solve these problems. During this past summer, we installed more geotextile fabric and gravel feeding pads, especially in winter feeding areas. We extended gravel roads to enable us to get to those feeding areas also. Successive winter feeding seasons were much more successful than formerly.

After a mild spring with adequate, but not excessive moisture, we harvested and wrapped a normal first cutting of alfalfa/orchardgrass baleage. Soon thereafter, rains became infrequent and the soil slowly began to dry. By July we were becoming concerned about smaller hay yields and slowing grass regrowth. Only the rain produced by hurricanes saved crops and pasture from complete failure. September and October saw less than an inch of rain each. Our two spring fed water tanks slowed to a trickle. We had to forgo grazing the pastures which were served by these two spring fed tanks even though they still had grass available. Thank heaven for the municipal water which served most of our farm! While neighbors began hauling water to cattle, we were able to keep rotating our heifers and harvesting what grass was still there. The increased forage utilization resulting from MIG was allowing our heifers to continue to gain reasonably well. Other managers had been feeding hay for some time in many

cases. The results of continuous grazing was evident. Our pastures, while not lush by any means, still had some forage available and would still have some nutrient reserves. On September 20, we began grazing corn with our >1000 pound heifers. They gained over 2 pounds per day through October and November. Eighteen acres of standing corn provided grazing for 115 1000 pound heifers for 55 days. We still have wrapped baleage to provide for the winter months. Clearly the benefits of MIG were paying dividends in the form of increased forage utilization. These benefits were satisfactory gains and ultimately, a profit.

My challenge to you, then, is to seriously consider the benefits of a Management Intensive Grazing system. The fencing technology is proven and available. Our humid climate and topography are ideally suited to grazing. Our toolbox contains many forage species that we can use to form our own system. A grazing system can also provide a very healthy environment for our livestock. Grazing cattle also provide the benefits of decreased runoff into streams and reduced dependence on fossil fuels and fertilizer, if managed properly. All this can be achieved at a relatively low cost. Best of all, Management Intensive Grazing can provide a very satisfying lifestyle for both man and livestock.

How Much Pasture Do I Have and How Long Will It Feed My Cows?

Ray Smith

Forage Extension Specialist
University of Kentucky

A very common question asked by cattlemen is, "How much pasture do I have and how long will it feed my cows." The purpose of this paper is to provide some guidelines and tools for answering this question. In pasture systems, determining the amount of pasture is much harder than in grain-based feeding systems because feed may be allocated for more than one day and feed quantity and quality is influenced by weather, fertility, stand density, and season. In addition, not all the available forage is consumed and the plants continue to grow after they are grazed. Variation in quality and animal production status (pregnant, dry, lactating, growing, etc.) also influence feed consumption.

The most commonly used methods to estimate available pasture include hand clipping, grazing sticks, and rising plate and falling plate meters. In the pages that follow I will provide an outline of how a grazing stick can be used to estimate pasture yield and how to calculate pasture allocation to your herd. Remember that grazing sticks and other tools are useful for making immediate pasture management decisions, but good records of pasture yield, grazing days, and other data will provide a means to evaluate past efforts to improve the system. Records can also be used to identify areas of weakness in the system and help make plans for

improvement. More specific information about grazing, pasture management, and forage species is available in other publications, such as *Rotational Grazing* (ID-143) at www.uky.edu/Ag/Forage/ForagePublications.htm. Other excellent resources are listed at the end of this document.

Grazing sticks are handy tools that simplify the tasks of measuring pasture yield, allocating pasture to animals, and tracking changes in productivity. These are all critical aspects of good pasture management. Grazing sticks vary somewhat from state to state. The Kentucky model consists of the following:

- A ruler to measure forage height
- A quick guide to start and stop grazing on a paddock
- A table to convert stand density to dry matter per acre inch
- Formulas for pasture allocation
- Rules of thumb and planning information

Keep in mind that grazing sticks provide only an estimate of pasture yield. If you keep good records and compare yield estimates with actual grazing days, you will be able to get closer to the actual yield for your farm and your conditions.

Determining How Much Pasture You Have

The grazing stick procedure is designed to estimate the amount of forage in a pasture. The estimate is only as good as the sample. Sample numbers are key to obtaining a good estimate. If the forage stand and the topography are uniform, a minimum of two samples per acre is recommended. At least 20 individual measurements should be averaged to estimate yield in pastures of 10 acres. A higher number of measurements should be made for fields with variable soils, topography, or forage stands.

Step 1: Use the ruler side of the grazing stick to measure the height of the forage. With most forages, plant height taller than 18-24 inches is really better suited to hay than to grazing. This is particularly true with infected tall fescue, because toxins increase with stem growth and seed head development. See *Tall Fescue Endophyte Concepts* www.uky.edu/Ag/Forage/ForagePublications.htm for more information.

Height is not a measure, but rather an average, of the tallest plants. Spread your hand and lower it onto the canopy. The average height is measured at the point where you feel very modest resistance from the plant canopy. Record the height for each sample location in the pasture and then calculate the average height for the pasture.

Step 2: Visually estimate the density of the stand by looking directly down at the spot where you have just measured canopy height and continue to do this at each location where you measure plant height. Stand density is simply the amount of the ground surface covered

with standing forage (do not include residue directly on the ground, but only plant material tall enough for the livestock to consume).

Your goal is to place the pasture into one of three density categories (<75%, 75 to 90%, >90%). Record the density reading for each location where height was measured, then calculate the average stand density for the pasture. The density yield table (Table 1) can now be used to estimate forage yield per acre inch.

Note: Stand density measurements using the grazing stick are most accurate when canopy height is approximately 8 inches tall. Also, the density yield table is more accurate with denser stands. Grazing sticks used by some other states show higher forage yield per inch of growth. For the Kentucky Grazing Stick we have validated our estimations during several sessions of the KY Grazing School, but we have been intentionally conservative in our yield estimations. Stands of stockpiled tall fescue tend to be much denser than those recorded on the grazing stick and are most accurately measured using plate meters or hand clipping.

Step 3: Determine the dry matter (DM) yield per inch using the density measured in Step 2. For example, if you are measuring a tall fescue pasture and you estimate that the available forage covers 85% of the ground area. This pasture would be assigned the middle density category of 75 to 90% cover and according the chart located below the density ratings would have between 150 and 200 lb of DM per acre inch (Table 1). Based on your assessment of the stand, assign a yield (the thicker the

stand the closer to the upper end of the range). Since 85% is in the upper end of this density category then 200 lb of DM per acre inch would be a good estimate. If the average stand height was 8 inches, and you want to maintain 3 inches of stubble after grazing, then available forage equals:

$$5 \text{ inches} \times 200 \text{ lb/acre inch} = 1000 \text{ lb DM/acre}$$

Step 4a: Calibration (quick estimate): A periodic check of your measurements can help you to be consistent about using the grazing stick. Harvest 1 square foot of forage (cut at soil level), weigh it in grams, and multiply by 20. This will give an estimate of lb per acre assuming the forage is 20% DM. While this method is useful for a quick check, the DM content of forage does vary throughout the year, so the yield estimate will be more accurate if the sample is actually dried.

Step 4b: Calibration (better estimate):

1. Harvest 1 square foot of forage (cut at soil level) and chop the forage into 1- to 2-inch lengths.
2. Weigh the forage (in grams) then place it on a microwave-safe dish and place the dish in a microwave oven. Place a cup of water in the microwave as well (this will reduce the risk of burning the forage).
3. Heat on high for two minutes.
4. Weigh the forage.
5. If the forage is not dry, place it back in the oven and heat it for 30 seconds.
6. Repeat steps D and E until the weight does not change. If the forage is charred, use the last weight.
7. Multiply the dry weight in grams by 100 for an estimate of dry matter yield in lbs per acre.

Table 1. Density-yield relationships to determine estimated dry matter per acre inch.

Density Category	<75%	75-90%	>90%
Tall Fescue or orchardgrass	50-150	150-200	200-300
Bluegrass	50-100	100-175	175-250
Cool-season grass-clover	50-125	125-200	200-275
Bermudagrass	100-200	200-300	300-400
Alfalfa	75-150	150-225	225-300
Red clover	75-125	125-175	175-250

Determining Pasture Allocation for your herd

The pasture system that you are using will determine the way you apportion forage to your animals. If you are using temporary electric fencing and allocating acreage to feed your animals for a specific number of days, you will need to calculate the acres needed per day. If you have a slow rotation with modest-sized paddocks, you will have to determine how many days a particular paddock will carry your herd. If you can vary animal numbers to fully utilize your available pasture, you will have to determine how many animals are required to fully utilize the available forage. Each situation requires you to use the above yield estimation to make the appropriate allocation. In addition to forage yield, the formulas require values for percent utilization (Table 2), animal weights, and animal intake (Table 3).

Utilization is defined as the percent of the available forage that animals consume. The unconsumed portion includes waste from trampling, dung, and urine. Utilization rates vary with the intensity of the grazing system (Table 2).

Animals will only use 30 to 40% of the forage on a continuously grazed pasture. This is due to the fact that they have excess forage and graze selectively. The forage that they do not eat may become mature and unpalatable. In addition, much of the available forage is trampled or fouled with dung or urine. With pasture rotation, the grazing period is shortened, animals cannot be as selective and less forage is wasted (Table 2). With a slow rotation (three to four paddocks, animals move every seven to 10 days), the utilization increases to 40 to 55% and a faster rotation will increase utilization to 55 to 70%. It is possible to achieve higher utilization (70 to 80%) with very intensive rotational systems (animals moved once or twice a day).

System	Utilization
Continuous	30-40%
Slow rotation (3-4 paddocks)	40-55%
Fast rotation (8+ paddocks)	55-70%

Livestock species, class, and physiological condition all have profound

effects on intake (Table 3). Forage intake may also be influenced by plant growth stage. Mature plants have high fiber content and because fiber digests slowly, this low-quality feed can limit the amount an animal can consume. See *Understanding Forage Quality* at www.uky.edu/Ag/Forage/ForagePublications.htm for more detailed information. Lactating dairy cows need a high plane of nutrition to maintain high levels of milk production and, as indicated in the table, some supplementation with grain may be necessary to provide sufficient intake for these animals.

Livestock	Dry matter intake as a % body weight
Dry beef cow	2
Lactating beef cow	3-4
Lactating dairy cow	2.5-5*
Stockers	2.5-3.5
Horses	2.5-3
Sheep & goats	3.5-4
*May include grain.	

Pasture Allocation Examples Using Formulas from the Grazing Stick

Calculate: The paddock size needed to feed a set number of animals.

Example 1: 100 dry cows, average weight 1,350 lb.

Acres required/paddock =
$\frac{(\text{weight}) \times (\text{intake in \% body weight}) \times (\text{animal \#}) \times (\text{days/paddock})}{(\text{available DM/acre}) \times (\% \text{ utilization})}$

Step 1: Animals will be moved every three to five days in an eight-paddock system, so utilization is estimated to be 60% (Table 2).

Step 2: Set intake—because they are dry cows, use 2% (Table 3).

$(1,350 \text{ lb/cow}) \times (0.02/\text{day}) \times (100 \text{ cows}) \times (4 \text{ days})$
$(1,050 \text{ lb/acre}) \times (.60)$
= 17.1 acres

Calculate: The number of animals needed to utilize the available forage.

Example 2: The paddock size is 20 acres and the grazing period is 4 days.

of animals required to graze a paddock =
$(\text{DM/acre}) \times (\text{acres}) \times (\% \text{ utilization})$
$(\text{animal weight}) \times (\text{intake in } \% \text{ body weight}) \times (\text{days})$
$(1,050 \text{ lb/acre}) \times (20 \text{ acres}) \times (.60)$
$(1,350 \text{ lb}) \times (.02/\text{day}) \times (4 \text{ days})$
= 117 cows would be needed to graze this paddock in 4 days

Calculate: The number of days a paddock will last.

Example 3: A herd of 100 cows on a fast rotation.

Days of grazing/paddock =
$(\text{DM/acre}) \times (\text{acres}) \times (\% \text{ utilization})$
$(\text{animal weight}) \times (\text{intake in } \% \text{ body weight}) \times (\# \text{ animals})$
$(1,050 \text{ lb/acre}) \times (20 \text{ acres}) \times (.60)$
$(1,350 \text{ lb}) \times (.02/\text{day}) \times (100 \text{ cows})$
= 4.6 days

The grazing stick also has a quick guide to determine when to start and stop grazing. If you carry the stick with you whenever you check animals or move fences, you can quickly assess pasture regrowth and readiness for grazing. The suggested starting height for grazing is 8 to 10 inches, which ensures that forage is in a high-quality vegetative stage. The stop-grazing limit applies to

grass or grass-legume pastures. The 3 to 4 inch stubble height ensures that some leaf tissue is available for grass regrowth. Removal of basal leaves will slow grass regrowth and limit yield. If pastures are growing quickly in the spring, you may need to harvest or clip them to keep them productive and in a high-quality condition.

The guidelines for grazing vary according to the requirements for different plant species (Table 4). For example, grazing is normally delayed until bud stage for alfalfa, so that the plants can restore root reserves that were used in regrowth. Consistently grazing forages, prior to the indicated height or stage, may thin the stand. Overgrazing (too little stubble remaining after grazing) may limit pasture yield because plants do not have enough leaf tissue for photosynthesis and rapid growth. Rest periods and amount of forage removal must be carefully balanced to keep pastures productive. One of the best tools to accomplish this is frequent observation of pastures and pasture regrowth. In spring, pasture growth is often too rapid for optimum grazing, so rotations may need to be accelerated to keep pastures in good quality. During summer, cool-season plants grow more slowly and the rotations may need to be slowed down to allow full recovery from grazing. When planning grazing systems, you can calculate the number of paddocks necessary to provide a desired rest period.

Table 4. Beginning and ending grazing heights from the Kentucky Grazing Stick.		
General Thumb Rules for Grazing Heights		
Forage Type	Height, Inches	
	Begin Grazing	End Grazing
Cool-season grasses and legumes other than alfalfa	8-10	3-4
Alfalfa	Bud stage	2-3
Annual warm-season grasses	20-24	8-10
Native warm-season grasses	18=22	8-10
Bermudagrass	6-8	1-2

Justification for Good Records

Grain producers determine the number of inputs to use based on the yield that they will gain from each input. The inputs and the resulting yield are easily measured, so grain production systems are quickly refined and improved. Good pasture records are slightly more difficult to collect, but they can also contribute to rapid improvement of pasture systems. One objective of pasture improvement is to increase yield, but changes in pasture management may also target herbage quality, distribution of yield, or persistence. Pasture improvements may result in improved gains, increased carrying capacity, or reduced need for supplementation during summer months. These improvements are not necessarily obvious unless producers keep good records and study them. Records will help a manager place a value on improvements and thus help decide where to spend limited resources to maximize the benefits.

Keeping Good Records

All information should be entered in a timely manner and regularly reviewed. Pasture records should include information about both inputs and outputs. General and input information should include: year, paddock identification, paddock size, monthly rainfall, date and amounts of fertilizer, seed and pesticide inputs, and the most recent soil test data. In addition, each time a paddock is grazed, record the number and average size of animals, dates in and out, pasture height at the beginning and end of grazing, yield estimate at the start of grazing, and stand density at the start of grazing.

Using Your Records for Planning

One of the most important points about

records is that they must be studied. Some people diligently keep records and then file them at the end of the season. It will take some work to compile records into a form that you can use efficiently, but this effort is worthwhile. If you are going to keep records, then commit yourself to using them. Here are a few examples of questions that might be answered by studying your pasture records:

- How much did legumes increase animal grazing days per acre in the summer?
- How much did fertilizer improve animal grazing days per acre?
- Which pastures and forages performed best in a dry year?
- How severe is the summer slump? Do you need to increase production during this period?
- Are your pastures improving or declining? Do you need to increase or decrease stock density?
- Did your stockpile run out before spring growth began? How many more acres of stockpile do you need to support the herd? Can you fill gaps in forage production by grazing crop residues?
- Did your pasture management improvements result in reduced costs, or increased carrying capacity, or better gains?

The following is a selection of the publications available online at www.uky.edu/Ag/Forage/ForagePublications.htm.

- ID-74—*Planning Fencing Systems for Intensive Grazing Management*
- ID-97—*Grazing Alfalfa*
- ID-143—*Rotational Grazing*
- PPA-30—*Sampling for the Tall Fescue Endophyte in Pasture or Hay Stands*

Additional Useful References

One of the best references for determining forage production is Chapter 16 of the new publication "Pasture and Grazing Management in the Northwest." It contains step by step guidelines on the clipping method and other methods to estimate pasture productivity. It is now available on-line (<http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=1586>) or a hard copy can be ordered by calling 1-800-723-1763 or on the website <http://pubs.wsu.edu>.

Impact of the Endophyte on Animal Production¹

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Tall fescue is productive and well adapted to the soils and climate in a region commonly referred to as the “fescue belt”, which overlays the transition zone between the temperate northeast and subtropical southeast. Persistence of the grass under low input management is attributed to a fungal endophyte that infects most fescue plants and produces alkaloids that impart tolerance to heat, drought, and grazing stresses. Unfortunately, the endophyte also produces ergot alkaloids that can induce toxicosis. Signs of “fescue toxicosis” are elevated body temperature and respiration rate, retention of winter hair coats through the summer months, hormonal imbalances, and reduction in dry matter (DM) intake (Strickland et al., 1993). Consequently, ingested ergot alkaloids adversely affect calf growth rates, conception and pregnancy rates, and milk production (Porter and Thompson, 1992).

A primary of ergot alkaloids is on the persistent constriction of blood flow to peripheral tissues, and a reduction in certain hormones involved in growth, pregnancy, and lactation. Vascular constriction reduces an animal’s ability

to dissipate body heat via skin, making them vulnerable to severe heat stress (Strickland et al., 1993). Furthermore, poor blood flow in cold air temperatures can lead to “fescue foot”, a chronic condition that causes lameness and necrosis of peripheral tissues (hoofs, tail, and ear tips). Ergot alkaloids also reduce circulating hormones, such as prolactin (Porter and Thompson, 1992; linked to milk production); progesterone (Jones et al., 2003); linked to pregnancy); and luteinizing hormone (Porter and Thompson, 1993; linked to conception). A less recognized problem of cattle grazing toxic fescue is the nutrient deficiencies that can develop from low DM intakes.

Hoveland (1993) estimated that the toxic endophyte annually costs the U.S. beef industry \$354 million in reduced calf numbers and \$255 million in reduced weaning weights. Adjustment of these estimates to 2006 calf prices shows costs of \$468 million in reduced calf numbers and \$338 million in reduced weaning weights. Therefore, the annual cost of the toxic endophyte to the beef industry has increased to a total cost of approximately \$800 million.

¹Mention of trade names or commercial products in the article is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA.

Cow-Calf Production

Reduced calving rates for cow herds grazing toxic endophyte fescue have been well documented. Schmidt et al. (1986) found 96% conception for heifers grazing tall fescue with a low endophyte infection percentage while there was 55% conception for those grazing tall fescue with a high level of infection. Calving rates were observed by Gay et al. (1988) to be 94.6 and 55.4% for cows grazing uninfected and infected tall fescue, respectively. Reductions in circulating prolactin, progesterone, and luteinizing hormones in cows grazing toxic fescue have been implicated in impaired reproductive performance.

Suckling calf ADG and weaning weights on toxic fescue pastures can be less than those achieved on endophyte-free pastures. Watson et al. (2004) reported lower ADG and weaning weights for steer calves weaned on toxic fescue pastures (ADG = 2.14 lb/day, weaning weight = 500 lb) than those weaned on a tall fescue infected with a novel nontoxic endophyte (Jesup MaxQ) that does not produce ergot alkaloids (ADG = 2.54 lb/day, weaning weight = 562 lb). Low milk production is a major limiting factor of reduced weaning weights on toxic fescue. Angus cows grazing toxic fescue have shown a 43% decrease in milk yield and lower milk fat compared to those grazing common bermudagrass (Brown et al., 1996).

Creep-feeding or creep-grazing of higher quality, nontoxic forages can increase weaning weights on toxic fescue pastures. Cow-calf producers also have options of using fall calving or early weaning to avoid warmer air temperatures during the summer.

Overseeding clovers or feeding co-product feeds can improve cow body condition and dilute dietary alkaloid concentrations to improve reproductive performance. Planting nontoxic, novel endophyte fescues also is an option in improving reproductive performance and weaning weights.

Stocker Calf Production

Poor weight gain and ill-thriftiness of calves that graze toxic tall fescue has resulted in the grass not being used to any extent for stocker production. Paterson et al. (1995) concluded that average daily gains (ADG) on toxic fescue range from 0.40 to 1.3 lb/day. It is doubtful that toxic tall fescue pastures can support ADG > 1.75 lb/day to meet target body weights. For growing 500 lb stockers to 750 lb body weights on pasture, it takes 192 days to accomplish this target body weight if an ADG of 1.3 lb/day is achieved. An ADG of 0.75 lb/day with these same stockers would require 333 days. Therefore, weight gain efficiency with E+ fescue is typically too low to generate profitable stocker production.

A problem with achieving acceptable ADG is when grazing is extended into the late spring and summer when warmer air temperatures and humidity induce heat stress. Aldrich et al. (1993) observed a 22% decline in DM consumption of E+ fescue with an air temperature of 90°F. Grazing frequency declined for cattle grazing toxic tall fescue in the afternoon and evening hours when daily mean air temperatures exceeded 76°F (McClanahan et al., 2008). This decrease in DM intake is associated with heat stress as cattle become less able to adjust to high air

temperatures. Further, the typical rough hair coat of fescue cattle during the summer has an insulation effect on elevated core body temperatures. Another problem for fescue cattle in dissipating body heat is a reduction in sweating and evaporative cooling of skin (Aldrich et al., 1993; McClanahan et al., 2008), which is likely due to constricted blood flows to sweat glands.

There are options in “managing around” fescue toxicosis to improve the profit potential of stocker production on toxic endophyte fescue. Overseeding clovers or feeding by-product feeds can generate acceptable ADG. Clovers also add fixed nitrogen, via bacteria that colonize in their roots, to the soil as a cost effective alternative to commercial nitrogen. Aiken et al. (2010) demonstrated a 32% increase in ADG and a reduction in the severity of fescue toxicosis by feeding pelleted soybean hulls at a consumption of 5 lb/steer/day. Grazing nontoxic novel endophyte fescue, particularly during periods of warm temperatures, also can provide ADG to efficiently meet targeted body weights

Feedyard Performance

There is concern that poor performance and thriftiness of calves exhibiting toxicosis can carry-over into the

feedyard. Experiments have shown rapid recovery from toxicosis based on rectal temperatures and prolactin concentrations (Aiken et al., 2008), and urinary alkaloid concentrations (Stuedemann et al., 1998), but rapid and complete clearance of alkaloids from the animal body is doubtful because they are bound in animal tissues. Unpublished data collected with steers that were removed from toxic endophyte-infected or endophyte-free fescue pastures and placed on nontoxic diets in pens showed that rectal temperatures in steers grazed on toxic endophyte fescue took approximately 30 days to decline to those similar to steers grazed on endophyte-free fescue.(Figure 1). However, in the next year with cooler air temperatures, rectal temperatures in steers grazed on toxic endophyte-infected pasture declined rapidly and were similar to those similar to the endophyte-free steers in 8 to 10 days. Fescue cattle apparently can effectively dissipate body heat when they are in milder air temperatures. Therefore, feedyard cattle that were background on toxic endophyte-infected fescue can be vulnerable to heat or cold stress for a certain period of time, which should be taken in consideration when deciding times of the year to transport fescue cattle to the feedyard.

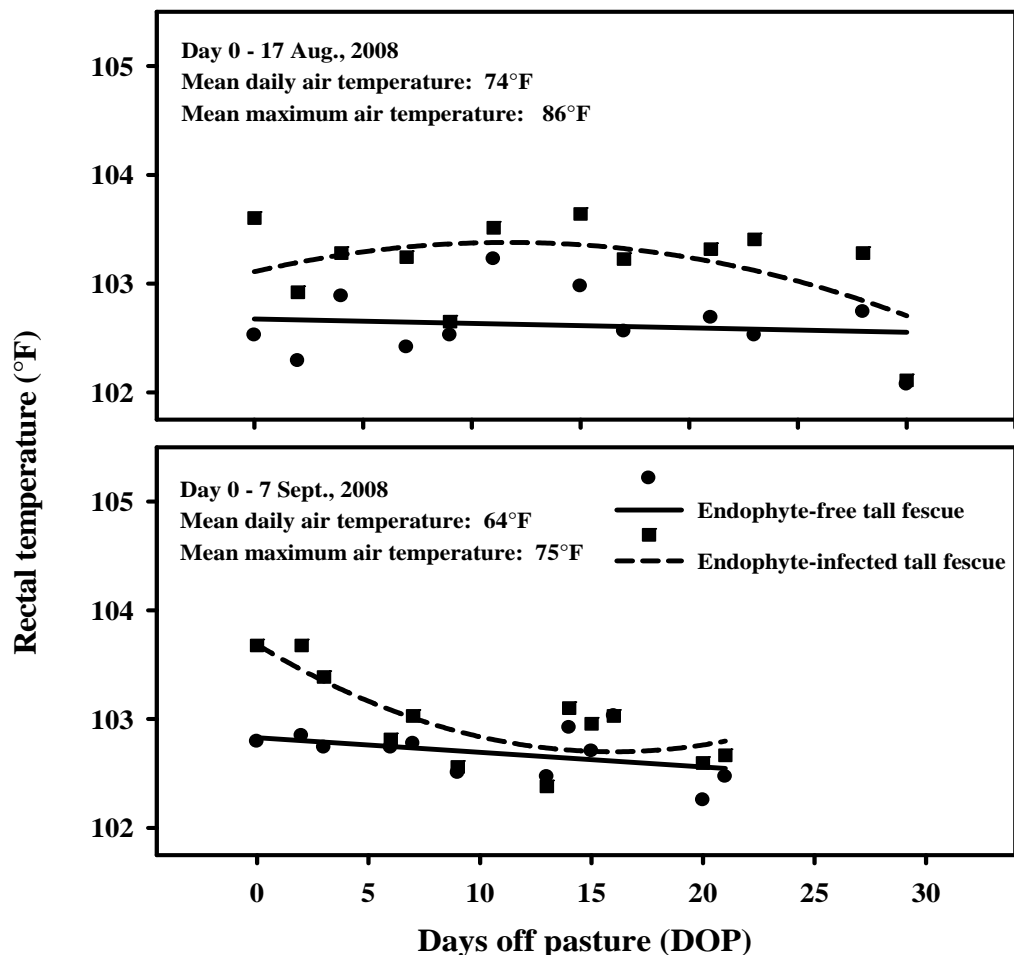


Figure 1. Trends in rectal temperature over days after steers are removed from endophyte-infected pasture and fed a corn silage-soybean hull diet. Data is for 2 monitoring periods presenting different air temperature conditions.

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Organic Dairying: Role of Grazing

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Certified organic and many conventional dairy farmers are using grazing techniques for a number of reasons, including building better soil, reducing feed costs, improving milk quality, and enhancing herd health. Additionally, certified organic farmers must utilize their pastures because the United States Department of Agriculture's (USDA) organic rule requires organic cows to graze. Both the farmer and the USDA are working hard to ensure that "organic dairy" is synonymous with "grazing cows," because the organic consumer vehemently demands dairy products from pasture-grazed livestock.

The USDA National Organic Program (NOP) is the agency that regulates all organic production, processing, and handling. The NOP recently redefined what "access to pasture" meant. The NOP originally stated that "ruminants must have access to pasture." It defines pasture as land used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources. However, "access to pasture" was not well defined, so, in years past, the rule was manipulated to justify confinement operations that were not meeting the spirit of the rule. That spirit is to have animals living in a system that mimics nature, and for a cow, that means grazing on pasture during the grazing season.

Consumers became furious when a few confinement style, organic dairies were discovered by organic consumer watchdog groups to be violating the spirit of the NOP. In order to correct the confusion, the USDA asked for and received significant public input about the original pasture rule. Over 80,500 comments were given in support for strict standards and greater detail on the role of pasture in organic livestock production. Only 28 comments opposed closing the loopholes of the old rule. The USDA listened to the overall consensus and wrote a more stringent rule, which requires cows to have access to pasture throughout the grazing season, as appropriate for each farm's specific environmental and climatic conditions. The new rule also requires a diet consisting of at least 30% dry matter intake (DMI) from pasture, grazed during the farm's grazing season. That grazing season must be at least 120 days of each year.

Regulation by the USDA, however, is not at all the reason why organic dairy farmers graze. This is evident by the amount of DMI most organic farmers achieve from their cows, which is above and beyond the USDA's requirement of 30% for 120 days. Organic farmers tend to double the DMI and their cows spend about 50% more than the minimum number of days required on pasture.

However, there are some very good grazers who are working with less than desirable land that may be just above the minimum. Therefore, access to pasture must be, as the USDA says, "site specific." Many things can change the length of a grazing season such as aspect, canopy cover, topography, geology, soil depth, precipitation, pasture management, and organic matter in the soil.

Like many grazing farmers, certified organic farmers are exploring ways to extend their grazing seasons and maximize DMI from pasture. In Northern Indiana, many of the organic cows are grazing until late December and into January. Farmers are grazing their herds on turnips, oats, peas, and other creative crops to lengthen the grazing season. Many also graze cover crops in early spring, while their permanent pastures approach the proper grazing height. The summer slump in Southern Kentucky is managed with organic farmers turning their cows out onto sorghum-sudangrass, alfalfa, and hayfields. Farmers that are blessed with acreage, allow the fescue to grow in late summer and early fall, in order to have some overwinter stockpile.

It is common practice through the "Heart of America" region for farmers to graze their permanent pastures around the dairy barn during spring, cutting some of their permanent pastures and all their hay fields while the grass is lush. When summer slump arrives and the grass growth slows, the hay fields are then grazed along with the permanent pasture to give more area to accommodate the herd.

Organic farmers also use grazing for weed control. Dr. Paul Dettloff, the staff veterinarian for CROPP Cooperative/Organic Valley, says a cow should eat 100 different types of plants, once every 3 days. This means that some plants often considered weeds are actually good pasture plants, which I call "Change of perspective" weed control. Some of these plants provide trace minerals that are accumulated by their long tap roots, like the dandelion. Others have tannins that kill parasites, like chicory. But for noxious weeds that must be eradicated, such as Himalayan blackberry, tall grass grazing, overgrazing, and trampling are often chosen techniques for elimination. Non-grazing techniques can also be used, like clipping or plowing. For example, weeds can be tilled under the soil for a corn crop in order to break the weeds' growing pattern, especially since corn ground is cultivated several times throughout spring.

Manure and urine supply a nutrient boost to the biota in the soil, which secretes and decomposes, providing nutrients which grow the grass that the cow ruminates into milk. This nutrient cycle has other benefits, beyond top-quality milk. It also provides conditions for good herd health, clean air and water, a reduction in methane production, and root surge. Root surge is the root growth that is equal to the vegetative growth above-ground. When the vegetation is grazed, the root dies back in an equal amount to that which the animal took. Root surge is an effective way to increase soil organic matter, being the literal, "grass roots" method to sequester carbon.

There are a few differences that can exist between organic grazing and conventional grazing practices. Since biological processes in the soil are essential to making the entire organic system work, the NOP requires that no input or process may degrade the health of the soil or water. For instance, parasiticides can kill dung beetles, earthworms, and microbes. Therefore, parasiticides are not allowed, and alternative methods such as rotational grazing are employed instead. Another difference is feed. 100% of certified organic livestock feed must be grown on certified organic land, including the feed from pasture. Organic farmers are limited on nitrogen sources where conventional farms have a few synthetic options. However, poultry manure is a popular source, along with a yearly frost-seeding of inoculated clover, for the organic farmer. As mentioned earlier, weed control can be different too. Herbicides have a negative effect to soil life, so they are also prohibited too.

After doing pasture audits and farm visits over the last 6 years on over 300 certified organic farms, I can see benefits of grazing on certified organic land. This is especially true when these organic practices are continued over a few years, giving time for microbial life to thrive. For instance, the active soils decompose manure patties within a couple weeks. Urine and manure spots level out due to the microbes in the soil spreading the nutrients beyond where they drop. These little things all add up to give farmers better bottom lines and healthier cows. The role of grazing in organic dairy is a solid cornerstone for farmers, consumers, regulators, the farm's ecosystem, and cows. Consensus is a good thing!

Mob Grazing, High Density Grazing, Management-intensive Grazing: What's the Difference?

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Before we can answer that question we need to review some basic fundamentals of successful grazing management. Four goals of any sustainable grazing management strategy should be: 1) Meet the nutritional needs of livestock from standing pasture as many days as possible; 2) Optimize pasture yield, quality and persistence; 3) Maintain or enhance the natural resource base; 4) Integrate the appropriate technology and knowledge into a practical and profitable system that fits your available resources and meets your objectives. We will use these goals to compare and contrast these 2 grazing management techniques. Both techniques should be considered tools in the grazer's toolbox. No one tool is perfect for every job. Each has a place and can be successful if monitored and managed properly.

Management-intensive Grazing

Management-intensive grazing has been defined as “a goal driven approach to managing grassland resources for long term sustainability, characterized by balancing animal demand with forage supply throughout the growing season and allocating available forage based on animal requirements.” (Gerrish, et al 1999) Typically management-intensive grazing strives for grazing periods shorter than 5 days with rest periods of 20 – 40 days depending on plant growth rates. The idea is to keep plants in

phase 2 or actively growing (vegetative to early reproductive). In order to accomplish this, multiple paddocks are needed. Depending on how short the grazing period is paddock numbers could range from 8 to 80 with stock densities ranging from 10,000 to 100,000 pounds per acre. Sufficient residual heights are managed during the grazing period to maintain growing points; leave enough leaf area for good photosynthesis and to keep the roots actively growing; and provide adequate bite size for the grazing animal. Rest periods are scheduled to allow leaves to regrow and replenish carbohydrates; provide adequate bite size for grazing livestock; and provide quality forage needed by the livestock. Typically, appropriate turn in height is somewhere between 6 – 10” tall for most introduced cool season grass/legume pastures. During any one grazing event about 50 – 60% of the top growth is removed for a residual height of 3 – 4”. This strategy tries to balance forage quantity and availability based on the needs of the livestock and maintain a healthy plant community. It is what I call the “middle of the road” approach. Maintaining some flexibility is the key to making this strategy work.

Mob or High Density Grazing

Mob grazing is defined as “grazing by relatively large numbers of animals at a high stock density for a short period of

time.” (Allen, etal 1991) This strategy was first introduced into the U. S. by Allan Savory in the mid 1980’s and is carried on by Holistic Management International, Inc. and organization founded by Savory. The goal is to use the impact of high stock density to improve the land. Stock densities used vary from 100,000 to 500,000+ pounds per acre. Grazing periods are 1 day or less based on site, time and management objectives. Rest periods tend to be longer than with conventional management-intensive grazing ranging from 30 days to 180 days. The longer rest periods are based on the premise that the plants will be more fully rested and have a deeper root system. Paddock numbers are more variable and infinite. Typically forage is allocated by using temporary fencing in strips to achieve the desired stock density. The goal is to remove 60 – 70% of the topgrowth and trample the rest onto the soil surface. It is the increased amount of litter left on the soil surface, pruning of deeper root system through grazing and increased concentration of manure that should help increase organic matter and feed the micro-organisms in the soil. Generally, there are 2 different modes of mode grazing employed depending on the manager’s objective: landscape mode and animal performance mode. The landscape mode uses the highest level of stock density to create an effect on the landscape – remove undesirable species, remove over mature forage, provide greater hoof action to trample more residue. The most valuable tool for the landscape mode is the dry bred

cow because of the lower nutritional requirements at that physiological stage. These animals also tend to be less selective in their diets, especially in high stock densities. When in the animal performance mode, the stock densities are lower to allow the grazing animals to be a little more selective in their intake due to their higher nutrient requirements. Some of the possible problems with mob grazing are: 1)it is going to require more intensive monitoring and management; 2)animal performance may be lower due to lowered forage quality of the more +too long at these densities then you end up with the “scorched earth” effect. Too much was grazed off leaving too much bare ground.

Summary

Both of these grazing management techniques have some benefits. Both are better than unmanaged continuous grazing. We have to realize that anytime we push the system too far to one side or the other there are tradeoffs. To be effective, both must be monitored closely and managed intensively. The higher the density the more intensive the monitoring and management needs to be. There are conditions under which either of these or both would be the grazing prescription of choice. The table below summarizes my comparison of Management-intensive Grazing and Mob or High Density Grazing. These opinions are mine and based on observations working with many producers employing these strategies over the state of Missouri.

Grazing Method	Diversity	Persistence	Forage Quality	Utilization	Animal Performance	Gain/AC	Wildlife	Soil Health
MiG	+	+	+	+	+	+	+	+
Mob	++	+	-	++	-	++	+	++

Integrating Weed Management Practices to Enhance Productivity of Grazed Pastures

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As animal grazing has intensified within Kentucky and the surrounding region problematic weeds such as tall ironweed, spiny amaranth, horsenettle, buttercup, common cocklebur, and thistles have been increasing. These weeds become prominent in pastures because they have spines, thorns, or are unpalatable to animals. Animals selectively graze and avoid these weedy plants and with intensive grazing practices their populations are allowed to increase. Livestock producers are seeking ways to increase pasture productivity by minimizing the impact of these and other weeds on grazed lands.

One of the primary means used to fight weeds in pastures has been mowing, a mechanical control method. Pastures are typically mowed only once and occasionally twice per year. Not all fields are mowed in a timely manner to reduce new weed seed production or to limit top growth of unwanted vegetation. Rising gasoline and diesel fuel prices have greatly increased mowing cost. Maintaining optimum soil pH and added fertility is also known to increase pasture productivity. This cultural practice is not always used as extensively as it could be to reduce the impact of weedy plants and increase pasture productivity. Furthermore, livestock and hay producers have also been challenged with rapidly rising fertilizer prices.

Herbicides are another control method available to curtail broadleaf weed problems in pastures. If herbicides are applied at the right time biennial thistles, buttercup, and cocklebur can be easily controlled. In recent years newer herbicide products have been introduced that are more effective on problematic weeds such as tall ironweed, Canada thistle, and horsenettle. In general, herbicides are not widely used. Some of the primary reasons given for limited use are that broadleaf herbicides have the potential to kill clovers, herbicides are too expensive, and the need of spray equipment suitable for use on pastures. Regardless of effectiveness, chemical weed control is seen as an additional expense that producers struggle to justify. A more ideal approach to weed management in grazed pastures could be the use of integrated control tactics that achieve long-term control of problematic weeds and ultimately increase forage productivity. Previous research on tall ironweed indicates that one mid-summer mowing followed by fall herbicide application was highly effective in reducing tall ironweed populations during the next growing season.

Research Objectives

Field research studies were initiated in 2008 to evaluate mechanical (mowing),

chemical (herbicide treatment), and a cultural practice (added fertility) affects on weed populations and forage yield. A total of eight different treatments compared untreated areas with each main factor alone of mowing, herbicide application, and added fertility; and a combination of each of these factors including all three factors combined. Research trials were established on three beef cattle farms located near Lawrenceburg [Anderson county], Tompkinsville [Monroe county], and Richmond [Madison county], Kentucky and continued through the 2010 season. Mowed treatments were performed in July each year, herbicide treatment was applied once in August 2008 [except the Monroe location received an additional herbicide application in 2009], and fertilization added in September. Nitrogen was added in the fall as ammonium nitrate (50 lb N) at all locations. Phosphorus and potash were added based on soil test recommendations. The cost of inputs associated with each treatment and the forage value achieved by these various weed management strategies were used to determine if economic returns justify higher levels of weed management.

The intended outcome of this project was to help determine whether or not mechanical, chemical or cultural control methods or an integrated approach of these management practices provide the most benefit to livestock producers in reducing the impact of weeds on forage production. If a positive net return can be realized with specific weed management practices, producers may be encouraged to implement strategies which decrease weed

populations, and subsequently increase forage productivity.

Weed Populations

Weed species and weed populations varied by location with tall ironweed present at all three sites. Although there were other weed species present, the predominate weeds evaluated in Anderson county were tall ironweed goldenrod, marshelder, and tick clover (*Desmodium* spp.); at Monroe county tall ironweed, common ragweed, marestail, and tick clover; and at Madison county tall ironweed, horsenettle, clammy groundcherry, and common cocklebur. Mowing and/or added fertility did little to reduce the population of most weeds present relative to the untreated areas. Whereas, treatments that included an herbicide application did significantly decrease weed density. In herbicide treated areas a decline in weed population was observed during the first year and continued to be effective into the second year after application.

Weed Biomass and Forage Yields

Weed biomass and forage yields were determined at all locations during the spring in 2009 and 2010. During the fall of 2009 an additional harvest was taken at the Anderson and Madison county sites. For determining relative biomass yields (dry weight produced with each treatment) three sub-samples were harvested from individual plots and separated into weeds, forage grasses, and clover (present at 2 of 3 sites).

At Anderson County approximately 4300 lb of dry matter (total biomass) was produced from the untreated areas (Figure 1). However, 45% of this yield was the result of weeds and 55% of this

biomass was due to desirable grasses. Fertility alone provided a higher total biomass yield by increasing forage grasses, but the weed biomass remained the same as the untreated. The mowing treatment and herbicide alone provided a similar total yield as the untreated areas, but provided a higher percentage of forage grasses

with lower weed biomass. Combinations of added fertility with mowing or with herbicide provided the highest total yields. Combinations of herbicide + fertility, mowing + herbicide, and mowing + herbicide + fertility resulted in the lowest level of weed biomass indicating fewer weeds.

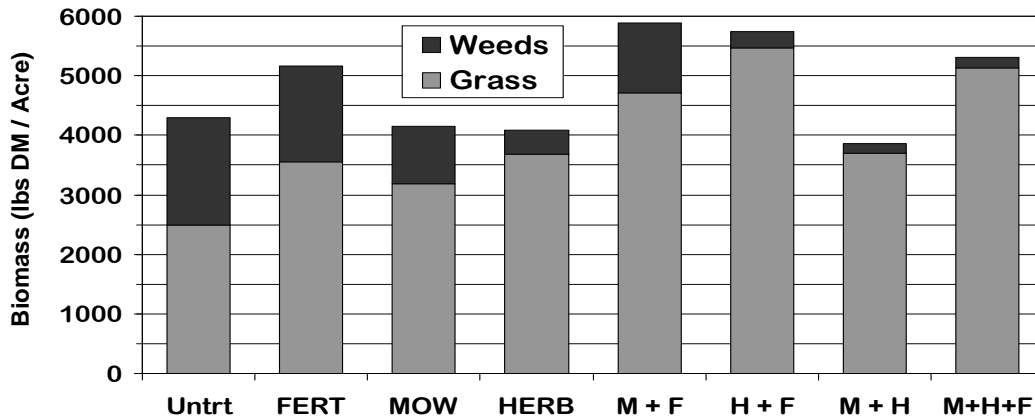


Figure 1. Forage yield and total biomass at Anderson County 2009-2010 (3 harvests)

Monroe County had similar trends in total biomass yield as observed with treatments in Anderson County (Figure 2). Approximately 30% of biomass produced was due to weeds in the untreated areas. Added fertility increased grass yield, but clover yield and weed biomass remained the same as the untreated areas. Mowing alone increased clover yield and resulted in a decrease in weed biomass. However,

mowing + fertility resulted in a similar level of weeds produced as the untreated. All treatments that included a herbicide provided higher forage grass yields compared to the untreated areas and had the lowest level of weed biomass. While clover was killed in all herbicide treated areas since this location received an herbicide application both in 2008 and 2009.

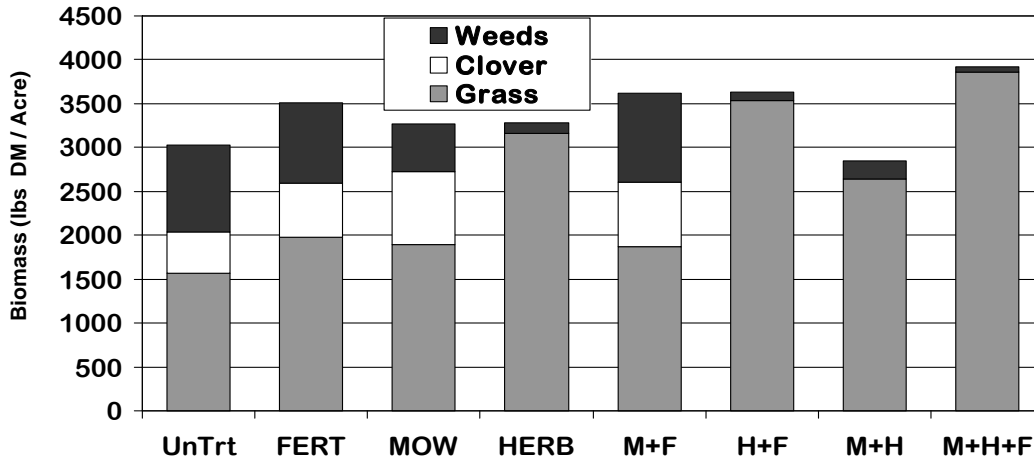


Figure 2. Forage yield and total biomass at Monroe County 2009-2010 (2 harvests)

Relative biomass yields between treatments at Madison County were somewhat different than yields observed at the other two sites. Furthermore, a lower percentage of weeds were present at this site relative to desirable grasses and clover as illustrated by the untreated areas. At this site hay is cut in the spring followed by grazing in late summer. Except for the fertility treatment the untreated area had a total biomass that exceeded the yields of the other treatments. The response to added fertility was an increase in forage

grass yields with no effect on weed biomass as observed at the other two locations. Mowing resulted in lower grass yields, but the percentage of clover present increased. Mowing alone had little affect on decreasing weed biomass. Herbicide treatments significantly decreased weed biomass. Clover was not present the first year after herbicide treatment in 2008 (results for 2009 not shown), however, volunteer clover did germinate in the early spring of 2010 and provided measurable yields.

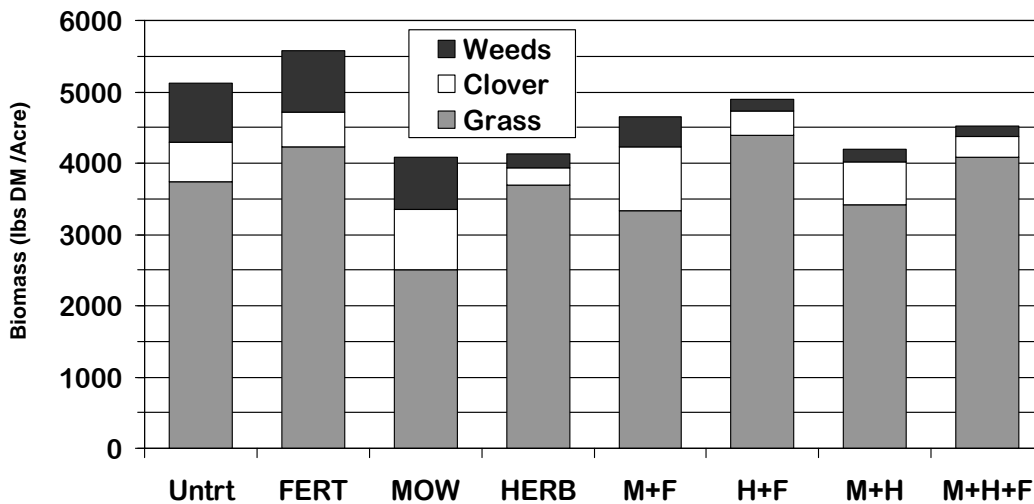


Figure 3. Forage yield and total biomass at Madison County 2009-2010 (3 harvests)

Economic Assessment

Best economic returns were obtained with the herbicide treatment alone at all three locations as determined by the value of the desirable forages produced (grasses and clover) relative to the cost of herbicide treatment, particularly since input cost can be prorated over a two year period. Net returns to the cost of mowing were equivalent to the forage value obtained from the untreated areas at Anderson and Monroe counties, but not in Madison. Treatment combinations of mowing + herbicide, which had fewer weeds, provided a partial economic benefit at Anderson and Madison counties. Increasing forage yields with added fertility did not result in a net return in forage profitability due to the high cost associated with added nitrogen and other nutrients.

Acknowledgements

Funding for this project was provided through the USDA-Southern Region IPM Grants Program. Project leaders include J. D. Green (weed scientist), Bill Witt (weed scientist), Greg Schwab (soil scientist), and Kenny Burdine (Agriculture Economist). The authors also acknowledge the assistance and cooperation of county extension agents for agriculture and natural resources Tommy Yankey, Brandon Sears, and Kevin Lyons, and livestock producers Walter Majors, Billy Glen Turpin, and Jimmie Thompson who provided land resources for this project.

Grazing Goats and Cattle and other Co-Species Grazing

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Multispecies, co-species, mixed species grazing, it does not really matter what it is called they all revolve around the same premise; grazing more than one species of livestock on a given land area to improve resource use efficiencies.

When grazing one class or type of livestock, the pastures (without good management) over time will move toward one variety of forage which could be much less desirable to that class of animal. Cattle prefer different forages than goats. Goats prefer different forages than horses. Horses prefer different forages than sheep. Sheep prefer different forages than cattle. The point is, even though there is some overlap in forage preference between livestock species the differences are great enough that the potential exists for improved production (both land and animal) by taking advantage of these different taste preferences. Grazing differences not only can be seen by forage type but also heights. Cattle tend to graze close to the ground where as goats would much rather browse several feet above the ground.

Numerous studies over the years have shown that cattle tend to consume a larger percent of grass in their diets. Sheep are split closely between forbs and grass where as goats tend to prefer the browse. Understanding this relationship gives a producer a powerful

planning tool when designing the grazing plans for the operation. Not only does this allow one to choose the forage species to be a part of the operation but also could be used to estimate stocking rates for each grazing species depending on the forage resource on the operation. Multiple trials have shown trends toward increased animal weight gain when two species are grazed together versus the same species grazing alone. This should, in turn lead to increased revenues to the grazing operation by having more weight to sell at the end of the season.

Benefits of multispecies grazing are not just limited to land improvement but this practice can have a benefit to animal health. Parasites are a major management challenge in sheep and goat production in the heart of America. Forage management and good animal husbandry can help a great deal with this issue but so could the addition of cattle to a goat operation. Cattle act like a big vacuum cleaner to goat and sheep parasites as cattle are a dead-end host to the troublesome internal parasites of the small ruminant. And the reverse is true of the internal parasites of cattle as goats and sheep are a dead-end host. There are also positive reports of adding poultry to a grazing program to help with fly population control. The birds like to scratch through the cow "pie" and eat the

horn fly larva that hatch. If there are no larvae, it is hard for the fly population to increase.

So, on the positive side of multispecies grazing we have the potential of increased forage production, improved land management, increased animal weight gain, decreased weed control costs, and improved animal health. One has to admit however, multispecies grazing is just not all positives there are some other considerations that must be made.

Here in the mid west most producers thinking about multispecies grazing are likely to be a cow/calf operation that has some weed issues that need to be resolved. So instead of spending money to kill the weeds of concern why not let something eat them that can be sold at the end of the grazing season. The first issue that may need addressed is fence. The old rundown fence that keeps the cows in most of the time would likely just be laughed at by a goat. Fence to keep them on the property needs to be more substantial than an old cow fence. One barb wire or a couple hot wires (that are not very hot) will not hold a goat. For hot wires to work the spacing must be correct and the voltage must be high. If using old woven wire caution must be made to be sure horned animals cannot get their head through because more often than not they will not be able to get their head back out. Along with fence concerns one needs to consider if the catch pens or working facilities are tight enough to hold in small ruminants.

Predators are another consideration when adding small ruminants to an operation. Things that may have never

bothered the cows could be an issue with goats or sheep. One may have to think about adding guard animals to the operation. This could cause issues with the existing cow herd depending on the guard animal. Some types of fence could help in this situation as well.

General animal husbandry work needs to be thought through before adding another specie. Small ruminants and particularly goats tend to be more labor intensive than a cow herd. Managing parasites and foot problems can be a very time consuming and a labor intensive proposition if not properly prepared. Are there any risks to the added specie from supplements that are available free choice (copper for example in a beef mineral mix)? Are there any health risks that the added specie may bring to the existing herd of grazing animals (johnes passing from goats to cattle)?

As with any management practice there are positives and negatives that each producer must consider. With proper thought and preparation, multispecies grazing could very well be an overall positive to a grazing operation.

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Grazing Non-Traditional Forages

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In the Heart of America region we are blessed with perennial cool-season grasses and legumes as the bulk of our forage production. Efficiently taking advantage of that perennial production is the focus of most grazing operations. Occasionally there are times when the production from our cool-season grass and legume pasture is not sufficient. In Ohio, that is late summer and late fall through winter till early spring. Non-traditional forages could be used when cool season forages are not producing. Non-traditional forages can provide a large volume, of high-quality feed during specific times of the year.

To utilize non-traditional forages takes forethought and planning. Most need to be planted months before they are needed using equipment that the grazer may not have. Some producers have tried a non-traditional forage and had trouble getting it established. The production suffered. They then become discouraged about the usefulness of the forage in their system.

How will you incorporate an annual into your existing system? Some graziers have successfully included an annual as part of their perennial pasture renovation. By planting an annual for two years they can successfully eradicate the existing forages, while still harvesting feed from that field. Others have devoted the most appropriate

fields to a rotation of annuals. Summer annuals and winter annuals can be grown on the same field in succession. Basically this double cropping takes more planning.

Finally, how do you plan to use the annual crop planted. What happens if you have too much or it matures at the same time? Can you harvest it effectively? Will you just graze it? Perhaps you want to use the annual in a combination of production systems, i.e., hay and graze.

Small Grains

Most grain crops can also be used for forage. This includes small grains such as wheat, rye, barley, triticale, and spring oats. Planting these in the fall allows for some fall grazing and early spring grazing. The most widely used are rye and spring oats.

Grazing of small grains should begin when there is enough growth to support livestock. Typically the two biggest problems are delayed planting dates and wet fields during the prime grazing season. Sufficient growth in the fall for late fall grazing will be in the early planted stands. Begin grazing when at least six inches of growth is available, and leave a two to three-inch stubble after grazing. Heavy fall grazing increases the risk of winter kill. In the spring, graze only when fields are firm.

Heavy or late-spring grazing greatly reduces grain yields. If you want grain then remove livestock when the plants begin stem elongation or "jointing" stage. Rye will be the first to begin jointing.

Summer-Annual Grasses

These annuals grow rapidly in late spring and summer. This group includes Sudan, Sorghum-Sudan, Millet and Corn. They can supplement pastures forages when perennial cool-season forages are in the summer slump.

These summer annuals should be grazed after they are 18-inches tall. Grazing earlier will weaken them causing slower regrowth. Trampling and wastage will increase when grazing is delayed past the boot stage. Plants reach the grazeable height of 18 to 30 inches about six to eight weeks after planting. Rotational grazing or strip grazing management should be practiced. A high stocking density should be used to graze the grass down in less than 10 days. Clipping left over stems down to 8 inches will improve forage quality for the next grazing period.

Corn

Corn is a summer annual grass but it has a few more options for utilization than the preceding ones. Grazing standing corn can be a viable forage for some producers. Corn provides several options to livestock producers. As an annual it is extremely flexible as to when it can be grazed. It has been successfully used during the summer, fall and even winter. With the potential to produce more than ten tons of forage to the acre, few annual crops can

compare to corn in terms of dry matter (DM) yield per acre.

Standing corn has the nutritive composition to meet the requirements for many categories of livestock. From the animal's nutritional standpoint, grazing immature corn is similar to grazing other summer annual forages. The big difference comes when the plant reaches maturity. With corn the loss in the feed value of the forage (leaves and stalk) is compensated by the grain produced.

Corn can be grazed during that mid-summer slump that occurs when the temperatures are hot and/or the moisture is short. Local producers have had success grazing sheep when corn plants are 18 inches tall, rotating quickly as to protect the growing point (3-4 inches above the ground) and rotating back into the corn throughout the summer.

Harvesting corn by grazing may take place from 30 to 100 or more days following planting. Traditionally, producers have planted grazing corn as they would for corn silage, planting corn in late May or early June and grazing it 70 to 90 days following planting. This late summer to early fall grazing allows them to stockpile their perennial pastures for late fall/early winter grazing.

Corn may also be grazed extremely late in the season, even after it is fully mature, providing needed energy and shelter during the winter months. Typically, the corn plant loses some leaves and stalks begin to break down as the winter progresses. This causes a loss in digestible nutrients and protein. However, the remaining stalks, leaves,

and grain are still excellent supplemental feed for over-wintering beef cows, stockers, and growing animals. Depending on the type of livestock used, producers may have to supplement to compensate for lower protein levels.

Animal Health Concerns with Annuals

There are a few animal health concerns that producers should be aware of before grazing annuals. These have been written about many times and are repeated here as a reminder. Winter annuals need to be aware of grass tetney and the summer annuals need to be aware of nitrate and prussic acid poisoning.

Brassicas

Forage brassicas are high quality, high yielding, fast growing crops. Both the tops and bulbs can be grazed. Brassicas can be planted in April through May for summer grazing or in July through August for fall/winter grazing. All members of the brassica family - turnips, rape, kale, and swedes can be used.

Turnips and rutabagas are short-season root brassicas that provide roots, stem and leaf growth for rotational grazing or strip grazing 70 to 90 days after planting. Rape is a short-season leafy brassica whose stems and leaves are ready to graze in 90- 120 days. Kale has highest yields of all brassicas (12,000 lb/acre dry matter) but requires the longest growing season to produce that (150 days). It has the greatest cold tolerance in the Brassica family, surviving temperatures down to 10 degrees

Brassicas are very high in crude protein and energy, but extremely low in fiber. Consider them a concentrate that needs roughage supplementation. Feeding grass hay or allowing access to grass pastures is usually all that is required. Most dairymen have avoided off-flavors in milk by preventing brassica consumption two hours before milking.

Chicory

Forage chicory (*Cichorium intybus* L.) is a perennial plant that produces leafy growth.

It is higher in nutritive and mineral content than cool-season grasses. It has a deep taproot which helps it produce during drought conditions.

In stands it last from two to seven years. Care must be taken to prevent overgrazing. A stubble height of 1.5 to 2 inches should remain after grazing. Rotational grazing management is needed for forage chicory persistence. Generally, 25 to 30 days of rest between grazing events is recommended.

Warm Season Grasses

Perennial warm-season grasses have potential to produce good hay and pasture growth during the warm and dry mid- summer months. These grasses initiate growth in late April or early May, and produce 65 to 75 percent of their growth from mid- June to mid-August in Ohio.

Warm-season grasses are slow to establish. They are weak competitors with weeds and cool-season grasses until established. Patience is required. Two years is generally required for successful establishment of warm-season grasses.

Once established these grasses should be harvested or grazed when they are 16 to 20 inches or more in height (boot stage). Once seedheads emerge, the quality decreases rapidly. Heading will occur in late June to early July depending on location, year and species. Mowing or grazing height is critical to stand maintenance. Leave at least a 5-inch stubble for rapid regrowth. Mowing or grazing closer than 5 inches will remove important plant carbohydrate storage organs and areas of new bud development.

Enough time should be allowed for at least 12 inches of fall regrowth before frost on all species. This means these grasses should not be grazed or harvested after mid-September. Plants can be harvested after a killing frost without damage to the stand and the forage is safe to livestock.

For more detailed information check out the references for this paper:

Maximizing Fall and Winter Grazing of Beef Cows and Stocker Cattle Bulletin 872
<http://ohioline.osu.edu/b872/index.html>

Grazing Corn Residue ANR-10-02
<http://ohioline.osu.edu/anr-fact/0010.html>

Using Corn for Livestock Grazing ANR-11-02
<http://ohioline.osu.edu/anr-fact/0011.html>

Emergency and Supplemental Crops for Forage AGF-019-90
<http://ohioline.osu.edu/agf-fact/0019.html>

Winter Rye for Extending the Grazing Season AGF-026-00
<http://ohioline.osu.edu/agf-fact/0026.html>

Brassicas for Forage AGF-020-92
<http://ohioline.osu.edu/agf-fact/0020.html>

Perennial Warm Season Grasses For Ohio AGF-022-95
<http://ohioline.osu.edu/agf-fact/0022.html>

CHICORY: An Alternative Livestock Forage AGR-190
<http://www.ca.uky.edu/agc/pubs/agr/agr190/agr190.pdf>

Extended Grazing and Reduced Stored Feed

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Feed costs represent the major cost in most livestock production systems. A recently completed analysis of 225 Standardized Performance Analysis (SPA) Beef Cow Records on herds in Illinois and Iowa showed that feed cost was the overriding factor determining profitability, explaining over 57 percent of the herd-to-herd variation. Typically the cost of supplying nutrients to

ruminant livestock is much greater using harvested feedstuffs as opposed to grazing pastures or crop residues. The primary function of a grassland farm is to convert solar energy to marketable livestock products in the most efficient manner. The fewer steps between the animal product and the solar energy, typically, the more economically efficient the production systems will be.

Eight Financial Measures Capable of Explaining Over 82% of Variation in RLM in Beef Cow Enterprise	
DEPENDENT VARIABLE	R ²
Feed Cost	.567
Depreciation Cost	.086
Operating Cost	.049
Calf Weight	.046
Capital Charge	.024
Calf Price	.027
Weaning Percentage	.017
Herd Size	.007
Total	.823

A. Miller, R. Knipe, University of Illinois SPA, 2004

Providing grazable forage, in a cost-effective manner to the animal, for as many days of the year as possible should be the goal of the grazing manager.

Feeding Hay

We have been raised in the cattle industry that we need to feed hay at least 120 days a year. But do we really know what it cost to produce or feed hay on our farm. Very few farmers have an ideal what it cost to raise hay. Let look

at an example where we had 50 beef cows weighing an average of 1,200 pounds and we are going to feed hay at 36 pounds per head for 120 days. That

would require 216,000 pounds of hay. At 4 tons per acre that would require 27 acres of hay to raise 108 tons of hay to meet our requirement.

Hay Production Cost					
Acres of Hay	27 Acres				
Expected Yield	4 tons per acre				
Number of Harvest	3				
Weight of Bales	1,000 lb square bale				
Total Hay Produces	108 tons				
Bales Per Acre	8				
					Cost Per Acre
Land Rent					\$50.00
Establishment Cost					\$60.00
Maintenance Fertilizer					\$177.00
	Cost/Lb	Removal	Application		
Nitrogen	\$0.55	0	0	\$0	
Phosphorus	\$0.45	60	1	\$27.00	
Potassium	\$0.70	200	2	\$140.00	
Spreading	\$5.00		2	\$10.00	
Mowing-mow-cond	\$18.00/acre		3		\$54.00
Rake-side-delivery	\$8.40		3		\$25.20
Baling-1,000 sq. bale	\$8.23-8 bales				\$65.84
Cost per acre					\$432.04
Cost per ton					\$108.01
Cost per bale					\$54.00
Cost per lb					\$0.054

With a cost of \$108.01 per ton that would mean it cost \$1.94 per day to feed the cow for 120 days. When we feed the hay we need equipment to haul

and feed the hay. We need feeders to reduce the amount the cattle waste. Then we must haul the manure. Plus there is depreciation on the equipment.

EXTENDING GRAZING IN THE FALL AND WINTER

Several strategies can be employed to supply forage into the fall or early winter and effectively extend the grazing season by 60 to 90 days, thus reducing the need for stored feeds. These strategies can be categorized into three major groups: 1) stockpiling (conserving cool-season forages in late summer for use in the fall and winter), or 2) utilizing forage crops that continue to grow into the fall, early winter and early spring, and 3) grazing crop residues.

Not all cool-season species are adapted to stockpiling because most species reduce growth in the fall because of shorter day lengths and/or lose leaves (quality) after being frosted. Tall fescue and birdsfoot trefoil are two forage species, which are suited to stockpile management because they continue to grow into the fall and do not lose leaves, as readily as other cool-season species after frost.

Stockpiling Tall Fescue

Tall fescue is a deep-rooted, long-lived, sod-forming grass that spreads by short underground stems called rhizomes. It is drought resistant and will maintain itself under rather limited fertility conditions. Animals readily graze tall fescue during the fall and winter, but show some reluctance to graze it during the summer months of July and August. Some of this reduced summer palatability, which results in poor animal performance, is associated with the presence of a fungus in the plant (endophytic). Endophyte-free varieties are now available. Tall fescue is the best-adapted cool-season grass for stockpiling.

Tall fescue will maintain more active growth at lower temperatures than most other cool-season grasses and so will continue to accumulate yield later into the year. In response to shortening day length and cooler night temperatures, tall fescue accumulates a high level of soluble carbohydrates in both the leaves and stem bases. With up to 20 percent of the dry weight of the plant as free sugars, the nutritive quality of fall grown tall fescue is quite high. The heavy waxy layer or cuticle on the leaves makes the plant more resistant to frost damage than most other cool-season grasses.

To stockpile tall fescue, don't graze it from early to mid August through mid-October. Cattle and sheep perform less than optimally on it during this period. Tall fescue is also very responsive to nitrogen fertilization. To produce a high yielding, high quality stockpile, the pasture should be grazed or clipped fairly short and 40 to 80 pounds of nitrogen per acre applied 60 to 90 days prior to the end of the growing season. Normally, that is early to mid-August. If soil moisture is favorable, the higher rate of N may be applied. If the summer has been dry, application of more than 40 lb N/acre may not be profitable. If the red clover component of a mixed fescue-clover pasture is greater than 30 to 40 percent, it is probably not cost effective to apply additional nitrogen. Some recent work has indicated that a mixture of Orchardgrass and tall fescue can be stockpiled for early fall grazing.

Stockpiling Birdsfoot Trefoil

Birdfoot trefoil is a perennial legume adapted to production on poorly drained, low pH soils. It can reseed itself, is

resistant to Phytophthora root rot and numerous alfalfa insects, responds well to fertilization, and does not cause bloat in animals. Birdsfoot trefoil is well suited for stockpiling since it holds its leaves at maturity and after frost, thus maintaining a relatively high level of quality.

To stockpile birdsfoot trefoil, avoid grazing between September 1 and the first killing frost. This period is needed to accumulate root reserves that improve winter survival and growth the following spring. The forage that accumulates during the stockpiling period can be grazed anytime after a killing frost.

FALL GROWING FORAGE

The growth of some forage species is not adversely affected by cooler fall weather and shorter day lengths, as are many cool-season types of forage. The species, which seem to grow best in the fall, are perennial ryegrass, small grain cereal crops such as rye, wheat, oats and triticale, and certain brassica crops like turnips, rape and kale.

Brassicas

Brassicas are annual crops that continue to grow during the fall and into the winter. They are highly productive and digestible and contain relatively high levels of crude protein. Sheep producers probably more commonly use these than cattlemen. Early to mid-August establishment is best suited for November-December grazing. Animals will readily consume the plant tops and will also grub the root bulbs out of the ground. The plants tops will typically contain 16-18 percent crude protein and the roots are highly digestible carbohydrates. These crops are best

suited for crop rotation pastures or no-tilled into light sod. Total dry matter yield is very variable and is highly dependent upon soil type, fertility, time of seeding, and precipitation.

Turnips grow fast and can be grazed as early as 70 days after planting. They reach near maximum production level in 80 to 90 days. Some of the newer forage type turnip varieties can often be grazed in 30 to 45 days including spring oats or cereal rye with the turnips increases the total production, durability and digestibility of the forage. The proportion of top growth for turnips to roots can vary from 90 percent tops/10 percent roots to 15 percent to/85 percent roots. Moisture content is almost always greater than 90 percent. This is why they work so well in mixtures with small grains or with crop residues. Turnips can be seeded any time from when soil temperature reaches 50 degrees until 70 days prior to a killing frost. Ideal time for fall seeding is sometime during the first 15 days of August in central Illinois.

Rape is more easily managed for multiple (generally more than two) grazings than are the other brassica species. Approximately six to ten inches of stubble should remain after the first grazing of rape; this practice promotes rapid regrowth. Regrowth of rape may be grazed at four-week intervals. On the final grazing, the plants should be grazed close to ground level.

Swedes, like turnips, produce large edible roots. Swedes yield more than turnips but require 150 to 180 days to reach maximum production. Swedes is one of the best crops for fattening lambs

and flushing ewes. Yield is maximized with a 180-day growth period for many varieties while most hybrids; on the other hand, produce greatest yields when allowed to grow 60 days before first harvest and 30 days before the second harvest.

ESTABLISHMENT OF BRASSICAS

Brassicas require good soil drainage and a soil pH should be in the range of 5.5 to 6.8. Brassicas can be no tilled into a sod provided it has been killed with glyphosate. This reduces insect problems. They can also be seeded into wheat stubble. Clean till seeding works well but may have increased insect pressure. If seeding after crop farming, herbicide carryover residues are an enormous problem for Brassicas and small grains. Some commonly used herbicides can affect the establishment and growth of Brassicas for up to 24 months. As a rule, carry-over label recommendations for sugar beets are usually applicable to most members of the Brassicas family. Use 2 to 4 lbs/acre of seed for turnips and 3.5 to 4 lbs/acre for rape or kale. Drill the seed on 6-8 inch row spacing and place seed no more than 0.5 inch deep. When seeding spring oats or cereal rye with turnips the usual seeding rate is 1.5 to 2 bushels per acre of the small grain. Some producers have had success in aerial seeding of turnips, spring oats and cereal rye in to standing

corn in mid-August. Again, check out your herbicide program for potential carryover and grazing restrictions before trying this method of seeding.

Fertilizer should be applied at the time of seeding to give the brassicas a competitive edge on weeds. Apply 60 to 80 pounds per acre of nitrogen and fertilize with phosphorus and potassium similar to what would be applied for a small grain.

How to Graze

When possible, turnips should be strip-grazed (size of available grazing are controlled by temporary electric fencing) during the growing season, much like a rotational grazing system. During the growing season strip grazing with a break wire in front of and behind the animals can be used to control consumption, allowing regrowth, preventing wastage, and conserving available dry matter. Strip grazing limits grazing damage to the root and lower leaf, allowing leaf surface for regeneration of plant growth. If regrowth is desired, at least two inches of leaf should be left intact. Generally animals will consume the leafy portion of the plant before progressing to the root portion.

Levels of Utilization:

Length of grazing period	Expected % utilization
1 day or less	80
3-4 days	70
6-8 days	60
10 – 14 days	50
> 20 days or longer	40 or less

FSRC, University of Missouri

SMALL GRAINS

The use of winter cereal crops such as wheat, rye, spring oats, barley, or triticale can provide fall or early winter grazing opportunities. However, certain management practices need to be modified from what is normally done for grain production. When small grains are used for grazing, plant them three to four weeks earlier than for grain production. Increase the seeding rate to 2 ½ to 3 bushels per acre and apply nitrogen at the rate of 40 to 60 lb/N per acre at planting time.

Rye will be more productive than wheat or triticale for both fall and spring production. However, grazing quality will be better with triticale than for rye. Spring oats seeded in the fall can be very productive but will die out over the winter. However, with adequate fall moisture, grazing should be available from October through December and then again in early spring for the rye, triticale and wheat.

Stocking rate and time of grazing will be somewhat determined by the intended use of the crop. If you are planning to take a silage or grain harvest, grazing should only be moderate. Heavy grazing can reduce grain yields. Moderate grazing in the fall will not result in significant silage or grain losses provided that moisture and soil fertility are adequate. In fact, fall pasturing can be beneficial where the small grain was seeded early and has made excessive growth and soil conditions are dry.

Spring grazing may be started when growth resumes. If a grain or silage crop is to be harvested, grazing should be discontinued when the plants start to grow erect, just before jointing (growth stage). Grazing at any time after their growing points are above the ground will injure small grain plants.

The Following table summarizes important characteristics of Cereal Grains and Annual Ryegrass.

Characteristic	Oats	Rye	Triticale	Wheat	Annual Ryegrass
Regional Adaptation	Anywhere	Anywhere	Anywhere	Anywhere	South/Central
Winter Hardiness	Low	High	Moderate	Moderate	Variable
Yield Potential	Moderate	High	High	Moderate	High/Variable
Forage Quality	High	Moderate	Variable	Moderate	High
Fertility Requirement	Moderate	Low	Moderate	Moderate	High
Regrowth Potential	Moderate	Moderate	High	Low	High

All of these designations are site and management dependent.

CROP RESIDUES

Corn Stalks

In mixed crop and livestock operations, corn and grain sorghum stalk fields can be used to supply substantial grazing days. As grassed waterways, terraces, and field borders become more widely used, this option becomes even more attractive.

The crop residues represent about one-half of the plant dry matter and, therefore, a field producing 120 bushel corn grain will have close to 3 to 4 tons of roughage dry matter per acre. The optimal grazing allowance on corn crop residue fields is dependent on the weight gains necessary to obtain a desired body condition. With low supplementation, cows can maintain

bodyweight with as little as .5 acres corn crop residues per cow per month, but may need as much as 2 acres per cow per month if bodyweight gain is necessary.

Because grazing cattle will select the portions of crop residues with the highest digestibility and protein concentration, needs for supplemental feeds beyond trace mineral salt and vitamin A are likely to be minimal for the first month of grazing. Simultaneous grazing of stockpiled grass or legume forages (late summer growth) may also supply protein and energy and, thereby, reduce needs for supplementation. As winter progresses and crop residue quality decreases because of grazing selection and weathering, supplementation of protein and phosphorus may become necessary.

Table 1. Effects of strip-grazing management on cow economics			
Item	Treatments		
	1 / acre (2 wk)	1.5 / acre (2 wk)	1.5 / acre (1 wk)
Corn stalks (\$10/acre), \$/hd/d	\$0.24	\$0.16	\$0.16
DDGS (\$100/ ton @ 4 lbs/hd/d)	\$0.20	\$0.20	\$0.20
DDGS feeding labor ^a , \$/hd/d (1.5 hrs for all 192 hd)	\$0.09	\$0.09	\$0.09
Fence moving labor ^a , \$/hd/d (20 minutes – 2x or 5x)	\$0.01	\$0.01	\$0.02
Total cost, \$/hd/d	\$0.54	\$0.46	\$0.47

^a **Labor @ \$12/hr**

Shike, Faulkner, Ballard, U of I, 2008

Grazing Dormant Alfalfa

Another option that has become increasingly popular for extending the fall grazing season has been to graze the regrowth of alfalfa hay fields or pastures after cold weather has ensured dormancy. Usually 2 to 3 days of successive temperatures in the 24-27 degree Fahrenheit range should be experienced before grazing alfalfa. It is important to graze early enough to utilize the forage while still in a leafy palatable state. If grazing is delayed until freezing has desiccated the plants and caused most of the leaves to drop, then the cows or sheep had just as well be kept off. An added benefit to fall grazing alfalfa is that research and farmer experience indicates a reduction in alfalfa weevil populations the following spring. This is due to removal of some of the stems where weevil egg masses overwinter. Some points of concern when grazing alfalfa hay fields are not to graze when the soil is saturated, as this will cause long term stand damage and roughen the field. Enough stubble, 3 to 4 inches, should be left to catch and hold snow to reduce winter damage to the plant crowns and minimize temperature fluctuations, which result in plant heaving.

Grazing Maize (Corn)

Grazing Maize is a selectively bred composite designed to graze by livestock. Grazing Maize can be grazed during late summer months or allowed to mature and be grazed as standing corn during the winter months. Also, to prevent corn wastage, daily strip grazing is required. Some source of dry feed should also be fed to cattle while grazing Maize.

Plant population should be nearly the same as traditional planting rates and can be planted with a regular corn planter.

Frost Seeding

Legumes can be interseeded into grass stand by several methods. The important criterion for success is to achieve good seed-soil contact. If the seed never makes it into the soil, it is not likely to ever become established. Different seeding methods are appropriate for different legume species.

Frost seeding works very well for all clovers and lespedeza. Seed-soil contact is achieved through freezing and thawing action drawing the seed down into the soil. If there is a heavy thatch layer on the soil surface, the seed may never actually reach the soil. Frost seeding where cattle have grazed during the fall or winter and disturbed the thatch is a good strategy. The clovers tend to be more tolerant of cold temperatures in the seedling stage than is alfalfa or birdsfoot trefoil, thus making clovers better adapted for frost seeding. In Illinois the window of opportunity for frost seeding is between February 15 and March 15.

Frost seeding red clover into tall fescue can help improve the quality of the pasture while also helping to keep it more productive during the summer months. Ideally a mixture of 30 to 40 percent red clover and the remainder tall fescues will help decrease the summer slack production of straight tall fescue.

The keys to frost seeding success are to graze the grass down in the fall. Then frost seed the legume in the spring and next graze back the early flush of spring

grass and then allow for a rest period from grazing providing time for the legumes to become established.

EXTENDING THE SUMMER GRAZING SEASON

Cool-season Grass-Legumes Mixtures

Growth of cool-season grasses such as tall fescue, Orchardgrass, perennial ryegrass, or smooth brome grass is limited in the summer by both high temperatures and soil moisture deficiency. Photosynthesis in cool-season plants becomes much less efficient at higher temperatures. Heavy grazing without rest also reduces total leaf area available to the plant to support maintenance and growth. The combined effect of reduced photosynthetic efficiency and diminished leaf area is low summer pasture production.

Cool-season legumes such as alfalfa and red clover have somewhat higher optimum growth temperatures than do the cool-season grasses and are frequently more deeply rooted. For these reasons, cool-season legumes tend to be somewhat more productive in the summer months. Interseeding legumes into grass dominant pastures can be the first step toward extending the summer grazing season. Grazing management, which provides planned rest periods for the pasture plants, is essential for the maintenance of legumes in pasture.

In a Management Intensive Grazing system, we can also control grazing pressure to the extent that reproductive stems in the grasses can be grazed off in the early stages of elongation. This

will typically result in early initiation of tillering and production of more vegetative regrowth during the summer months. The same management used to accomplish this goal of seedhead suppression will also encourage legume development in the sward. The combined effect is greater levels of higher quality cool-season forage in the summer months.

Warm-Season Perennials

Warm-season grass species can be used as an alternative to cool-season pastures in the summer months. Warm-season perennial species would include the native tall grass prairie species such as big bluestem, eastern gamagrass, indiangrass, and switchgrass as well as introduced species such as Caucasian bluestem and bermudagrass.

The native species are quite sensitive to grazing management and will respond well to plan rotational grazing. In fact, some recent evidence has shown that under control grazing systems cool-season and warm-season grasses can be interseeded and the warm-season grasses will become an important part of the stand and help increase production during the warm summer months.

Warm-season Annuals

Summer annual crops such as sudangrass, sorghum-sudan hybrids, pearl millet, and crabgrass can also be used to supplement cool-season pastures. The limiting factor for the use of these crops by many producers is land availability. While overseeding and no-till establishment can be used successfully for some warm-season annual species, many respond more favorably to seeding on a tilled seedbed. Cost of establishment and potential for

erosion losses are two main deterrents to the use of conventionally seeded annual crops.

Because annual crops are typically high investment crops, management to fully utilize the crop is essential. This is particularly true with the taller growing species where wastage can be very high if feed budgeting is not tightly followed. Animal output per acre can frequently be doubled if grazing periods are kept to fewer than 3 days compared to periods of 14 days or longer.

Cost is normally ten to twenty cents more per grazing day compared to cool season grasses.

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