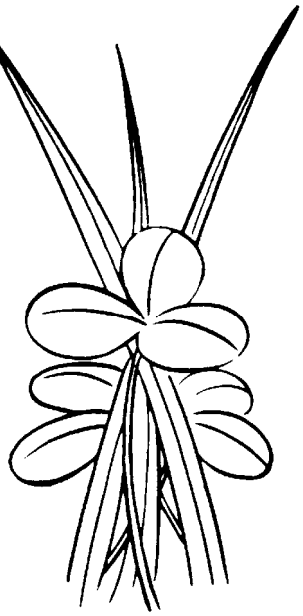
5th Kentucky Grazing Conference



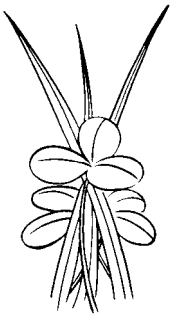
October 26, 2004

Western Kentucky University Expo Center
Bowling Green, KY

Sponsored by:
Kentucky Forage & Grassland Council

Special Publication KFGC-04-3
Garry Lacefield and Christi Forsythe, Editors

Kentucky Forage and Grassland Council
A Forage-Livestock Educational Association



Garry D. Lacefield, Interim Secretary
P.O. Box 469
Princeton, KY 42445-0469

ABOUT KFGC...

The Kentucky Forage and Grassland Council is an educational forage-livestock organization composed of farmers, industry, and public service personnel. Forages are produced on more open land in Kentucky than any other crop.

In KFGC everyone interested in forages can work together to improve the forage-livestock industry in Kentucky. At the same time, KFGC serves the interests of the entire state by promoting better land use, soil conservation and improved water quality.

OBJECTIVES

- ► Promote the profitable and sustainable and environmentally sound use of forages for the efficient production of feed, food and fiber.
- ► Provide a forum for discussing forage problems and the exchange of ideas, opportunities and solutions to problems.
- ► To collect and publicize information on forage technology and economics.
- ► Promote the development and production of equipment and products by industries needed for forage production and utilization.
- ► Encourage expanded and intensified research in production, marketing and utilization of forages.
- ► Promote the use of forages for soil and water conservation and control of water pollution.
- ► Cooperate with other organizations to promote forage farming, marketing and utilization.
- ► Encourage outstanding achievements in the forage industry through a recognition and awards program.
- ► Develop vigorous leadership in forage activities to ensure continued support in Kentucky's forage industry.

MEMBERSHIP BENEFITS

- ► A Kentucky forage newsletter containing highlights of forage research and extension publications relevant to the Kentucky forage and livestock producer
- ► Updates on current and future educational meetings dealing with forages within Kentucky and across the United States
- ► Interaction with innovative and motivated individuals from the farmer, industry, and public service sector that can help with forage-livestock problems
- ► An affiliate membership in the American Forage and Grassland Council
- ► A free subscription to the *Forage Leader*, the magazine of the American Forage and Grassland Council
- ► Recognition for outstanding service and accomplishments in the farmer, industry, and public service sector through KFGC's awards program
- ► Opportunities to hear leading national speakers in the forage and livestock area through KFGC's annual forage conference
- ► A commodity voice in educational and legislative decisions that addresses the unique interests of the forage-livestock producer

ACTIVITIES

- ► Annual educational meetings to learn and exchange ideas on the production and utilization of forages.
- ► Forage tours and field days to see research and extension work as well as farmer and industry experience with forages.
- ► Conduct Grazing Schools across the state that will help farmers learn how forages and improved grazing systems can increase their profits and satisfaction of livestock farming..
- ► Print and distribute newsletters and other publications dealing with forage activities and information.
- ► Awards program to recognize outstanding accomplishments by forage producers and leaders in education and industry.

- ► Coordinate forage promotion efforts with other state and national organizations.
- ► Cooperate with state and federal agencies, educational institutions and local organizations in forage research, development and educational efforts

MEMBERSHIP

KFGC membership is open to anyone who is interested in promoting forage agriculture.

Individual members form the backbone of the council. They provide the leadership and carry out the daily activities of KFGC.

Corporate members are made up of agricultural or industrial business firms interested in promoting the objectives of KFGC. They provide financial support and program direction through their representative to KFGC.

OFFICERS FOR 2004-2005

President – Ken Johnson
Vice President – Dan Grigson
Treasurer – Phil Howell
Secretary – Garry Lacefield

TO BECOME A MEMBER

Send the following information and your check to:
Kentucky Forage and Grassland Council
Dr. Garry Lacefield, U.K. Research & Education Center, P.O. Box 469, Princeton, KY 42445

Name _____
Address _____
_____
City_____ State_____
Zip_____
Phone_____
County_____

Please check the appropriate spaces:

Producer:
Beef___, Dairy ___, Hay ___, Sheep ___,
Horse ___, Other _____

Public:
Extension ___, VoAg ___, NRCS ___,
Other _____

Industry: Feed ___, Seed ___, Fertilizer ___,
Chemical ___, Other _____

Annual Dues:
_____ Individual ($20)

_____ Corporate or Business ($40)

For more information, contact:
Garry Lacefield, University of Kentucky
P.O. Box 469
Princeton, KY 42445
Ph: 270 365 7541, Ext. 202
Fax: 270 365 2667
glacefie@uky.edu
Website: http://www.uky.edu/Ag/Forage

DATES TO REMEMBER

January 7 – Forages at KCA, Bowling Green
January 19-20 – 4th Heart of America Grazing Conference, Wilmington, OH
February 24 – 25th Kentucky Alfalfa Conference, Cave City

KFGC Award Winners History

Year	Grassroots	Public Service: County	Public Service: State	Industry
2004	Lee Robey	Don Sorrell	Donnie Davis	Joe Stephens
2003	Jason Sandefur	Keenan Turner	Tim Phillips	Mike Feldhaus
2002	Jimmy May	Doug Shepherd	Chuck Dougherty	Charlie Leppert
2001	Steve Johnson	Charlie McIntire	Donna Amaral-Phillips	Sharon Burton
2000	Nicky Baker	Gary Tilghman	Oran Little	Phil Rowland
1999	Russell Hackley	Bill Green	Joe Wyles	John Long
1998	Minos Cox	Dr. Luther Smith	Billy Ray Smith	Bill Cisney
1997	Cecil Cade	Terry Gibson Darrell Burks	David Stipes	J.W. Stephens
1996	Bryan Hatfield	John Fourqurean	Jimmy C. Henning	Phil Howell
1995	Donnie Shaw	Steve Moore	John Johns	Tim Keene
1994 (Nov)	J.B. & Bill Holtzclaw	Steve Osborne Ken Johnson	David Williamson	Bill Talley
1994 (Jan)	Ben Crawford	Jack Ewing	Mike Collins	Gary Coughlin
1993	Larry Shirley	Paul Deaton	Roy Burris	Gary Lane
1992	Larry Jeffries	Tom Curtsinger	Harold Vaught	Dink Embry
1991	John Nowak	Dan Grigson	Ken Wells	Tim Sickman
1990	Wallace Campbell	Kelsey Driskill	Don Henry	Charles Dobbs
1989	None	None	None	None
1988	None	None	Normal Taylor	Henry T. McCarley
1987	Hillary Skees	John Kavanaugh (1st year awarded)	Paul Burris	Wayne Harr
1986	Don Moore		Curtis Absher	Garland Bastin
1985	Lenn Lee Nelson Dr. G.L. Simpson		Monroe Rasnake	
1984	Paul McCarthy		A.J. Hiatt	Jack Crowner
1983	Dale Lovell		Bobby Pass	
1982	Larry Campbell			
1981	Harry Goodin Henry Besuden		Garry Lacefield J. Kenneth Evans	Aubrey Warren
1980	Charles Schnitzler Harold Rose John Turner Don Evans		Tim Taylor	Warren Thompson
1979				
1978				
1977				
1976			E.N. Fergus Bill Johnstone	Barney Arnold

T A B L E O F C O N T E N T S

PAGE

ROLE OF LEGUMES IN PASTURE SYSTEMS

Garry D. Lacefield
Extension Forage Specialist
University of Kentucky

Successful livestock programs are dependent on forage programs which supply large quantities of adequate quality, homegrown feed. A major percentage of the feed units for beef (83%) and dairy (61%) cattle come from forages. In addition, forages supply an estimated 91%, 72%, 15% and 99% of the nutrients consumed by sheep and goats, horses, swine and ruminant wildlife, respectively. These values can be put in perspective when we consider that 63% of Kentucky's Agricultural Cash Receipts are from livestock and livestock products. Cash hay accounts for approximately 28% of the total crop value. Hay ranks second only to tobacco in crop value. Add to this any value you want to put on forages role in soil conservation, seed production, aesthetics, etc.

Kentucky's forage base is composed of cool-season grasses and legumes. Four grasses occupy the vast majority of our forage land with Kentucky 31 tall fescue occupying the largest number of acres (Figure 1). Clovers (red, ladino, white) (Figure 2) are, by far, the dominant legumes found in Kentucky hay/pasture fields. Pasture production from the cool-season species varies greatly during the growing season (Figure 3).

Figure 1. Forage Grasses

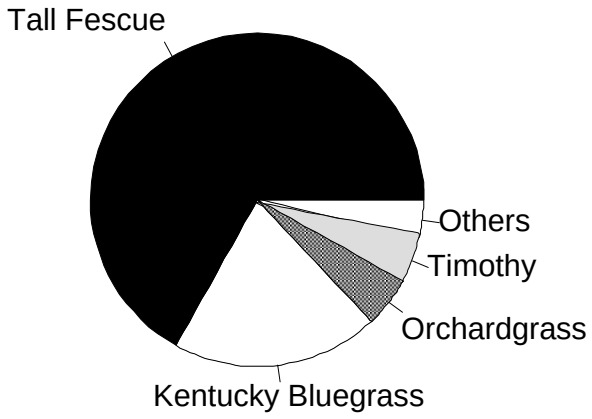


Figure 2. Forage Legumes

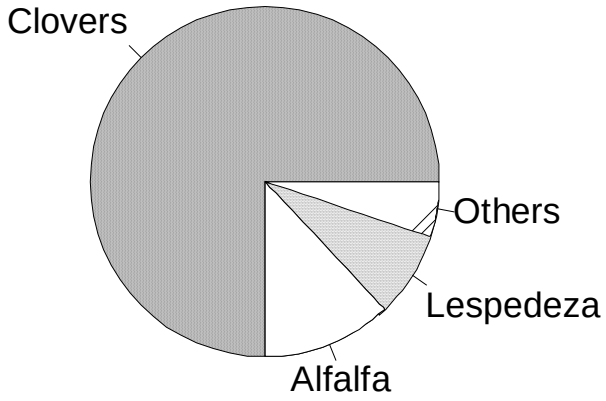
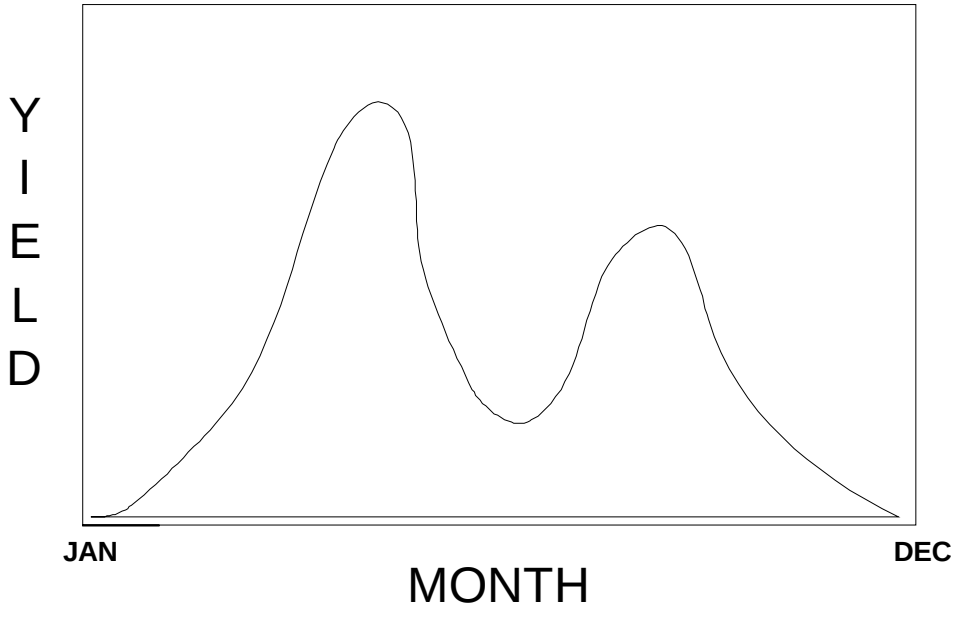


Figure 3. Seasonal Yield Distribution of KY 31 Tall Fescue.



Legumes are present at a high enough level to significantly improve overall animal production on less than one-fourth of the acreage needed. Research, demonstration and farmer experience have clearly documented the positive contribution legumes can make when incorporated into grass pastures. Adding legumes to hay and pasture fields can bring at least four major benefits:

(1) **Higher Yields**

The total yield of forage per acre is increased. For example, a study conducted at Lexington compared renovating a fescue pasture using red clover to fertilizing the grass with nitrogen (Table 1). In this study, red clover growing with fescue produced higher yields than fescue fertilized with up to 180 lb N/ac.

Table 1. Dry Matter Yields of Fescue-Clover vs. Fescue-Nitrogen–Lexington, 1978, 2 Yr. Average.

Treatments	Yields, lb/ac
Fescue-Red Clover	
6 lb Seed/ac	11,100
Fescue + Nitrogen	
0 lb/ac	3,900
90 lb/ac	6,700
180 lb/ac	9.900

Taylor, T.H., et.al. University of Kentucky.

(2) **Improved Quality**

Adding legumes to grass fields improves forage quality over grass alone. This added quality includes increases in palatability, intake, digestibility, and nutrient content. The result is improved animal performance. Research has shown that legumes improve animal growth rates, reproductive efficiency, and milk production. The three studies summarized in Table 2 show improved growth rates of beef cows, calves, and steers when legumes are used. The study reported in Table 3 shows increased growth rates of beef steers grazing a fescue-ladino clover pasture. It also shows higher gains per acre as a result of improved forage quality and higher yields.

Table 2. Animal Performance on Grass vs. Legume-Grass Mixtures.				
Species	Length of Trial (Yrs)	Gain/Head (lb/day	Animal Class	State
Tall Fescue	3	0.12	Cows	IN
Tall Fescue + Red & Ladino Clover		0.74		
Tall Fescue	3	1.30	Calves	IN
Tall Fescue + Red & Ladino Clover		1.80		
Orchardgrass	10	1.07	Steers	VA
Orchardgrass + Ladino Clover		1.28		

Table 3. Av. Daily Gain and Gains/Acre of Steers Grazing Tall Fescue & Tall Fescue-Clover Pastures.			
Pastures	Daily Gain (lb/steer)	Total Gains	
		lb/steer	lb/ac
Fescue + Ladino Clover	1.53	307	582
Fescue + 150 lb N/ac	1.06	203	374

Hoveland, C.S., et al. 1981. Bulletin 530. Auburn, AL.

High quality feed is important in getting beef cows rebred after calving. Research conducted in Illinois and Indiana (Table 4) compared conception rates of cows grazing tall fescue pastures with and without legumes. In both tests, the cows grazing legume-grass pastures had much higher conception rates.

Table 4. Conception Rates on Grass vs. Grass-Legume Pastures		
Species	Conception Rate %	State
Tall Fescue	75	IL
Tall Fescue + Legume	89	
Tall Fescue	72	IN
Tall Fescue + Clover	92	

(3) **Nitrogen Fixation**

Legumes get their nitrogen needs from symbiotic bacteria that live in “knots” (nodules) on their roots. These bacteria are added when legume seed is inoculated. This “fixed” nitrogen provides the nitrogen needed by the legumes and also by grasses growing with them. Different legumes are able to “fix” different amounts of nitrogen (Table 5). Alfalfa usually fixes the most, while annual lespedeza is on the low side with about 75 pounds.

Table 5. Value and amount of nitrogen fixed by various legumes.				
Crop	N fixed, lb/A/year	N value, $, @		
		25¢/lb	35¢/lb	45¢/lb
Alfalfa	150-250	38-63	53-88	68-113
Red clover	75-200	19-50	26-70	34-90
White clover	75-150	19-38	26-53	34-68
Vetch, lespedeza, and other annual forage legumes	50-150	13-38	18-53	23-68

SOURCE: Southern Forages 2002

The value of the nitrogen fixed by legumes depends on the cost of nitrogen fertilizer. The values in the right column of Table 5 are based on nitrogen priced at 25 cents/lb or ammonium nitrate fertilizer at $170/ton.

(4) **More Summer Growth**

Most of the growth of cool-season grasses occurs during the spring and fall. Legumes (alfalfa, lespedeza, red clover) make more growth during the summer months than cool-season grasses. Growing grasses and legumes together improves the seasonal distribution of forages and provides more growth during summer.

Summary

Legumes have played an important role in Kentucky pasture and hay fields in the **PAST**. They are playing an important role at **PRESENT**; however, they must play a more important role in the **FUTURE** as we exploit these unique plants to improve the overall forage-livestock situation in the state.

FERTILIZING PASTURES FOR PROFIT

Byron Sleugh
Associate Professor
Western Kentucky University

It has been known for centuries that providing certain nutrients to plants is critical for high productivity. The nutrient source and manner in which it is applied may vary, but the desired outcome is the same: high crop yield and quality. Fertilization is the most practical means that producers have to ensure that crops receive the nutrients they need. While increasing fertilizer application and managing pH by liming can lead to increase forage production, your investment should be measured against the potential return. Also, over application of nutrients can potentially cause environmental problems.

The missing link in forage production is often soil fertility management because enough attention is not paid to soil testing, tissue testing, and fertilizer and/or manure application. Since the growth and productivity of plants are directly linked to soil fertility every effort should be made to provide the necessary nutrients for plants. The equation is a simple one: **Feed the forages so they can feed the livestock!** To determine the fertility needs of pasture or hayfield soil testing is required. Even so, only approximately 21% of the forage land in the South is soil tested and of that amount over half (52%) had a pH below 6.0, and nearly half (46%) of the land was low in phosphorus and potassium (Ball et. al., 2002). This means we still have a lot of producers fertilizing forages without the benefit of a soil test. They may be wasting their money and valuable fertilizer in the process.

Unfortunately, producers are more likely to apply fertilizer to hayfields and not to pastures. This is often because they do not see the immediate economic impact of a pasture in the same way they would see money received for selling hay. Pasture is just as valuable though. Its economic impact is seen in the pounds of meat of milk produced by grazing animals.

To show that we really need to replenish the soil by applying fertilizer, one only needs to look at the numbers in Table 1 that indicate the amount of various nutrients removed from the soil when certain forages are harvested as hay.

Table 1. Approximate pounds of nutrients removed by various forage crops at specified yield levels when harvested as hay.					
	Species and assumed hay yield, tons/A				
	Alfalfa 5	Tall Fescue 3.5	Sorghum-sudangrass 4	Orchardgrass 3	Bermudagrass 6
	Amount of nutrient removed (Lb/A)				
Nitrogen	280	135	160	150	258
Phosphorus	75	65	61	50	60
Potash	300	185	233	185	288

Adapted from Ball et al. Southern Forages, 3rd Ed.

The availability of nutrients in the soil is affected by the soil pH. Therefore it is important to make sure that we do soil tests to determine if we need to adjust the pH of our pastures and hayfields. The amount of lime that may need to be applied will vary depending on your soil test, but Table 2 provides some general suggestions.

Table 2. Generalized lime recommendation for cool-season grasses.	
Soil pH	Tons of Ag Lime/A
Above 6.4	0
5.8 - 6.4	0 - 2
5.2 - 5.8	2 - 4
Below 5.8	4

AGR-103 Fertilization of cool-season grasses. Issued: 11-82. K.L. Wells, L.W. Murdock and C.T. Dougherty.

Fertilizer options for forage crops:

There are several options you can choose from for a source of nutrients for your forage crops. The two main sources of nutrients are: inorganic fertilizer and organic fertilizers (manures, crops residue, compost etc.). As the price of inorganic fertilizer and broiler production increases, the use of organic fertilizers (especially swine or cattle manure and chicken litter) has increase dramatically.

When a producer decides to use inorganic fertilizer, the nutrient content of the fertilizer they apply is known and application rates may be adjusted accordingly. This same principle should be followed for organic fertilizers; they need to be analyzed to determine their nutrient content. The nutrient content of the manures will vary widely and it is recommended that you sample and analyze manures before making application rate decisions. Over-applying manures (or any fertilizer) can lead to pollution as well as plant and animal health problems. For more information on manure sampling and testing, and the potential use of broiler litter as a nutrient source see Extension Publications ID-123 and AGR-168.

The importance of taking soil samples and determining the soil nutrient status **BEFORE** applying fertilizer cannot be overstated. If your soil test report indicated that your field is high in potash or phosphorus, it would not make good economic sense to apply a fertilizer with those nutrients. Many fertilizer suppliers are able to custom blend fertilizers to meet your need.

In research conducted at Western Kentucky University Agricultural Research and Education Complex and other locations, it has become evident that producers may be able to apply smaller amounts of poultry litter and supplement with inorganic nitrogen to produce forage of comparable yield and quality (and lower cost) to that produced with inorganic fertilizer or very high rates of poultry (Litter at the N rate). An additional benefit to applying less poultry is the reduction of the rate of buildup of soil nutrients such as copper, zinc, and phosphorus. Tables 3 and 4 show the nutrient content of an alfalfa-orchardgrass and a sorghum-sudangrass hayfield fertilized with litter or inorganic fertilizer in various combinations (Sleugh et al. 2002).

Table 3. Crude protein, nutrient concentration and yield of sudangrass fertilized with poultry litter and/or inorganic fertilizer.

Treatment	Crude protein	P	Cu	Zn	Fe	Yield
	------% Dry matter-------		----------PPM----------			T/acre
Litter at N rate (N)	11.15b[a]	.41a	14.75a	55.33a	101.83a	1.66ab[b]
Inorganic fert. (I)	12.10a	.32c	14.91a	55.16a	107.08a	1.77a
Litter at P rate + supplemental N (NP)	11.34b	.37b	14.75a	53.91a	101.42a	1.25b
Litter at P rate	9.00c	.40ab	13.83a	39.08b	124.42a	.73c

[a]Means in each column followed by the same letter are not significantly different at the 5% level.

[b]Average yield at each of the 3 harvests in 2001.

Table 4. Crude protein, nutrient concentration and yield of orchardgrass fertilized with poultry litter and/or inorganic fertilizer.

Treatment	Crude protein	P	Cu	Zn	Fe	Yield
	------% Dry matter------		----------PPM----------			T/acre
Litter at N rate (N)	18.47a[a]	.53a	15.53a	35.61a	174.94ab	1.48a[b]
Inorganic fert. (I)	18.58a	.50a	12.56b	31.82b	168.38ab	1.26ab
Litter at P rate + supplemental N (NP)	19.17a	.47b	14.88a	33.52ab	223.69a	1.28ab
Litter at P rate	17.6a	.49ab	15.4a	31.91b	153.81b	1.05b

[a]Means in each column followed by the same letter are not significantly different at the 5% level.

[b]Average yield at each of the 4 harvests in 2001.

The soil test information from these plots indicate a buildup of soil phosphorus, copper and zinc in the plots that received high amounts of litter (litter at the N rate)

Most producers are very aware of the importance of nitrogen fertility in their fields. Some overlook the importance of P, K, and the other nutrients. It is just as important to provide enough magnesium as it is to provide enough nitrogen or else the nutrient you do apply will not have maximum effect. Phosphorus and potassium are particularly important because they improve root development and winter survival, respectively.

Table 5. Dry matter yields of fescue-clover vs. fescue-nitrogen, Lexington, KY, 1978, 2 year average.	
Treatment	Yields, lb/A
Fescue-Red clover (6 lb seed/A)	11,100
Fescue + Nitrogen	
0 lb/A	3,900
90 lb/A	6,700
180 lb/A	9,900

Taylor, T.H., et al. University of Kentucky

In Kentucky (Table 5), research has shown that a tall fescue-red clover stand (6 lb/acre red clover) can produced yields greater than tall fescue grown alone and fertilized with up to 180 lb/N/acre. Using the data from Table 5, if you planted 6 seed lb/A at a cost of $2.00/lb you would have spent $12 for seed. Even with the cost planting the seed included it would still be more cost effective and provide more of a return than applying the lowest amount of nitrogen (90 lb/A) even if nitrogen is $0.31/lb. This information shows that management decisions such as inclusion of forage legumes in grass pastures and hayfields can help lower the cost of fertilizer over the long run.

Overall, it is important to know the nutrient requirement of your forage crop, know the nutrients available from the soil (soil test) and supply that nutrient in the appropriate manner from inorganic or organic sources. Making the right fertilizer decisions can improve your forage yield and nutrient content and thus the performance of your livestock.

PRESENT AND FUTURE TALL FESCUE VARIETIES

Tim Phillips
Associate Professor
Tall Fescue Genetics and Breeding
Department of Agronomy, University of Kentucky

Tall fescue has played a key role in forage production over the past century in the USA. It has other uses besides forage applications, such as turf, mine reclamation, and highway rights-of-way, but in this presentation we will focus on forage varieties. Several hundred turf-type tall fescue varieties have been developed over the past 30 years, mainly by private seed companies using material from Reed Funk at Rutgers University in New Jersey. Forage varieties aren't as numerous. I will discuss some of the older and current forage tall fescue varieties, and finish by discussing the newest varieties, and those that are in the pipeline that you will be seeing in the next few years.

The first forage crop variety to be registered by the American Society of Agronomy was a tall fescue. It wasn't the variety that you may be thinking of, but was called Alta. Alta originated in Oregon from seed from Germany and Missouri that was sent to Oregon before 1918. Alta was released in 1940, but never was as important as the variety that was released in Kentucky in 1943. Kentucky 31 has a very interesting history, and its wide adaptation, persistence, and success is legendary. It is estimated that around 85% of all tall fescue seeded in the southeastern US was Kentucky 31. The third and last of the grandfathers of tall fescue is the variety Goar, released in 1946 in California. It was mainly used in the western US and Alabama, but never achieved widespread adoption like Kentucky 31 did.

Oregon was the source of another important early tall fescue variety, Fawn. Fawn traces back to eight parents and was released in 1964. It often has competed with Kentucky 31 as a lower-cost endophyte-free forage variety. It is earlier in maturity than Kentucky 31. Dr. Robert Buckner, the tall fescue breeder at U.K. (as a USDA-ARS employee), released two varieties of tall fescue in the 1960s, Kenwell and Kenmont. Kenwell resulted from selfing tall fescue parents, and was slightly less competitive than Kentucky 31, and was heavily infected with the endophyte. Reports from forage workers during that time suggest that Kenwell caused even more animal health problems than has been seen with endophyte-infected Kentucky 31. Kenmont was used mainly in Montana due to its tolerance to alkaline soils.

Another active breeding program produced tall fescue varieties in Missouri. Missouri-96, or Mo-96, was released in 1977. It was derived from French tall fescue. Mozark and Martin were released during the 1980s and have been successful varieties, even though they have only four and two parents, respectively.

Dr. Buckner developed and released two new varieties from his wide-hybridization work. He spent much of his career making crosses between tall fescue and related species such as annual and perennial ryegrass and giant fescue. Kenhy was released in 1976, and was actually the first endophyte-free variety, even though that happened accidentally. Johnstone was released in 1983, and includes seven of the 11 Kenhy parents (plus 29 other parents). It has much better digestibility than most tall fescue varieties, but suffers from a reputation of being slower to establish and less persistent than other tall fescue varieties.

Dr. Joe Bouton at the University of Georgia developed several tall fescue varieties, in addition to developing the first of the grazing-tolerant alfalfa varieties, Alfagraze. Georgia-5 was released in 1992 and was recommended as a perennial cool-season grass to use in bermudagrass and bahiagrass pastures instead of annual ryegrass overseeding each year. Jesup was released in 1995. These two varieties were the first American varieties to be infected with the novel endophytes from AgResearch of New Zealand, the MaxQ product.

Sam Stratton and Bret Winsett at Farmers Forage Research in Indiana have developed some excellent varieties of forage tall fescue. These include Penngrazer, Cattle Club, Phyter, Stargrazer, and Select. Because these varieties are bred near West Lafayette, IN, they generally have excellent winter-hardiness. Their varieties are consistently among the best performers in the U.K. forage variety trials.

Over the past decade, we have seen more and more tall fescue varieties coming from outside the USA. These are mostly European, but some have come from Australia, New Zealand, Canada, Poland, and Japan. Several large forage seed companies are involved in these varieties. These include Barenbrug from the Netherlands, AgResearch from New Zealand, Grasslands from Australia, and DLF-Trifolium from Denmark. Many of these companies are multinational in their reach, and all are entering their new experimental varieties in university forage performance trials in the USA. Many of the Barenbrug varieties begin with ‘Bar’ such as Barcel, Barolex, Bariane, Barcarella and Barvetia. They also market other European varieties in the USA. Dovey originated from Great Britain, and consistently has shown the best seedling vigor of all tall fescue varieties, and it is endophyte-free. Many varieties have been developed using material from France, including the variety Seine. Van der Have in The Netherlands developed several successful varieties; Festorina and Fuego are two examples. Stef is a Polish variety that showed up in tall fescue variety trials in the early 1990s. Courtenay and Kokanee both were developed in British Columbia, Canada.

During the 1990s, several Oregon breeding and seed producing companies also developed forage tall fescue varieties, or were involved with other breeders around the world to develop newer varieties. We have a good range of tall fescue varieties, but not the overwhelming number that the turf side has (see Table 1.).

Table 1. A Partial list of Commercial Tall Fescue Varieties from U.K. Variety Trials

Atlas	Carmine	Georgia-5	Martin II	Select
Barcarella	Cattle Club	Jesup	Maximize	Stargrazer
Bar 9 TMPO	Festival	Hoedown	Quincy	TF 33
Bronson	Festorina	Kokanee	Resolute	Tuscany II
Bull	Fuego	Martin	Seine	Vulcan

Several recent new directions have appeared in tall fescue varieties. One is the use of novel, non-toxic, or friendly endophytes. The first of these was MaxQ with AgResearch NZ's endophyte strains in Univ. of Georgia's varieties (Jesup and Georgia-5) marketed by Pennington Seed. The AgResearch strains are being deployed by other parties as well, including Univ. of Kentucky, The Noble Foundation, and Grasslands in Australia (Advance, Quantum, and Resolute varieties, called 'Max P' down under). Arkansas and Missouri co-released a competing version called ArkPlus. It is a natural strain of the endophyte that has been inserted into the variety HiMag from David Sleper at Missouri University. These varieties are sometimes called novel endophyte tall fescues (NETFs), and they combine the benefits of endophyte infection with the animal performance of endophyte-free tall fescue by using fungal strains that do not produce ergovaline. At the University of Kentucky, Dr. Chris Schardl in the Plant Pathology is developing 'knockout' mutants of the endophyte for use in future tall fescue varieties.

Other workers are selecting tall fescue varieties under grazing pressure with impressive results. Persistence under grazing can be dramatically increased with as few as two cycles of selection, even in orchardgrass and endophyte-free tall fescue. One of the sources of the grazing pressure/selection on varieties has been the forage variety trials like those started by Jimmy Henning in 1996 at U.K. Forage breeders are invited back after the study has concluded to retrieve any surviving plants to use in their breeding program. The U.K. Tall Fescue Breeding program is also taking advantage of this opportunity as well.

Other new directions include the continued use of wide hybridization to move more desirable genes into tall fescue from its relatives. A fairly new species has resulted from crosses between meadow fescue and perennial ryegrass, called *Festulolium braunii*. Festuloliums are intermediate between tall fescue and perennial ryegrass in how they grow, but with excellent quality and palatability as good as ryegrass. Some of these varieties will be familiar to you: Duo, Tandem, Spring Green, and Kemal. While not as persistent as tall fescue, these grasses offer excellent seedling vigor and forage quality, without any endophyte. Meadow fescue, as well, may become more common as new varieties are tested and developed for the North American market. Animal acceptance is excellent for meadow fescue, but it is similar in yield potential to Kentucky bluegrass.

The U.K. Tall Fescue Breeding project has over 100 new experimental tall fescue varieties in various stages of testing, so we should be seeing many of these over the next few years, as we sort out the outstanding from the average varieties. We also

have two varieties that have the MaxQ endophytes inserted into them. Table 2, from the 2001 Tall Fescue Variety Report, shows the newest variety released by the Kentucky Agricultural Experiment Station. KYFA9304 was approved for release on September 10, 2004. We hope to get this variety out to Oregon for seed increase, so Kentucky producers will be able to grow this new endophyte-free tall fescue. It traces back to old plantings of Kenhy and Johnstone in Breckinridge County. It has tested well in both the hay and grazing variety trials. It is shorter, denser, and later flowering than either of its parental varieties, or Kentucky 31. It has the same shiny, soft leaves as Kenhy and Johnstone, but is different from them in being more persistent under grazing pressure.

Table 2. Dry matter yields (tons/acre) of tall fescue and festulolium (FL) varieties sown 23 August 1999 at Lexington, Kentucky. ***(From the 2001 Tall Fescue Report)***

Variety	Total 2000	Maturity May 10, 2001	2001 Harvests					Total 2001	2-yr Total
			May 11	Jun 21	Aug 2	Sep 4	Oct 18		
Commercial Varieties - Available for Farm Use									
Atlas	10.30	59.75	2.97	1.49	0.86	1.56	0.62	7.49	17.80*
Select	10.03	56.00	3.14	1.50	0.80	1.69	0.41	7.54	17.58*
Duo (FL)	11.04	41.75	2.56	1.70	0.36	1.27	0.38	6.27	17.30*
KY 31+ [1]	9.60	48.00	2.48	1.84	0.73	1.66	0.63	7.33	16.93*
Fuego	9.33	44.25	2.29	1.99	0.71	1.58	0.61	7.18	16.51*
Seine	8.93	51.25	2.49	1.97	0.65	1.68	0.78	7.57	16.51*
Maximize	8.88	54.00	2.40	1.63	0.72	1.84	0.56	7.15	16.04*
DLF-B	8.86	57.75	2.51	1.79	0.72	1.63	0.50	7.15	16.01*
BAR 9 TMPO	9.15	49.75	2.34	1.63	0.57	1.72	0.48	6.74	15.89*
Johnstone	8.89	51.50	2.65	1.78	0.56	1.53	0.37	6.89	15.78
Experimental Varieties - Not Available for Farm Use									
KYFA 9304	**10.39**	**52.75**	**2.94**	**1.64**	**0.83**	**1.74**	**0.62**	**7.77**	**18.16***
BAR-FA-BTR7	10.75	56.75	3.00	1.28	0.94	1.54	0.60	7.35	18.11*
Jesup 584	10.11	56.00	2.76	1.59	0.93	1.74	0.53	7.55	17.67*
BAR-FA-BTR6	10.24	46.00	2.51	1.67	0.78	1.56	0.80	7.32	17.57*
Ampac pp7	10.41	61.50	2.91	1.45	0.86	1.17	0.35	6.74	17.15*
TF 9202	10.03	54.50	2.63	1.66	0.75	1.57	0.49	7.10	17.13*
GA 7CLONE-542	9.70	59.50	2.78	1.39	0.90	1.79	0.42	7.27	16.98*
GA 5-584	9.49	56.50	2.55	1.51	0.92	1.57	0.46	7.01	16.50*
Ampac-pp3	10.10	49.00	3.29	1.51	0.77	0.56	0.17	6.29	16.39*
Jesup 542	9.29	56.00	2.48	1.74	0.76	1.68	0.40	7.07	16.36*
KYTF 2	9.10	46.75	2.48	2.09	0.58	1.55	0.46	7.17	16.27*
Ampac pp8	9.78	50.25	3.00	1.39	0.80	0.87	0.27	6.32	16.10*
KY 31- [1]	8.09	54.00	2.77	1.60	0.75	1.56	0.63	7.31	15.40
GA 153E-542	8.33	56.50	2.02	2.02	0.73	1.57	0.50	6.83	15.16
KYFA 9301	8.40	52.50	2.51	1.25	0.66	1.42	0.43	6.28	14.68
GA156L-542	7.64	48.00	1.95	2.10	0.44	1.67	0.48	6.64	14.28
Mean	9.50	52.71	2.63	1.66	0.73	1.53	0.50	7.05	16.55
CV, %	15.85	6.91	17.04	25.57	31.32	13.68	26.60	6.35	10.15
LSD, 0.05	2.12	5.13	0.63	0.60	0.32	0.29	0.19	0.63	2.36

* Not significantly different from the highest value in the column, based on the 0.05 LSD.

[1] "+" indicates variety is endophyte infected, "-" indicates variety is endophyte free.

WILL IMPROVED GRAZING PAY FOR EXTRA FENCING AND WATER COST?

Ken Johnson
USDA District Conservationist
Tompkinsville, KY

Expectation is founded on faith, and in faith lays opportunities. I suppose as we look at most farming operations most changes occur from force not by choice. What I propose today and hope to convince most of you; is that here is an opportunity to make more profit, if you're willing to change and have faith that it will work.

Most of us have heard of, if not practiced rotation grazing for a long time. The question many ask, is it worthwhile. Does better grazing management make me any more money? I hope to at least provide some insight as to answers to that question.

Rather than trying to prove how much various systems improve profits, I am going to narrow down the cost associated with a few options and let you decide if it will pay in your system or one you may be considering.

As we start this process we must define our parameters. Let's use a 40 acre field with 25 cow/calf pairs as a base to start. I'm order to give you a conservative answer, I want to use high material cost, knowing you may be able to do better.

4-5 inch wood corner post	5.00 each
High Tensile wire	1 to 2 cents per foot (55 to 75 dollars per roll)
Polywire	2 to 3 cents per foot (23 to 40 dollars per roll)
Step-in posts	89 cents to 3.00 each
Water system expansion	
Pipe on top of the ground	25 to 30 cents per foot
Pipe buried	75 cents to one dollar per foot
Portable waterers	60 to 100 dollars each
Permanent waters	400 dollars plus

I am not going to use a labor expense at this point, however we will add a labor cost in a few minutes.

Our field is 1325 ft square containing a little over 40 acres.

Options 1. Suppose we divide this field twice, once each direction, giving us 4, 10 acre paddocks with one water point in the center.

Using polywire	2650 ft @ 3 cents per foot cost	79.50
Step-in posts	88@ 3.00	264.00
Portable water tank		100.00
665 ft pipe on top of the ground		199.50
	Total	**$643.00**

The important question to ask with each option is; what would it take to pay for this?

25 cows, 23 calves -- 643.00/23 = 27.90 pr calf @ .75 lb 37 lbs per calf or

21 lbs per acre

This would cover all costs in one year, use the materials for 5 years and the cost would be 4 lbs per acre

Option 2. Same a one but using High Tensile wile and a few wood corner posts

Water cost		299.50
Step-in post	80 @ 3.00	240.00
Wood Post	8 @ 5.00	40.00
Wire	2650 ft @ .02 per ft	53.00
	Total	**632.50**

Same math; still only about **21 lbs per acre**, more labor but about the same out-of-pocket cost.

Option 3. Same wire approach as option two but using a permanent water source.

Wire and posts		333.00
Waterer		400.00
Pipe	665 @ 1.00 ft	665.00
	Total	**1398.00**

Over double the cost, at **35 lbs per acre,** but if you use the water system for 10 years, you are still taking about only about 2.5 lbs per acre per year for water development.

21 pounds per acre, 35 pounds per acre, so what! What does this mean in terms of farm profit?

Research at the University of Kentucky and many other places show that by dividing a continuous grazed field into 2 to 4 paddocks will increase the gain per acre from 150 to over 300 pounds per aces. If it costs 21 pounds to install the system and you get even 150 pound gain, you do the math.

You can use about any material cost and any calf price, charge 20 dollars an hour for your time, and the way I look at it: water and fence development Pays….. BIG TIME!

GRAZING: GETTING FROM WHERE YOU ARE TO WHERE YOU WANT TO BE

Gary Bates
Forage Specialist
Department of Plant Sciences
The University of Tennessee

When trying to design a forage and grazing program, producers often try to consider so many factors that it becomes mind-boggling. If basic plant physiology, how and when a forage plant grows is considered, improving a forage program will usually become easier, especially in developing a controlled grazing system. The purpose of a controlled grazing system should be to improve the utilization of the high quality forage produced on the farm. In order to improve this utilization, it is helpful to understand plant growth and quality, and the factors that affect them.

UNDERSTAND PLANT GROWTH

An important point in forage management is that forage is not always equal. Over time, the forage quality, defined as the relative amounts of protein, energy, and fiber that are present in the plant, will change. In general, as a plant becomes more mature, fiber levels will increase, and protein and energy levels will decrease. As leaves mature, fiber is laid down in the leaves, so quality will drop. Also, as a plant switches from vegetative growth (leaf production) to reproductive growth (seedhead or bloom production) the quality of the forage will decrease. This is because there is more fiber in the reproductive structures than in leaves, so the quality of the overall plant will be lower. The goal is to have a plant high in protein and energy, and low in fiber. The result will be a forage that is nutritious, highly digestible, and will provide good animal performance.

Quality vs. Quantity

For the best quality possible, forage should be cut when it is very young. This will provide young leaves that contain very little fiber and are very high in protein and energy. The problem is that the yield will be very low. To produce the largest quantity of forage possible, wait for the forage to get old and mature, with as many seedheads as possible. The problem here is that the quality will be very low. For the most efficient forage production, a mid-point should be found. The goal is to produce a good tonnage of a high quality forage. It may not be necessary to producer the highest quality or quantity, but acceptable levels of both. Figure 1 illustrates forage accumulation over time. During phase 1, forage quality is high, but tonnage is low. During phase 3, tonnage is high but quality is low. Harvesting during phase 2 should be the goal.

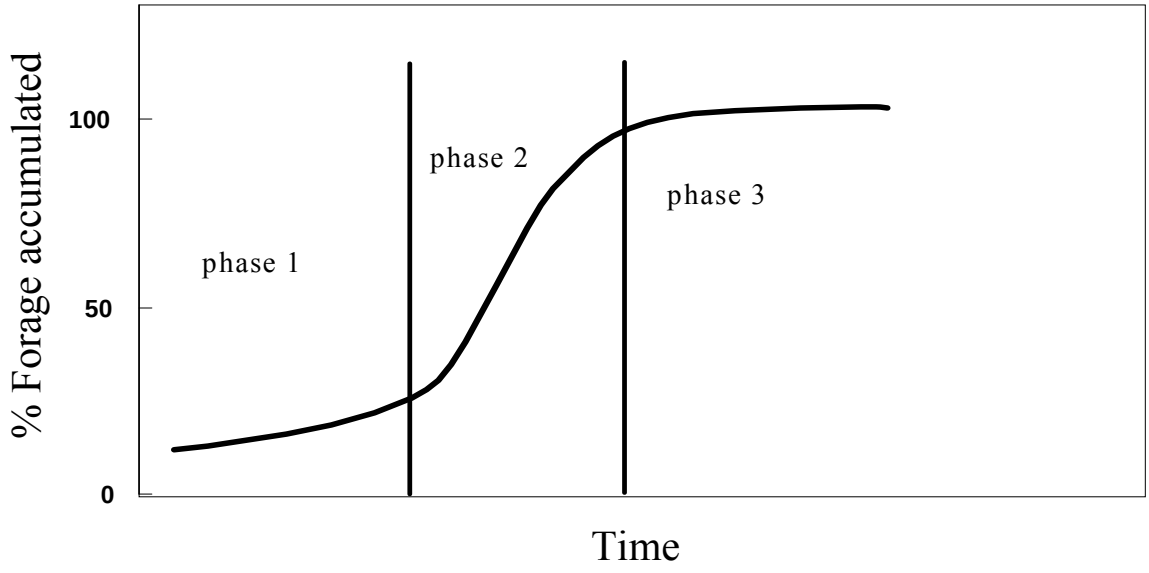


Figure 1. Phases of forage growth

Managing leaf area

One of the most important factors influencing forage growth is the amount of light absorbed by the plant. Because plants need sunlight to carry on photosynthesis, growth depends on sunlight, as long as the other nutrients are available (water, fertilizer, etc.). Because of this, the management of a plant's leaf area will influence yield. Look again at Figure 1. Early, as the plant begins to grow, there is not much leaf area available to capture sunlight. Most of the light is falling on the soil around the plant. Because of this, the growth rate during phase 1 is slow. Since the plant can't produce the energy it needs to grow, its growth is dependant on stored energy from the roots. As the leaves begin to develop, more sunlight is captured, more energy from photosynthesis is produced, and less root carbohydrates are needed. This cycle begins to build on itself. More energy means more leaf growth, which captures more sunlight, which means more energy, producing more growth, and so on. Phase 2 is characterized by a very rapid growth rate. As the plant moves into phase 3, the leaves produced during phase 2 get older, are less efficient at photosynthesis, and growth rate slows. The amount of forage accumulated comes to a halt.

Overgrazing vs. undergrazing

Figure 1 is the basis for the benefit for rotational grazing. In phase 1, the forage quality is high, but quantity is low. The plant is depending on stored energy for its growth. If a plant is forced, through overgrazing, to stay in phase 1, forage quality may be high, but eventually the plant may run out of energy in the roots, and will die. Some species are more sensitive to overgrazing than others. It is easy to kill alfalfa and orchardgrass by overgrazing, while bermudagrass and tall fescue are more tolerant of overgrazing.

If plants go into phase 3 before grazing, they are able to keep high levels of root carbohydrates, but a lot of forage matures before harvest, so efficiency is reduced. The best management is to let the plants grow into phase 2, then graze and force them back into phase 1. After they regrow back into phase 2, graze again into phase 1.

As difficult as we would like to think rotational grazing is, it boils down to this simple point: rotational grazing is used to manage the forage growth curve shown in Figure 1.

UNDERSTAND FORAGE GROWTH SEASONS

The major expense involved with growing or maintaining cattle is feed cost. Because grazing is usually the least expensive means to provide nutrients to livestock, a primary goal of beef cattle producers should be to utilize pasture for as many months of the year as possible and minimize dependence on stored feed. This sounds very simple in theory, but in reality is often difficult to accomplish.

The difficulty relates to the seasonal growth pattern for most pastures. Tall fescue is the predominant forage in most Kentucky pastures, and is most productive during spring and fall, but high temperatures and limited rainfall during the summer cause a decrease in growth (Fig.2). This fluctuation in forage production creates a dilemma for cattle producers. How many cattle can be carried on the farm? If stocking rates are based on summer forage production, excessive spring growth will result in pastures that are undergrazed, forage will mature and drop in quality, and large amounts of forage may be wasted because of selective grazing and trampling. If pastures are stocked based on spring growth, then overgrazing during summer months could damage plant stands, and result in the need to supplement the diet of the grazing animals. If stocking rates are set somewhere in between, then there will be problems in both seasons, even though they will be less severe.

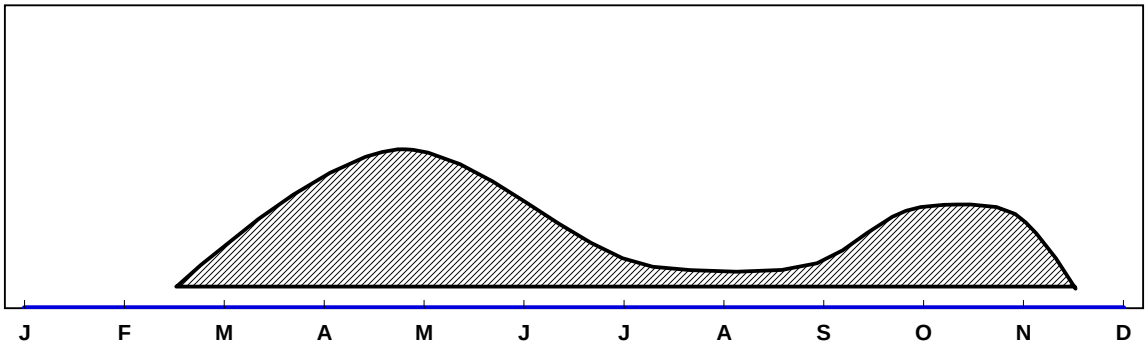


Figure 2. Yield distribution of tall fescue.

One solution to the stocking rate problem is to buy or sell animals every couple of weeks, depending on the amount of forage produced. This is not a practical solution, however, because of health and behavioral problems that invariably occur with frequent changes of this nature.

The method that can best be used to match forage production to livestock numbers is not by changing the number of animals stocked on the farm but by increasing or decreasing the amount of pasture that they have access to. This is the concept behind controlled grazing. The number of paddocks created by cross fencing may vary from only a few to 12 or more. The animals may be stocked on the paddock for 1-2 days up to a week. Size and number of paddocks, as well as the length of time livestock have access to a paddock are decisions each producer should make based on their specific situation.

USING SEVERAL FORAGE SPECIES TO FILL PRODUCTION GAPS

Even with the best controlled grazing program, a drought during the summer will cause a lack of forage production, and the potential for overgrazing. The best way to solve this problem is by adding a warm-season forage. When trying to decide which forages to use on a farm, several factors need to be considered. A step-by-step process can help make the decision a lot easier. In fact, it can often make the decision obvious. Following are the items that should be considered.

(1) **Determine your farm's current forage production curve.** Before adding any new forages, it is important to determine what are the best and worst production seasons for your farm. In general, if cool-season grasses form the base of a program, spring and fall are productive periods, while summer is a period of forage deficit.

(2) **Select forages that complement the current program.** If a new forage species is to be added, be sure that its production will improve the farm's forage availability during the time of the year when forage is lacking. If a pasture is planted to a cool-season grass, when all the other pastures are already producing during the spring and fall, the problem of poor summer production has not been helped.

(3) **Use perennials over annuals, if possible.** In general, forage from perennial pastures is more economical and dependable, with less risk of environmental problems. Establishment costs can be prorated over several years, whereas annuals must be seeded every year. A minor drought can be devastating to the establishment and production of an annual crop, while it may only reduce or delay the production of a perennial pasture.

(4) **Consider the forage quality needed by the herd.** The forage selected should be able to provide the appropriate quality for the animals on the farm. A forage that is too low in protein or too high in fiber will reduce the performance of

grazing cattle. If a forage is higher in quality than is required by the grazing animals, it will not be used efficiently. A spring-calving cow herd does not have very high nutrient requirements during the summer, so a medium quality forage like bermudagrass will be more economical than alfalfa. However, if a producer is stockering beef calves, the high quality of alfalfa may be a profitable forage because of the high nutrient requirements of these animals.

(5) Consider the ease of management. If all other characteristics are similar, choose the forage that will be the easiest to manage and maintain. Forages that require a high level of management to produce and persist will be more difficult to deal with than a forage that is persistent under the stressful conditions that can occur in pastures. In general, grasses are easier to maintain and require less careful management that do legumes.

For most operations in Kentucky, tall fescue is the primary forage. The ease of establishment, persistence and long production season make it an excellent species to use for cow-calf operations. The biggest weakness in forage production with tall fescue comes during the summer months. The cool-season perennial grass does not produce well during the hot, dry summer conditions. Since the summer is the period with the greatest lack of forage, a warm-season forage is the best choice for a type of species to add. Seeding a new field to orchardgrass will not help the summer forage lack, and will only add more forage during the spring and fall. If the cattle on the farm are a spring calving cow herd, minimal forage quality is needed by the cows during this period. Warm-season grasses such as bermudagrass are probably the best choices.

There is nothing magic to having a good forage program. Adding forage species to fill production gaps, and utilizing forage efficiently by controlled grazing will allow a producer to have productive, high quality, persistent stands of forage.

STOCKING DECISIONS: THEY MAKE OR BREAK YOU

Glen E. Aiken
USDA-ARS
Forage-Animal Production Research Unit
Lexington, KY

Decisions on species and variety of forage to plant and manage are economically critical because it establishes the potential to meet a particular production goal. However, the stocking rate used to graze these forages is more critical because it ultimately determines if a targeted level of production is reached. Most cattlemen aim for a stocking rate that provides maximum economic return, but it should be emphasized that an economically optimum stocking rate is one that potentially provides sustained economic return. It is obvious that dollar return is not maximized if excessive heavy grazing results in costly pasture renovation, ranging from 15.00 to 120.00 dollars/acre. Therefore, the challenge is to set stocking rates that meet product goals, adjust stocking rates during adverse weather patterns, and follow pasture management practices that match the intensity that pastures are grazed (heavy grazing requires higher inputs of management!). This paper will discuss factors in setting stocking rates (species/varieties of forages, stocking rate effects on weight gain, climate and forage growth distribution), and having contingency plans for adjusting stocking rates in response to dry weather patterns.

Factors in Setting Stocking Rates

The economically optimum stocking rate for a given pasture is heavily dependent on the forage species and variety to be grazed. To reduce risk of losing forage stands with intensively managed grazing systems, it is important that the forage species/variety is well adapted to the soils and climate. Forage species less suitable to a given set of conditions will require higher inputs of management (fertilization, irrigation, controlled grazing, etc.) to improve their persistence under moderate to heavy grazing intensities. Extension specialists and agents should be consulted to match pasture conditions with an adapted species/variety. Other forages with greater quality or yield potential can be considered over more adapted ones if it is feasible and practical to manage these less adapted species or varieties.

Forage species/varieties differ in their grazing tolerances and carrying capacities (number of cattle a pasture will hold when optimally grazed), but animal weight gain will follow similar trends as stocking rate increases. Figure 1 shows general trends in average daily gain (ADG) and weight gain per acre as stocking rate increases. Average daily gain will be highest and stable over a narrow range of low stocking rates that allows forage to accumulate. These stocking rates are extremely low and of little

economic value for most cattle operations. Beyond a critical stocking rate, ADG declines with increases in stocking rate and reductions in forage supply. The more economically relevant measure, weight gain per acre, gradually increases as ADG declines because additional animals compensate for the losses in individual animal gain (Fig. 1). Weight gain per acre will reach a maximum and then start to decline with further decreases in ADG. Obviously, these stocking rates should be avoided because ADG would likely be too low to pay for animal handling costs and negative profit margins. Furthermore, the economically sustainable stocking rate will be slightly less than the rate for maximum production per acre. The approach with a new forage or pasture is to either set initial rates conservatively low and adjust up, or have the capability to move cattle (or fortitude to sell!).

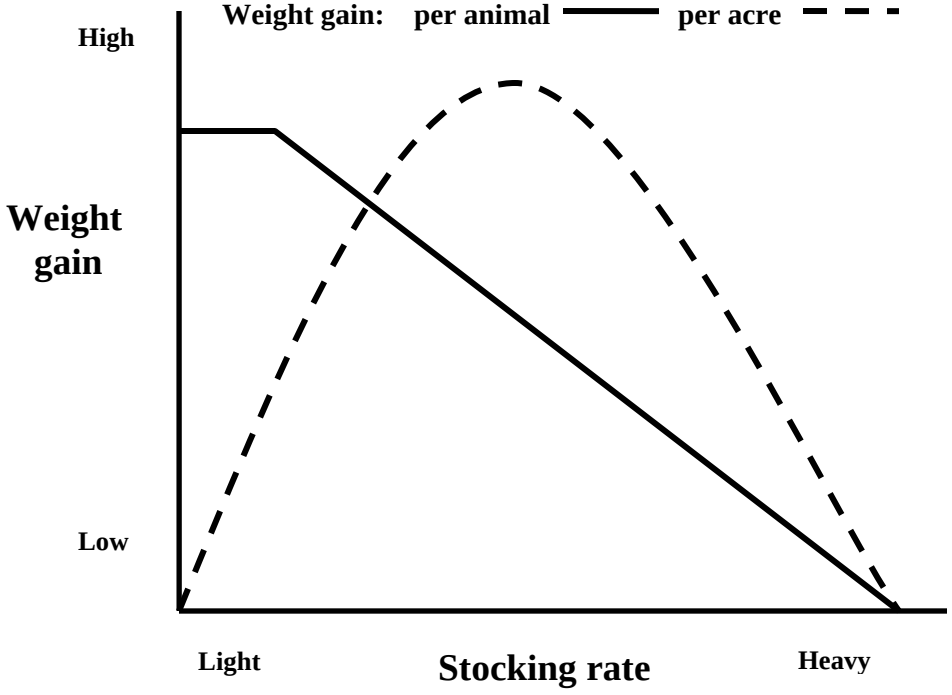


Fig. 1. Relationship between stocking rate and average daily gain and weight gain per acre (adapted from Jones and Sandland, 1974).

Decreasing weight gains with increases in stocking rates is typical across species and varieties, but the rates of change in ADG as grazing increases will vary considerably. Figure 2 illustrates how high-quality, upright growing grasses typically provide high ADG (>2.0 lb/day), but will show rapid declines in animal performance with increases in stocking rate. This group comprises cool-season perennials and annuals, and warm-season annuals. Sod-forming perennial warm-season grasses, with moderate to low quality, typically provide ranges of 1 to 2 lb ADG. Decline in ADG as stocking increases will be less with these grasses than with the upright growing cool- and warm-season grasses because they produce lateral growth that allows them to have greater growth with heavier grazing. Endophyte-infected tall fescue is an exception because alkaloids produced by the endophyte serve as an anti-quality factor causing substantial reductions in forage intake. As a result, the grass provides extremely high carrying capacity, but with very low ADG (< 1.0 lb/day).

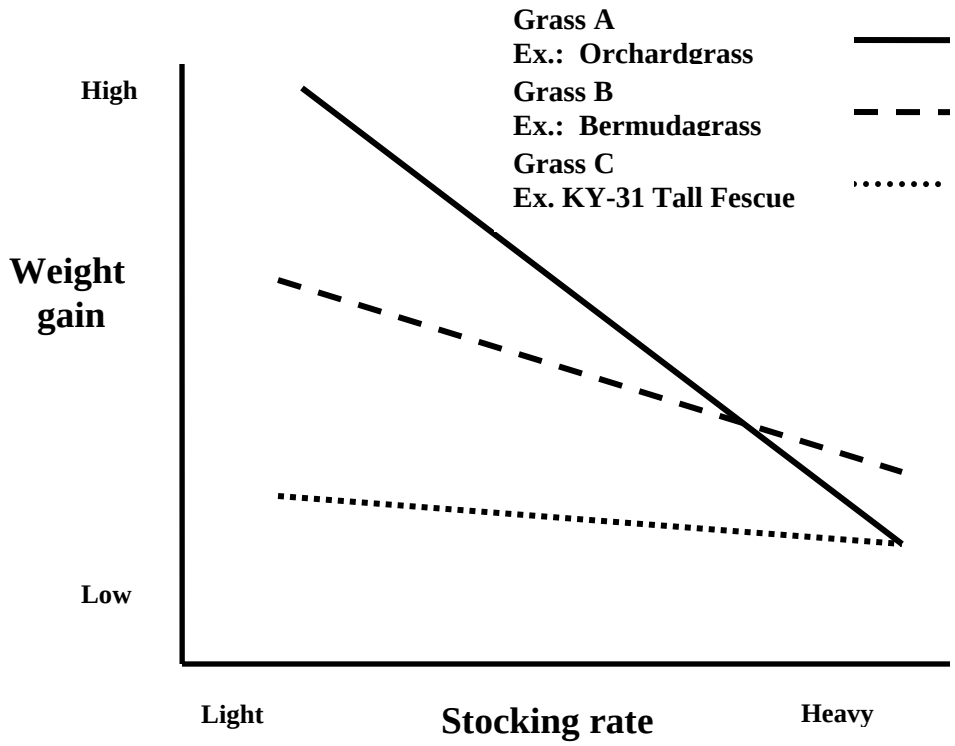


Fig. 2. Hypothetical relationships between stocking rate and average daily gain for three grasses that vary in tolerance to grazing and pasture carrying capacity.

It is important that cattlemen understand how their pasture forage grows and recovers over a range of stocking rates and weather patterns. It might take a number of growing seasons, but it should be a goal to have a clear visual impression of the grazing intensity and pasture condition needed for an economically optimum stocking rate. This comes with knowledge, experience, and working with extension specialists and agents.

Seasonal growth and weather patterns vary, which causes fluctuations in pasture carrying capacity. The conservative approach with the least amount of risk is to set stocking rates based on forage production during periods of low growth (cool-season perennial grasses during July and August). Forage accumulates rapidly during periods of active growth, but can be either cut for hay or stockpiled for later consumption during periods of low forage growth. A disadvantage to this approach is that stocking rates are likely less than the economically optimum during active forage growth, but an advantage is that periodic accumulation of forage would encourage healthy stands with strong, robust root systems and help to control weeds (assuming weeds are already under control). Another approach is to set stocking rates for high utilization during periods of rapid growth and rely on rotational stocking and provide hay and concentrate feeding, if needed, during periods of low growth. This allows economically optimum stocking rates during periods of higher forage production when pasture carry capacity is at its highest, but rotational stocking and feeding management are strongly recommended to reduce risk of inducing severe pasture deterioration during reduced forage growth.

Heavy grazing intensities inevitably occur sometime, even with economically optimum stocking rates, and increase risks of weakened stands and weed encroachment. These risks are reduced with a rotational system that provides sufficient pasture growth and recovery. Furthermore, ADG with heavy stocking can be increased through steady movement of cattle onto fresh regrowth.

Contingencies for Adjusting Stocking Rates

No matter the grazing system, drought conditions can weaken grass stands under moderate to heavy grazing intensities. The problem is that grazing intensities can change quickly during periods of drought. Moderate to heavy stocking rates can rapidly become excessive in a time that depends on soil moisture prior to onset of dry weather, soil moisture holding capacity, and tolerance of the pasture forage to drought.

Preparedness is the key to surviving a drought with a healthy pasture and herd. One recommendation is to sell early before pastures growth ceases and no rainfall is in the distant forecast. This is one of those, “Easier said than done,” types of recommendations; however, it can be done with a plan in place. A certain number of culls can be identified (everyone has them!) for selling before a drought pattern sets in and causes cattle markets to “bottom out”. A typical regret is to wait for cattle markets to rise during, or soon after, a drought. It doesn’t happen in severe drought situations! Selling early will therefore prove to be a sound business decision. A conservative approach can be taken by selling a small group to provide some relief without serious

herd reduction, but have a second group identified for dispersal if long-term drought is inevitable.

Another plan is to have a smaller pasture set aside to provide complimentary grazing. This pasture can contain high-quality forage, such as alfalfa, that is not part of the rotation but is available as needed. It can be used for either creep grazing, hay, or can be placed in the rotation to provide extra grazing and extend the growth and recovery periods for paddocks used in the normal rotation.

It goes without saying that soil fertility must be maintained with an intensively managed forage system, but risk of thinning stands during dry weather patterns will be less with adequate fertility going into drought patterns. Productive stands can withstand drought conditions, within limits, and not require replanting. However, following dry weather and prior to active growth, fertilization and weed control usually will be needed to strengthen stands and accelerate to their desired production level.

Summary

Stocking rates for intensive grazing systems are set to reach production goals, but these goals should be realistic so that pasture vigor and growth is sustained. A key to intensive grazing is to select adapted forage species and varieties, and to fully understand how the pasture forage reacts to grazing. Stocking rates are set based on expected forage availability during either active or inactive periods of forage growth. Intensive grazing systems often maximize utilization during active growth periods, but cattlemen must be prepared to adjust stocking rates or provide hay and feed during inactive growth periods. Intensive grazing requires rotational stocking and fertilization to maintain pasture productivity and reduce need for costly pasture renovation. Preparedness for drought conditions is necessary is minimize pasture deterioration from long-term excessive grazing.

References

Mott, G.O. Grazing pressure and the measurement of pasture production. P. 606-611. In C.L. Sidmore (ed.) Proc. 8th Int. Grassl. Congr. Reading, England. 11-21 July 1960. Alder Press, Oxford, England.

Jones, R.J., and R.L. Sandland. 1974. The relation between animal gain and stocking rate. J. Agric. Sci. (Camb.) 83:335-3442.

STRATEGIES FOR REDUCING STORED FEED REQUIREMENTS

Don Ball
Extension Forage Specialist
Auburn University

A basic, desirable goal for virtually any livestock producer is to minimize stored feed requirements. It is less expensive to have livestock harvest forage for themselves by grazing than to harvest it for them; therefore, the greater the extent to which pasture can be used to provide nutrition, the more profitable a livestock operation will generally be. Thus, it is worthwhile to consider all options that might be available for reducing stored feed needs.

Use Cool Season and Warm Season Perennials

In the Upper South, most pasture acreage is comprised of cool season perennials including tall fescue, orchardgrass, Kentucky bluegrass, white clover, and red clover. It is logical that these species should dominate most pasture acreage in this area because they are widely adapted and productive. However, during a hot, dry summer the amount and often the quality of forage they provide are low. Consequently, many livestock producers in this area could benefit greatly from having some acreage dominated by warm season perennial forages.

In recent years there has been increased interest in growing bermudagrass farther north than it has traditionally been grown. A few vegetatively-propagated varieties of bermudagrass that are winterhardy enough to persist in the Upper South have been released, but planting material is not widely available. These include 'Midland 99' and 'Ozarka', which were developed at the University of Oklahoma, and 'Quickstand', which was released by the University of Kentucky.

In addition, a number of seed-propagated bermudagrass varieties or blends have become commercially available that are being marketed widely in many parts of the South. In addition to being easier and less expensive to establish, seed-propagated bermudagrasses often will develop a stand and become productive more quickly than vegetatively-propagated types.

As compared to the Lower South where bermudagrass is widely grown for hay as well as pasture, the main limitations to growing this grass in the Upper South are level of winterhardiness and a shorter growing season. The winterhardiness of varieties currently available (whether vegetatively- or seed-propagated) varies greatly. Obviously, this is an important consideration because selection of the wrong variety may result in a reduced stand or perhaps complete stand loss.

There has also been increased interest in warm season perennial native grasses in recent years. These include switchgrass, indiangrass, eastern gamagrass, big bluestem, and little bluestem. These native grasses are widely adapted, potentially quite productive, and some (especially eastern gamagrass) provide surprisingly good forage quality. However, they are far more difficult to establish than most forage grasses, and are sensitive to close or frequent defoliation.

There is also one warm season perennial legume that can be used to advantage on some farms in much of the South, and that is sericea lespedeza. This species has a number of attributes as a forage crop, but two characteristics are especially unique and valuable. These are that it can be grown on poor land where other forage crops are not well suited, and also that once established it can provide very low cost production. A new variety named 'AU Grazer' is quite grazing tolerant, which has increased the feasibility of growing sericea lespedeza in pastures.

Variety Selection

In some cases there are significant differences in the distribution of growth provided by different varieties of a given forage species. Two varieties that usually make about the same total seasonal forage yield may differ considerably with regard to the time they make their growth, which potentially offers a producer the opportunity to "fill in gaps" in pasture forage availability. In most cases variety decisions should not be based solely on distribution of growth, but it is a trait worth considering when two or more varieties that are otherwise about equally acceptable are being considered.

Use Annuals to Complement Perennials

In general, annual forages are more expensive to grow than perennials, but many annuals provide forage of excellent quality and the timing of their growth may complement that of perennial species, thus allowing them to be of great value in providing grazing for livestock over an extended period of time. Warm season annual grasses such as sudangrass, sorghum-sudangrass hybrids, and pearl millet offer the advantage of making a substantial amount of growth in a relatively short period of time, though grazing management of these species can be challenging.

Another warm season annual grass that is vigorous and widely adapted but sometimes overlooked as a forage crop is crabgrass. The forage yield of crabgrass is usually less than that of the summer annual forages mentioned in the previous paragraph, but forage quality (and therefore animal performance resulting from grazing this species) is quite good as compared to other warm season species. In situations in which some soil disturbance can be provided sometime during the year, it is not difficult to get crabgrass to reseed and to provide relatively inexpensive volunteer stands year after year.

A warm season annual legume worthy of mention in this discussion is annual (either striate or Korean) lespedeza. Annual lespedeza is a relatively low yielder, but it makes good quality forage growth that is available in pastures at the time during summer when the quantity and quality of growth of tall fescue is at its lowest point. Thus, annual lespedeza can greatly enhance a tall fescue pasture, especially when grown with endophyte-infected 'Kentucky 31' fescue on low input upland sites where clovers are not a good choice of companion species for fescue.

Cool season annuals (especially annual ryegrass and small grains such as rye and wheat) also have something to offer in many forage programs. These species can either be planted on a prepared seedbed in early autumn, thus providing forage growth in autumn as well as spring, or they can be overseeded on the dormant sods of warm season species. When overseeded on warm season sods they produce little grazing in autumn, but can provide high quality spring grazing.

Overseeding winter annuals helps mitigate the problem of the short growing season of bermudagrass in the Upper South (which was mentioned earlier in this paper). Winter annuals also make more growth during cold weather than cool season perennial grasses, and thus can provide at least a few additional grazing days on many livestock farms in the Upper South dominated by such species.

Stockpile Forage

"Stockpiling" is the technique of allowing forage to accumulate and then subsequently grazing it during times when pasture plants are not growing. Forage of any type can be stockpiled, but with many forage crops the forage quality of stockpiled growth declines rather quickly. This is particularly true for warm season species such as bermudagrass. Any ungrazed forage of warm season species that is present when growth ceases in autumn should be utilized rapidly before its quality deteriorates excessively.

The forage crop that is by far the best suited for stockpiling is tall fescue. If tall fescue is fertilized in early autumn (normally with 50 to 80 pounds of nitrogen per acre as well as with any needed phosphorus and potassium) and grazing is deferred until the time hay would otherwise need to be fed, use of this stockpiled material by grazing can delay the feeding of hay for several weeks. Yields of stockpiled fescue growth can be substantial (Table 1). Stockpiled forage in essence serves as "standing hay," but the difference is that in the case of this forage, no harvesting costs are incurred other than the fence that needs to be used to enclose the area where the forage has been stockpiled.

Tall Fescue is particularly well suited for stockpiling because autumn growth is of higher quality than spring growth (Table 2) and the forage does not lose its quality very rapidly. In order to efficiently utilize stockpiled forage, it is desirable to strip graze by

allowing the animals to only have access to a few days supply of grazing at a time. If a legume is to be grown with tall fescue to be stockpiled, red clover is the best one to use.

Table 1. Yield and crude protein content of tall fescue produced from August 15 to December 1 under different levels of nitrogen fertilization at Lexington, KY. Average of 3 years.

Nitrogen Applied lbs/A	Fescue	
	Yield lbs/Acre	% Protein
0	1700	11.1
45	2800	11.8
90	3900	14

Source: Taylor, T.H., and Templeton, Jr., W.C., 1976. Agron, Jr., Vol. 68, Mar.-Apr.

Table 2. Seasonal percentage changes in chemical composition and digestibility of tall fescue.

	Spring	Summer	Fall
Sugars	9.5	8.5	19
Protein	22	18	19
DDM*	69	66	74

*Digestible Dry Matter

Source: Buckner, R.C., 1975. Univ. of Ky. Coop. Ext. AGR-44.

Graze Crop Residues

The residues of summer row crops, especially corn, can be utilized by livestock after the crop has been harvested. While the fodder of such crops is of low nutritive value (Table 3), in some cases there may be substantial quantities of grain available that help increase the energy value of the material present. Even if only a few weeks of nutrition is provided for animals when a row crop field is grazed, delaying hay feeding by this amount of time can help reduce wintering expenses.

Table 3. Approximate feed value of selected crop residues.				
Residue	Percent Dry Matter*	Digestible Nutrients*	Percent Protein*	Percent of a Corn Feed Unit Per Pounds+
Barley straw	87	44	4.1	50
Cotton field residue	92	41	6.2	46
Field corn (stalk)	77	50	4.8	57
Oat straw	89	46	4.2	52
Peanut residue	91	58	5.5	66
Sorghum straw	85	50	5.3	57
Soybean stubble	88	36	5.1	41
Wheat straw	88	44	3.6	50

*Revised from National Research Council (NRC) nutritional data.
+Corn feed units (CFU) are calculated by dividing the percent TDN of residue on a 100% dry basis by the percent TDN of No. 2 yellow corn on a 100% dry basis.

Timing of Nitrogen Fertilization

Although a variety of nutrients are required to be present in adequate quantities in order to obtain good forage production, the level and timing of nitrogen fertilization has an especially important impact on forage yield and the timing of pasture forage availability. Perhaps the most important consideration regarding timing of nitrogen fertilization is to make certain there are adequate amounts available for plant growth in early spring at the beginning of the growing season of perennial grasses. Failure to have adequate nitrogen available when perennial grasses begin to grow can delay pasture forage availability, with the result being extension of the winter hay feeding period.

Grazing Management

There are numerous potential benefits to be gained from exercising good grazing management, but two deserve mention in this discussion. First, when pastures are grazed appropriately for the forage species they contain, the plants will be healthier and more productive over a longer period of time. If pastures are grazed too closely, the food-producing capacity of the plants is reduced, resulting in lower production and weakening of plants due to depletion of food reserves. Some forage crops are much more sensitive to this than others.

Good grazing management also reduces forage waste. If pastures are undergrazed (which often occurs with poorly managed continuously stocked areas), losses due to trampling and fouling of forage can be substantial. The use of limit grazing, strip grazing, or rotational stocking can reduce these losses, often resulting in utilization of 20 to 30 percent more of the forage produced, and lengthening of the grazing period.

Minimize Hay Losses

A final consideration pertains to minimizing hay losses. Because hay and other stored feed is costly, it would be desirable to eliminate the need for it entirely, but for most producers this is unrealistic. On most livestock farms there will inevitably be times when pasture growth is inadequate, with the result being that some amount of stored feed will be required to provide nutrition for grazing animals.

Unfortunately, due to poor hay storage and feeding practices, many producers end up needing to produce or purchase much more hay (sometimes more than twice as much) than they would otherwise need. Space does not permit a thorough discussion of this topic in this paper, but suffice it to say that there are many approaches that can be used to lower hay losses, many of which cost little or nothing to implement, making the minimization of hay losses an important strategy for reducing stored feed requirements.

2004 FORAGE SPOKESPERSON CONTESTANTS

James Chestnut, Logan County

While growing up on a small dairy farm in Indiana, I always wanted to make farming a career. But when I realized that I did not have the resources to purchase the family farm when it was sold, I left home, joined up with the 101st Army Airborne Division, made 44 jumps and was sent to serve in the Vietnam War. Following that overseas combat experience, I felt fortunate to just be coming home safe and not in a pine box! I settled in Logan County, went into business, and, about six years ago I finally, realized my long-ago dream by purchasing our 300 acre rolling hill farm in North Logan County. This farm was somewhat unproductive with gullies, broomsedge, bushes, weeds, vines and a run down homestead. We lived in a house trailer on the farm for about 3 years while improving the farmstead.

We finished building our new house on the farm in 2004.

I still recalled my Dad, back home, simply looking over the fences and deciding what was to be done for the pastures…. The answer seemed always to be…applying any available manure, put down 100 pounds of 10-10-10 and scatter a little grass seed over the rough spots from time to time.

When I participated in the Extension Service's first state-wide Master Cattlemen's Course and began attending the County Agent's forages, hay, and beef production meetings, I soon learned that successful farm management involves, among other things, long range planning, including soil sampling, following soil test recommendations, sowing certified seed, rotational grazing, cutting and storing hay according to research guidelines.

I developed a strategic farm plan that included the matching of forages to the unique characteristics of the lay of the land and the efficient production and utilization of these forages through the cattle.

For the past six years I have had a 120+ crossbred beef cow herd divided into spring and fall calving herds. Purebred sires, selected according to EPD requirements, were used and the calves were backgrounded. Stockers were sold direct to farmer feedlots and/or marketed through the Logan County CPH-45 graded calf sale. I helped reestablish this local feeder calf sale during my term as president of the Logan County Cattlemen's Association a few years ago.

I soil test the fields every two years, lime and fertilize according to recommendations. The 250 acres of pasture and hay fields are divided with electric fences into small paddocks for rotational grazing. Watering facilities are made available in each field.

I don't like to grow thistles and weeds; so as soon as the cattle are rotated out of a pasture field, I follow up with a tractor and bush hog to keep weeds under control. This year I have clipped some fields three and four times! I have even found that a cow will eat many varieties of weeds if they are kept cut down short and tender.

In early March, as I daily ride through the herd checking mother cows and calves, I begin spot spraying thistles with 2,4-D and continue spot spraying as long as needed throughout the spring.

Orchardgrass and fescue are seeded, no-till, in late August-September. I also renovate clovers into closely grazed pasture fields during this time. Clover renovating seeding in February and March has not been very successful on my hill farm. It seems that the clover will germinate okay, but about the time that the clover emerges into the crook stage, a killing frost will take it out. I may be sacrificing a season of clover production, but I usually get more successful clover stands by fall seeding.

I fenced the cattle out of the creek and with the use of filter fabric and properly sized gravel have developed limited access watering facilities that can be accessed from both sides of the creek as needed. These areas can also be used for equipment stream crossing. I did not apply for cost share funds for these projects when I determined that the Farm Service office cost share programs requirement was to fence off 85 to 100 feet of my best productive land.

Three quarters of the hay and pasture fields are in orchardgrass/fescue/clover mixture. There are two fields with 27 acres of Bermudagrass that is used effectively for summer grazing and haying as needed. I have found that by feeding Bermuda hay in the gulleys, amazingly the grass soon begins to take deep, elongated roots and, over time, tends to heal the open gulleys most successfully.

I renovated two tobacco/stock barns into modern cattle handling facilities. This provides much flexibility in managing and handling the cattle herd.

In an effort to cut back on haying, selected fescue pastures are fertilized with nitrogen in late August and held over for frosted down grazing in late November, December, and January.

In addition, this summer I changed cattle directions by selling the cow herd and began purchasing feeder calves for backgrounding during the spring, summer and fall months. My revised cattle program, when I reach my backgrounding goal for 2004-2005, is to utilize the abundant forage being produced through rotational grazing of about 500+ feeder calves.

An important lesson I have learned:

> “Take care of the land and water resources on your farm and they will be there and available to take care of you and your farming operation when you need them.”

Jimmy May, Logan County

I intend to develop the idea of the rediscovery of eastern gamagrass as a forage crop and give a brief history of how it was rediscovered and developed for release by NRCS Plant Materials to private growers. I intend to cover how an idea to get the private cattle producer to use gamagrass for summer forage has been put into action. The results obtained by various landowners, techniques used and resulting hay yields or beef gains will be presented. What we have done in Kentucky will be compared with research findings in the southeast United States. My efforts at growing and processing high quality gamagrass seed will be presented. The growing of a new variety developed by NRCS Plant Materials and released for the southeast will also be presented.

Steve Meredith, Hardin County

I along with my son Alex, age 15, operate a diversified farming program near Glendale in Hardin County. Our enterprise includes grain, tobacco, alfalfa, and a cow herd of approximately 100 head which produces feeder calves. We also have a successful greenhouse business. Our home farm includes 160 acres and we rent and lease an additional 270 acres of crop and pastureland.

Bill Payne, Lincoln County

I would like to describe my transition from a conventional dairy operation to our current MIG enterprise. I joined my father in 1974 who at that time 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. We also had about 120 beef cows on another farm of 450 acres.

In April 2000, I attended the Kentucky Grazing School held in Washington County. The grazing techniques presented there seemed to be much simpler and more in synch with nature than the drylot operation which we were employing. Not only did the animals harvest their own feed, but they spread their own manure! Perhaps the

most important advantage, it seemed to me at the time was better hoof health. I decided to move any future operation in the direction of MIG.

When my father retired in August 2000, I made a business decision to sell the dairy herd. I continued to raise the remaining dairy heifers on pasture as well as the beef herd. The 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 raising dairy heifers exclusively. There are 400-500 of these heifers on the farm at a given time.

In order to better utilize the larger pastures that we had fenced, I installed temporary polywire fencing. At that point, water became the limiting factor. With the advice of Ken Johnson, Jimmy Henning and Dan Grigson, I drew a plan to extend waterlines around both farms. Bo Renfro, NRCS director in Lincoln County assisted by securing cost share money that enabled me to implement that plan, which included fencing off Hanging Fork Creek. State (Phase I) cost share dollars allowed me to improve our cattle handling facilities and to install feeding pads of geotextile fabric and gravel.

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 converted two tobacco barns for additional storage. We raised 90 acres of alfalfa for sale this past year, while using another 80 acres for grazing and haylage.

While I have experience with corn silage, alfalfa hay and cool season grass/clover pastures, I have read about lots of new forages and uses for traditional ones. We have utilized standing corn as fall pasture after we conclude grazing alfalfa on September 15. Small grains such as oats and rye provide good fall, winter and spring grazing. We are trying turnips with the oats this fall. We drilled perennial ryegrass into a thinning stand of alfalfa this past spring. Stockpiling fescue is perhaps the best way to reduce reliance on stored feeds for winter. Our imagination may be the only limit to extending the grazing season.