

# FORAGES AT KCA

Presented By

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***GARRY D. LACEFIELD AND CHRISTI FORSYTHE, EDITORS***

# FOREWORD

This marks the twelfth consecutive year we have had a Forage Symposium at the Kentucky Cattlemen's Convention. We challenge you to consider the content of the proceedings and the discussions of the day in light of your overall beef-forage program. It is our hope you will go away with at least one idea or practice that you can implement to improve your overall forage-animal program.

On behalf of the program committee, I want to thank Mr. Dave Maples and all the fine folks at KCA for their support, assistance and encouragement. In addition, I want to thank the Kentucky Forage and Grassland Council for their continued support of Forages in Kentucky. My thanks to Ray Smith, Tom Keene, Kenny Burdine and our own National Forage Spokesperson Bill Payne for their presentations and papers for the proceedings.

Special THANKS are extended to Mrs. Christi Forsythe for her extra effort in program planning and in preparing and editing the proceedings.

Let me close by extending a special invitation to attend the 27<sup>th</sup> Kentucky Alfalfa Conference at the Cave City Convention Center on February 22. For more information on forages and forage-related events, see our website at <http://www.uky.edu/Ag/Forage>

Garry D. Lacefield  
Program Chairman

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# WHERE TO FIND FORAGE INFORMATION ON THE WEB

*Tom Keene*

Extension Hay Marketing Specialist  
University of Kentucky

The Internet can take you almost anywhere you want to go these days. You can gather information, shop, take classes, play games, etc. So, it is logical to assume that you can find lots of information about forages on the Internet.

It is not feasible or logical to try and list all of the internet sites that pertain to forages in this presentation but below you will find several good sites that can open the doors to a plethora of forage information from variety trial numbers to accurate and local weather for hay making. The list is endless.....so enjoy!!!!!!!

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American Forage and Grassland Council

<http://www.afgc.org/>

Kentucky Forage and Grassland Council

<http://www.kfgc.org>

Buffalo Trace Produce & Hay Auction, LLC

<http://www.buffalotraceauctions.com/>

E-Hay Weekly

[http://enews.prismb2b.com/enews/hayandforagegrower/ehay\\_weekly/current](http://enews.prismb2b.com/enews/hayandforagegrower/ehay_weekly/current)

Forage Focus

<http://foragefocus.com>

Hay Barn

<http://www.haybarn.com/>

Hay and Forage Grower

<http://www.hayandforage.com/>

Hay Exchange

<http://www.hayexchange.com/hay.htm>

Hay Making Weather

<http://www.agwx.ca.uky.edu/kynowwx.2.html>

Hay Probe Listings (NFTA)

[http://www.foragetesting.org/index.php?page=hay\\_probes](http://www.foragetesting.org/index.php?page=hay_probes)

Kentucky Hay Testing Program

[http://www.kyagr.com/mkt\\_promo/hort/hay/index.htm](http://www.kyagr.com/mkt_promo/hort/hay/index.htm)

National Forage Testing Association (NFTA)

<http://www.foragetesting.org/>

National Hay Association

<http://www.nationalhay.homestead.com>

National Weather Service Precipitation Analysis

[http://www.srh.noaa.gov/rfcshare/precip\\_analysis\\_new.php](http://www.srh.noaa.gov/rfcshare/precip_analysis_new.php)

Oregon State University Forage Website

<http://www.forages.oregonstate.edu>

Taking a Good Hay Sample

[http://www.foragetesting.org/index.php?page=exam\\_info2](http://www.foragetesting.org/index.php?page=exam_info2)

United States Department of Agriculture Ag Marketing Page

<http://www.ams.usda.gov/LSMNpubs/HayW.htm>

University of Kentucky Forage Webpage

<http://www.uky.edu/Ag/Forage>

University of Kentucky Ag Weather

<http://www.agwx.ca.uky.edu/Agwx.html>

Web Soil Survey

<http://websoilsurvey.nrcs.gov/app/>

Google Earth Program

Must download from the Internet

# HOW I PRODUCE, MANAGE AND MARKET FORAGES

*Bill Payne*  
Knob Lick Farm LLC

I would like to amend the title to: “How I Produce, Manage and Market Forages, Profitably.” My experience has led me to believe that keeping things simple has allowed me to focus better and that has led to profitability. This has led me to make every effort to reduce my reliance on machinery and to allow the cows to do the work. I focus on maximizing forage utilization and minimizing the number of days of feeding stored feeds.

One of the ways to achieve this goal is to graze standing corn. I plan to start grazing corn on September 15, when we stop grazing alfalfa. My experience has shown that:

- Offering smaller strips improves utilization
- Beginning earlier in season improves utilization of fodder
- Works better with older/heavier stock; ours are 900—1200 pounds
- Corn probably provides more nutrition than necessary for dry, pregnant cows
- Cattle will clean up almost all ears if allowed to do so

The next strategy we use to extend the grazing season is to use winter annuals such as cereal rye, oats, turnips and annual ryegrass. When planted in late summer or early fall these can provide high quality winter grazing.

Permanent pastures which I plan to renovate by frost seeding in the following February are grazed in late fall or early winter. Good results can be realized if the pastures are grazed **closely** before broadcast seeding. I have found that some dirt should be visible as you walk across the pasture.

Probably the least expensive option for winter grazing is stockpiled fescue. Fescue at this time of year is at its nutritional peak and quite palatable. In order to utilize stockpiled fescue:

- Select pasture in spring
- Test soil and correct fertility and pH
- Graze or mow **closely** first week of August
- Add nitrogen first week of August; consider using a N stabilizer on urea
- Begin grazing after all other grazing resources have been used—strip grazing will improve utilization

When all pasture forage has been consumed, then we start feeding stored alfalfa/orchardgrass balage. This can be high quality feed, but is necessarily more expensive. We unroll bales in the pasture for our heifers until there is sufficient spring forage available to graze again.

Other methods of increasing forage utilization include:

- Use of rotational grazing (or MIG)
- Use of leader/follower grazing systems for cow/calf programs
- Use of Spring & Fall calving seasons

Increasing forage utilization is not the only important goal necessary to realize a profitable livestock system. Increased forage quality is also necessary. We use several strategies to improve quality. Among these are pasture renovation to add legumes to our pastures. We graze rotationally to keep grass in vegetative state. We use balage because it is easier to harvest in early May. It is also of higher nutritional value and it loses less quality and quantity because of the plastic wrap. Grazing alfalfa/orchardgrass pastures in July, August and September allow us to avoid the problems associated with grazing fescue in hot weather.

To summarize my strategy for increased profits in livestock operations, I suggest letting the cows do more work by grazing as many days as possible. Increasing forage utilization throughout the year will also improve productivity. Increasing forage quality will enhance animal performance. These factors cannot only yield profits, but can decrease stress for all concerned.

Knob Lick Farm LLC also produces alfalfa/orchardgrass mixed hay for sale. We attempt to produce adequate quantity and quality hay by selecting high quality varieties; we have been using grazing tolerant varieties for about eight years now. We test our soils annually and correct nutrient deficiencies. For the first time, this year, we have applied fertilizer between cuttings to avoid luxury consumption which plagues fall applications. Planting takes place in the spring with a no-till drill. Frequently the first cutting is rolled and wrapped as balage. I frequently refer to the UK Forage website for research and production information: [www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage).

These are a few of the market characteristics which we have discovered:

- Alfalfa/orchardgrass mix is in demand; there is also a market for straight orchardgrass and timothy/alfalfa mixes
- Must be of excellent quality—no mold, weeds
- Must be green in color
- We have a competitive advantage—little alfalfa is produced south of Kentucky. We are the closest alfalfa producers to the Florida market for horse hay. Increasing fuel costs make this even more important. The Central Kentucky market for horse hay is also important, but sometimes hard to access.

While the profit potential for cash hay sales is reasonable, there are some drawbacks to consider. Some of these are:

- *High stress due to poor hay curing weather during typical Kentucky summers*
- *Need for an alternative use for weather damaged hay*
- *Plan on receiving a bad check occasionally*
- *Little market demand for round bales or balage*
- *Labor and machinery intensive*

We have some valuable resources today to aid our marketing efforts. One of these is the internet, which can put our name in front of a very select audience—people who are looking for hay. I have found that the following internet sites have helped me in my marketing efforts.

- [www.haybarn.com](http://www.haybarn.com)
- [www.hayexchange.com](http://www.hayexchange.com)
- [www.kyagr.com/buyky/corral/haylistingpara.asp](http://www.kyagr.com/buyky/corral/haylistingpara.asp)
- Many State Departments of Agriculture have hay sale sites
- Offering delivery service will expand your market

Forage production is a natural resource of our humid climate. While there are several ways to utilize this forage, I think livestock production makes the most sense. Grazing livestock is nature's way of utilizing forage. It is also a way of adding value to forage. So we can keep it simple (KISS) and let the cows do the work. Our job is to keep an adequate quantity of high quality forage in front of them—and to cash the checks!

# CAN I AFFORD TO SEED NOVEL-ENDOPHYTE TALL FESCUE?

*Kenny Burdine*  
Extension Economist  
University of Kentucky

Tall fescue is the predominant forage grass of Kentucky. It is an easily established, relatively persistent bunchgrass that has reasonable drought tolerance and does well in clay or loam soils. However, the endophyte fungus found in the grass was linked to poor animal performance in the late 1970's (Ball, Hoveland, and Lacefield). It has been estimated that 85% of Kentucky's fescue pastures are endophyte infected, making it a serious problem for Kentucky cattle producers (Lacefield, Henning, and Philips). Producers interested in establishing or replacing tall fescue stands have several options available to them.

Traditional Endophyte infected fescue can still be purchased through most agricultural input suppliers. There are also endophyte-free tall fescue varieties that are a little more expensive. Endophyte free varieties offer improved animal performance, but also lack some of the advantages that traditional fescue offers, most importantly, persistence. More recently, novel-endophyte varieties have become available. These varieties contain a non-harmful endophyte fungus which has many of the benefits of both endophyte-infected and endophyte-free varieties. They offer animal performance similar to non-endophyte varieties, but stands are likely to persist much longer.

Producers are often surprised at the huge cost difference that exists between varieties of tall fescue seed. While prices vary by location, E+ fescue seed will likely be the least expensive. Endophyte-free seed might cost 15 – 20% more, while novel-endophyte seed may cost three times as much. This price difference causes many forage producers to avoid purchasing novel endophyte varieties. The purpose of this analysis is to examine the conditions under which the more expensive variety might make economic sense.

I want to examine this question in two specific situations. Producers establishing pastures from scratch are likely to spend money on fertilizer, lime, labor, and machinery, in addition to seed costs. A sample budget is shown below in Table 1.

**Table 1. A Simple Novel-Endophyte Fescue Pasture Establishment Budget**

<b>EXPECTED COSTS</b>	<b>Quantity</b>	<b>Unit</b>	<b>Price / Unit</b>	<b>Annual Cost</b>
Grass Seed	<b>20</b>	lbs	<b>\$4.00</b>	\$80.00
Legume Seed	<b>12</b>	lbs	<b>\$2.50</b>	\$30.00
Lime	<b>2</b>	tons	<b>\$15.00</b>	\$30.00
Nitrogen	<b>30</b>	lbs	<b>\$0.55</b>	\$16.50
Phosphate	<b>60</b>	lbs	<b>\$0.35</b>	\$21.00
Potash	<b>40</b>	lbs	<b>\$0.35</b>	\$14.00
Machinery Charge	<b>1</b>	acre	<b>\$15.00</b>	\$15.00
<b>Other</b>	<b>0</b>	units	<b>\$0.00</b>	\$0.00
<b>Other</b>	<b>0</b>	units	<b>\$0.00</b>	\$0.00
<b>TOTAL COST</b>				<b>\$206.50</b>

Notice that in Table 1, grass seed made up less than 40% of pasture establishment costs. In this scenario, novel-endophyte fescue seed was assumed to cost around \$4.00 per pound, and it was further assumed that 20 lbs of seed were sown per acre. If traditional fescue seed were sown at a price of \$1.50 per pound, seed cost would drop to \$30 per acre, but total establishment costs would still exceed \$150 per acre based on the assumptions made in Table 1. In other words, although E+ fescue seed may cost less than half as much per pound, the total pasture establishment costs per acre would only decrease by about 25%.

Another key point is that establishment costs are incurred in the first year and include the cost of fescue seed as shown in Table 1. Maintenance costs are incurred in subsequent years when the stand is established and in production. Seed costs are significant, but are only incurred in year one and still represent only a percentage of total grazing costs.

The same case could also be made for the producer who is considering replacing an existing stand of fescue with a novel-endophyte variety. Again, seed costs will only be part of the total cost of establishment. In the case of replacement, fescue seed costs are likely to make-up an even smaller percentage of total costs because additional money would be spent eliminating the original stand.

For the purposes of this discussion, we will assume that endophyte-infected fescue seed costs \$1.50 per pound, non-endophyte seed costs \$2.00 per pound, and novel-endophyte seed costs \$4.00 per pound. These prices were based on a telephone discussion with a common input supplier in December of 2006. We will also assume that other costs of establishing the pasture are the same, so the only difference in establishment cost is the difference in seed costs. We will further assume that a seeding rate of 20 pounds per acre is used. Based on these assumptions, seeding

novel-endophyte fescue costs approximately \$50 more per acre than E+ varieties and \$40 more per acre than E- varieties.

Pasture establishment is a multi-year investment. Research is ongoing on the persistence of novel-endophyte varieties, but stands are likely to last 10 years or better if managed properly. When additional seed costs are spread over 10 years, the price difference really seems small. The rest of this discussion will be focused on whether this additional expense can be recouped through increased animal performance.

As mentioned before, the primary advantage of novel-endophyte varieties over infected varieties is animal performance. Stocker gains are often 50-100% better on novel varieties. Conception rates of cows on E+ fescue are often 20-40% lower than on novel varieties; weaning weights are often smaller as well due to decreased milk production (Ball, Hoveland, and Lacefield). These types of performance differences can easily offset the additional expense associated with novel-endophyte varieties.

A cow herd with an average weaning weight of 500 pounds, that experiences only a 10% increase in conception rates, will wean 50 more lbs of calf per cow. If we value these additional pounds at \$80 per cwt., that would mean an additional \$40 of revenue per cow assuming there was no increase in weaning weights. This translates to \$20 per acre, if we assume two acres per cow-calf unit. Most producers would be willing to spend \$50 for an investment that would yield an additional \$20 per year over a ten year stand life. This is an appropriate way for cow-calf producers to look at this decision.

For the stocker operator, let's assume that rates of gain increase by 0.5 lbs per animal per day. Over a 5 month backgrounding period, this would mean an additional 75 pounds to sell. If we value these additional pounds at \$70 per cwt., this represents an additional \$52.50 per stocker. If we assume a stocking rate of 1.5 acres per stocker, this is \$35 per acre. Again, a producer being offered a \$50 investment that would yield a return of \$35 per year over 10 years would most likely consider this an attractive investment.

Finally, if we want to compare novel-endophyte varieties to endophyte-free varieties, animal performance is likely to be very similar. In fact, many studies have found no statistical difference. However, endophyte free varieties are much less tolerant to drought and overgrazing. Based on the prices mentioned earlier, sowing novel varieties would cost about \$40 more per acre. If the life of the novel-endophyte stand exceeds the endophyte-free variety by 5 years, the novel variety remains the best investment. In other words, it would be more economically efficient to establish a stand of novel-endophyte fescue every ten years than it would be to establish an endophyte-free stand every 5 years.

As producers make these types of decisions, the best way to look at a forage program is as an investment. The money that is spent establishing and maintaining forages is spent in order to receive a return over time. The primary purpose of this

discussion was to provide an investment framework for producers looking at their fescue options. Minimizing expense is not always the best way to make these decisions. Producers should think about how their money can best be spent. In the case of novel-endophyte fescue, a little additional money on seed could be a good investment over the life of the stand. The following publications were utilized in this analysis and are excellent sources of information for producers considering fescue options:

Ball, D.M., C.S. Hoveland, and G.D. Lacefield. *Southern Forages*. Potash and Phosphate Institute and the Foundation for Agronomic Research. Third Edition. 2002.

Ball, D.M., S.P. Schmidt, G.D. Lacefield, C.S. Hoveland, and W.C. Young III. Oregon Tall Fescue Commission Special Publication. "Tall Fescue Endophyte Concepts." 1-03. 2003.

Burdine, Kenny and Richard Trimble. "The Economics of Replacing Endophyte Infected Fescue." Agricultural Economics AEC 2005-01C. April 2005.

Lacefield, G.D., J.C. Henning, and T.D. Phillips. "Tall Fescue". AGR-39.

# MATCHING PASTURE TO ANIMAL NEEDS

*S. Ray Smith*

Forage Extension Specialist  
University of Kentucky

Cattle have a wide range of nutrient requirements depending on maturity, weight, growth potential, pregnancy, milk production, desired daily production, and other factors. The total digestible nutrient (TDN) and crude protein (CP) requirements of several cattle classes are shown in Table 1. For maximum production it is essential that forage (or other feed) contain TDN and CP levels at least as high as shown in the table below.

Table 1. Total digestible nutrients (TDN) and crude protein (CP) requirements of selected animal classes.

Animal class	TDN, %	CP, %
Growing beef steer		
450 lb (1.5 lb/day gain)	65	11-13
650 lb (1.7 lb/day gain)	68	10-11
Beef cow		
Lactating	60	10-12
Dry, pregnant	50	7-8

Source: M.A. McCann, Virginia Tech University.

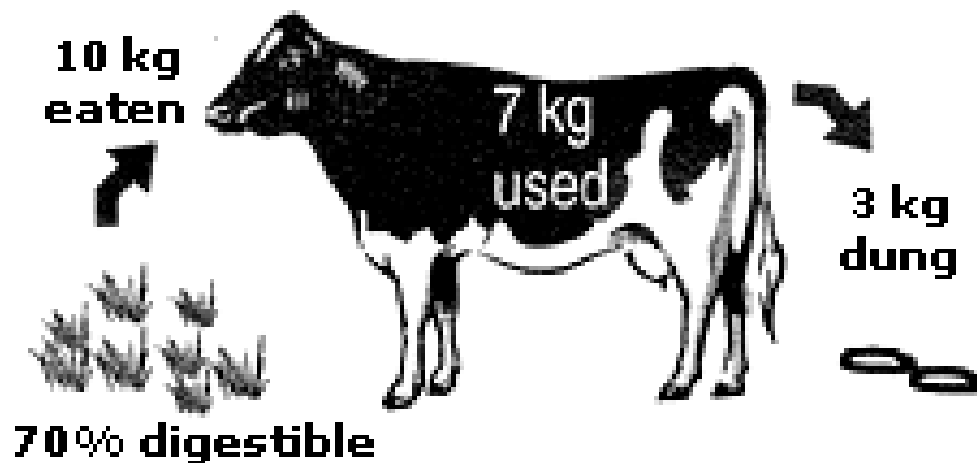
## Definition of Forage Digestibility

Digestibility is the most useful measure of pasture quality. It refers to the proportion of a given forage that an animal can use for growth and maintenance. If the digestibility of a pasture is 70%, then approximately 70% of the pasture material consumed will be used for the animal's nutritive requirements, while 30% leaves the animal as manure (Figure 1). Remember that cattle intake is 2 to 3% of their body weight (on a dry matter basis) depending on their nutrient requirements. For example, a dry cow may only need to consume 2% of their body weight in average quality forage, while a beef cow in heavy milk production or a growing steer needs to consume approximately 3% of their body weight in high quality forage and/or supplements.

**Digestibility** is a useful measure of pasture quality for the following reasons: 1) **It is directly and positively related to the energy content of the pasture;** 2) **It is positively related to protein content.** In other words, when digestibility is high, protein content will also be high. There are exceptions: clovers are generally higher in protein

than grasses at a similar stage of growth, also when grazing standing mature corn energy will be relatively high and protein will be low; and 3) **It relates directly to the speed of digestion and therefore the movement of feed through the animal.** In general, pastures with higher levels of digestibility will be digested more rapidly, allowing for higher intake and consequently higher levels of animal production.

**Figure 1.** Forage dry matter consumed and utilized based on percent digestibility (Bell, 2003).

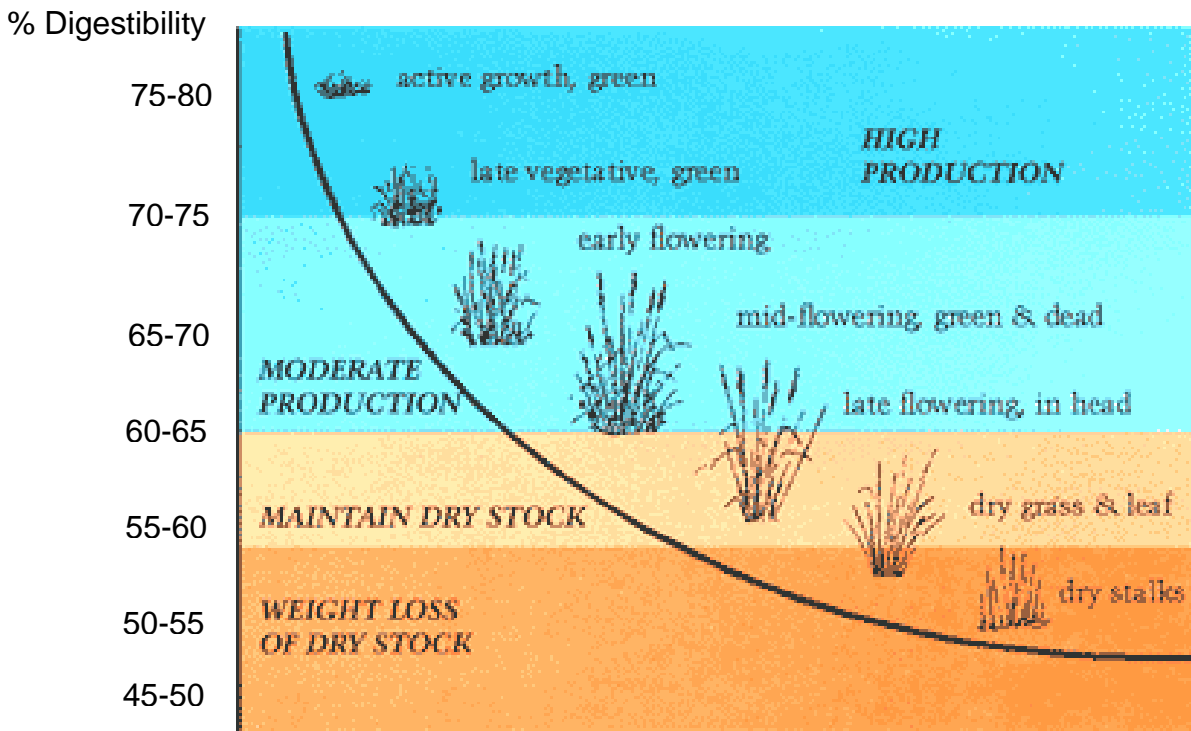


Note: 1kg = 2.2 lbs, therefore 10 kg = 22 lbs.

### **Forage Species/Maturity and Digestibility**

Forage species can differ markedly in TDN and CP, but within the species commonly found in cool season pastures in Kentucky, the most important factor in controlling quality is maturity (Figure 2). In other words, maintaining pastures in an actively growing vegetative state is the best way to maximize quality.

**Figure 2.** A guide to digestibility decline as cool season pastures mature (Bell, 2003).

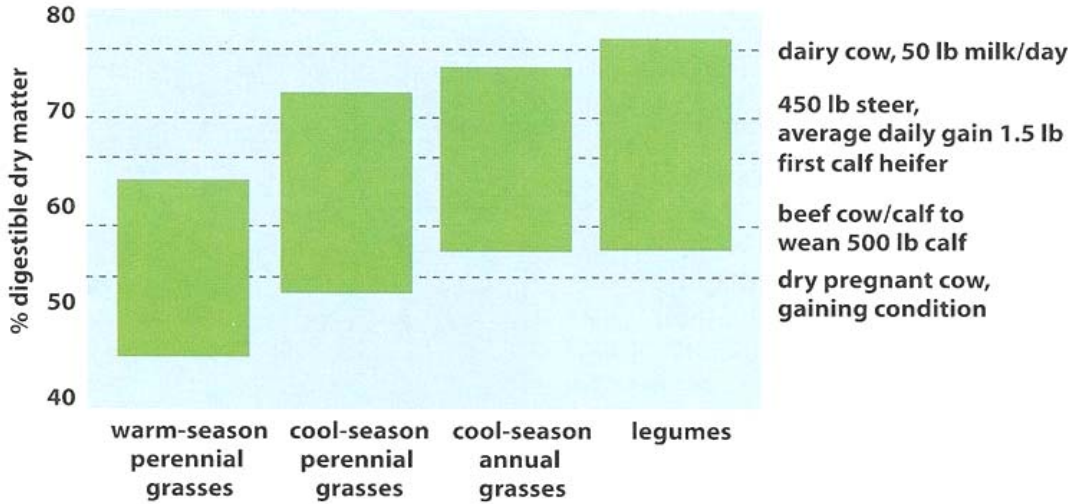


### Combining Pasture Species/Maturity with Animal Requirements

Figure 3 provides an overview of the combined concepts of livestock requirement in comparison to forage species and maturity. This figure shows that average cool season perennial grasses range in digestibility from a low of 50% to a high of 72% or higher. In the early spring or late fall these grasses can easily have even higher digestibility. The upper end of the range occurs during the vegetative or leafy growth stage of the plant. Figure 3 also indicates that legumes (eg. – clovers or alfalfa) range in digestibility from a low of 58% to a high close to 80%. Pasture legumes like white clover maintain digestibility in the upper end of this range, because the forage available for grazing is mostly leaves and petioles.

Figure 3 shows that a 450 lb steer, with a projected average daily gain of 1.5 lb, requires forage with a digestibility of 70%. When managed for vegetative growth several forage types will supply the needs of a 450 lb steer.

**Figure 3.** Forage digestibility ranges and their suitability for different classes of livestock (Ball et al., 2002).



Source: Adapted from H. Lippke and M.E. Riewe. 1976. *Principles of grazing management.*  
 In *Grasses and Legumes in Texas* (E.T. Holt, ed.) Texas Agric. Exp. Stn. Res. Monograph RM6C:165

### Goal of Pasture Management

The goal of any livestock enterprise is to maximum profits and to minimize the risk for economic loss. With cattle the best way to accomplish this goal is to produce and utilize high quality pasture. The best way to maintain a stand of high quality pasture is to maintain the stand in a vegetative or leafy state.

Establishing a rotational grazing system allows control over pasture plant growth. As the figures and table above show, cool season pastures will produce forage quality high enough to forego or limit the need for supplementation for almost any class of cattle.

Mature cows can be maintained on pasture that is lower quality, but rarely is it a disadvantage to have pasture quality higher than animal needs. The extra nutrients will simply be recycled back onto the pasture. If mature animals are over conditioned then limit feeding or feeding supplemental low quality hay is an option. One option in a cow/calf operation is to use a creep feed system where the calves are able to enter a new pasture first and remove the top growth and then the cows follow to graze the lower quality basal material.

For more information refer to a number of excellent publications on developing and maintaining a rotational grazing system including the UK publication "Rotational Grazing" ID-143 (<http://www.ca.uky.edu/agc/pubs/id/id143/id143.pdf>).

**References:**

Ball, D.M., C.S. Hoveland, and G.D. Lacefield. 2002. Southern Forages. Potash and Phosphate Institute. Norcross, GA.

Bell, Allen. 2003. Pasture assessment and livestock production. NSW Dept. of Primary Industry Agnote Publication DPI-428. New South Wales, Australia.  
<http://www.agric.nsw.gov.au/reader/assesspasture/dpi428.htm#quality>

# FORAGE QUALITY: WHAT IS IT? WHAT CAN WE DO ABOUT IT? AND, WILL IT PAY?

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University of Kentucky

Profitable livestock production almost always requires a forage program that will supply large quantities of adequate quality, homegrown feed. A major percentage of the feed units for beef (83%) and dairy cattle (61%) 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 wildlife, respectively.

Although both quantity and quality are important, it is easier for livestock producers to recognize problems associated with quantity than with quality because quantity can be readily assessed visually; whereas, analysis of a sample is required to determine quality. Fiber, which is less digestible than other components of, increases with age, so it is not possible to simultaneously maximize quantity and quality from a given pasture or hay/silage field.

## WHAT IS QUALITY?

Quality has been defined in many ways, including protein, fiber, lignin content, relative feed value, color, smell, leafiness, fineness of stems, total digestible nutrients, and other physical and/or chemical components. Each of these has merit, but all fall short of clearly defining forage quality. Factors such as average daily gains, conception rates, milk production, wool production, etc. are reliable indicators of quality.

Perhaps the best concise definition of quality is: the extent to which forage (pasture, hay, or silage) has the potential to produce a desired animal response. This definition acknowledges the necessity of considering the animal. As an example, a high producing dairy cow needs higher quality feed than a dry, pregnant beef cow. Animal performance is influenced by a number of factors, including:

**Palatability** - Will the animals eat it? Animal selection of one forage species over another depends on smell, touch, and taste. Therefore, palatability may be affected by texture, leafiness, fertilization, dung or urine patches, moisture content, pest infestation, or compounds that cause a forage to be sweet, sour, or salty. In general, high quality forage is highly palatable and vice versa.

**Intake** - How much will they eat? Forage must be consumed in adequate quantities to enable animals to perform well. In general, the higher the palatability and forage quality, the more that will be consumed. The poorer forage quality is, the longer

it remains in a ruminant animal's digestive system, resulting in lower animal performance.

**Digestibility** - Of the forage consumed, how much will be digested? Digestibility (the portion of the forage consumed as it passes through an animal's body) varies greatly. Immature, leafy plants may be 80 to 90 percent digested, while mature, stemmy material often has a digestibility below 50 percent.

**Nutrient content** - Once digested, does the forage provide an adequate level of nutrients? Leafy, growing forage plants usually contain 70 to 90 percent water. Because of this range in water content, for most purposes, it is best to express forage yield and nutrient content on a dry matter basis. Forage dry matter can be divided into two main categories: (1) cell contents (the non-structural part of the plant tissue such as protein, sugar, and starch); and (2) structural components of the cell wall (cellulose, hemicellulose, and lignin).

**Anti-quality factors** - Depending on the plant species, time of year, environmental conditions, and animal sensitivity, various compounds may be present in forage that can result in reduced animal performance, sickness, or even death. Such compounds include tannins, nitrates, alkaloids, cyanoglycosides, estrogens, and mycotoxins. High quality forages must not contain harmful levels of anti-quality components.

The ultimate test of forage quality is animal performance. Forage quality encompasses its "nutritive quality" (its potential for supplying nutrients), the intake that results when it is made available to animals, and any anti-quality factors present. We

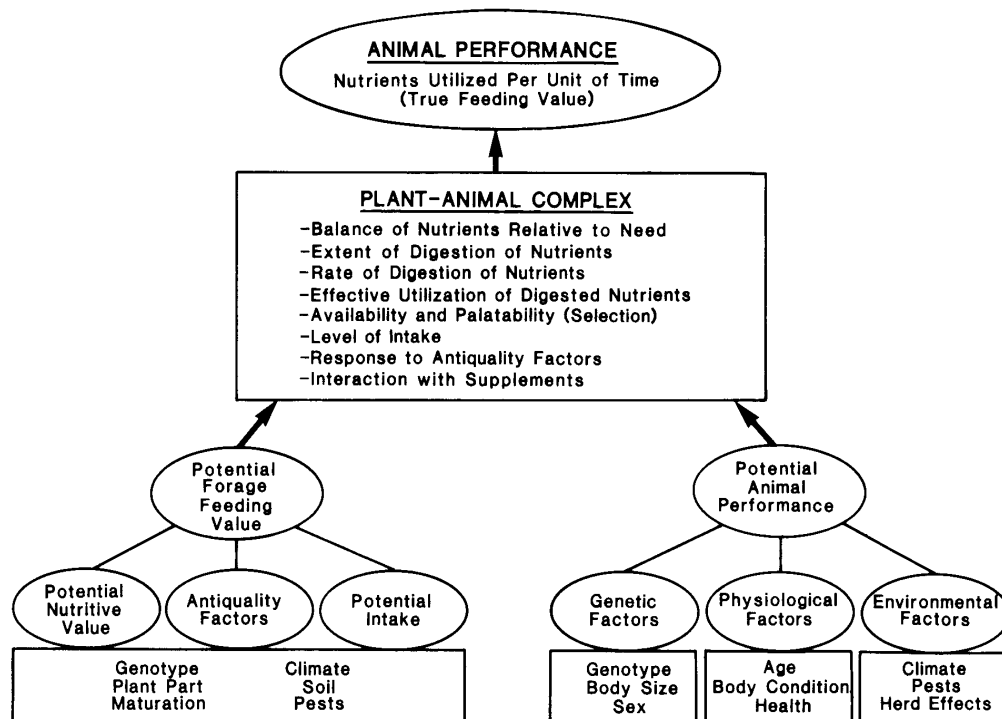


Figure 1. Factors associated with true forage feeding value (Marten et al.)

cannot separate forage quality from animals because their performance can be influenced by any of a number of factors associated with plants and forage-consuming animals (Figure 1). A failure to give proper consideration to any of these factors may result in a level of performance less than is desired.

### WHAT CAN WE DO ABOUT FORAGE QUALITY?

Forage plants, both grasses and legumes, have high quality potential. Our ability to manage all the factors impacting quality will determine how much of this “potential” we can capture and have available for use by our animals or for sale.

Forage quality is influenced by soils and fertility, varieties, other species, pests, growing conditions, season of the year, time of day, stage of maturity, harvesting, handling and storage, and of course weather. All of these factors can have an impact on forage quality regardless of whether we are using it as pasture, hay, or silage.

Although all of the above are important, in general, the most important and the one that will have the greatest impact on forage quality is the “stage of maturity” when harvested. As forage plants advance from the vegetative to reproductive (seed) stage, they become higher in fiber and lignin content, lower in protein, digestibility and acceptability to livestock (Figure 2 and Tables 1 & 2). For example, delaying harvest of from late bud to full bloom (early seed stage) can result in over 45 percent loss in protein. Digestibility can drop by up to 0.5 percent per day and RFV by 5 points per day.

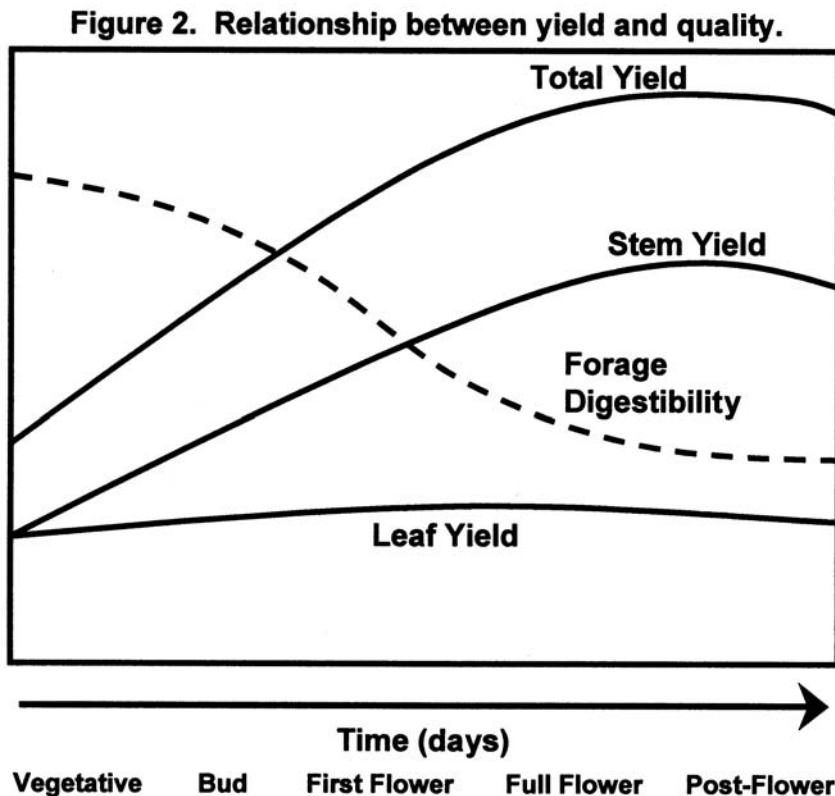


Table 1. Effects of Hay Quality on Animal Performance			
Alfalfa Hay	Quality		
	Good	Fair	Poor
Crude Protein	18.7	15.9	13.7
Crude Fiber	29.4	35.4	46.7
<u>Animal Performance*</u>			
Hay	17.1	16.5	13.8
consumed/day	1.85	1.49	0.06
ADG			

\*550 lb. beef steers - Tennessee

Table 2. Estimated Grade, Average Concentration of Crude Protein (CP), Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF) and Milk Yield in Wisconsin Forage Council Green Gold Project.					
Estimated Grade	Number of Cuts	CP%	ADF %	NDF%	Milk lbs/A
Prime to 1	5	22	31	43	10,688
No. 1	4	21	32	44	9,120
No. 1 to 2	3	19	35	46	7,022
No. 2	2	17	36	48	4,259

SOURCE: Adapted from D.A. Rohweder, et al., University of Wisconsin.

### WILL IT PAY TO PRODUCE HIGHER QUALITY?

This is an excellent question and one that I would like to say a resounding YES to; however, it's not always that easy and true. To say "it depends" may seem like a very weak answer, but in this case I think it is true. For example, if you are selling by the ton or bale and quality is not a factor, then it will likely not pay you to go the extra mile to achieve the highest quality if overall yield is reduced in the process or stand persistence is compromised. There are some markets where this is the case, but things are changing.

In general, most people are able to market their highest quality hay even during surplus production years. The biggest challenge during these years is how to market the medium and low quality.

With advances in testing and marketing, and with greater awareness of the relationship between quality and animal performance, and with a greater database showing the relationship between quality and price (Table 3), it appears the answer to the question “Will it pay?” is appearing more positive all the time.

<b>Table 3. Forage Quality Values as Alfalfa Advances in Maturity.</b>						
Stage of maturity	Crude protein	Acid detergent fiber	Neutral detergent fiber	Digestible dry matter	Relative feed value	Market value <sup>1</sup> average
	----- % of dry weight -----				index	\$/T
Vegetative	>22	<25	<34	>69	>189	144
Bud	22-20	25-31	34-41	69-65	189-147	126
Early Bloom	19-18	32-36	42-46	64-61	146-123	96
Late Bloom	17-16	37-40	47-50	60-58	122-107	78
Seed pod	<16	>41	>50	<58	<107	72

<sup>1</sup>Market value based  $Y = .88X - 22.3$  where,  $Y = \$/T$  and  $X = RFV$  index.  
 SOURCE: Dr. Neal Martin, Director, Dairy Forage Research Center, Madison, WI, personal communications.

### SUMMARY

Our challenge is: to establish to get good stands, produce for high yields, graze/harvest for highest quality and market for profit.

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