

HAY QUALITY: WHAT IS IT? -

Garry Lacefield and Don Ball

Extension Forage Specialists

University of Kentucky and Professor Emeritus Auburn University,
respectively

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

WHAT IS ALFALFA QUALITY?

Alfalfa quality has been defined in many ways, including protein, fiber, lignin content, relative feed value, relative forage quality, 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 alfalfa quality. Factors such as average daily gains, conception rates, milk production, wool production, etc. are reliable indicators of alfalfa quality.

Perhaps the best concise definition of alfalfa quality is: the extent to which alfalfa (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 alfalfa is highly palatable and vice versa.

Intake - How much will they eat? Alfalfa 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 alfalfa 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 alfalfa may be 80 to 90 percent digested, while mature, stemmy material often has a digestibility below 50 percent.

Nutrient content - Once digested, does the alfalfa 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 alfalfa quality is animal performance. Alfalfa 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 cannot separate alfalfa 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.

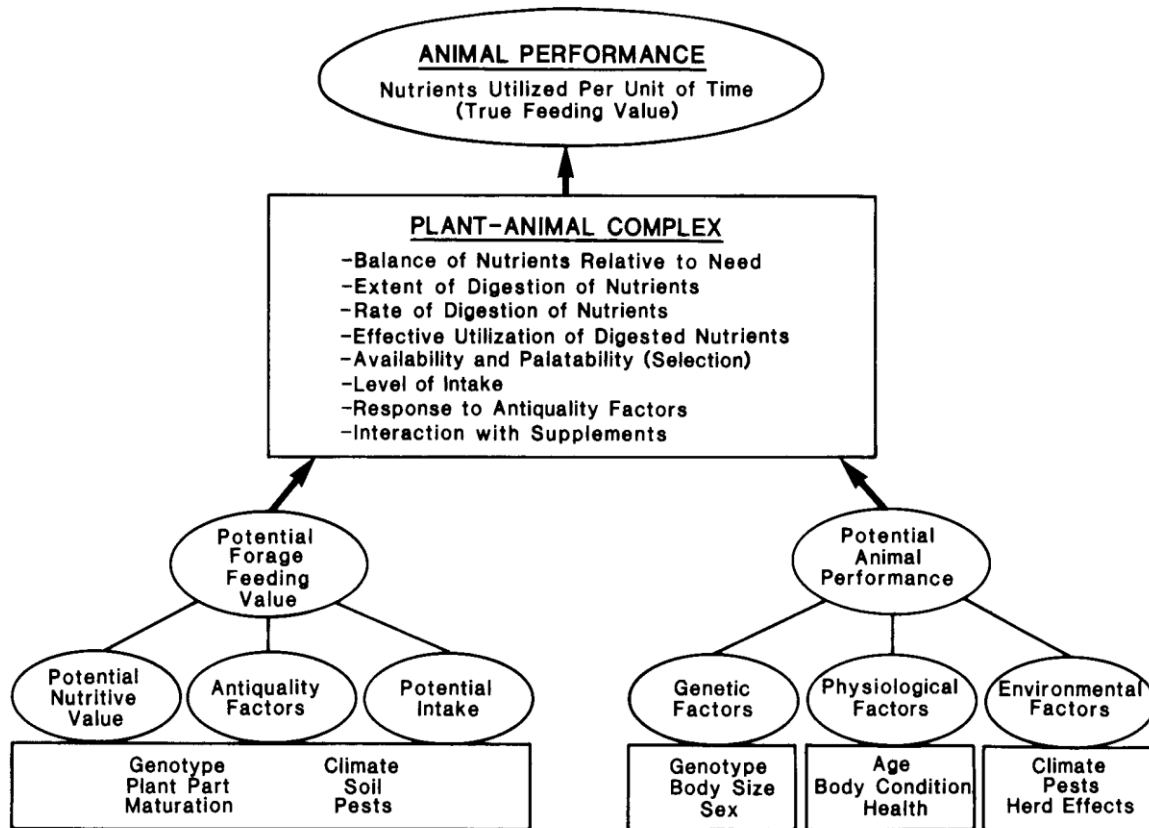


Figure 1. Factors associated with true forage feeding value (Marten et al.)

WHAT CAN WE DO ABOUT ALFALFA QUALITY?

Alfalfa has 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.

Alfalfa 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 alfalfa 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 alfalfa quality is the “stage of maturity” when harvested. As alfalfa 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). Delaying harvest 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.

Figure 2. Relationship between yield and quality.

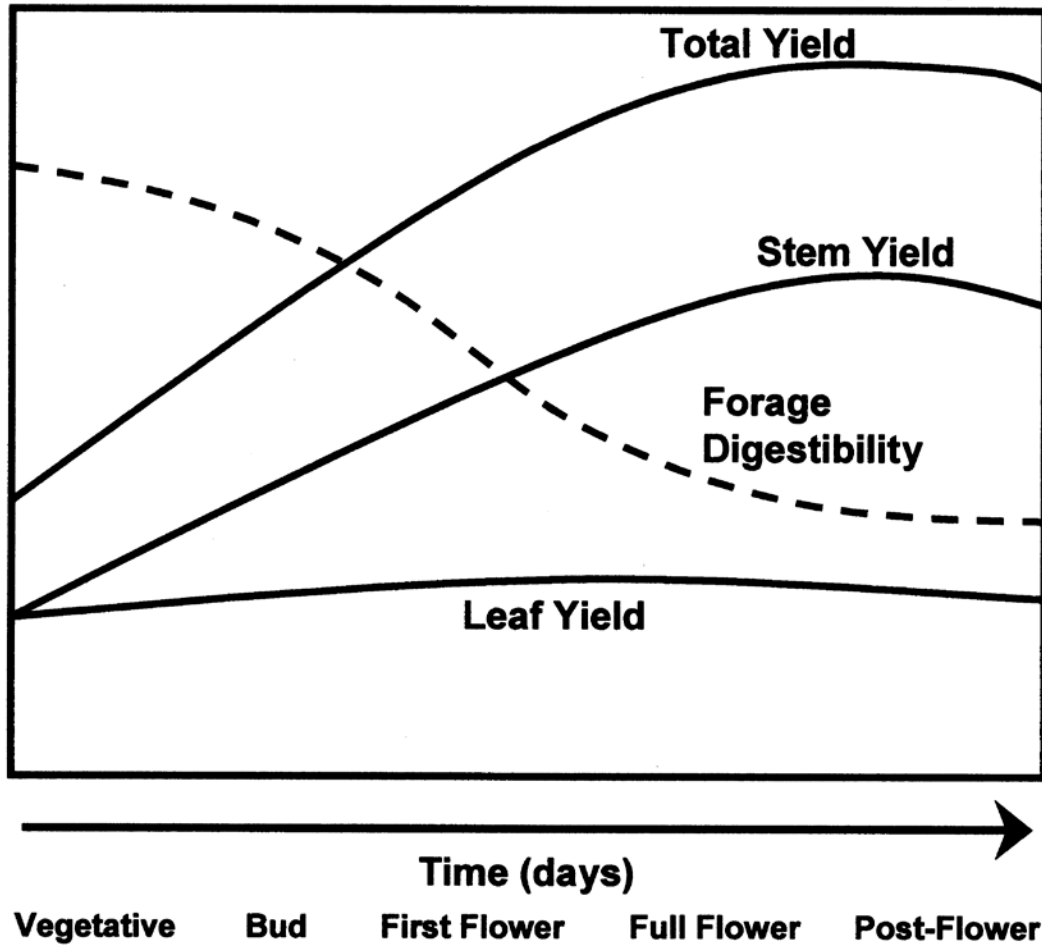


Table 1. Effects of Alfalfa Hay Quality on Animal Performance			
Alfalfa Hay	Quality		
	Good	Fair	Poor
Crude Protein	18.7	15.9	13.7
Crude Fiber	29.4	35.4	46.7
<u>Animal Performance*</u>			
Hay consumed/day	17.1	16.5	13.8
ADG	1.85	1.49	0.06

*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 alfalfa 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.

Table 3. Forage Quality Values as Alfalfa Advances in Maturity.						
Stage of maturity	Crude protein	Acid detergent fiber	Neutral detergent fiber	Digestible dry matter	Relative feed value	Market value ¹ 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

¹Market 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

Alfalfa is a premier forage legume with potential for high yield, quality and stand persistence. Our challenge is: to establish to get good stands, produce for high yields, harvest for highest quality and market for profit.