

ROLE OF ALFALFA IN LIVESTOCK FEEDING PROGRAMS IN KENTUCKY

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Alfalfa, the "Queen of the Forage Crops", is a highly versatile forage crop which can be grazed directly by livestock or harvested as hay or silage. With the development of new alfalfa varieties, increased pest and weed control, and increased demand from livestock owners, the amount of alfalfa fed to livestock will increase. As with any forage crop, proper harvest and feeding management is necessary to reap the benefits.

Merits of Feeding Alfalfa

Alfalfa provides dairy and beef cattle, sheep, and horses with a highly nutritious and digestible forage. Alfalfa contains more crude protein, calcium, and vitamin A than early-cut grasses or corn silage (see table 1). Thus, when feed alone or in combination with corn silage, alfalfa can provide a portion of the protein fractions and energy needed by ruminants and horses. In years when protein costs are high, alfalfa plays an important role in reducing the costs of providing the needed protein fractions which increases profitability.

Table 1. Nutrient content of selected forages (on a dry matter basis).

	Nutrient Content (% dry matter)				
	Crude Protein	ADF	NDF	Calcium	Vitamin A (IU/lb)
Alfalfa (Early Bloom)	18.0	31.0	42.0	1.41	25,000
Red Clover (Early Bloom)	16.0	36.0	46.0	1.53	3,600
Corn Silage	8.1	28.0	51.0	0.23	8,200
Orchardgrass (Late Boot)	15.0	34.0	61.0	0.27	6,800
Timothy (Late Boot)	15.0	32.0	61.0	0.53	9,500

Source: Nutrient Requirements for Dairy Cattle. 1989

One of the most overlooked benefits of feeding alfalfa is its ability to increase feed intake either when fed alone or in combination with low quality forages. Alfalfa passes more rapidly through the digestive tract than grasses (36 hours versus 70 hours). In young animals and lactating females, increasing feed intake which allows more nutrients to be consumed from the forage and cheaper fraction of the diet. These additional nutrients can be used to support growth and/or the production of milk. In beef cattle, a small amount of good-quality alfalfa can stimulate intake and digestibility of lower quality forages.

Before Feeding or Selling - Test Alfalfa

After harvesting alfalfa, the first step is to determine its nutrient content. When sampling alfalfa hay, each lot of hay, which was cut from the same field and under the same weather conditions, should be sampled from the butt end of the bale using a hay probe. For small square bales of hay, 15 to 20 probe samples should be taken from each lot of hay. For large round bales of hay, ten representative bales need to be sampled with two samples taken from each bale. Do not send "grab" samples or flakes of hay to be analyzed. Samples should be shipped to the laboratory in a sealed, airtight bag. (Interlocking, plastic freezer bags work well for shipping samples.)

Determining the Quality of Alfalfa Harvested

Stage of maturity at which alfalfa is harvested or grazed is the most important variable affecting quality. Table 2 shows the changes that occur in pure alfalfa as it matures. As the alfalfa plant matures from a vegetative to a reproductive (flower) stage, the fiber content increases while at the same time, the digestibility, protein content and acceptability by livestock decreases.

Table 2. Effect of maturity on nutrient content of pure alfalfa hay (dry matter basis).

Maturity	TDN (%)	ADF (%)	NDF (%)	Relative Feed Value	Crude Protein (%)
Early Vegetative	66.0	28	38	164	23.0
Late Vegetative	63.0	29	40	154	20.0
Early Bloom	60.0	31	42	143	18.0
Midbloom	58.0	35	46	125	17.0
Full Bloom	55.0	37	50	112	15.0

Source: Nutrient Requirements for Dairy Cattle. 1989.

Relative Feed Value is an index used to compare the quality of forages relative to the feed value of full-bloom alfalfa. Table 3 lists the quality standards that were developed by the American Forage and Grassland Council which are in use today.

Table 3. Quality standards developed by the American Forage and Grassland Council for legume, grass, and legume/grass mixtures.

Quality Standard	Analysis (% Dry Matter)			Relative Feed Value
	Crude Protein	ADF	NDF	
Prime	Greater than 19	Less than 31	Less than 40	Greater than 151
1	17-19	31-35	40-46	151-125
2	14-16	36-40	47-53	124-103
3	11-13	41-42	54-60	102-87
4	8-10	43-45	61-65	86-75
5	Less than 8	Greater than 45	Greater than 65	Less than 75

To calculate the relative feed value for a forage, the acid detergent fiber (ADF) and neutral detergent fiber (NDF) are used. The ADF content of the forage is used to calculate the percentage of the forage which is digestible. Whereas, the NDF content is used to estimate the relative amount of forage an animal will eat. As the ADF and NDF content of a forage increase, the forage becomes less digestible and livestock eat less. The crude protein content of the forage does not enter into these calculations. Figure 1 illustrates how to calculate the relative feed value of an alfalfa/grass hay.

Figure 1. Calculating the Relative Feed Value for alfalfa/grass hay containing 34% ADF and 48% NDF. (ADF and NDF values must be on a dry matter basis.)

Step 1. Calculate Digestible Dry Matter of Forage

$$\text{DDM} = 88.9 - (0.779 \times \text{ADF})$$

$$\text{DDM} = 88.9 - (0.779 \times 34) = 62.41$$

Step 2. Calculate Dry Matter Intake of Forage

$$\text{DMI} = 120 / \text{NDF}$$

$$\text{DMI} = 120 / 48 = 2.50$$

Step 3. Calculate Relative Feed Value

$$\text{RFV} = (\text{DDM} \times \text{DMI}) / 1.29$$

$$\text{RFV} = (62.41 \times 2.50) / 1.29 = 121 \text{ RFV}$$

Alfalfa Quality Determines Animal Performance

The quality of alfalfa hay, silage, or fresh forage being grazed will determine animal performance, the amount and type of grain needed to be fed, and the costs in implementing a sound feeding program for any livestock operation. This is especially true when feeding young, rapidly growing livestock or milking females.

Beef Steers: The quality of alfalfa hay fed to growing steers greatly affects their average daily gain. In table 4, the classical data from a trial conducted at the University of Tennessee is shown. When steers were fed poor-quality hay without any additional grain, the steers essentially did not gain any weight. In this case, the poor quality hay did not contain enough energy to promote growth and weight gain.

Table 4. Effect of the quality of alfalfa hay on performance of 550 lb beef steers.

	Quality of Alfalfa Hay		
	Good	Fair	Poor
Crude Protein	18.7	15.9	13.7
Crude Fiber	29.4	35.4	46.7
Animal Performance			
Hay Consumed (lbs/day)	17.1	16.5	13.8
Average Daily Gain (lbs/day)	1.85	1.49	-0.06

Adapted from 6th Annual KY Alfalfa Conference Proceedings from data collected at the University of Tennessee

Dairy Cows: Dairy cows, especially early lactation cows, are very sensitive to the quality of forage fed. The milk production of early-lactation cows rapidly responds to changing forage quality. Within two weeks, dairy farmers often see the beneficial or detrimental effects of changing forage quality, especially in their fresh cows.

Figure 2 shows the effect of the maturity of alfalfa hay on milk production of midlactation Holsteins fed different amounts of grain. Cows fed prebloom alfalfa hay and a small amount of grain (20% dry matter intake) produced more milk than the cows receiving the full bloom alfalfa hay and a large amount of grain (71% dry matter intake). Thus, early-cut alfalfa helps cows milk to their genetic potential at the same time saving feed costs and improving the profitability of a dairy operation.

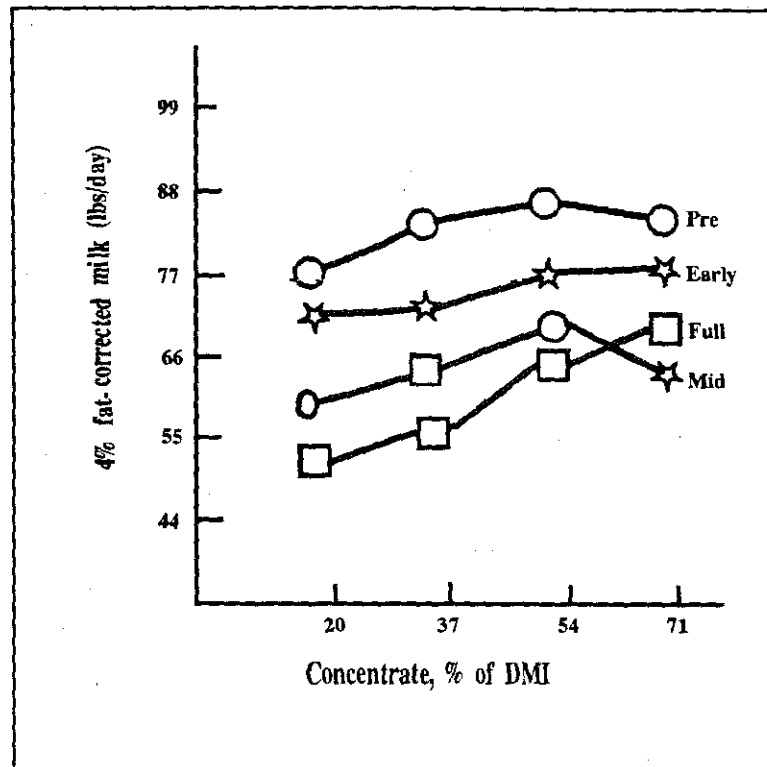


Figure 2. Effects of stage of maturity of alfalfa hay and amount of concentrate fed on milk production of dairy cows.

Rotational Grazing

Rotational grazing systems require more management than continuous grazing systems but are an excellent management tool to increase the productivity of pasture lands. When dairy cows, beef cattle, horses, and sheep rotationally graze alfalfa or other forages, they are providing with a lush, highly nutritious forage. Cattle, sheep, and horses like the tender, young forage which is available and their performance matches the excellent forage quality.

Alfalfa Hay Should Be Allocated By Its Quality

Farmers should allocate and sell alfalfa hay based on its quality. Highest-quality, early-cut alfalfa more closely matches the nutrient needs of livestock under a year of age and milking females. Young animals and milking females have the highest needs for protein, calcium, and energy and, thus, require a higher quality forage so that grain costs can be minimized. Table 5 illustrates this concept. Using alfalfa instead of grass hay reduces the protein content needed in the grain mixture.

Table 5. Nutrient requirements for sheep, dairy and beef cattle, and horses at different ages.

	Nutrient Requirements		
	Expected Feed Intake (lbs)	Crude Protein (%)	Energy (TDN) (%)
Early Weaned Lamb - 66 lbs	3.1	16.5	76.0
Nonlactating Ewe (first 15 wks preg and 110 lbs)	3.3	10.6	57.6
Dairy Holstein Heifer (400 lb)	9.98	16.0	69.0
Dairy Holstein Cow Milking 100 lbs	57.2	17.5	75.0
Nonlactating Dairy Cow (last 2 mo preg- Holstein)	28.0	12.0	56.0
Beef Steer- Medium Frame 400 lbs ADG=2.50 lbs	11.0	14.2	73.5
Beef Cow- Nonlactating middle third preg 1000 lbs	18.1	7.0	49.0
Beef Cow Nursing- 1000 lb producing 20 lbs milk	20.6	12.3	67.0
Foal-4 month weanling (400 lbs)	11.0	16.0	70.9
Horse- Mature 1000 lbs Maintenance	16.0	10.0	52.0
Horse- 1000 lb horse producing 30 lbs milk	25.0	13.0	56.4

Adapted from Nutrient Requirements for Sheep (1985), Dairy Cattle (1989), Beef Cattle (1984), and Horses (1989)

Alfalfa hay can be used as a source of protein for cattle and horses. It is an excellent source of protein for beef cattle fed low-quality, grass hay or grazing corn stalks. Small amounts of good-quality alfalfa not only furnish the needed protein, but also enhance the digestion of low quality forages in cattle.

Forage quality should match an animal's needs for most efficient use of forages purchased or grown. Table 6 attempts to allocate forages for their best purpose for beef and dairy cattle. It does not mean that higher quality alfalfa can not be fed to older cattle.

Table 6. Match forage quality to meet the nutrient needs.

Relative Feed Value	Dairy Cattle	Beef Cattle
Over 170	<ul style="list-style-type: none"> ● Limit to half forage dry matter of milking cows to provide enough fiber 	
140-170	<ul style="list-style-type: none"> ● Early lactation cows ● Baby calves 	
125-140	<ul style="list-style-type: none"> ● Mid to late lactation cows ● Heifers 3-12 months 	<ul style="list-style-type: none"> ● Background or stocker cattle ● First-calf heifers nursing a calf (RFV = 120-130)
115-125	<ul style="list-style-type: none"> ● Heifers 12-18 months 	<ul style="list-style-type: none"> ● Beef cow with calf ● Replacement heifers 8-18 months
100-115	<ul style="list-style-type: none"> ● Heifers 18-24 months ● Heifers 12-18 months with corn silage 	<ul style="list-style-type: none"> ● Dry Beef cow
Under 100		<ul style="list-style-type: none"> ● Dry Beef cow
Other Comments	DO NOT FEED Alfalfa to Dry Cows to reduce incidence of milk fever	