

Use Forage Testing To Diagnose Management Problems

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A forage test can be used to detect forage management problems as well as to balance an animal's ration.

The first question to be addressed is, do I need to change my management? The forage quality needed is dependent on the animal's nutritional requirement, the value of the forage, and the cost of energy and protein supplements. In general it is cheaper to grow good-quality forage than to buy supplements for poor-quality forage. Table 1 lists the energy and protein requirements for different classes of cattle and the forage ADF (average \pm range) associated with that level of energy. In general, it is most cost effective to provide all or most of the animal's nutritional needs from quality forage.

Forage maturity and legume content are the main determinants of forage quality. If the quality of pasture and hay is equal to or greater than that needed by the livestock being fed, you don't need to change management. However, if the forage quality is too low, you can often improve forage quality through harvesting at an earlier maturity or by including legumes in the stand.

Moisture (Dry Matter) is an indication of how well the forage was dried before storage. Hay crops should be baled when the moisture is less than 18% (dry matter greater than 82%). Haylage should be made when the forage moisture is 50-60% (dry matter 40-50%). Dry hay will cure to 10-15% moisture (85-90% dry matter) during storage. Ensure that you allow hay to dry adequately before baling for dry hay but that you don't let it dry too much if making haylage. Damp hay can cause barn fires due to spontaneous combustion. Haylage that is too dry can have poor fermentation, resulting in potential health problems in livestock.

Acid Detergent Fiber (ADF) is the best independent measure of forage digestibility. If ADF is high, digestibility will be low. Forage crops increase in ADF as they mature. To reduce ADF in hay, harvest at an earlier growth stage.

Table 1. The total digestible nutrient (TDN) and crude protein (CP) requirement for different cattle classes and the approximate forage acid detergent fiber (ADF, average \pm range) content which will supply the indicated TDN.

Production Status	TDN	CP	ADF
	----- % -----		
Growing steer	60-68	10-11	34 \pm 5
Dry cow	50	7	42 \pm 5
Last 3 rd gestation	52-54	8	40 \pm 5
Lactating beef cow			
average	55-56	9	39 \pm 5
above average	63-64	11-12	34 \pm 5
heifer	62-64	10-11	34 \pm 5
Lactating dairy cow			
50-70 lb milk/day ¹	68-70	15-16	27 \pm 5

¹ At milk production levels over 50 lb milk/day, grain supplementation will be needed.

Neutral Detergent Fiber (NDF) is a good indicator of forage dry matter intake by livestock. The lower the NDF content, the higher the intake. Legumes are lower in NDF than grasses at the same growth stage but both increase in NDF as they grow and mature. If there is the need for animals to eat more forage, manage the stand for a lower NDF content. This can be done by harvesting at an earlier growth stage and by inter-seeding or managing for legumes in the stand.

Crude Protein (CP) is a measure of the nitrogen in the forage. The CP is used by rumen bacteria in digesting forage and other feeds in the diet. The bacteria digest fiber and nonstructural carbohydrates (sugars and starches) in the ration, releasing volatile fatty acids that ruminants use for energy. Ruminants also digest the bacteria for energy and high-quality protein as they pass out of the rumen. The ration CP content needs to meet the needs of the animal. Sometimes the CP in a hay may be too low for the rumen bacteria. In these cases supplementing with a high-protein supplement will stimulate the bacteria to digest the hay more rapidly, allowing livestock to eat more hay each day to meet their nutrient requirement for energy. The CP content of forage can be increased by harvesting the forage at an earlier growth stage, by adding legumes to the stand, or (to a small extent) when using nitrogen fertilizer by using higher rates of nitrogen.

Total Digestible Nutrients (TDN) is a measure of digestible energy (DE) in a forage and is calculated from the fiber, non-fiber carbohydrate, protein and ash content in the sample. Several alternative energy systems are used in formulating livestock rations. The energy systems used in the United States are summarized in Table 2 using equivalent values. Table 2 can be used for converting the feeding value of forage or grain supplement from one energy system to another. Horses digest forages less efficiently than ruminants. To estimate an energy value for horses, multiply the energy values in Table 1 by 0.80.

To increase the digestible energy in forage, harvest the stand at a younger age to decrease the forage ADF content. Also, to increase digestible energy intake, decrease the forage NDF by harvesting earlier or by increasing legumes in the stand. Livestock will eat more grass-legume forage than straight grass, be it hay or pasture. Forage containing 25-30% legumes will allow yearling cattle to grow 0.25-0.33 lb/day and weaned calves to grow 0.5 lb/day faster than nitrogen fertilized grass and dairy cattle will produce 6-10 lbs./day more milk at the same level of grain feeding.

Table 2

Equivalent values for total digestible nutrients (TDN), digestible energy (DE), metabolizable energy (ME), net energy maintenance (NEM), net energy gain (NEG), and net energy lactation (NEL).

TDN	DE	ME	NEM	NEG	NEL
%		-----Mcal/lb -----			
45	0.90	0.74	0.36	0.11	0.45
50	1.00	0.82	0.44	0.19	0.50
55	1.10	0.90	0.52	0.26	0.56
60	1.20	0.99	0.60	0.33	0.61
65	1.30	1.07	0.67	0.40	0.67
70	1.40	1.15	0.74	0.47	0.73
75	1.50	1.23	0.81	0.53	0.78
80	1.60	1.31	0.88	0.59	0.84
85	1.70	1.40	0.95	0.65	0.89
90	1.80	1.48	1.02	0.70	0.95

Conclusion

Forage quality is mainly determined by harvest management and legume content. If the quality of hay or pasture is equal to or greater than that needed by the livestock fed, then there is no need to change management. However, if forage quality is lower than needed it can often be improved by earlier harvest or by including legumes in the stand.

References:

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