ASSESSING FORAGE QUALITY AND USING RESULTS IN FLOCK NUTRITION

Lawton Stewart
Department of Animal and Poultry Sciences
Virginia Tech

Throughout the production year nutrient requirements of sheep change significantly. Forages play a major role as part of a feed program both as pasture and conserved forages such as hay. Complicating the situation is the fact that forage quality changes drastically due to maturity at harvest and storage. Nutrition represents the single most expensive segment of production in a flock and proper feeding is vital for optimizing production. Matching nutritive value of forage to the changing nutrient requirement of your flock can drastically reduce the amount of additional supplement needed and improve your bottom line. The best way to start is to properly assess the nutritive value of your forage through proper testing.

Forage Sampling

Hay and pastures do not come with an ingredient tag so determining their nutritive value isn't as simple as for your supplement. No special equipment is needed to sample your pastures, but for sampling hay, your local extension office may have the proper equipment needed to sample hay. This equipment most commonly used is a mechanical coring probe which consists of a long tube (approximately 18" long; 1" diameter) with a cutting edge on one end and a shank on the other that can be connected to a hand driver or electric drill. Several labs are available for the analysis of your samples, one of which listed below.

Forage Testing Techniques:

1. To sample your pastures, walk a predetermined pattern through the field. This could be an 'X' or zig-zag pattern. While walking this pattern, stopped every 10-30 steps, depending on the size of the pasture cutting a handful of forage at a height of approximately four inches. This will allow you to collect a representative sample of the whole pasture. Mix the samples together for each pasture to be analyzed.

2. To correctly sample square bales, the bit is driven the full length of the tube into the long end of 6-8 bales per lot of hay to be tested. Compile the core samples and mix thoroughly to be sent for analysis.

3. For round bales, the samples should be taken from the rounded side of the bales. Samples should be taken from 4-6 bales per lot to be tested. If the outside of the bale is weathered, remove the outer 1-3 inches, or deeper depending on the depth of the weather damage and drill the entire length of the tube. Compile the core samples and mix thoroughly to be sent for analysis.

Forage Testing Lab:

Cumberland Valley Analytical Services Inc.
Mail: PO Box 669, Maugansville, MD 21767
UPS: 14515 Industry Drive, Hagerstown, MD 21742
Phone: 800-282-7522 (800-CVAS-LAB) Fax: 301-790-1981
http://www.foragelab.com

Each hay type and cutting, and pasture should be sampled separately. Forage quality of hay can change drastically between cuttings, therefore it is important to store your hay separately based on cutting and type and based on quality. It is also important to sample randomly so not to select for or against what 'looks good or bad', but to collect a representative sample of the forage present.

Interpreting the Analysis

Once your forage is analyzed, the two major constituents to consider are crude protein (CP) and total digestible nutrients (TDN). These are the major constituents when assessing forage quality and are listed below for varying qualities of hay. In table 1 below, a general guide for nutritive value of hay and the quality expected from it is given.

Table 1. Forage values as a percentage of dry matter.

Hay Quality	CP (%)	TDN (%)
Excellent	11.2 & up	56 & up
Good +	9.5-11.1	53-56
Moderate	8.2-9.5	50-53
Fair	7.3-8.2	47-50
Very Poor	Below 7.3	Below 47

Applying the results to your production system

Your ewe flock's nutrient requirement is at its lowest during the open period and the first 15 weeks of gestation. Their needs increase during flushing, a practice of increasing energy intake to increase ovulation rates, thus potentially increasing lambing percentage by 10-20%. Roughly 66% of the fetal development will occur during late gestation (approximately 6 weeks). During this time the ewe will gain up to 20 pounds, greatly increasing the nutrient requirement for both protein and energy. In addition, ewe lambs have similar changes in nutrient needs, but are still growing, so need addition nutrients on top of those required for the pregnancy and lactation. These can be critical points in the feed program. In the below tables, the nutrient requirement changes are

illustrated for both mature ewes (Table 2) and ewe lambs (Table 3). The variation in nutrient requirements of ewes in different production stages is apparent in these tables. Our goal now is to take the information from the analysis of our forage and apply it to the needs of the sheep.

Table 4 presents a comparison of several forage situations and production stages of ewes and the balance of nutrients (positive meaning excess nutrients available and negative meaning the forage is deficit). As we see from the table, a poor quality forage (TDN=45%; CP=6%) almost matches the requirements of a ewe in maintenance, but no other production stage. These are forages that mature over 6-8 weeks and/or allowed to develop seedheads. In addition to not meeting requirements, poor quality forages usually have a decreased passage rate through the animal's digestive system, decreasing intake and the ability of the forage to meet the animal's requirements. As we increase to the moderate quality forage (TDN=52%; CP=10%), we are now able to meet the nutrient requirements of an early gestation ewe with minimal supplementation to meet the energy requirement. This forage also meets the requirement of the maintenance ewe, but provides excess valuable nutrients that could be utilized in other production areas. As the ewe enters late gestation and lactation we see the only way we can meet or come close to meeting the ewes' requirements is by using the high quality forage (TDN=65%; CP=15%). High quality forages are those of less maturity often harvested at 4-5 weeks of growth and/or include legumes. High quality forage will meet the needs of lactating ewes with little or no supplementation and should be reserved for that purpose.

Table 2. Daily nutrient requirement of mature ewes[a]

Stage of Production	Body Wt. (lb.)	Wt gain or loss (lb.)	DM intake/day (lb.)[b]	Energy TDN (lb.)	Protein (lb.)
Maintenance	110	0.02	2.2	0.55	0.21
	132	0.02	2.4	0.61	0.23
	154	0.02	2.6	0.66	0.25
	176	0.02	2.9	0.72	0.29
	198	0.02	3.1	0.78	0.29
Flushing--	110	0.22	3.5	2.1	0.33
2 wks pre-breeding	132	0.22	3.7	2.2	0.34
& 3 wks of breeding	154	0.22	4.0	2.3	0.36
	176	0.22	4.2	2.5	0.38
	198	0.22	4.4	2.6	0.39
1st 15 wks gestation	110	0.07	2.6	1.5	0.25
	132	0.07	2.9	1.6	0.27
	154	0.07	3.1	1.7	0.29
	176	0.07	3.3	1.8	0.31
	198	0.07	3.5	1.9	0.33
Last 4 wks	110	0.40	3.5	2.1	0.38
(130-150% lamb crop)	132	0.40	3.7	2.2	0.40
	154	0.40	4.0	2.3	0.42
	176	0.40	4.2	2.4	0.44
	198	0.40	4.4	2.5	0.47
(180-225% lamb crop)	110	0.50	3.7	2.4	0.43
	132	0.50	4.0	2.6	0.45
	154	0.50	4.2	2.8	0.47
	176	0.50	4.4	2.9	0.49
	198	0.50	4.6	3.0	0.51
Lactation (1st 8 wks)	110	-0.06	4.6	3.0	0.67
Nursing single	132	-0.06	5.1	3.3	0.70
	154	-0.06	5.5	3.6	0.73
	176	-0.06	5.7	3.7	0.76
	198	-0.06	5.9	3.8	0.79
Nursing twins	110	-0.13	5.3	3.4	0.86
	132	-0.13	5.7	3.7	0.89
	154	-0.13	6.2	4.0	0.92
	176	-0.13	6.6	4.3	0.96
	198	-0.13	7.0	4.6	0.99

[a] Values adopted from the National Research Council for Sheep (6th Ed.).
[b] To convert dry matter to as-fed, divide dry matter values by DM%.

Table 3. Daily nutrient requirement of ewe lambs[a]

Stage of Production	Body Wt. (lb.)	Wt. gain or loss (lb.)	DM Intake/day[b] (lb.)	Energy TDN (lb.)	Protein (lb.)
Pre-breeding	66	.50	2.6	1.7	.41
	88	.40	3.1	2.0	.39
	110	.26	3.3	1.9	.30
	132	.22	3.3	1.9	.30
1st15 wk. gestation	110	.30	3.3	1.9	.35
	130	.30	3.5	2.0	.35
	155	.28	3.7	2.2	.36
Last 4 wk. gestation	110	.35	3.5	2.2	.42
(100-120% lamb crop)	130	.35	3.7	2.4	.42
	155	.33	4.0	2.5	.43
(135-175% lamb crop)	110	.50	3.5	2.4	.45
	130	.50	3.7	2.6	.46
	155	.47	4.0	2.7	.46
Lactation (1st8 wk.)	110	-.10	4.6	3.3	.62
Nursing single	130	-.10	5.1	3.6	.65
	155	-.10	5.5	3.8	.68
Nursing twins	110	-.22	5.1	3.7	.71
	130	-.22	5.5	4.0	.74
	155	-.22	6.0	4.3	.77

[a] Values adopted from the National Research Council for Sheep (6th Ed.).
[b] To convert dry matter to as-fed, divide dry matter values by DM%.

Table 4. Nutrient balance of three forage qualities for a 154 lb ewe throughout the production cycle[a].

	Forage Nutritive Value					
	Poor Quality		Moderate Quality		High Quality	
	TDN (%)	CP (%)	TDN (%)	CP (%)	TDN (%)	CP (%)
	45	6	52	10	65	15
Stage of Production	Nutrient Balance[b]					
Maintenance	0.51	-0.09	0.69	0.01	1.03	0.14
Flushing	-0.50	-0.12	-0.22	0.04	0.30	0.24
1st 15 wks gestation	-0.31	-0.10	-0.09	0.02	0.32	0.18
Last 4 wks						
(130-150% crop)	-0.50	-0.18	-0.22	-0.02	0.30	0.18
(180-225% crop)	-0.91	-0.22	-0.62	-0.05	-0.07	0.16
Lactation						
Nursing single	-1.13	-0.40	-0.74	-0.18	-0.02	0.10
Nursing twins	-1.21	-0.55	-0.78	-0.30	0.03	0.01

[a]Values from table 2.
[b]Nutrient balance = (intake * nutrient content) – requirement.

As discussed, the nutrient requirement of your flock will change throughout the production year. By taking the time to test your forages and separate hay based on forage quality, producers can more closely match the available nutrients to the changing needs of the flock. This can greatly reduce the need of additional supplement, decreasing the feed bill for producers.